

**I.O.S.**

**RRS SHACKLETON  
RRS CHALLENGER**

**CRUISE 7/79 : 3-15 AUGUST 1979**

**CRUISE 14/79 : 21 SEPTEMBER - 2 OCTOBER 1979**

**NORTH CHANNEL/MALIN SHELF SEA**

**CRUISE REPORT NO 97**

**1980**

**NATURAL ENVIRONMENT  
INSTITUTE OF OCEANOGRAPHIC SCIENCES  
RESEARCH COUNCIL**

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RRS SHACKLETON CRUISE 7/79 : 3-15 August 1979  
RRS CHALLENGER CRUISE 14/79 : 21 September -  
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North Channel/Malin Shelf sea

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Institute of Oceanographic Sciences,  
Bidston Observatory,  
Birkenhead,  
Merseyside, L43 7RA.



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Note: All times are in GMT

DIRECTION

RRS Shackleton 7/79 - Deployment:

Sailed from Barry at 1200	3 August 1979
Arrived at Barry at 1200	15 August 1979

RRS Challenger 14/79 - Recovery

Sailed from Ardrossan at 0900	21 September 1979
Arrived at Ardrossan at 1230	2 October 1979

SCIENTIFIC STAFF

Deployment Leg

G. A. Alcock  
 J. J. Bolton  
 V. L. Doodson  
 D. Flatt  
 P. R. Foden  
 M. J. Howarth (Principal Scientist)  
 A. G. Kerr  
 D. L. Leighton  
 J. Mackinnon  
 R. I. R. Palin  
 J. E. Tranter

Recovery Leg

G. Ballard  
 A. D. Banaszek  
 B. A. Duff  
 A. J. Harrison (Principal Scientist)  
 A. G. Kerr  
 D. L. Leighton  
 R. I. R. Palin

## SHIPS' OFFICERS

Deployment leg  
RRS Shackleton

S. D. Mayl	Master
A. L. Moore	Chief Officer
P. T. Oldfield	Second Officer
G. P. Harries	Third Officer
C. S. Storrier	Chief Engineer
G. M. Batten	Second Engineer
J. Landry	Third Engineer
P. March	Fourth Engineer
F. P. Sharpe	Electrical Engineer
D. Scott	Radio Officer

Recovery leg  
RRS Challenger

P. Maw	Master
P. Coombs	Chief Officer
S. Sykes	Second Officer
P. Pepler	Third Officer
R. Anderson	Chief Engineer
C. Harman	Second Engineer
J. Landry	Third Engineer
D. Hornsby	Fourth Engineer



## SCIENTIFIC OBJECTIVES

The objectives of the cruises were to moor in the sea for 45 days 12 current meter or bottom pressure recorder rigs at positions shown in Table 1 and Figure 1 and to execute a density survey of the area bounded in the south by the North channel, on the west by  $8^{\circ}W$ , on the north by  $56^{\circ} 15' N$  and by the coasts of Ireland and Scotland (see also Figure 2 and Table 2).

The information was required for studies of

1. The semi-diurnal amphidrome between Islay, the Mull of Kintyre and the Antrim coasts - current meter and sea bed pressure rigs at B, D, E and coastal tide gauges installed for a year from July 1979 at Port Ellen, Macrihanish and Torr Head.
2. The non-tidal dynamics of the North Channel - current meter rigs at A, B, C, D, E, F, G and I and the density survey.
3. The tidal regime at the shelf edge- sea bed pressure rigs at J, K and L. Rig J filled a gap in IOS measurements round the shelf edge of the British Isles. Rigs K and L were for sensor evaluation. Data from all three would help to determine the behaviour of the diurnal tides which is complex there.
4. Comparisons between VACM and Aanderaa current meters - at rigs C, F and G - and comparisons between the voltages recorded on a telephone cable across the North channel and the currents (tidal and low frequency) recorded at rigs A, B and C.

## NARRATIVE - Deployment leg

The plan was to deploy 7 'u' shaped current meter rigs, Figure 7, (one including a pressure recorder), 1 'u' shaped bottom mounted tide gauge / current meter rig, Figure 8, 4 pop up rigs and 2 marker toroids with 'Lensret' radar reflectors. The current meter rigs were all deployed sub-surface buoy first and surface buoy last, the bottom mounted tide gauge/current meter surface buoy first. Each rig was fitted with a command pinger or acoustic release and the acoustics were tested at their operational depth before the rig was deployed. A CTD profile was taken close to each station after deployment. A calibration sample for the CTD was taken approximately every third profile using a reversing water bottle.

RRS Shackleton sailed from Barry at 12.00 on Friday 3 August 1979 heading for station B via the St. George's Channel and the Irish Sea, see Figures 3 and 4 for cruise tracks. At 08.00 on 4 August the pump was deployed overside and surface sampling of sea water conductivity and temperature began at 11.15. A brief CTD survey of the southern portion of the North Channel (CTD profiles 1-13) was started at 14.00 and finished at 06.00 5 August. Rig B was deployed by 10.15, rig C by 14.50 and rig A by 19.40. At rig A the command pinger went into the release mode after deployment and refused to switch off. It was decided to leave it and re-deploy the rig later, if time allowed.

CTD profiles 17-22 were recorded on the way to station D. The ship hove to at 02.40 on 6 August because wind force 9 was forecast but was able to proceed at 05.45. Deployment of the three rigs at D - a bottom mounted current meter/tide gauge, a current meter rig and a toroidal marker was complete by 15.30. The site was well

protected from the winds and the sea calm. At E a bottom frame containing two pressure recorders formed the base for a current meter rig. At the first attempt to launch the rig the heavy base plate broke free from the rig as a light swell filled it. The second attempt was successful at 21.00.

During the night CTD profiles 25-34 were recorded. Rig I was deployed by 10.15 on 7 August, two rigs at station G - a current meter rig and a toroidal marker buoy - by 15.54 and rig F by 21.00. Course was set for station J and CTD profiles 38 and 39 recorded on the way.

Before the deployment of each of the next three rigs the acoustics were tested at their operational depth, the tide gauge frames were float tested and a depth survey of each site conducted. The first attempt to deploy the gauge at J failed at 10.54 on 8 August when the tide gauge frame hit the side of the ship as the ship rolled and the pyro release triggered. The second attempt was successful at 12.28. A back-up CTD probe had been borrowed from R.V.S. Barry and was tested. Since the probe was too light for the wire and pulley arrangement the wire tangled on the winch drum and broke. The probe was pulled in by hand. A course was set for K without completing the CTD profile at J. The tangle was sorted out but now the probe did not work. It transpired that the temperature sensor unit had leaked. The IOS Bidston probe was re-attached to the wire and used for the rest of the cruise.

Rig K was successfully deployed at 20.40.

Rig L was successfully deployed at 11.19 on 9 August. Station J was re-occupied at 17.00 to record CTD profile 43. CTD profiles 44-59 were recorded in the N.W. Approaches finishing at

station I at 20.25 on 10 August. Here the pellet floats marking the sub-surface buoy were observed to be close by the surface buoy. The rig was recovered tangled, the spindles of both meters were bent and scored by wire - the damage probably occurred during the recovery, and some of the meter wire was damaged. CTD profiles 60-65 recorded during the night. Rig I was successfully deployed by 09.15 on 11 August. The shore based tide gauge at Port Ellen was visited at 14.30 and found to be working satisfactorily.

The rigs at stations G and F were checked and CTD profiles 66-78 recorded, arriving at station D at 11.00 on 12 August. The current meter rig and toroid were found, but the surface buoy for the current meter/tide gauge made a fleeting appearance before being dragged under by the current. Near slack water the rig was recovered and re-deployed in shallower water by 15.30.

CTD profiles 80-87 were obtained during the night and rigs B and C checked. Rig A was recovered by 9.17 on 13 August and re-deployed with new acoustics by 10.40. Rig C was checked in daylight and CTD profiles 89-98 recorded between the coasts of the Isle of Man and Eire up to 13.00 on 14 August. The wind was strengthening and force 10 was forecast so the CTD survey was curtailed by 3 profiles, surface monitoring was stopped and the ship headed for Barry, where it docked at 12.00 on 15 August.

The weather had been good, with 3 hours lost on 6 August and a storm on the way back to Barry. The winds were mainly light and the sea slight. There was plenty of rain and at times visibility was poor. All the rigs had been successfully deployed and checked, 98 CTD profiles and 1800 miles of surface conductivity and temperature recorded and 2280 miles steamed.

## NARRATIVE-Recovery Leg

RRS Challenger sailed from Ardrossan at 09.00hrs on Friday 21 September 1979 after a delay of 24 Hrs due to bad weather, to recover 12 moorings which had been previously deployed from RRS Shackleton cruise 7/79 (see fig 1, Table 1-3) and to carry out a CTD and surface water sampling survey (see Table 2).

The first mooring at C was located on position at 14-23 Hrs and CTD profile No. 309 was carried out at 14-45 Hrs. (see Fig 5). After waiting some time for the wind to moderate attempts were made to recover the mooring but this was not possible due to the strong tidal currents at this site and a wind of 25-30 Knots, so at 18-00 Hrs the recovery was abandoned until conditions improved. The ship left station C at 20-20 Hrs and a CTD section was carried out across the North Channel in a westerly direction along  $56^{\circ}40'N$  with profile No. 310 to 316 arriving at station A at 03-40 Hrs the following morning, Saturday 22 September, to find the mooring on position. CTD profile No. 317 was taken at 03-50 Hrs then recovery of the mooring started at 06-30 Hrs and was successfully completed by 07-21 when the ship left and headed for station B carrying out CTD profile No. 318 on the way. At station B the surface buoy was located on position so recovery of the mooring started at 09-29 Hrs and continued until 10-22 Hrs when 3 current meters and 1 TG had been successfully recovered although the rotor from CM 2576 was missing and the TG frame showed signs of having been on its side. CTD profile No. 319 was taken at 10-30 Hrs then the ship left station B and headed for station C which was eventually re-occupied at 13-25 Hrs. after carrying out CTD profile No. 320 on route.

Recovery of the mooring started at 13-43 Hrs and was successfully completed by 14-17 Hrs, then CTD profile No. 321 was taken at 14-35 Hrs and the ship left station C and headed for station D with CTD profiles No. 322 to 333 being taken on route.

At 05-00 Hrs Sunday 23 September station D was occupied and CTD profile No. 334 was carried out. All the surface buoy and pellet floats marking the two moorings at this site were visible. The new radar reflector mounted on one of the surface buoys was monitored on the ship's radar at a distance of 4 miles. Recovery of the first mooring at this station, the CM/TG, started at 06-26 Hrs by grappelling the pellet floats marking the instrument (see Fig 8) but the polypropelene line parted just above the instrument frame where it had frayed, as it took up the load. However, the recovery continued from the surface buoy end of the mooring until the CM/TG was on board at 08-42 Hrs. The rotor and direction vane were both fouled by seaweed and the frame was damaged during recovery. A temporary TG mooring was deployed at this site for a few days and this operation was completed at 09-35 Hrs. Recovery of the second mooring at this station, the CM rig, started at 10-09 Hrs and was successfully completed by 10-39 Hrs, then the ship headed for station E taking CTD profiles No. 335 and 336 on route.

At station E the pinger on the pop-up combined CM and TG mooring was located, the release was operated without difficulty and all the instruments were recovered on position and in good condition. CTD profile No. 337 taken at 15-55 Hrs completed the work at station E and the ship left this position and headed for station G taking CTD profiles No. 338 and 339 on route and arriving at 19-20 Hrs.

But on arrival there was no sign of the surface buoys and no response from the pinger so a course was set for station I along a CTD section to the west of stations G & I, taking profiles 340 to 347, and arriving at station I at first light on Monday 24 September. On arrival at station I nothing was sighted, however, after an acoustic search the pinger was located and dragging across the ground line position started at 09-48 Hrs, but after 2 Hrs the attempt was abandoned as the weather conditions steadily deteriorated and the ship was forced to run for shelter off the Northern Ireland coast.

A south-westerly gale persisted throughout Tuesday 25 September and it was not until 02-00 Hrs on Wednesday 26 September that the ship was able to leave the shelter of the coast and proceed to station F which was eventually occupied at 05-30 Hrs. CTD profile No. 348 was carried out at 07-00 Hrs then recovery of the CM mooring, which was still on position, started at 08-00 Hrs and was successfully completed by 08-25 with the recovery of all three instruments although the middle one was tangled with the meter wire. The ship left this station at 08-28 Hr and headed for station J which was occupied at 03-00 Hrs. the following morning, Thursday 27 September. The pop-up TG was located on position, the release operated at 06-24 Hrs and the recovery completed by 06-37 Hrs with the instrument in good condition. CTD cast No. 349 was taken at 06-44 then the ship left station J and moved to station K and L where the deep sea TGs at both stations were located and recovered without difficulty at 13-00 Hrs and 17-23 Hrs respectively.

With the favourable weather conditions maintaining the ship moved directly to station G and arrived at 09-25 Hrs on Friday 28 September. The command pinger was switched on almost immediately and shortly after the pellet floats marking the sub-surface buoy were sighted on position. Dragging across the ground line position started at 09-58 Hrs but it took several runs before the meter wire (see Fig 7) was eventually grappled and the mooring brought inboard at 12-27 Hrs. The surface buoy, its mooring line and shackle were all missing from its anchor weight and the spindle of the bottom CM was bent during recovery. At this point in the cruise the overside pump was deployed for the first time and sampling of sea surface temperature and conductivity every 3 min started at 12-39 Hrs, then the ship left this station and moved to station I, arriving at 16-00 Hrs. The Gifford grapnel was rigged and with the command pinger switch on, dragging started at 16-30 Hrs across the ground line position. On the second run contact was made with the rope strop in the buoy anchor weight and the mooring recovered at 17-31 Hrs. It was noted during the recovery attempt that the sound of the Gifford grapnel moving over the hard stony sea bed could be heard on the acoustic equipment; this brings into question the effectiveness of the Gifford grapnel when used on this type of sea bed since neither ground line on the moorings at station G or I was caught by the grapnel. CTD profile No. 350 completed the work at Station I.

With only one more mooring to be recovered at Station D a CTD survey was started along a cruise track north-west from station I as shown in Fig 6. However during CTD profile No. 352 at 22-00 Hrs the CTD system failed completely and it was not until 12-00 Hrs the



following day, Saturday 29 September that repairs were complete. The survey work continued throughout Sunday 30 September along the Northern Ireland coast, through the North Channel and along the Scottish Coast to station D, which was eventually occupied at 11.30 Hrs on Monday 1 October. To facilitate the recovery of the mooring the surface sampling pump was switched off and brought inboard at 10-05 Hrs. Recovery of the temporary mooring at station D started at 12-15 and was successfully completed by 12-45 Hrs. A separate toroidal marker buoy on this site was also recovered but the mooring line broke during recovery and the chain anchor was lost. CTD cast No. 380 was taken at 13-26 Hrs and the surface sampling pump re-deployed at 14-19 Hrs, then the CTD survey was resumed in the North Channel as shown in Fig 6 and continued until 09-45 Hr on Tuesday 2 October when it was complete.

With all the objectives achieved the cruise ended at 12-30 Hrs when the ship docked at Ardrossan.

## STATION REPORT. DEPLOYMENT LEG

Times in GMT. Decca co-ordinates are in sequence red, green, purple.

## STATION A - current meter rig

Designated position	:	54° 49.5' N	5° 39.5' W
Surface buoy	:	SELCO	No. 14
Sub-surface buoy	:	32" sphere	No. 9
Current meters	:	1867 (20m), 568 (45m), 567 (70m)	
Acoustics	:	No. 237c	
Deployment started	:	09.50	13 August 1979
Deployment finished	:	10.36	
Decca chain	:	3B	
Sub-surface buoy position	:	G 22.67, A 47.61, C 78.70	
Surface buoy position	:	G 22.57, A 47.71, C 78.27	
Water depth	:	103m	
CTD profile number	:	87	
Comments	:	The rig was originally deployed on 5 August but was recovered and re-deployed on 13 August because the acoustics were faulty.	

## STATION B - Tide gauge and current meter rig.

Designated position	:	54° 57' N	5° 35' W
Surface buoy	:	SELCO No. 2, with additional radar reflector on top of buoy.	
Sub-surface buoy	:	40" sphere No. 1A	
Current meters	:	3562 (20m), 2576 (60m), 2970 (110m)	
Tide gauge	:	Aanderaa 2A No. 64 in Dunbar frame	
Acoustics	:	W3	
Deployment started	:	07.34	5 August 1979
Deployment finished	:	10.14	
Decca chain	:	3B	
Sub-surface buoy position	:	G 9.70, A 40.96, D 69.68	
Tide gauge position	:	G 9.70, A 40.85, D 70.22	
Surface buoy position	:	G 9.86, A 40.74, D 70.84	
Water depth	:	157m	
CTD profile number	:	14	

## STATION C - current meter rig

Designated position : 54° 57' N 5° 15' W  
Surface buoy : SELCO No. 15  
Sub-surface buoy : 32" sphere No. 7  
Current meters : 1749 (10m), 4387 (31m), VACM 0430  
(33m)  
Acoustics : 227  
Deployment started : 13.21 5 August 1979  
Deployment finished : 14.52  
Decca chain : 3B  
Sub-surface buoy position : E 15.89, A 35.80, D 59.47  
Surface buoy position : E 15.59, A 35.72, D 59.65  
Water depth : 48m  
CTD profile number : 15

## STATION D

Designated position : 55° 52' N 5° 46' W  
Current meter rig  
 Surface buoy : SELCO No. 11  
 Sub-surface buoy : 32" sphere No. 2  
 Current meters : 3561 (41m), 3982 (81m)  
 Acoustics : 236  
 Deployment started : 13.35 6 August 1979  
 Deployment finished : 14.45  
 Decca chain : 3B  
 Sub-surface buoy position : F 19.76, - , J 64.39  
 Surface buoy position : F 19.60, - , J 65.11  
 Water depth : 121m  
 CTD profile number : 23  
Bottom mounted CM/TG  
 Surface buoy : SELCO No. 8  
 CM/TG : No. 5 (current meter 1750)  
 Acoustics : 233  
 Deployment started : 14.51 12 August 1979  
 Deployment finished : 15.31  
 Decca chain : 8E  
 Frame position : H 17.42, C 37.70, J 70.25  
 Water depth : 104m  
 Comments : The rig was originally deployed on 6 August but was recovered and redeployed in shallower water when it was discovered that the surface buoy was towing under at peak current speeds.  
 A toroidal buoy with a 'Lensref' radar reflector was deployed nearby.

## STATION E - Pop-up current meter and tide gauge rig

Designated position : 55° 28' N 6° 10' W  
Sub-surface buoy : 32" sphere with tie bar, No. 3A  
Current meter : 3559 (6m)  
Pressure recorders : TG 280, TG 281  
Acoustics : 229  
Teleost frame : 2  
Deployment started : 19.07 6 August 1979  
Deployment finished : 20.59  
Decca chain : 3B  
Deployment position : H 10.07, - , G 76.84  
Water depth : 108m  
CTD profile number : 24  
Comments : The rig consisted of a Teleost frame mounted on a heavy (1140 lbs) large (2m x 2m) metal base plate from which 8mm wire lead to a current meter and a 32" sub-surface buoy. The metal base plate would be separated from the rest of the rig by an acoustic release during recovery.

The release mechanism broke when the base plate filled with water in a gentle swell during deployment. The release was replaced and the second attempt to deploy the rig was successful.

## STATION F - current meter rig

Designated position	:	55°25.5'N 7°30'W
Surface buoy	:	SELCO No.13
Sub-surface buoy	:	32" sphere No.3
Current meters	:	1865 (11m), 1508 (28m), VACM 0132 (30m)
Acoustics	:	232c
Deployment started	:	20.17 7 August 1979
Deployment finished	:	20.54
Decca chain	:	8E
Sub-surface buoy position	:	E8.88, A34.51, F75.67
Surface buoy position	:	E9.04, A34.51, F76.14
Water depth	:	53m
CTD profile number	:	37

## STATION G - current meter rig

Designated position : 55°29'N 6°48'W  
Surface buoy : SELCO No.12  
Sub-surface buoy : Free-flooding Slingsby, No 2A  
Current meters : 4388 (11m), 3277 (27m),  
2573 (37m), VACM 0429 (39m)  
Acoustics : 235c  
Deployment started : 14.21 7 August 1979  
Deployment finished : 15.26  
Decca chain : 8E  
Sub-surface buoy position : F11.72, A43.18, D73.03  
Surface buoy position : F11.54, A43.12, D72.86  
Water depth : 59m  
CTD profile number : 36  
Comments : A toroidal buoy with a 'Lensref'  
radar reflector was deployed  
nearby.



## STATION I - current meter rig

Designated position : 55°53'N 6°35'W  
Surface buoy : SELCO No.7  
Sub-surface buoy : 32" sphere No.6.  
Current meters : 3890 (11m), 2575 (26m)  
Acoustics : 2161c  
Deployment started : 08.30 11 August 1979  
Deployment finished : 09.15  
Decca chain : 8E  
Sub-surface buoy position : F23.86, -, A56.24  
Surface buoy position : F23.85, -, A56.45  
Water depth : 46m  
CTD profile number : 66  
Comments : The rig was deployed on 7 August but the pellet floats were observed to be beside the surface buoy when the rig was checked on 10 August. The rig was recovered, both meters had bent spindles which were replaced, and the rig was then re-deployed.

## STATION J - Pop-up tide gauge rig

Designated position : 55°00'N 10°00'W  
Pressure recorder : TG 284  
Acoustics : 231  
Teleost frame : 1  
Deployment started : 10.50 8 August 1979  
Deployment finished : 12.28  
Decca chain : 7D  
Deployment position : C1.10, D44.08, -  
SATNAV position : 55°00.2'N 09°59.5'W  
Water depth : 115m  
Comments : During the first attempt to  
deploy the rig, the tide gauge  
frame hit the side of the ship  
and the pyros fired. The rig  
was successfully deployed at  
the next attempt.

## STATION K - Pop-up tide gauge rig

Designated position	:	55°15'N	10°45'W
Pressure recorders	:	TG282, TG283, TG285	
Acoustics	:	238	
Teleost frame	:	3	
Deployment started	:	20.08	8 August 1979
Deployment finished	:	20.40	
Decca chain	:	7D	
Deployment position	:	C20.22, D37.47, _	
SATNAV position	:	55°14.6'N	10°43.0'W
Water depth	:	2510m	
CTD profile number	:	41	

## STATION L - Pop up tide gauge rig

Designated position	:	55° 40' N	10° 45' W
Tide gauge	:	Mk IV	No.4
Acoustics	:	225 and 2160	
Deployment started	:	10.36	9 August 1979
Deployment finished	:	11.19	
Decca chain	:	7D	
Deployment position	:	C 17.46, E 38.56, -	
SATNAV position	:	55° 40.3' N	10° 49.2' W
Water depth	:	2510m	
CTD profile	:	42	

## Station Report, Leg 2 - Recovery

Decca co-ordinates for chains 3B/8E/7D in sequence Red, Green,  
Purple.

## Station A

Current meter rig

Current meter No. 567 Top  
568 Mid  
1867 Bottom

Command pinger No. 237 C

Deployment position (G 22.57, A 47.61, C 78.70) 3B

Recovery position (G 22.5, A 47.6, C 78.6)

Recovery started at 06-33 Hrs. 22 September 79

Surface buoy on deck 06-37

Surface buoy anchor on deck 06-45

Sub-surface buoy anchor and acoustics on deck 06-53

Meter wire parted 06-58

Sub surface buoy grappled and brought on deck 07-07

Top CM on deck 07-15

Mid CM on deck 07-20

Bottom CM on deck and recovery complete 07-21

All equipment recovered in good condition

CTD profile No. 317 carried out at 03-50 Hrs 22 September

## Station B

Tide gauge and current meter rig

Aanderaa TG - 2A No. 64  
 Command pinger No. 3  
 Current meter No. 2970 top  
                           2576 mid  
                           3562 bottom

Deployment position (G 9.86, A 40.74, D 70.84) 3B

Recovery position (G 10.80, A 40.92, D 70.84)

Recovery started at 09-29 Hrs 22nd September

Surface buoy on deck 09-38

Surface buoy anchor on deck 09-50

TG on deck 10-00

Sub-surface buoy anchor on deck 10-07

Bottom CM on deck 10-13

Mid CM on deck 10-16

Top CM on deck 10-19

Sub-surface buoy on deck and recovery complete 10-22

Radar reflector missing from surface buoy.

Rotor missing from CM 2576. Score marks and corrosion on TG frame indicating it has been on its side. Later inspection of CM 2576 shows that it has stopped due to flat battery.

CTD profile No. 319 carried out at 10-30 Hrs. 22 September

## Station C

Current meter rig

Current Meter No. 0430 (VACM)	Top
4387	Mid
1749	Bottom

Command pinger No. 227

Deployment position (E 15.59, A 35.72, D 59.65) 3B

Recovery position (E 15.70, A 35.8, D 59.1)

Recovery started at 13-43 Hrs 22 September

Surface buoy on deck 13-47

Surface buoy anchor on deck 13-57

Sub-surface buoy anchor on deck 14-05

Bottom CM and pinger on deck 14-08

Mid and top CM on deck 14-14

Sub-surface buoy on deck and recovery complete 14-17

All equipment recovered in good condition and operational

CTD profile No. 321 carried out at 14-35 Hrs 22 September

## Station D

- a) Bottom mounted CM/TG Rig No. 5
- b) Current meter rig
- c) Temporary TG rig

a) Bottom mounted CM/TG rig No. 5

Current meter No. 1750  
 Pressure sensor, Digiquartz No. 4132  
 Command pinger No. 233/90<sup>0</sup>

Deployment position (H 17.42, C 37.70, J 70.25) 8E  
 Recovery position (F 19.9, - , J 62.9 ) 3B  
 Recovery started at 06-26 Hrs. 23 September  
 Pellet line parted 06-34  
 Surface buoy grappled 08-17  
 Surface buoy on deck 08-22  
 Surface buoy anchor on deck 08-30  
 CM/TG on deck and recovery complete 08-42  
 Rotor and Vane fouled with seaweed.  
 Main frame broken in two places.

b) Current meter rig

Current Meter No. 3982 Top  
 3561 Bottom  
 Command pinger No. 236

Deployment position (F 19.60, - , J 65.11) 3B  
 Recovery position (F 19.62, C 30.20, J 64.86.)  
 Recovery started at 10-09 Hrs. 23 September  
 Surface buoy on deck 10-13  
 Surface buoy anchor on deck 10-20  
 Sub-surface buoy anchor on deck 10-28  
 Bottom CM and pinger on deck 10-33



Station D cont.

Top CM on deck 10-37

Sub-surface buoy on deck and recovery complete 10-39

All equipment recovered in good condition and operational although there was some seaweed attached to the top CM spindle.

c) Temporary TG rig

Experimental TG 286. Dunbar frame  
Command pinger No. 3

Deployment position (F 19.20, C 30.21, J 63.35.)

3B

Deployment depth 60m

Deployment started 09-04 Hrs 23 September 79

Deployment complete 09-35 Hrs

Recovery started 12-15 Hrs 1 October 79

Recovery complete 12-45 Hrs

Rig removed in good condition

CTD profile No. 334 carried out at 04-50 Hrs 23 September

No. 380 " " " 13-26 Hrs 1 October

Station E

Pop-up current meter/tide gauge rig

Current meter No. 3559

Teleost TG No. 280

Teleost TG No. 281

Release pinger No. 229

Deployment position (H 10.07, - , G 76.84.) 3B

Recovery position (H 10.82, C 35.22, G 77.65.)

Recovery started at 15-18 Hrs 23 September

Sub-surface buoy on sea surface 15-23 Hrs.

CM + TG on deck and recovery complete 15-45 Hrs.

All equipment is good condition and operational

CTD profile No. 337 carried out at 15-55 Hrs.

23 September

## Station F

Current meter rig

Current Meter No. 0132 (VACM)	Top
1508	Mid
1865	Bottom
Command pinger No. 232c	

Deployment position (E 9.04, A 34.51, F 76.14.) 8E

Recovery position (E 8.96, - , F 75.90.)

Recovery started at 08-00 Hrs. 26 September

Surface buoy on deck 08-07

Surface buoy anchor on deck 08-12

Sub-surface buoy anchor on deck 08-16

Bottom CM and pinger on deck 08-19

Mid and top CM on deck 08-22

Sub-surface buoy on deck and recovery complete 08-25

All the equipment recovered was in good condition but the Middle current meter was tangled with the meter wire. The wear on the current meter casting caused by the meter wire was only slight and is unlikely to have been tangled for the duration of the deployment.

CTD profile No. 348 carried out at 07-00 Hrs. 26 September

## Station G

Current meter rig

Current meter No. 0429 (VACM)	Top
2573	2nd
3277	3rd
4388	Bottom

Command pinger No. 235 C

Deployment position (F 11.54, A 43.12, D 72.86.)

Recovery position (F 11.70, A 43.10, D 72.74.)

8E

Rig recovered by dragging

Recovery started at 09-58 Hrs. 28 September

Meter wire caught by grapnel 11-40 Hrs.

Sub-surface buoy anchor on deck 11-54

Surface buoy anchor on deck 12-09

Bottom CM and pinger on deck 12-16

Third CM on deck 12-21

Second and top CM on deck 12-25

Sub-surface buoy on deck and recovery complete 12-27

The current meter spindle of the bottom current meter was bent during recovery and the rotor was missing from the third current meter. The surface buoy and its mooring line was not recovered.

CTD profile No. 340 carried out at 19-20 Hrs. 23 September

## Station I

Current meter rig

Current meter No. 2575 top  
3890 bottom

Command pinger No. 2161 c

Deployment position (F 23.85, - , A 56.45.) 8E

Recovery position (G 0.20, - , A 56.04.)

Rig recovered by dragging

Recovery started at 16-30 Hrs. 28 September

Surface buoy anchor caught by grapnel and brought on deck 17-11  
Hrs.

Sub-surface buoy anchor on deck 17-22

Bottom CM and pinger on deck 17-26

Top CM on deck 17-29

Sub-surface buoy on deck and recovery complete 17-31

All equipment recovered in good condition excepting the surface buoy which was later recovered from Islay.

CTD profile No. 347 carried out at 08-45 24 September

" " No. 350 carried out at 18-35 28 September

## Station J

Pop-up tide gauge mooring

Teleost TG No. 284

Release pinger No. 231

Deployment position (C 1.10, D 44.08. - .) 7D

Recovery position (C 1.02, D 44.10, - .)

Release operated at 06-24 Hrs. 27 September

TG on sea surface 06-26

TG on deck and recovery complete 06-37 Hrs.

The TG was found to be in good condition and operating normally.

CTD profile No. 349 carried out at 06-44 27 September

## Station K

Deep sea pop-up tide gauge

Teleost TG No. 282  
 No. 283  
 No. 285

Release pinger No. 238

Deployment position (C 20.22, D 37.47, - .) 7D

Recovery position (C 20.1, D 37.4, J 50.8.)

Release operated at 11-43 27 September

TG on sea surface 12-44

TG on deck and recovery complete 13-00

All equipment in good condition and still operating.

## Station L

Mk IV Deep sea pop-up tide gauge

TG No. 4 with SG pressure sensor No. 2D2/78  
 SG " " SCHAEVITZ  
 SG " " Bell & Howell Thin  
 Film  
 DIG " " No. 3845  
 Temperature sensor 2T4 and 2T6  
 Release pinger No. 225 and 2160

Deployment position (C 17.46, E 38.56, - .) 7D

Recovery position (C 17.44, E 38.56, - .)

Release operated at 16-17 Hrs. 27 September

TG on sea surface 17-05

TG on deck and recovery complete 17-23

The TG was recovered in good condition and still operating.

Equipment Lost

Surface buoy    Selco No. 12    Station G

Surface buoy    Toroidal No. 7 with 'Lensref' radar  
reflector        Station G



## COMMENTS ON THE SHIPS

This was the first time that IOS Bidston had used RRS Shackleton for this kind of work. The ship was very stable but useful deck and storage space was limited, particularly as an auxiliary winch was mounted especially for the rig deployment. This winch was very noisy and lacked spooling gear.

The ship handled well and was suitable for rig deployment.

The new winch fitted to RRS Challenger for the PDR fish worked very well and is a worthwhile improvement. Rig recovery was also carried out without difficulty.

## ACKNOWLEDGEMENTS

We would like to thank the Masters, Officers and crews of RRS Shackleton and RRS Challenger for their co-operation and assistance during these cruises.

Abbreviations

IOS	Institute of Oceanographic Sciences
CM	Current meter
CM/TG	Current meter/tide gauge
TG	Tide gauge
S/S	Sub-surface buoy
T/C	Temperature/conductivity
CTD	Conductivity, Temperature, Depth

## List of tables.

Table 1. Summary of station positions and equipment deployed.

Table 2. CTD profile positions.

Table 3. List of equipment deployed.

TABLE 1

Summary of station positions and equipment deployed

Station	Position		Water depth (m)	Equipment deployed	Current meter height above sea floor (m)
	Latitude (N)	Longitude (W)			
A	54° 49'	5° 38'	100	3 CM	20, 45, 70
B	54° 58'	5° 36'	155	3 CM, TG	20, 60, 110
C	54° 58'	5° 14'	45	3 CM	10, 31, 33
D	55° 52'	5° 45'	120	2 CM	41, 81
CM/TG					
E	55° 28'	6° 10'	105	CM, TG	6
F	55° 25'	7° 31'	50	3 CM	11, 28, 30
G	55° 31'	6° 51'	55	4 CM	11, 27, 37, 39
I	55° 53'	6° 33'	40	2 CM	11, 26
J	55° 00'	10° 00'	115	TG	-
K	55° 15'	10° 43'	2510	TG	-
L	55° 40'	10° 49'	2510	TG	-

TABLE 2. LIST OF CTD PROFILES

PROFILE NUMBER	DATE	TIME STARTED	POSITION		RIC
			LATITUDE	LONGITUDE	
1	4/ 8/79	14.10	N 54 15.5	W 5 18.2	
2	4/ 8/79	15.20	N 54 22.4	W 5 18.1	
3	4/ 8/79	16.48	N 54 29.8	W 5 22.2	
4	4/ 8/79	18. 7	N 54 31.7	W 5 11.5	
5	4/ 8/79	19.10	N 54 33.6	W 5 0.7	
6	4/ 8/79	20.15	N 54 34.8	W 4 50.4	
7	4/ 8/79	21.15	N 54 40.5	W 5 0.3	
8	4/ 8/79	22.15	N 54 40.0	W 5 15.5	
9	4/ 8/79	23.35	N 54 40.1	W 5 28.3	
10	5/ 8/79	0.35	N 54 43.2	W 5 18.3	
11	5/ 8/79	2. 8	N 54 46.8	W 5 5.7	
12	5/ 8/79	3.49	N 54 47.2	W 5 23.5	
13	5/ 8/79	5.27	N 54 47.0	W 5 39.7	
14	5/ 8/79	10.23	N 54 58.2	W 5 36.2	
15	5/ 8/79	15. 8	N 54 57.8	W 5 14.0	
16	5/ 8/79	20.35	N 55 50.0	W 5 38.7	
17	5/ 8/79	23. 9	N 55 4.1	W 5 41.0	
18	6/ 8/79	0.17	N 55 10.9	W 5 46.3	
19	6/ 8/79	1.20	N 55 17.2	W 5 51.1	
20	6/ 8/79	2. 0	N 55 22.7	W 5 56.2	
21	6/ 8/79	6.35	N 55 28.9	W 5 58.5	
22	6/ 8/79	7.45	N 55 35.5	W 5 54.6	
23	6/ 8/79	15.45	N 55 51.8	W 5 44.8	
24	6/ 8/79	21.36	N 55 27.7	W 6 7.8	
25	6/ 8/79	22.37	N 55 31.8	W 6 20.4	
26	6/ 8/79	23.25	N 55 36.2	W 6 30.6	
27	7/ 8/79	0.10	N 55 40.1	W 6 39.7	
28	7/ 8/79	1. 0	N 55 45.3	W 6 50.8	
29	7/ 8/79	1.45	N 55 48.5	W 7 0.4	
30	7/ 8/79	2.40	N 55 51.9	W 7 8.6	
31	7/ 8/79	3.85	N 55 58.3	W 7 5.0	
32	7/ 8/79	4.30	N 56 5.0	W 6 57.2	
33	7/ 8/79	5.30	N 55 59.8	W 6 50.4	
34	7/ 8/79	6.38	N 55 55.3	W 6 40.5	
35	7/ 8/79	10.19	N 55 53.3	W 6 34.9	
36	7/ 8/79	16. 6	N 55 30.8	W 6 50.0	
37	7/ 8/79	21.15	N 55 25.2	W 7 31.0	
38	7/ 8/79	22.22	N 55 24.8	W 7 42.6	
39	7/ 8/79	23.24	N 55 25.3	W 7 54.9	
41	8/ 8/79	20.18	N 55 14.4	W10 43.7	
42	9/ 8/79	10.45	N 55 40.5	W10 49.8	
43	9/ 8/79	17. 2	N 55 0.	W10 0.8	
44	9/ 8/79	21.19	N 55 15.4	W 8 59.0	
45	9/ 8/79	23. 5	N 55 14.6	W 8 40.5	
46	10/ 8/79	0.30	N 55 14.4	W 8 20.1	
47	10/ 8/79	2. 5	N 55 15.3	W 7 59.3	
48	10/ 8/79	3. 0	N 55 20.7	W 7 59.5	
49	10/ 8/79	4.22	N 55 30.0	W 7 59.8	
50	10/ 8/79	5.48	N 55 40.4	W 8 0.5	
51	10/ 8/79	7.14	N 55 50.8	W 8 0.	
52	10/ 8/79	8.34	N 55 59.8	W 7 58.8	

P  
C  
AD  
FI  
G  
FK  
L  
J

PROFILE NUMBER	DATE	TIME STARTED	POSITION		RIG
			LATITUDE	LONGITUDE	
53	10/ 8/79	10.27	N 56 14.8	W 8 0.5	
54	10/ 8/79	12. 0	N 56 15.5	W 7 39.5	
55	10/ 8/79	13.30	N 56 14.9	W 7 19.4	
56	10/ 8/79	14.56	N 56 14.5	W 7 1.1	
57	10/ 8/79	16.18	N 56 15.0	W 6 44.8	
58	10/ 8/79	17.24	N 56 14.6	W 6 31.4	
59	10/ 8/79	18.52	N 56 3.4	W 6 32.5	
60	10/ 8/79	23. 9	N 55 52.9	W 6 54.8	
61	11/ 8/79	0.42	N 55 53.0	W 7 15.1	
62	11/ 8/79	2. 5	N 55 53.0	W 7 35.0	
63	11/ 8/79	3.26	N 56 2.8	W 7 37.0	
64	11/ 8/79	5. 3	N 56 4.8	W 7 13.5	
65	11/ 8/79	6.37	N 56 5.0	W 6 53.8	
66	11/ 8/79	10.20	N 55 52.4	W 6 34.0	I
67	11/ 8/79	14. 7	N 55 38.8	W 6 11.8	
68	11/ 8/79	18. 7	N 55 31.4	W 6 50.9	G
69	11/ 8/79	19. 9	N 55 33.8	W 7 5.9	
70	11/ 8/79	20.36	N 55 36.0	W 7 23.3	
71	11/ 8/79	22. 6	N 55 40.4	W 7 39.9	
72	11/ 8/79	23. 6	N 55 33.4	W 7 35.2	
73	12/ 8/79	0.16	N 55 28.7	W 7 28.8	F
74	12/ 8/79	2.47	N 55 20.5	W 7 0.8	
75	12/ 8/79	4.20	N 55 18.0	W 6 40.4	
76	12/ 8/79	5.55	N 55 24.8	W 6 28.5	
77	12/ 8/79	8.30	N 55 36.9	W 6 0.6	
78	12/ 8/79	9.45	N 55 44.6	W 5 52.7	
79	12/ 8/79	11.54	N 55 51.7	W 5 45.5	D
80	12/ 8/79	18.18	N 55 29.8	W 5 50.1	
81	12/ 8/79	21.20	N 55 14.8	W 5 30.6	
82	12/ 8/79	22.42	N 55 6.1	W 5 20.1	
83	12/ 8/79	23.45	N 54 56.7	W 5 14.9	C
84	13/ 8/79	2. 5	N 54 57.0	W 5 32.5	B
85	13/ 8/79	3.34	N 55 2.3	W 5 52.1	
86	13/ 8/79	4.30	N 55 9.5	W 5 58.1	
87	13/ 8/79	11.15	N 54 48.7	W 5 31.8	A
88	13/ 8/79	12. 0	N 54 45.9	W 5 32.7	
89	13/ 8/79	19. 5	N 54 34.8	W 4 52.2	
90	13/ 8/79	21.25	N 54 35.1	W 4 23.3	
91	13/ 8/79	22.20	N 54 28.8	W 4 22.5	
92	14/ 8/79	0. 3	N 54 28.8	W 4 41.8	
93	14/ 8/79	1.46	N 54 28.8	W 5 1.5	
94	14/ 8/79	3.14	N 54 28.2	W 5 20.5	
95	14/ 8/79	5.21	N 54 15.0	W 5 30.0	
96	14/ 8/79	7. 1	N 54 14.5	W 5 9.0	
97	14/ 8/79	8.35	N 54 15.0	W 4 47.8	
98	14/ 8/79	12.55	N 53 50.0	W 5 26.5	
309	21/ 9/79	14.45	N 54 57.6	W 5 14.0	C
310	21/ 9/79	21.35	N 54 51.7	W 5 10.8	
311	21/ 9/79	22.35	N 54 47.1	W 5 4.7	
312	21/ 9/79	23.30	N 54 40.2	W 4 59.8	
313	22/ 9/79	0.50	N 54 40.3	W 5 8.8	
314	22/ 9/79	1.54	N 54 40.3	W 5 17.2	
315	22/ 9/79	3. 0	N 54 40.3	W 5 25.0	

PROFILE NUMBER	DATE	TIME STARTED	POSITION		RIG
			LATITUDE	LONGITUDE	
316	22/ 9/79	3.55	N 54 45.5	W 5 32.2	
317	22/ 9/79	4.50	N 54 49.3	W 5 37.9	A
318	22/ 9/79	8.18	N 54 54.3	W 5 37.2	
319	22/ 9/79	10.25	N 54 58.3	W 5 36.0	B
320	22/ 9/79	11.40	N 54 57.3	W 5 25.8	
321	22/ 9/79	14.20	N 54 58.0	W 5 14.4	C
322	22/ 9/79	15.30	N 55 2.2	W 5 21.8	
323	22/ 9/79	16.15	N 55 4.1	W 5 29.2	
324	22/ 9/79	17. 0	N 55 6.7	W 5 34.4	
325	22/ 9/79	17.45	N 55 11.0	W 5 40.8	
326	22/ 9/79	18.35	N 55 13.1	W 5 45.8	
327	22/ 9/79	19.50	N 55 16.9	W 5 50.1	
328	22/ 9/79	22.10	N 55 22.3	W 5 50.9	
329	22/ 9/79	23.20	N 55 28.0	W 5 51.0	
330	23/ 9/79	0.27	N 55 32.6	W 5 51.0	
331	23/ 9/79	1.25	N 55 37.7	W 5 50.7	
332	23/ 9/79	3.10	N 55 43.8	W 5 50.3	
333	23/ 9/79	3.50	N 55 47.6	W 5 46.9	
334	23/ 9/79	4.53	N 55 51.4	W 5 46.3	D
335	23/ 9/79	11.56	N 55 44.8	W 5 51.4	
336	23/ 9/79	13.25	N 55 38.1	W 5 59.1	
337	23/ 9/79	15.57	N 55 28.3	W 6 11.9	F
338	23/ 9/79	16.50	N 55 28.5	W 6 25.8	
339	23/ 9/79	18. 5	N 55 29.3	W 6 37.1	
340	23/ 9/79	19.20	N 55 30.8	W 6 50.7	G
341	23/ 9/79	22.24	N 55 37.5	W 7 2.1	
342	24/ 9/79	0.13	N 55 43.0	W 7 13.2	
343	24/ 9/79	1.45	N 55 50.3	W 7 24.0	
345	24/ 9/79	4.40	N 55 56.8	W 7 19.6	
347	24/ 9/79	8.30	N 55 52.3	W 6 33.3	I
348	26/ 9/79	8. 0	N 55 26.5	W 7 20.8	F
349	27/ 9/79	6.40	N 55 1.0	W 9 59.5	J
350	28/ 9/79	18.30	N 55 53.0	W 6 32.0	I
351	28/ 9/79	20. 5	N 56 3.0	W 6 45.0	
352	28/ 9/79	21.58	N 56 14.5	W 7 1.0	
353	29/ 9/79	12.20	N 56 15.5	W 7 20.5	
354	29/ 9/79	14.20	N 56 15.5	W 7 40.0	
355	29/ 9/79	15.50	N 56 16.0	W 7 57.5	
356	29/ 9/79	17.33	N 56 6.7	W 8 0.	
357	29/ 9/79	19. 0	N 55 56.5	W 7 59.5	
358	29/ 9/79	20.45	N 55 46.7	W 7 59.5	
359	29/ 9/79	22.36	N 55 37.0	W 8 0.	
360	30/ 9/79	1. 6	N 55 24.5	W 8 0.	
361	30/ 9/79	3.18	N 55 25.5	W 7 39.0	
362	30/ 9/79	5.23	N 55 25.5	W 7 20.0	
363	30/ 9/79	7.55	N 55 23.5	W 7 5.6	
364	30/ 9/79	8.44	N 55 22.0	W 6 46.9	
365	30/ 9/79	10.19	N 55 22.2	W 6 33.0	
366	30/ 9/79	11.45	N 55 22.5	W 6 19.1	
367	30/ 9/79	14.18	N 55 12.1	W 5 56.0	
368	30/ 9/79	15.22	N 55 4.6	W 5 54.3	
369	30/ 9/79	16.34	N 54 56.4	W 5 49.8	
370	30/ 9/79	17. 5	N 54 49.1	W 5 37.5	A

PROFILE NUMBER	DATE	TIME STARTED	POSITION		RIG
			LATITUDE	LONGITUDE	
371	30/ 9/79	19.36	N 54 40.0	W 5 28.5	
372	30/ 9/79	20.27	N 54 40.0	W 5 20.2	
373	30/ 9/79	21.27	N 54 39.9	W 5 10.2	
374	30/ 9/79	22.26	N 54 40.2	W 5 0.	
375	30/ 9/79	23.48	N 54 48.3	W 5 7.9	
376	1/10/79	1.23	N 54 57.8	W 5 15.0	C
377	1/10/79	2.55	N 55 7.5	W 5 15.3	
378	1/10/79	4.32	N 55 13.0	W 5 28.8	
379	1/10/79	6.19	N 55 15.0	W 5 45.5	
380	1/10/79	13.26	N 55 51.7	W 5 44.9	D
381	1/10/79	15.10	N 55 41.8	W 5 55.5	
382	1/10/79	16.50	N 55 31.0	W 6 6.7	
383	1/10/79	18.27	N 55 34.2	W 6 23.8	
384	1/10/79	19.43	N 55 37.5	W 6 42.3	
385	1/10/79	21. 2	N 55 40.5	W 6 59.8	
386	1/10/79	22.35	N 55 34.6	W 6 55.3	
387	2/10/79	0. 9	N 55 32.3	W 6 40.9	
388	2/10/79	1.54	N 55 27.6	W 6 22.3	
389	2/10/79	3.52	N 55 25.3	W 5 59.0	
390	2/10/79	5.15	N 55 15.3	W 5 46.5	
391	2/10/79	7.16	N 55 19.1	W 5 19.7	



TABLE 3List of Equipment Deployed1. Surface buoys

- a) SELCO No. 2, 7, 8, 11, 12, 13,  
14, 15.  
(fitted with flashing light)      Manufactured by Selco,  
Oslo, Norway.
- b) Toroidal No. 3, 7.      Manufactured by  
Cosalt Ltd.  
Lowestoft  
1.8m DIA 600kg buoyancy

2. Sub-surface buoys

- Hollow steel sphere      Manufactured to IOS  
32" diameter No. 1, 4, 7, 8, 9,  
10, 11.      design 175kg  
40" diameter No. 1A      buoyancy
- Slingsby free-flooding No. 2A      Manufactured by  
Slingsby Sailplanes Ltd.

3. Current Meters

- No. 567, 568, 1508, 1749,  
1865, 1867, 2573, 2575,  
2576, 2970, 3277, 3559,  
3561, 3562, 3890, 3982,  
4387, 4388.      Manufactured by  
Aanderaa,  
Bergen, Norway.  
Type RCM4.
- VACM No. 0132      Loaned from IOS  
0429      Wormley.  
0430      Manufactured by AMF,  
U.S.A.

4. Off-Shore tide gauges

- a) Mk IV Pop-up TG consisting      IOS, Bidston.  
of a data logger, acoustic  
release system, 4 pressure  
sensors and 2 temperature  
sensors
- Logger TYPE 610      Manufactured by  
Sea Data Corporation,  
Massachusetts, USA.
- Pressure transducer element
- i) Strain gauge      Manufactured by  
Bell & Howell,  
Basingstoke, UK.
- ii) Strain gauge      Manufactured by  
SCHAEVITZ

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>iii) Digiquartz (quartz crystal)<br/>S/No. 3845</li> </ul>                                     | Manufactured by<br>Paroscientific,<br>Washington, USA.<br>MODEL 75K-002 |
| <ul style="list-style-type: none"> <li>b) Teleost Pop-up TG consisting of a data logger, pressure sensors and temp. sensor</li> </ul> | IOS Bidston   |
| <ul style="list-style-type: none"> <li>Pressure transducer elements</li> <li>Strain gauge</li> </ul>                                  | Manufactured by<br>Bell & Howell,<br>Basingstoke, UK                    |
| <ul style="list-style-type: none"> <li>c) Moored TG incorporating Aanderaa Water Level recorder TG-2A S/No. 64</li> </ul>             | Manufactured by<br>Aanderaa Instruments,<br>Victoria, Canada.           |
| 5. <u>Bottom mounted CM/TG</u>  |   |
| Moored CM/TG system consisting of a current meter, direction vane and pressure sensor   | IOS Bidston   |
| Current meter No.1750   | Manufactured by<br>Aanderaa, Norway.<br>Type RCM4                       |
| Pressure sensor element<br>Digiquartz (quartz crystal)<br>No. 4132  | Manufactured by<br>Paroscientific,<br>Washington, USA.<br>Model 2400A.  |
| 6. <u>Acoustic Pinger</u>   |   |
| Pinger Nos. CP 3, CR 225, CR 227, CR 229, CB 231, CB 235C, CB 236, CB 237C, CR 238, CR 2160, CB 2161C, CB 2163, CB 232C, CB 233.      | IOS Bidston/Wormley   |

## List of figures.

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- Figure 4. Deployment leg, track chart 9/8 - 15/8/79.
- Figure 5. Recovery leg, track chart 21/9 - 27/9/79.
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- Figure 7. Diagram of 'u' shaped current meter mooring.
- Figure 8. Diagram of 'u' shaped mooring for bottom mounted current meter/tide gauge.



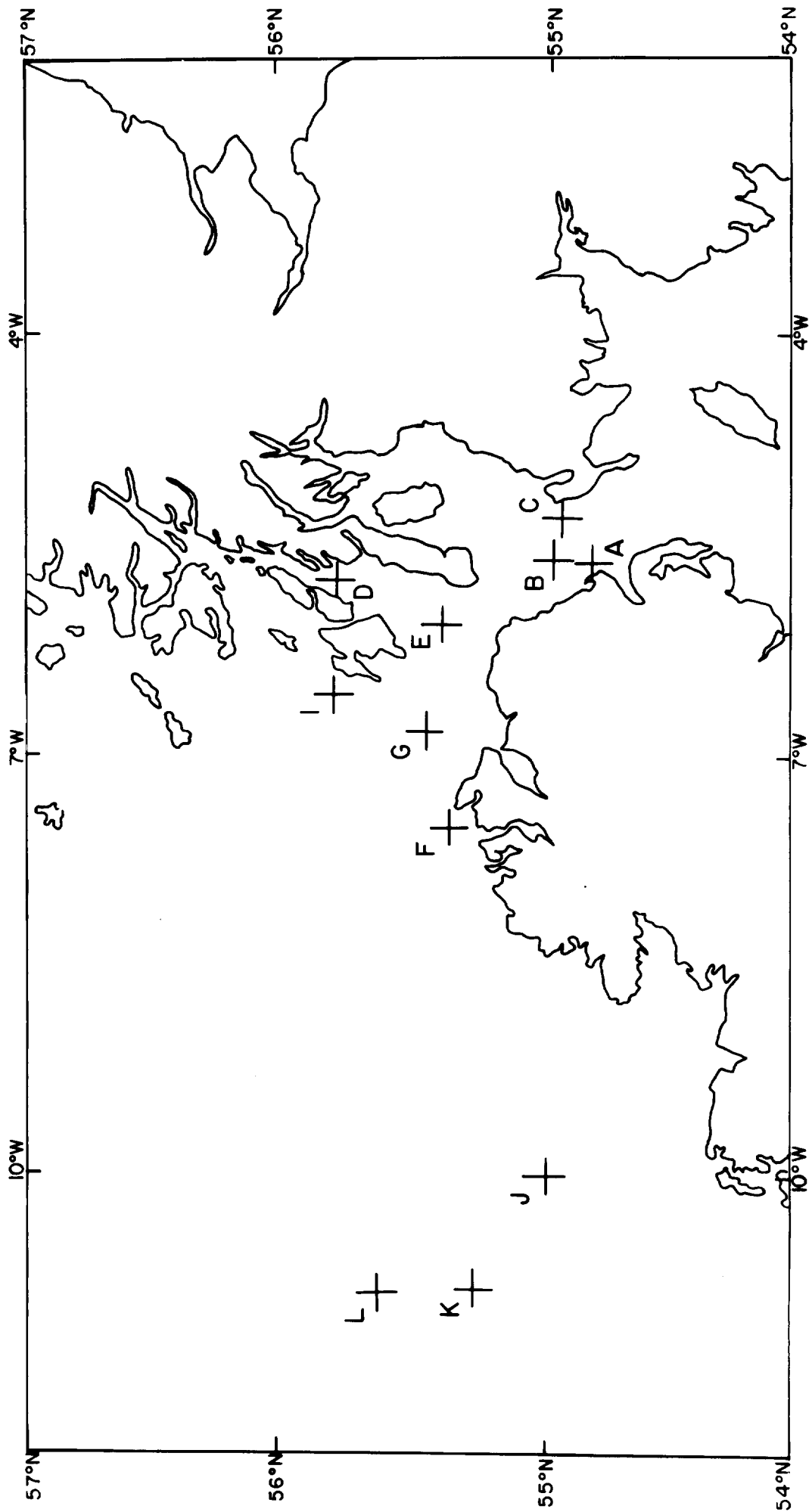


FIGURE I

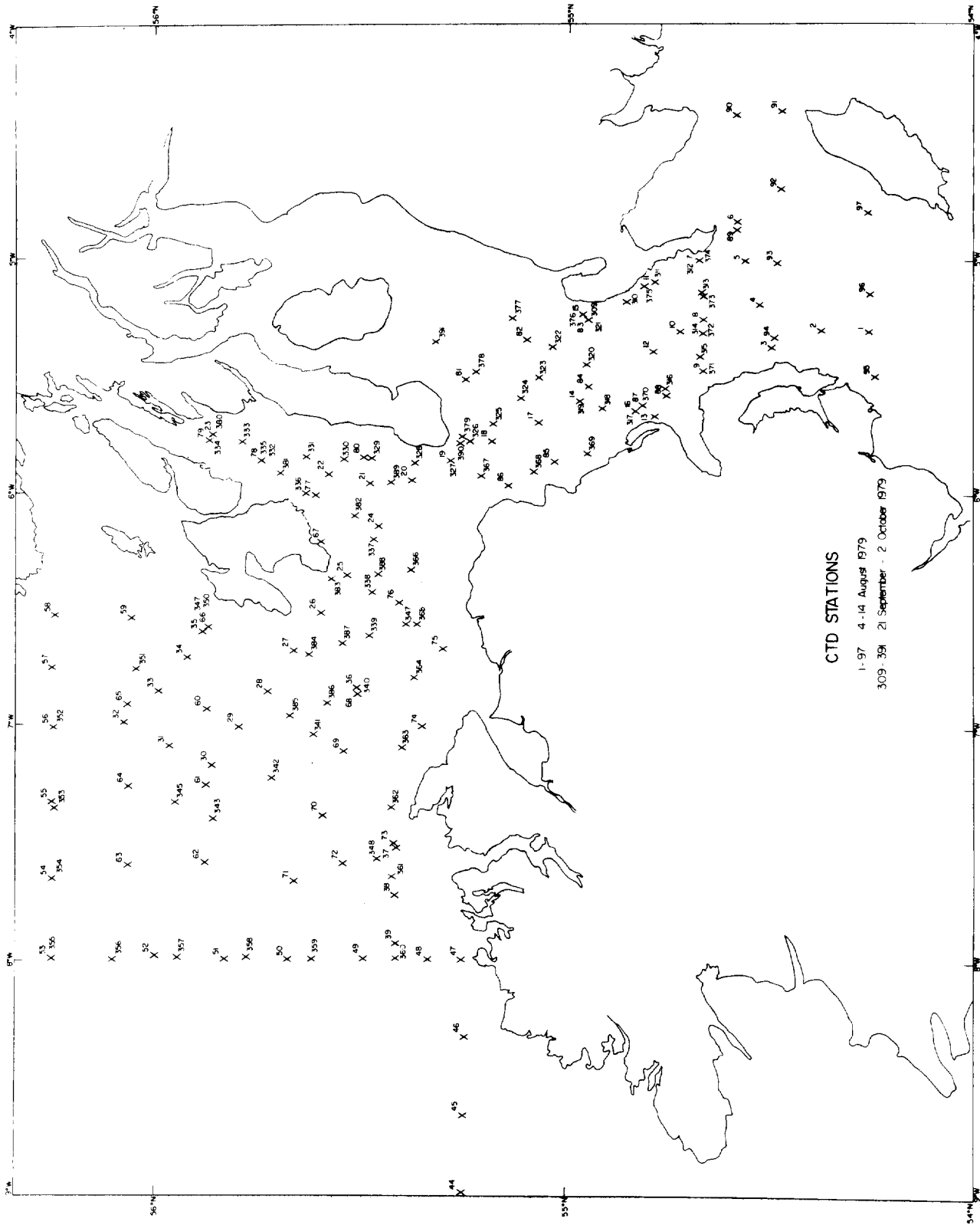


FIGURE 2

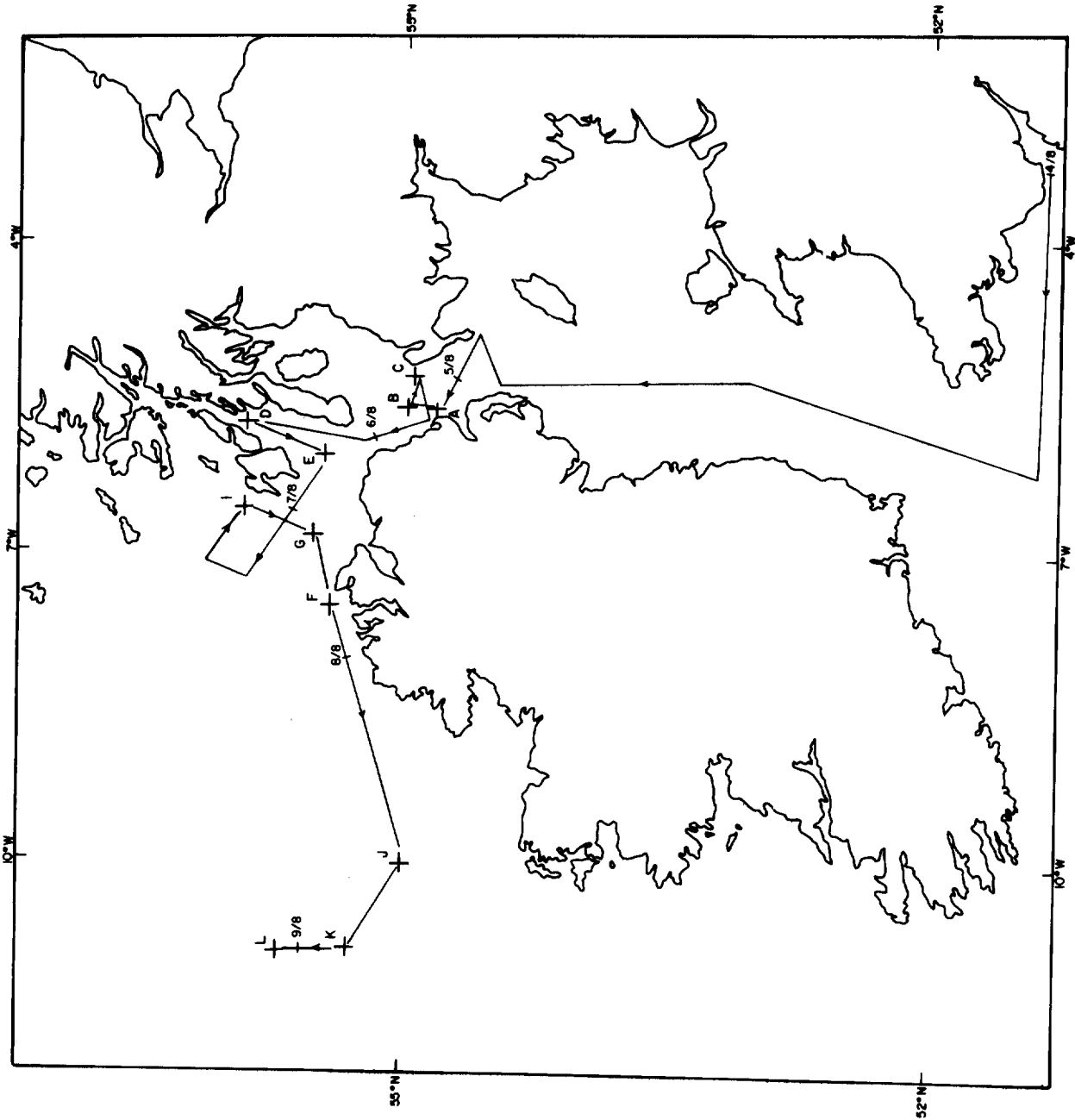


FIGURE 3

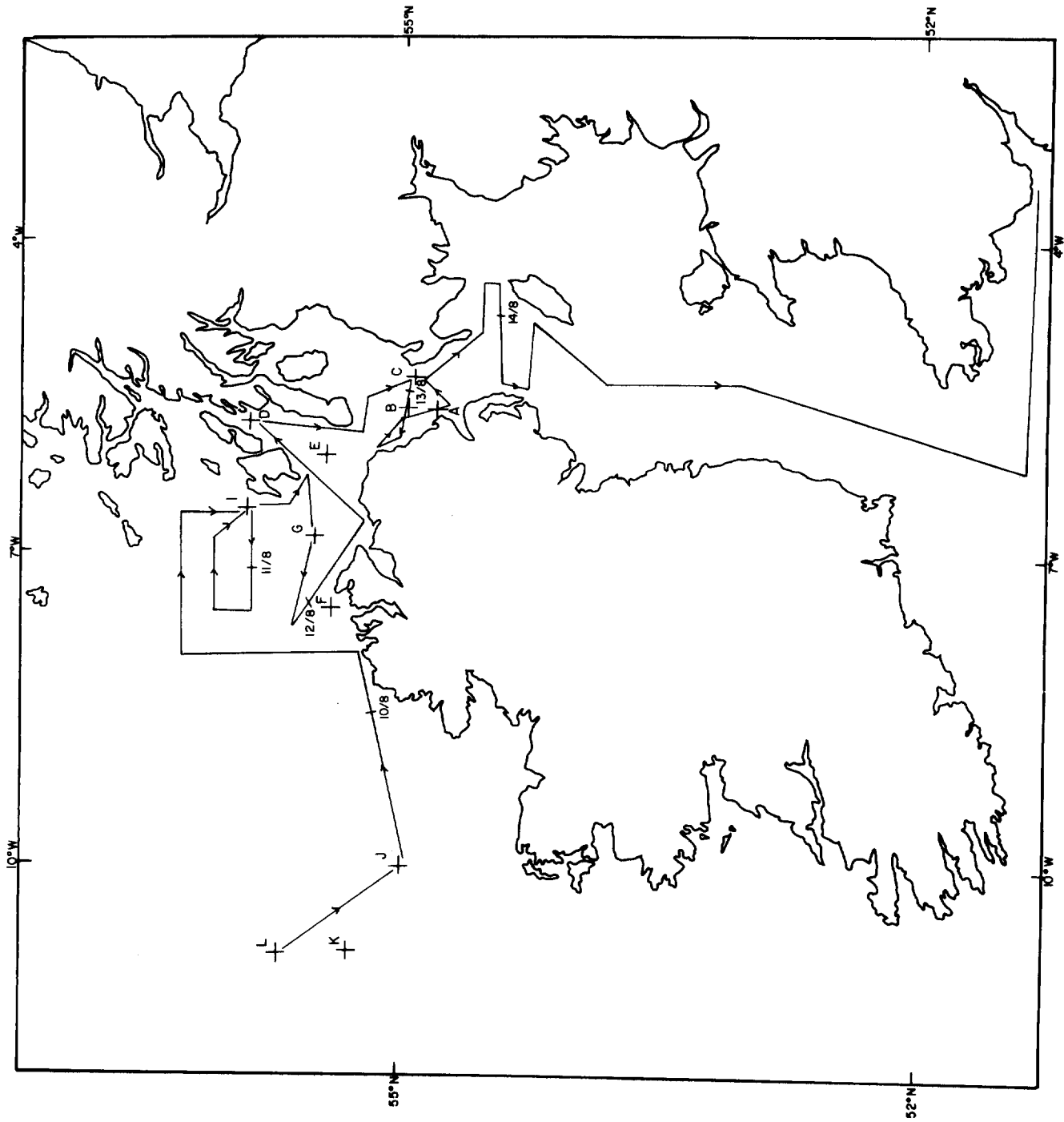


FIGURE 4



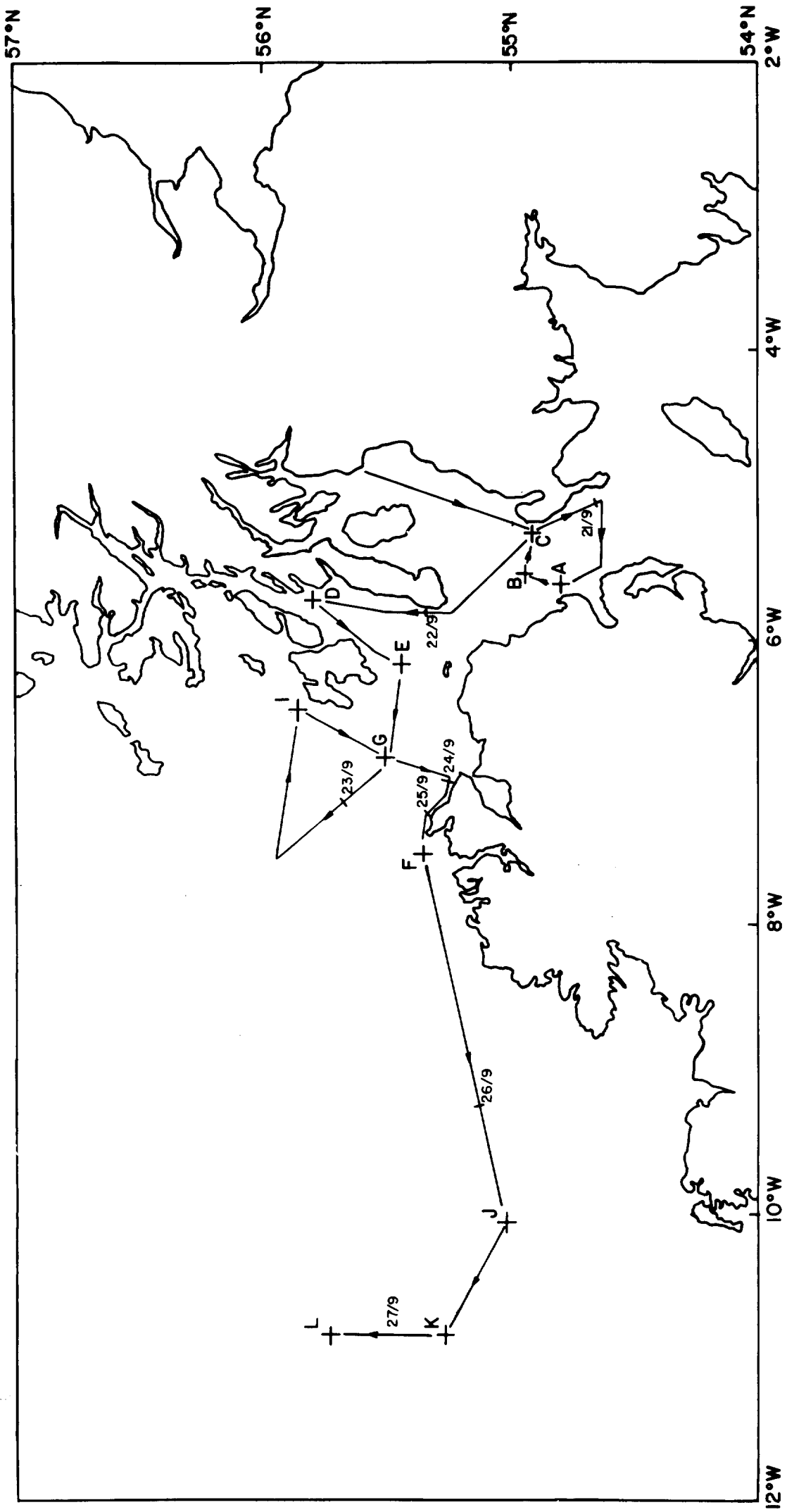


FIGURE 5

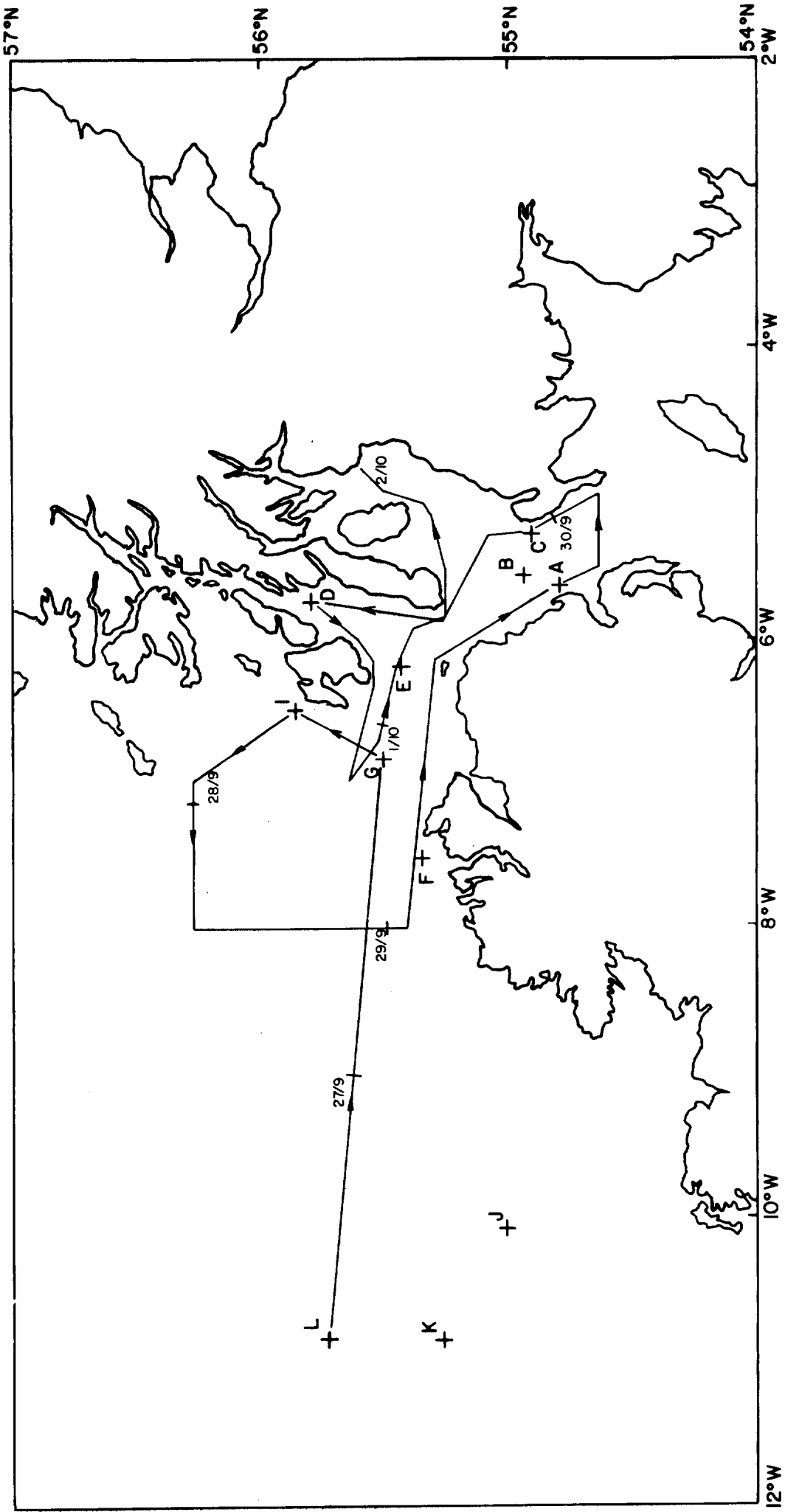


FIGURE 6

# CURRENT METER MOORING SYSTEM

INSTITUTE OF OCEANOGRAPHIC SCIENCES BIDSTON

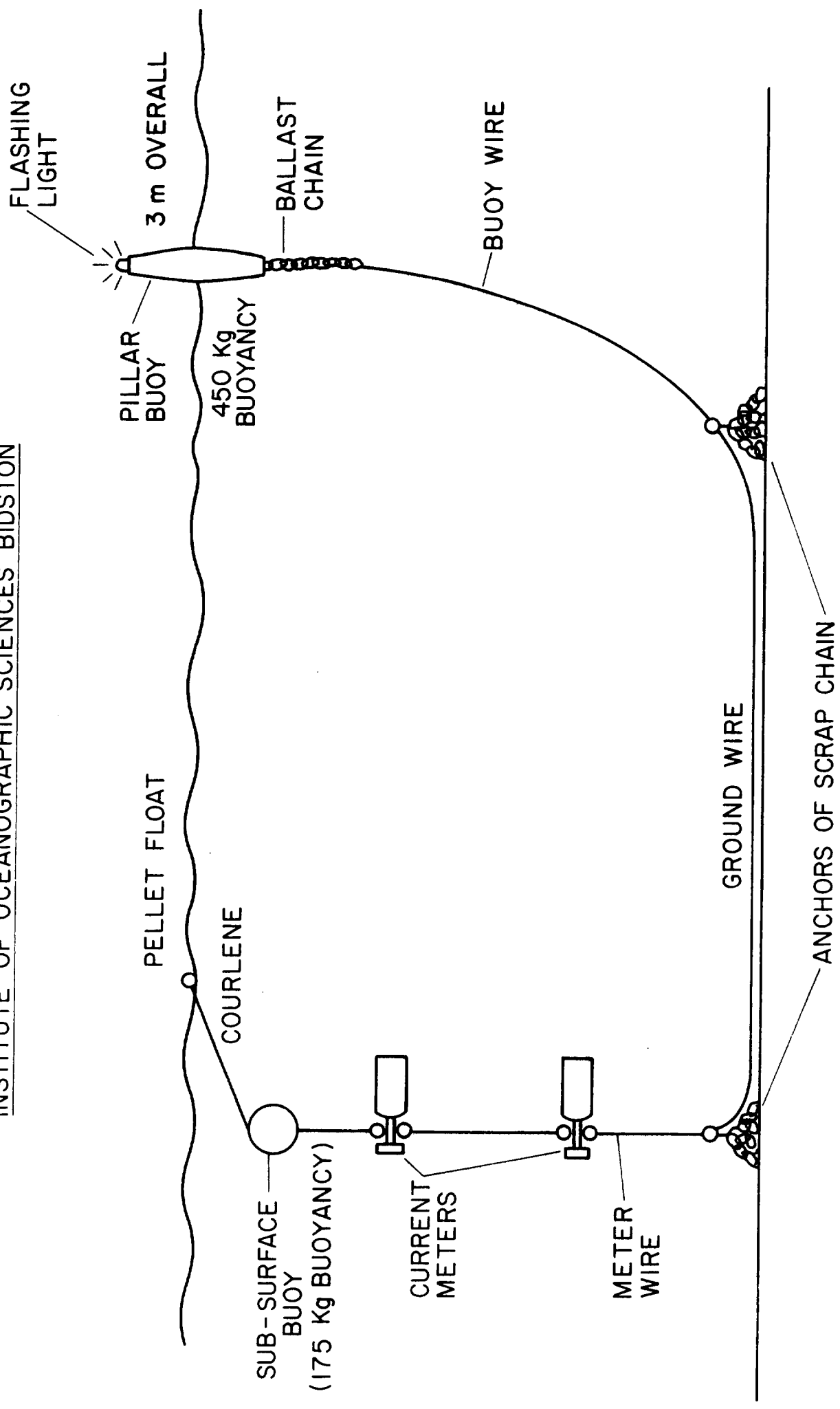


FIGURE 7

# BOTTOM MOUNTED CURRENT METER / TIDE GAUGE MOORING SYSTEM

INSTITUTE OF OCEANOGRAPHIC SCIENCES BIDSTON

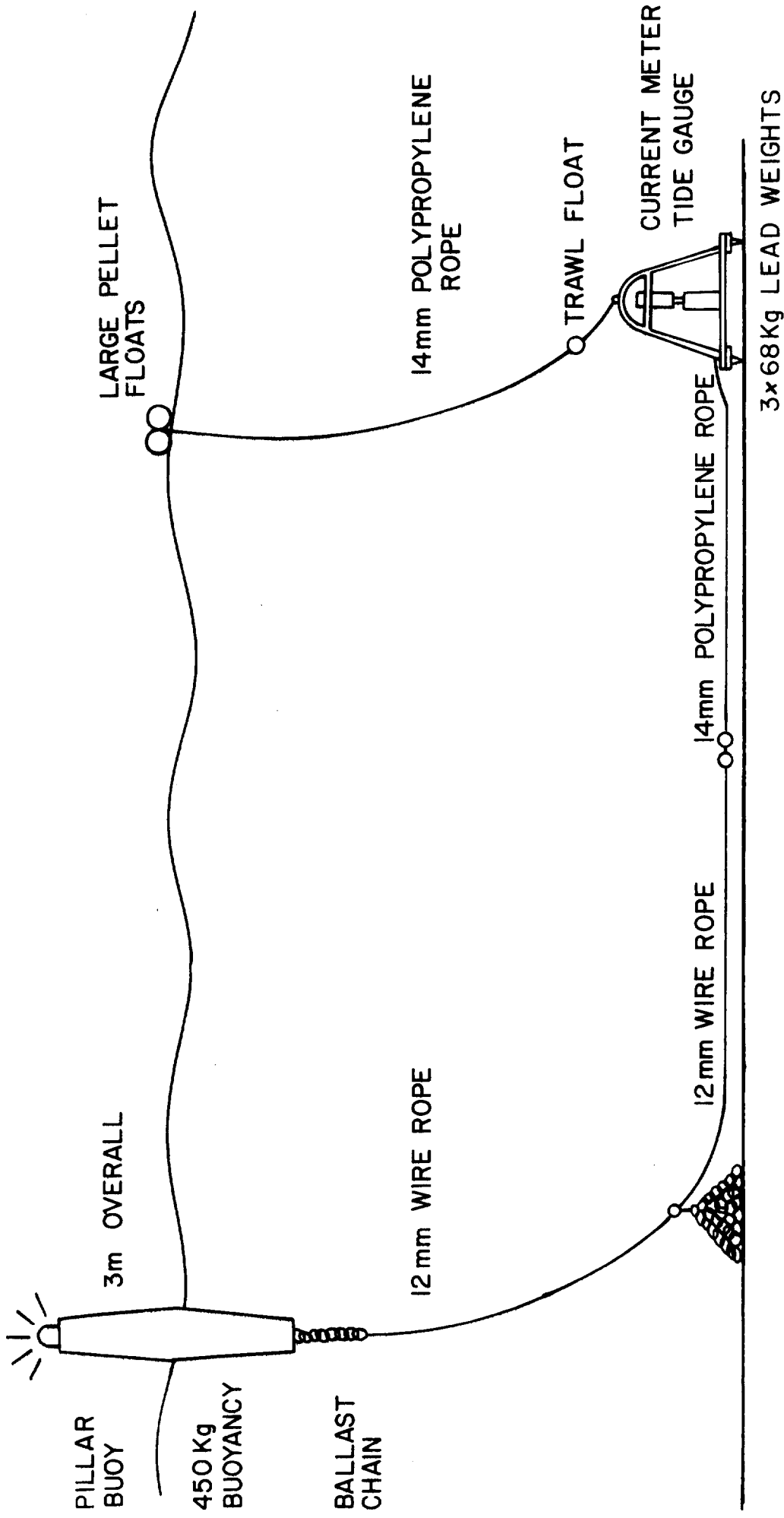


FIGURE 8

## CRUISE REPORTS

<i>RRS "DISCOVERY"</i>	CRUISE DATES	REPORT NO.																																																																																																																																																																																															
<table border="0" style="width: 100%;"> <tr> <th style="text-align: left;">CRUISE NO.</th> <th style="text-align: left;">REPORT NO.</th> </tr> <tr> <td>1</td> <td>JUN — AUG 1963</td> </tr> <tr> <td>2</td> <td>AUG — DEC 1963</td> </tr> <tr> <td>3</td> <td>DEC 1963 — SEP 1964</td> </tr> </table>	CRUISE NO.	REPORT NO.	1	JUN — AUG 1963	2	AUG — DEC 1963	3	DEC 1963 — SEP 1964	<table border="0" style="width: 100%;"> <tr> <th style="text-align: left;">CRUISE DATES</th> <th style="text-align: left;">REPORT NO.</th> </tr> <tr> <td><i>RRS "CHALLENGER"</i></td> <td></td> </tr> <tr> <td>AUG — SEP 1974</td> <td>IOS CR 22</td> </tr> <tr> <td>MAR — APR 1976</td> <td>IOS CR 47</td> </tr> <tr> <td>MAR — MAY 1978</td> <td>IOS CR 72</td> </tr> <tr> <td>APR — 1979</td> <td>IOS CR 81</td> </tr> </table>	CRUISE DATES	REPORT NO.	<i>RRS "CHALLENGER"</i>		AUG — SEP 1974	IOS CR 22	MAR — APR 1976	IOS CR 47	MAR — MAY 1978	IOS CR 72	APR — 1979	IOS CR 81																																																																																																																																																																												
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\*\* NIO CR: National Institute of Oceanography, Cruise Report.

\*\*\* IOS CR: Institute of Oceanographic Sciences, Cruise Report.

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