R.R.S. DISCOVERY

CRUISE 74 - LEGS 1 AND 3

3-15 SEPTEMBER and 28 SEPTEMBER - 13 OCTOBER 1975

Oceanic tidal survey covering shelf edge south and west of Ireland and along $53\frac{1}{2}^{o}$ parallel to 30^{o} West Meridian

CRUISE REPORT NO 35

1975

Institute of Oceanographic Sciences
Bidston Observatory
Birkenhead

ITINERARY

Leg 1 :	Leave Southampton	3 Sep 1975
	Arrive Bantry Bay	15 Sep 1975
Leg 2 :	Leave Bantry Bay	15 Sep 1975
	Arrive Brest	26 Sep 1975

(See separate Cruise Report for Leg 2)

Leg 3 :	Leave Brest	28 Sep 1975
	Arrive Barry	13 Oct 1975

SCIENTIFIC PERSONNEL

		Legs	
J B Rae	IOS-B	1,3	(Pr.Scientist, Leg 1)
R Spencer	"	1,3	
B A Hughes	"	1,3	
A G Kerr	"	1,3	
A J Harrison	"	1	
G A Alcock	"	1	
G Ballard	"	1	
D E Cartwright	"	3	(Pr.Scientist, Leg 3)
R A Flather	"	3	
A Banascek	"	3	
D Grohmann	IOS-W	1,3	
I Waddington	"	1,3	
R Wallace *	"	1,3	
G Phillips	"	1	
W Strudwick *	"	3	
P Hartland *	IOS-Barry	1,3	
Miss D Jones *	"	1,3	
D Booth *	Univ.Galway	1,3	
J Chamberlain	NIO Burban	1	
Y Camus	SHOM Brest	1	

* Also on board for Leg 2

SHIP'S OFFICERS

M A Harding	Captain
E M Bowen	Chief Officer
T N Gray	2nd Officer
A Howse	3rd Officer

OBJECTIVES OF CRUISE

(a) To complete a programme of measurements started in 1970, of tidal pressure and currents along the edge of the continental shelf bordering the British Seas by a chain of four stations between Little Sole Bank and Valentia.

(b) To continue an oceanic circuit of tidal pressure measurements begun in 1974, by a line of stations along or near latitude 53°36'N from about 50 miles west of Inishbofin to the 30°W meridian.

(c) To obtain data on tidal currents on and off the continental shelf near Porcupine Bank, to see if they show any relationship to the unusual diurnal tidal regime near St. Kilda and Rockall Bank.

(d) To obtain a profile of currents at a site Z1 about 3100m deep, west of the Porcupine Bank shelf edge, to investigate the energy level of internal tides.

Data for both (c) and (d) were obtained along the 53°36' line mentioned in (b).

Numbers of moorings totalled 6 shallow pressure recorders comprising 4 Mark 1 (Pop-up) units and 2 Mark 2 (surface buoy and drag-line) units, 3 deep pressure recorders, 4 single current meter moorings (shallow) and one mooring (deep) with 6 current meters. This was the largest number of tidal recorders yet deployed by IOS in a single cruise.

In addition to the mooring operations, hydrographic (water bottle) stations were taken near Z1 on both Legs 1 and 3, and Echo Sounding and Magnetometer logs were maintained on passage between stations whenever convenient.

The itinerary of the cruise was planned to enable all the above moorings to be laid during Leg 1, left to record during Leg 2, and recovered during Leg 3. Bantry Bay and Brest were chosen as change-over points between the legs as they were conveniently sited for the purposes of both the tidal and geophysical (Leg 2) programmes.

NARRATIVE - LEG 1

The sea bed tidal pressure recorders which were deployed during this cruise were of three types, referred to as Mark 1, 2 and 3. These will be described together with the different pressure sensors used in a further section of this report. The mooring positions referred to are indicated in Figure 1 and Table 1.

The ship left Southampton at 0900 on 3 September (day 246). After lowering the electro-magnetic logs and deploying the echo-sounder fish a course was set for Hurd Deep to carry out tests on tide gauges and acoustic systems. These tests were completed satisfactorily by 2159 and the ship proceeded in fine weather at 10.5 knots, direction 260°, towards the first station C3.

Station C3 was reached at 2034 on 4 September (day 247) and an acoustic survey was made of the shelf edge to locate a suitable tide gauge lay position. A Mark 1 tide gauge was released at 2228 about 1 mile south of the nominal position in a depth of 193 metres. At 2254 course was set for a test site in deeper water, over the shelf edge, to carry out acoustic and submergence tests on tide gauges, acoustic release systems, and sub-surface buoys. The test site was reached by 0142 on 5 September and tests were completed by 0624 when a course of 337° was set towards station C4.

At C4 an acoustic survey of the shelf edge was started at 1134 and a Mark 2 tide gauge was deployed by 1306 about 1 mile north of the nominal position in 203 metres of water. A current meter mooring was released about 1 mile north of the tide gauge position at 1514. After obtaining a satellite position fix the station was completed by 1630 and a course of 007° was set towards C5. On completion of an acoustic survey over the shelf edge at C5 a Mark 2 tide gauge was released at 2335 at a suitable position about 3 miles west of the nominal position in 190 metres of water.

A further test station was started at 0259 on the following day (249) at position 50°17'N, 11°20'W with 1014 metres water depth. Two Mark 1 tide gauges and one Mark 2 tide gauge were tested using the after "A" frame and main winch. Two acoustic release systems were tested at 1000 metres using the forward hydro davit. Testing was completed by 0620 and the ship proceeded towards station C6.

A suitable mooring site was found by acoustic survey of the shelf edge very close to the nominal position for C6. By 1130 a Mark 2 tide gauge had been deployed in 172 metres of water. The current meter mooring was released at 1295 about 1 mile east of the tide gauge position, also in 172 metres of water. The station was completed by 1354 when the ship proceeded towards a test position at $52^{o}02'N$, $12^{o}25'W$ in 916 metres of water. This position was reached at 0019 on 7 September (day 250) and tests were completed on acoustic release units by 0104. Course was set at 022^{o} towards station C7.

The position of C7 is at the eastern end of a line of stations at latitude $53^{o}35'N$, extending out to longitude $30^{o}W$. A Mark 1 tide gauge was released at 1125 over a very flat plain in a depth of 187 metres. A current meter was released at 1210 about 1 mile northwest of the tide gauge position.

Continuing westward along the line of latitude, position C8 on Porcupine Bank was reached by 2212. The topography was still very flat and a Mark 1 tide gauge was released at 2224 in 289 metres of water. A current meter was released at 2312 about 1 mile northwest of the tide gauge in 280 metres. The ship continued in a westerly direction over the shelf edge towards station Z1.

The position of Z1 was reached the following day (251) at 0615 and preparations were made to carry out deep wire tests on acoustic systems and Mark 3 tide gauges. Tests were completed on the acoustic unit and two of the Mark 3 tide gauges before a fault developed on the main winch clutch and tests had to be suspended. At about this time an unidentified pinger was noted giving a very strong signal which switched off suddenly and was not heard again. The deep current meter mooring was about to be deployed at 1512 when two small buoys were sighted. These were investigated and proved to be drifting marker buoys, not related to the unidentified pinger. The deep, six current meter mooring was released at 1946 in 3118 metres of water about 1 mile west of the nominal position. Due to the worsening weather conditions the hydrocast at this position was postponed until the return journey, and the westerly course towards D5 was recommenced at 2028.

Station D5 was reached the following day (252) at 1942 where the nominal tide gauge position was found to be too deep for the pressure sensor calibrations. An acoustic survey was carried out to find a suitable site higher up a slight ridge about 3 miles north of the nominal position. A Mark 3 tide gauge was released at 2056 in 2045 metres of water. By 2130 after the gauge had reached the sea bed and the command pinger had been switched off, the westerly course was continued towards D6. The faulty winch clutch had now been repaired and at 1006 on the next day (253) the ship hove to at 22°19'W to complete the deep wire tests on a Mark 3 tide gauge. About 30 small pilot whales were cruising round the ship during the tests, which were completed by 1355. During the night the westerly journey continued in worsening conditions. The wind increased to force 8 and there was a heavy swell causing excessive pitching, so that speed had to be reduced to about 4 knots.

On arrival at station D6 the following morning (day 254) at 0648, the wind was backing to the south and improving. An acoustic survey was started and a suitable position was found about 6 miles south west of the nominal position in 3508 metres of water. A Mark 3 tide gauge was released at 0648 and reached the sea bed at 0744. The command pinger was switched off and at 0756 course was set for D7.

The following morning (day 255) at 0408 the longitude of 30°W was achieved at position D7. Again the nominal position was not of a suitable depth for the pressure sensor calibrations and an acoustic survey was commenced to find a more appropriate site in deeper water about 4 miles to the north. A Mark 3 tide gauge was released at 0511, in water depth 3287 metres, and reached the sea bed at 0604. The command pinger was switched off at 0613 and the ship proceeded in an easterly direction towards station Z1. A position about 10 miles south west of the deep current meter mooring was reached on 14 September (day 257) at 1100 and a twelve bottle hydrocast was completed by 1407.

A course was set for Bantry Bay where the ship anchored at 1318 on 15 September (day 258). The scientific personnel were exchanged by the ship's and agent's boats in preparation for leg 2.

NARRATIVE - LEG 3

Leg 2, described in a separate Cruise Report by D G Roberts, the Principal Scientist for that Leg, brought 'Discovery' to Brest on 26 Sept, where the ship had 2 days for watering, laundry, etc. Exchange of scientific staff took place during the 27th, and the ship sailed at 1100 (French Time) on the 28th.

Three engines were used on the run to the first mooring C3, in order to reach it by early morning for daylight recovery. The Magnetometer was launched south of Ouessant, and routine PES/Mag watches were started at 1500 Z, partly at the request of D G Roberts. These watches were maintained during most of the cruise, except on a few occasions where the ship was severely slowed down by bad weather, or when the time taken to launch and recover the magnetometer would have unduly restricted daylight time on a late afternoon arrival at a mooring. Details are given in the logging report.

The computer typewriter in the 'Plot' was found to be U/S, and was replaced by the typewriter from the Chart Room area during the first three days, while P. Hartland repaired the faulty machine. During this time the Bridge had to get satellite fixes from the 'Plot'.

C3 was at first approached by its Decca fix, which proved to be about 10 miles out. On reaching its Sat. fix position, about 0950/29, the Command Pinger of the tide gauge was soon switched on, but tracking the exact position, using PES fish, tadpole and towed hydrophones, was hampered by a sluggish Release pinger, and excessive noise from porpoises (a nuisance not previously encountered). The release was finally fired at 1245, and the capsule brought inboard by 1335.

C4 was reached by 2050/29, and since the lights on both surface buoys of the Mark 2 mooring were clearly visible, an attempt was made immediately to recover the mooring, from the Dan Buoy end. A heavy swell and considerable current made the hauling of the taut wires by crane a very hazardous operation, and it was finally abandoned at 2250. Lay-to for the night.

The current meter mooring at C4 was recovered without difficulty by 0920/30, and with the sea conditions somewhat improved, another attempt was made to haul in the Mark 2 tide recorder, this time from the Selco Buoy, since the Dan Buoy had been damaged in the previous operation. This proved easier, and the mooring was brought inboard without mishap by 1135.

The Mark 1 tide recorder at C5 was located some six hours later, and recovered by 1835.

C6 current meter position was reached 0120/1 October, when the ship lay-to until daylight. This mooring was recovered by 0715. Recovery of the second Mark 2 tide gauge was then achieved by the same means as the first, by hauling the Selco Buoy, since the Dan Buoy from this mooring had disappeared. There were no problems, and the instrument was inboard by 0925. A severed wire from the Dan Buoy showed that this had probably been damaged by a fishing boat.

Both Mark 2 tide gauges were checked to be still recording properly on board, but the spheres were not opened during the cruise. All Marks 1 and 3 recorders were opened soon after recovery, and their tapes translated, edited and plotted during the course of the cruise, thus saving considerable time in the home laboratory.

The Mark 1 capsule from C7, the eastern-most site on the $53^{o}36'$ line, had been reported washed up on a beach near Belmullet before Leg 3 started. (It was later found to have about $8\frac{1}{2}$ days' good record, after which it must have been fouled by a trawler). On searching for the current-meter mooring at C7 on 2 October, it was soon evident that this also must have been carried away. 12 hours were spent transmitting at both frequencies on the tadpole, while the ship steamed at about 6 knots on a box pattern up to 3 miles from the (well fixed) lay position. No sign of a pinger was heard, and the search was abandoned at 1810/2.

The last shallow position, C8, was reached 0630/3. The Release pinger of the current-meter mooring was soon switched on, but despite very close approach, evidenced by the strength of the signal, it failed to fire the release bolts. This was a new

design of pinger, which gave no acoustic indication of actual release, so some care was taken with a visual search for the s/s buoy on the surface. Seeing conditions were fair, so by 0805 it was possible to be assured that it had not surfaced; the pinger was switched off and the mooring left until a more suitable time for dragging. However, the acoustic system was obviously unsatisfactory in its lack of a release indication, and a request will be made to IOS-W for a modification to the design. The Mark 1 tide recorder at C8 was recovered inboard by 0940, despite Force 8 winds. After another test of the current-meter acoustics, with the same result as before, the ship left the site at 1130/3.

Most of 3, 4 and 5 October were spent battling westwards against gale force westerly winds, with speed occasionally reduced as low as 2 knots. The deep current-meter mooring Z1 was passed without attempt at recovery, because bringing in some 2500 metres of wire would have been highly hazardous in the prevailing weather conditions. Abatement of winds on the 5th enabled the speed to increase somewhat, and position D5 was reached by 1800/5 in Force 5. The Mark 3 tide recorder was soon released from the bottom, and was approached slowly by acoustic tracking during its hour rise-time. It was sighted easily by means of its OAR flashing light in falling dusk at 1910, and was brought inboard by 1930.

From 6 October, the weather remained moderate or calm to the end of the cruise, and was no longer a limiting factor in any of the operations. The second deep tidal site D6 was reached at 1800/6, and was soon released from the bottom. There was some difficulty in following its progress owing to weak signals from the pinger and even weaker bottom echoes, and a satellite fix at 2005 altered the ship's apparent position by 2 miles, but finally the OAR light was seen within half a mile of the ship, and the capsule was brought inboard by 2050.

The last deep site D7, about 30^{o} West, was reached about 1730/7. There were three possible interpretations of the lay position depending on three different satellite fixes at the time of laying. All were tried, although only one gave the correct depth, but there was no acoustic response at either. The ship was then taken on a

search pattern at 6 knots, spanning the whole area of the three 'positions' with a mile radius, while all four acoustic frequencies were transmitted at high power. This continued until 0110/7. Then an attempt was made to define the lay of the 1760 fm contour (the correct depth), and it was found to be well covered by the search pattern. After some final transmissions, and frequent visual searching for a surface light, the search was abandoned at 0400/7. It is assumed that the capsule either flooded or else released itself at some earlier date. Course was then set back to the east, to recover the moorings at Z1 and C8.

The deep current meter mooring Z1 was reached at 0630/10, the release was quickly fired, and the whole mooring was inboard by 1000. A hydrocast of 12 bottles was then made, as in Leg 1, and was completed by 1230.

Three engines were used to reach C8 in daylight, in case of a normal acoustic release of the current-meter mooring which failed on 3 October. Renewed acoustic transmissions were made to the C8 release system, whose pinger was easily switched on again, between 1720 and 1840/10. Longer bursts of continuous transmission were used, and a close watch kept on the surface. By 1845 it was too dark to detect a surface buoy (unlighted), so the acoustics were switched off and a dan buoy launched as a marker for dragging. The first drag consisted of a loop round the dan, 1 cable radius, paying out 2200 m of warp from the starboard side-drum of the main winch - instructions had been received from Wormley not to use the main trawl warp for dragging. Two 'Gifford' grapnels were used. This drag, completed 2200/10, evidently missed the mooring, being more than a cable from the dan buoy, which was itself caught by the drag wire. The dan was re-laid at 2250, and a precise acoustic survey made to locate the pinger position. A small triangular area was identified as the best estimate, and a drag operation over this area was started 0050/11. By 0258 there were definite signs that the pinger had lifted from the bottom, and the whole mooring complete with anchor chain was brought inboard by 0405. The dragline had caught on the underside of the pinger itself, causing severe chafing, but the main components of the mooring were otherwise undamaged.

At 0420/11 the ship started a SE course towards Fastnet and thence to Barry. Owing to a misunderstanding, the magnetometer was not launched until 0800, but P.E.S./mag. watches were then maintained until the end of the 11th, off the Kerry coast. Magnetometer and P.E.S. 'Fish' were hauled in about 0915/12, and 'Discovery' proceeded uneventfully across the Celtic Sea to reach Barry Docks by 1030Z/13 October.

TIDAL PRESSURE RECORDERS

The sea bed tidal pressure recorders deployed during the cruise were of three types, Mark 1 and 2 for continental shelf measurements, and Mark 3 for deep sea measurements. In all of these instruments a number of different pressure and temperature sensors provide frequency modulated inputs to data loggers in which the input signals are integrated and recorded every 15 minutes. The Mark 1 and Mark 3 tide gauges free fall onto the sea bed with a ballast frame and recovery is by release of the weight using a modulated acoustic signal. The Mark 2 gauges are deployed in a heavy steel protective frame with a "U" shaped wire rope mooring and two surface buoys.

Mark 1 tide gauges were deployed at positions C3, 5, 7 and 8, each having two pressure sensors and one main temperature sensor. The gauges at C3 and C5 each had one strain gauge and one FM head, and those at C7 and C8 had two strain gauge sensors. The position of C8 on Porcupine Bank was in a depth of 289 metres and a GRP sphere was used. The Mark 1 gauges have a command and release acoustic system, using magnetostrictive scrolls and a double acting pyro-release unit. A surface pinger and flashing light are also incorporated to assist recovery. Three days before the start of the recovery leg (day 268) the Mark 1 tide gauge deployed at C7 was reported to have been recovered from the beach at Blacksod Bay on the west coast of Ireland. This gauge was found to be in good condition and 8 days of good tidal data was recovered. Marks on the frame indicate that a trawl wire was responsible for its premature release. It is significant that no trace was found of the current meter mooring deployed at C7, about 1 mile from the tide gauge, during an extensive acoustic search of the area. The Mark 1 tide gauges at C3, 5 and 8 were recovered without difficulty although excessive porpoise noise at C3 made acoustic location difficult.

At positions C4 and C6 Mark 2 tide gauges were deployed. The gauge at C4 was equipped with three pressure sensors, one OAR vibrating wire, one Vibrotron and one strain gauge. Each of these self contained sensor packs included temperature sensors. The

Mark 2 gauge at C6 was also used as part of a sensor evaluation programme. It contained four different pressure sensor packs, each with a temperature sensor, and also a self contained Aanderaa water level gauge which was being evaluated on the same frame. The pressure sensors were an OAR vibrating wire, a Vibrotron, a strain gauge and a Digiquartz. Both of these tide gauges had self contained acoustic command systems using magnetostrictive scrolls, and were deployed with Selco pillar and dan surface buoys, both with flashing lights and radar reflectors. These gauges were both successfully recovered by hauling in from the Selco buoy end of the mooring. Normally recovery is from the dan buoy end but this was found to be difficult at C4 due to a heavy swell, and at C6 the dan buoy was missing.

In the deep sea positions D5, 6 and 7 Mark 3 tide gauges were deployed. Again each of these had two pressure and two temperature sensors. The pressure sensors were all of the strain gauge type except at D6 where a Hewlett Packard Quartz Crystal Oceanographic Pressure Sensor was used. Each gauge contained two separate command and release acoustic systems with magnetostrictive scrolls and double pyro-release units. The gauges also contained OAR flashing lights to aid recovery in poor visibility. These lights were very useful during recovery of the gauges at D5 and D6 which both took place during the evening in poor sea conditions. Unfortunately no trace of the Mark 3 gauge at D7 could be found during an extensive acoustic search of the area. It is unlikely that all of the independent acoustic systems could have failed and it is assumed that the gauge has either pre-released or the pressure sphere has developed a leak.

Preliminary analysis of the recorded data indicates correct operation of all of the sensors and data recorders, apart from a fault which developed on the strain gauge deployed at D6 and a strain gauge deployed at C4 which developed a slight leak.

CURRENT METER MOORINGS

Leg 1 - Four taut wire current meter moorings were laid at positions C4, C6, C7 and C8 adjacent to shallow water tide gauges. Each mooring contained a single current meter set at 25 metres from the sea bed, all moorings were deployed using the IOS MkII command-release system. Sub-surface buoyancy for the shallow moorings was provided by IOS 32 inch diameter spun steel spheres, pretested to a depth of 200 metres.

A fifth mooring Z1 was set in a depth of 3118 metres, and contained 6 current meters. To prevent excessive vertical scope of the 48 inch diameter sub-surface buoy, three pairs of 16 inch glass spheres were used to support the lower part of the mooring.

All the moorings were laid from the foredeck using the double barrel warping capstan. During the lay operation the wire snagged several times on the reeling winch, on each occasion the fail-safe shear pin device on the horizontal sheeve operated, preventing wire breakage, and possible loss of the mooring.

Leg 3 - The moorings at positions C4 and C6 were recovered without problem. The mooring at position C7 was not located - see Narrative.

The mooring at position C8 was located and acoustically switched to the release mode, parting did not occur, and the mooring was recovered by dragging. Subsequent tests of the MkII release system showed no electronic or mechanical faults.

The deep mooring at position Z1 was recovered. The two top current meters showed signs of damage from trawling, but were still in working order. The 6mm diameter 'KILINDO' wire immediately above the glass buoyancy spheres was badly birdcaged. Possible causes of this damage, are rotation of the off-set glass buoyancy spheres, overshoot on lay, or energy release on recovery.

PRECISION ECHO SOUNDING AND MAGNETIC RECORDS

During the cruise precision echo soundings and magnetometer measurements were recorded and logged continuously between stations.

The Mark III precision echo sounder was set up to give six minute time marks. Uncorrected depths were noted at each time mark and the Mufax record annotated accordingly. These data were manually entered into the computer for correction and storage. Each day the stored depth values were checked against the log book and the Mufax record was checked and filed.

During Leg 1 records were started between Hurd Deep and station C3, at $7^{o}37'W$, and continued between stations until after station Z1, at $12^{o}53'W$, before arrival at Bantry Bay. On Leg 3 records were started just off Brest and again continued between stations until $10^{o}30'W$ on the return from station C8 to Barry.

Magnetic records were taken using the Varian V-75 proton magnetometer with automatic logging into the computer. Every hour the magnetometer was calibrated and the chart recorder annotated with time and total magnetic field reading. Periodically the recorder values were compared with the computer output.

On Leg 1 the magnetometer was streamed between stations, starting after station C4, and records continued until after station Z1, at $12^{o}53'W$. During Leg 3 records were started after departure from Brest and continued with interruptions between stations Z1 and D5, and Z1 and C8, until the magnetometer was recovered at $9^{o}18'W$ on the return to Barry.

NAVIGATIONAL AIDS

The most important navigational aspect of this cruise was the requirement to return to a mooring position with a maximum error of 0.5 mile. This implies a navigational accuracy of 0.25 mile. Having approached within 0.5 mile of the mooring, the acoustic command pinger can be turned on for more accurate location before the mooring is released. The acoustic re-location system is most important when the mooring has to be recovered in poor sea conditions, at night, or if the mooring has to be dragged for some reason.

Primary position fixing was by obtaining satellite fixes as close as possible to the time of deployment of a mooring. The computer dead reckoning and live plot display were very useful during topographical surveys of the mooring positions and in approaching a mooring position for recovery. However, allowance had to be made when the over-ground velocity was significantly different to that through the water. It was found desirable to plot and annotate positions so that the dead reckoning course could be compared with course corrected positions. The table of moorings shows that the lay and recovery positions of moorings obtained from satellite fixes close to the lay and recovery times agree to within 0.5 mile.

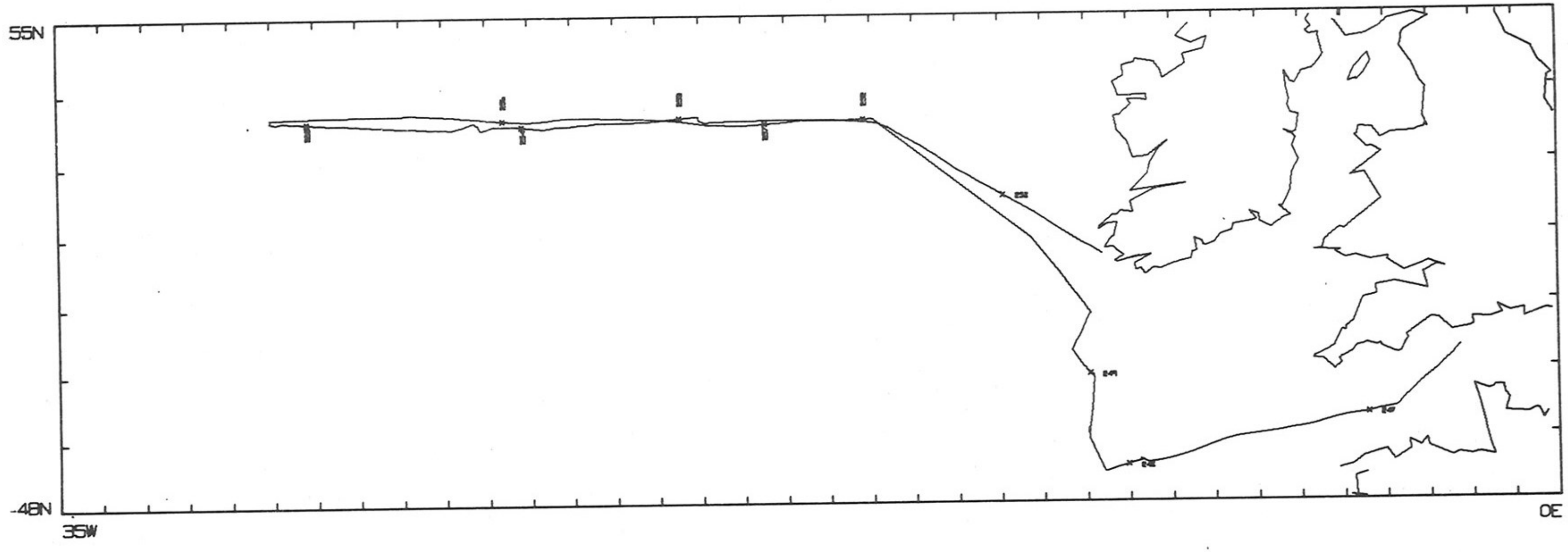
It was hoped that the satellite navigation system could be backed up by Decca Navigator for the continental shelf moorings and by Loran C for the deeper moorings. The shelf edge moorings C3, 4, 5 and 6 were marginal both for the S W British and the Irish Decca chains. Decca fixes were found to be unreliable and not to the required accuracy. Moorings at C7 and C8 were adequately covered by the Irish Chain but both were deployed during the evening when unreliable results are to be expected. The deep moorings were also marginal with respect to Loran C coverage but with care some good results were obtained, comparable in accuracy to the satellite system.

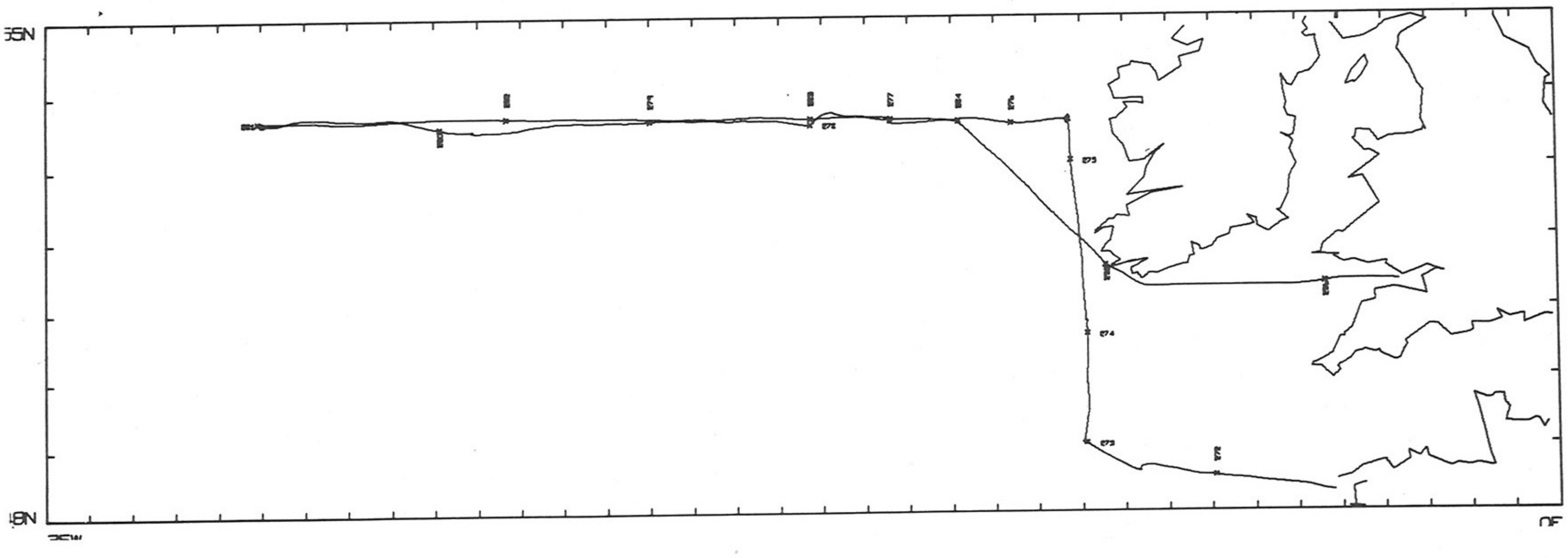
The use of precision pingers in the acoustic command units made it possible to determine the abeam position of a mooring using only one overside transducer. Two abeam positions enabled the mooring to be fixed with reasonable accuracy. This procedure was

used particularly effectively during the recovery of the current meter mooring which did not release at C8. Here a dan buoy was moored and the position of the current meter command pinger was determined relative to the radar range and bearing of the dan. By then navigating relative to the dan buoy the current meter line was encircled by a grappling line and the mooring recovered.

STN. NO.	IOS(B) DESIG-NATION	MOORING TYPE	DEPTH (m)	DATE		TIME/DAY NO.		POSITION		COMMENTS
				LAY	RCVY	LAY	RECOVERY	LAT.(N)	LONG.(W)	
8896	C3	T/G.Mk1	198	4 SEP	29 SEP	2228/247	1335/272	48°37.14 48°37.00	09°41.85 09°41.50	
8897	C4	T/G.Mk2	203	5 SEP	30 SEP	1250/248	1123/273	49°01.62 49°01.52	10°58.28 10°57.90	
		C/M	187	5 SEP	30 SEP	1514/248	0916/273	49°02.11 49°02.65	10°58.94 10°57.71	
8898	C5	T/G.Mk1	190	5 SEP	30 SEP	2335/248	1832/273	49°54.38 49°54.52	10°52.90 10°53.45	
8899	C6	T/G.Mk2	172	6 SEP	1 OCT	1130/249	0912/274	50°49.11 50°48.57	10°55.15 10°55.08	Dan Buoy missing
		C/M	172	6 SEP	1 OCT	1259/249	0700/274	50°49.33 50°49.00	10°53.32 10°53.44	
8900	C7	T/G.Mk1	187	7 SEP	28 SEP	1125/250		53°36.46	11°18.21	Beached at Blacksod Bay
		C/M	187	7 SEP		1210/250		53°37.08	11°17.26	No trace found
8901	C8	T/G.Mk1	289	7 SEP	3 OCT	2224/250	0936/276	53°35.51 53°35.39	13°50.84 13°51.32	
		C/M	280	7 SEP	11 OCT	2312/250	0258/284	53°36.13 53°35.70	13°50.28 13°50.38	Release did not operate
8902	Z1	C/M	3118	8 SEP	10 OCT	1946/251	0800/283	53°35.74 53°35.62	15°27.63 15°35.62	Top meter dmgd.
8903	D5	T/G.Mk3	2045	9 SEP	5 OCT	2056/252	1930/278	53°38.85 53°39.05	20°00.30 20°00.19	
8904	D6	T/G.Mk3	3508	11 SEP	6 OCT	0744/254	2030/279	53°30.60 53°30.99	25°05.66 25°05.97	
8905	D7	T/G.Mk3	3287	12 SEP		0511/255		53°39.70	30°00.70	No trace found

TABLE OF MOORINGS


55N
-48N
35W
0E


E73
E74
E75

APPENDIX

LEGS 1 & 3

As these legs were devoted to the deployment and recovery of tide gauges, accurate navigation was of great importance. Therefore, each day, a satellite prediction list was obtained so that any satellites which were obviously of no use could be turned out, and also that the number of rejected satellites due to course and speed changes could be reduced. To aid in navigation, both Decca and Loran 'c' fixes were input to the computer, whenever we were on station. Unfortunately, the corrections for the fixes were not recorded anywhere, so the Decca and Loran fixes were nowhere near the track. During each station, a live-track chart was displayed on the V.D.U. and once the station was completed a large scale track chart, annotated with satellite, Decca and Loran fixes was plotted.

Each day, the normal data processing continued. A listing of the previous days depths was printed and checked against the output from the P.E.S. Any corrections were re-entered and stored. A new program (DALEK) written by William Strudwick draws a small scale track chart, showing the entire track covered in the previous day.

During the cruise, William also wrote and tested new data editing programs. The data spikes correlated well with the spikes in the 1800 Reference Voltage, so this was used as a guide in deciding which times were edited. These programs were used during the greater part of the cruise.

The translated output from the tide gauges was checked and plotted during the third leg, again using programs written by William.

Unfortunately, the cruise was not without its accidents. At the end of the first leg an operator mix up caused the loss of some data. Also throughout the cruise the plot and Bridge printers gave trouble, ending in the complete jamming of the plot printer. This was dismantled and refurbished, and gave no further

trouble. While it was not in use, the bridge printer was moved to the plot, the satellite information was taken to the bridge as it came in. The A.N.T. also gave trouble but when it was exchanged for the one in the computer room, the problems cleared up.

Apart from this, the computer worked very well.

D. Jones

APPENDIX

LEG 2 - COMPUTER ENGINEERING REPORT

On previous cruises problems of an intermittent nature have occurred in the digital clock interface. These faults occurred again at the start of Leg 2 causing the computer to switch from external to internal clock numerous times, with the subsequent timing errors. Examination of the clock data, input to the computer showed intermittent latch up of certain bits, and these were finally isolated to be caused by a faulty Bistable I.C. which was replaced.

The plot typewriter was found to hang up on 'tab' operations, caused by missing interupts. The tab feedback contacts were replaced with a new set but IBM timing information was lacking, hence the problem still persists.

On one occasion the system crashed and a disk read/write error was suspected as the system would then not cold start. Examination of the disk heads showed that they were still in good condition, but the engineering disk diagnostics showed up 2 read errors from the first sector of the test disk. As down time was now becoming a problem it was decided to try a cold start to get the sampling back. This proved successful. CONCLUSION :- System crashed due to reason unknown (but possible disk error) and cold start would then not work due to disk head not in the home position.

The third problem was complete failure of the plot ANT. This was caused by a blown transistor on the CRT driver card which was causing the 26 volt supply to short to ground. The transistor was replaced restoring the display, but we could still not use the ANT as it caused the system to hang up. Various methods were tried, and finally the Camac diagnostics were ran. A Camac read error of an intermittent nature was found. Camac interface was changed and the test now ran satisfactorily.

A circuit was built to detect radio interference on the computer's analogue inputs to see if it could be used directly or indirectly to inhibit sampling during radio transmissions.

This is still being developed.

The documentation to the digital patchboard was rewritten in the hope of causing less confusion than the previous version did.