

I.O.S.

R R S JOHN MURRAY

CRUISES 11/75 LEG 1 15-22 AUGUST 1975

13/75 LEG 2 23-29 SEPTEMBER 1975

14/75 LEG 3 10-17 OCTOBER 1975

CRUISE REPORT NO 42

1976

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

INSTITUTE OF OCEANOGRAPHIC SCIENCES

**Wormley, Godalming,
Surrey, GU8 5UB.
(0428-79-2122)**

(Director: Professor H. Charnock)

**Bidston Observatory,
Birkenhead,
Merseyside, L43 7RA.
(051-652-2396)**

(Assistant Director: Dr. D. E. Cartwright)

**Crossway,
Taunton,
Somerset, TA1 2DW.
(0823-86211)**

(Assistant Director: M.J. Tucker)

**Marine Scientific Equipment Service
Research Vessel Base,
No. 1 Dock,
Barry,
South Glamorgan, CF6 6UZ.
(04462-77451)
(Officer-in-Charge: Dr. L.M. Skinner)**

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R R S JOHN MURRAY

Cruises 11/75 Leg 1 15-22 August 1975
13/75 Leg 2 23-29 September 1975
14/75 Leg 3 10-17 October 1975.

Cruise Report No 42

1976

Institute of Oceanographic Sciences
Bidston Observatory
Birkenhead
Merseyside L43 7RA

CONTENTS

	Page
Duration	1
Scientific staff	1
Ship's Officers	2
Objectives of cruise	3
Narrative - Leg 1	4
Leg 2	6
Leg 3	7
Station reports - Leg 1	10
Leg 3	15
Equipment losses	20
Comments on ship	20
Acknowledgements	20
Table 1 - List of station positions and corresponding depths	21
Table 2 - List of equipment deployed	22
Table 3 - List of CTD profiles	23
Abbreviations	26
Figure 1 - Diagram of moored current meter rig	
Figure 2 - Diagram of bottom mounted current meter rig	
Figure 3 - Map showing station positions	
Figure 4 - Track chart - Leg 1 15 Aug to 18 Aug	
Figure 5 - Track chart - Leg 1 19 Aug to 21 Aug	
Figure 6 - Track chart - Leg 3 10 Oct to 15 Oct	
Cruise reports	33

Note: All times in this report are in GMT.

Duration

Leg 1	-	sailed from Liverpool	11.00	15 August 1975
		arrived at Barry	17.00	21 August 1975
Leg 2	-	sailed from Barry	10.45	23 September 1975
		arrived at Barry	20.00	27 September 1975
Leg 3	-	sailed from Barry	08.00	10 October 1975
		arrived at Barry	05.10	16 October 1975

Scientific staff

Leg 1	N.E. Barrow	I.O.S.	Bidston
	D. Flatt		"
	M.J. Howarth		" (Principal scientist)
	I.D. James		"
	D.L. Leighton		"
	D.C.C. Macdonald		"
	R.I.R. Palin		"
Leg 2	M. Carson	I.O.S.	Wormley
	D. Flatt	I.O.S.	Bidston
	M.J. Howarth		"
	I.D. James		" (Principal scientist)
	D.L. Leighton		"
	R.I.R. Palin		"
	J. Smithers	I.O.S.	Wormley
	C.J. Walker	I.O.S.	Bidston
Leg 3	M. Amin	I.O.S.	Bidston
	D. Flatt		"
	N. Hanson		"
	A.J. Harrison		" (Principal scientist)
	I.D. James		"
	D.L. Leighton		"
	S.G. Loch		"

Ships Officers

Leg 1	G.M. Long	Master
	A.L. Moore	Chief Officer
	P.C. Oldfield	Second Officer
	D. Gregory	Third Officer
	P.J. Byrne	Chief Engineer
	R.S. Chant	Second Engineer
	J.T. O'Keefe	Third Engineer
Leg 2	A. Justen	Master
	W. Coverdale	Chief Officer
	S. Sykes	Second Officer
	D. Gregory	Third Officer
Leg 3	A.W. Justen	Master
	W. Coverdale	Chief Officer
	S.P. Tilbury	Second Officer
	W.R. Austin	Third Officer
	A.E. Coombes	Chief Engineer
	R.S. Chant	Second Engineer
	F.J. Richards	Third Engineer

Objectives of cruise

In summer there is a thermocline in the Celtic Sea whilst the St. George's Channel is well mixed. Thus, there is a frontal region between the two water masses where the depth of the thermocline decreases to zero and there is a large horizontal temperature gradient. The objectives of the cruise were

- (1) To study the frontal region, situated in the southern St. George's Channel, by continuously sampling surface conductivity and temperature, by taking vertical profiles of conductivity and temperature and by deploying a Batfish to measure conductivity and temperature against depth while the vessel was moving.
- (2) To study internal tides in the Celtic Sea, especially in the area where the depth of thermocline decreased. This entailed deploying recording current meter and thermistor chain rigs.
- (3) To continue a study of the circulation, long term variability and physical oceanography of the area by comparing the results from the above equipment with those from previous experiments.
- (4) To provide data for a cotidal chart and energy budget of the area by deploying two current meter rigs, one off St. Ives and one near Lundy, to fill in gaps from previous experiments.
- (5) To test hardware developments to recording current meters - an elapsed time counter and a new bottom frame - and the effects of sampling the data frequently.

Narrative - Leg 1

The programme for leg 1, see Figure 3, was to deploy nine current meter rigs, Figure 1, one each at stations A,C,D,E,H and J and three at B, to conduct a CTD survey of the southern St. George's Channel in the region of the front and to recover the two experimental current meter rigs at B.

R.R.S. John Murray sailed from Liverpool at 11.00 GMT on Friday, 15th August, 1975, with the intention of arriving at station J early next morning, see Figures 4 and 5 for track charts. At 17.14 logging of position, surface temperature and surface conductivity began and continued every 10 minutes throughout the cruise when the ship was under way. The next day, Saturday, rig J was in the water by 08.16, rig H by 11.05 and rig C by 15.42. The sea was moderate during the deployment of rig J, but had become fairly calm by the time station C was reached. The only difficulty experienced was in switching off a command pinger attached to rig H near the bottom meter, which took half an hour. A command pinger was fitted to only one other rig, A, and this caused no trouble. During Saturday night, CTD profiles were taken every 9km along the axis of the St. George's Channel. On 17th, in calm seas, rig A was in the water by 08.06, and the three rigs at B by 13.47, in the order the long term rig, the short term fast sample rig and the bottom frame, Figure 2. The rigs were all within 1.5km of each other. The ship then proceeded towards station E taking CTD profiles every 13km and rig E was successfully deployed by 07.30 on 18th. CTD profiles were executed every 13km during the return to the St. George's Channel and thereafter every 9km for a survey of the frontal region which lasted until early on the morning of the 20th. During the survey, the flashing lights at rigs J and H were both sighted during darkness. The two experimental rigs at B were recovered by 08.25 on 20th. Unfortunately it appeared that the meter in the bottom frame had leaked and only collected about 2.5 hour data. Rigs C and A were visited and found to be present and correct. Rig D was in the water by 07.31 on 21st and the ship then set course for Barry. At 13.13 surface sampling was stopped and the ship docked at Barry at 16.45. This leg of the cruise

lasted 6 days during which time 96 CTD profiles were taken and 1530km of surface conductivity and temperature data recorded.

Narrative - Leg 2

The aim of leg 2 of the cruise was to make detailed measurements of the temperature and salinity field in the vicinity of the front in St. George's Channel, using both the CTD system and the Batfish towed system. It was also planned to lay experimental current meter rigs near position B and to recover them after 4 days operation, to recover current meter rigs D and E, and to inspect the rigs at A, H, J and C. In the event, continuous bad weather prevented any useful work from being done.

The ship sailed from Barry at 10.45 GMT on Tuesday, 23rd September, towards rig D. The buoy at D was sighted at 19.10 and recovery of D was attempted unsuccessfully in darkness and a moderate sea. It was decided to postpone recovery until daylight and shelter in the lee of Lundy until then, as gales were forecast. Sheltering during gales continued for the next two days. At 12.15 on 26th September, after the wind had dropped, the ship left Lundy for rig D, but the sea remained too rough for recovery of rig D. At 15.30 the ship anchored off Clovelly in order to shelter from the forecast gale. On 27th September, with a force 10 wind forecast and only two more days of the cruise remaining, it was concluded that none of the planned programme was now feasible and the ship returned to Barry, arriving at 20.00 on Saturday, 27th September.

Narrative - Leg 3

R.R.S. John Murray sailed from Barry at 08.00 hours on Friday 10 October. The surface monitoring pump was deployed and measurements of temperature and conductivity started at 10.10 hours with a sampling interval of 3 min along a course set for station D. (See Figures 3 and 6).

Station D was occupied at 14.12 hours and the current meter rig located on position, recovery started at 14.30 hours and was successfully completed by 14.57. A CTD profile was taken at 15.00 and the ship left the station at 15.12 on course for station B.

At 23.01 in good weather and clear visibility, the buoy on station B was sighted and the station occupied at 23.30 with the rig still on its lay position. The deployment of a temporary current meter rig with 2 current meters, commenced at 00.01 and was satisfactorily completed by 00.35. Deployment of a temporary bottom mounted current meter rig started at 01.30 and successfully completed by 01.52. A CTD profile was taken to complete the work on station B and the ship left at 02.22 on a course set for station A.

Station A was occupied at 07.45 but there was no sign of the current meter rig. Transmission of acoustic signals to the pinger on the rig started at 08.07 in an attempt to locate its position, but almost immediately the cable of the overside transducer became entangled with the ship's propeller and was cut, resulting in the loss of the transducer. However transmission continued on the ship's hull transducer. In addition, a grapnel was deployed at 09.26 and dragging started, which continued throughout the daylight hours. At 17.55 dragging was discontinued but the acoustic search continued until 02.00 the following day, Sunday. No positive contact was made with the rig during this time, so station A was left and course set for a return to station B.

Station B was reoccupied at 05.30 and all rigs sighted in position. Recovery of the permanent current meter rig started at 07.30 and was completed by 08.08. Recovery of the temporary rigs started at 08.48 and was completed by 09.50 hours. A CTD

profile was taken at 09.56 and the ship left the station at 10.00 on course for station H.

Station H was occupied at 14.30 in perfect weather conditions but there was no sign of the rig. Dragging across the lay position started at 14.40 and contact was made with the rig ground line at 14.50. Only the bottom current meter, the acoustic pinger and part of the thermistor chain were recovered. Both the meter wire and the surface buoy wire had been cut at about mid water depth. Recovery was complete by 15.30. A CTD profile was taken at 15.37 and the ship left the station at 15.54 heading for station J.

Station J was occupied at 17.40 but there was no sign of the rig, so dragging started at 17.42 across the lay position of the ground line. (No acoustic pinger on this rig). No positive contact had been made with the rig so dragging was stopped for the night at 19.00. During the night a CTD section was carried out on a heading 038° from station J with profiles at about 10 mile intervals.

At 07.00 on Monday 13th October, station J was reoccupied and dragging started at 07.17 hours. Contact was made with the rig at 09.18 and by 10.05 the recovery of all instruments and the sub-surface buoy was complete. A final CTD profile was taken at 10.23 and the ship left station J heading for station A. Two CTD profiles were taken along this track to complete the section through station J.

Station A was reoccupied at 14.28 and dragging started immediately. At 14.43 the pinger on the rig was switched on, giving the first positive contact. Dragging continued aided by the pinger but was discontinued at nightfall (17.36 hrs) without success. A box search of the area was started at 18.30 to pin-point the position of the pinger and this was completed by 23.30.

Dragging recommenced at 07.30 on Tuesday 14th October and continued until 15.30 when the ground line of the rig was grappled. Recovery started and the bottom current meter, together with the pinger, was recovered by 15.58. A CTD profile at 16.45 completed the work on station A and the ship left at 16.47 to continue the CTD section in a southerly direction along the line of stations.

At 05.50 hours on Wednesday, 15th October, the ship was within 8 miles of station E when the Master decided to heave-to because of the deteriorating weather, but at 08.15, with gales forecast for the area, a course was set to seek shelter off the Isle of Lundy. After sheltering for 6 hours and no improvement expected during the next 24 hours, it was decided to sail for Barry on the next tide, since this left no time to re-visit station E and dock in Barry on schedule.

Surface sampling was stopped at 18.00 hours and the pump brought inboard.

The ship docked in Barry at 05.10 hours on Thursday, 16th October.

NOTE : Station C had been recovered by a fishing trawler on 19 September so it was not visited on this leg.

Station Report Leg 1. Deployment

(Decca - 1 B/MP. S.W. British)

Station A

Current meter rig with 2 meters, 1 Thermistor chain and acoustic command pinger.

<u>Surface buoy</u>	<u>Sub-surface buoy</u>	<u>Meters</u>
Toroid No 7 with No.17 flasher	Free flooding Slingsby No.4	417 TOP T111 Logger 139 Chain (50m) 1507 BOTTOM CP9 (Pinger)

Water depth at launch 109m

Decca positions (of surface and sub-surface buoys)

RED	GREEN	PURPLE	RED	GREEN	PURPLE
-	J45.48	H51.58	-	J45.48	H51.52

Deployment started at 07.35 17 Aug 75

Deployment complete 08.06

CTD profile No.19

Station B

- a) Current meter rig with 2 meters + 1 thermistor chain
 - b) Temporary current meter rig with 2 meters
 - c) Temporary bottom mounted current meter rig with 1 meter
- a) Current meter rig (Permanent) :-

<u>Surface buoy</u>	<u>Sub-surface buoy</u>	<u>Meters</u>
Toroid No 10 with No.15 flasher	Free flooding Slingsby No.3	1509 TOP T178 Logger 212 chain 1506 BOTTOM

Water depth at launch 79m

Decca positions

RED	GREEN	PURPLE	RED	GREEN	PURPLE
-	B39.60	H52.34	-	B39.50	H52.45

Deployment started at 11.21 17 Aug 75

Deployment complete 11.43

CTD profile No.20.

b) Current meter rig (Temporary) :-

<u>Surface buoy</u>	<u>Sub-surface buoy</u>	<u>Meter</u>
Toroid No.2 with No.11 flasher	Steel sphere Bidston A	1750 TOP 1747 BOTTOM

Water depth at launch 80m

Decca positions

RED	GREEN	PURPLE	RED	GREEN	PURPLE
-	B41.14	H52.20	-	B41.14	H52.12

Deployment started at 12.00 17 Aug 75

Deployment complete 12.26

Recovery position	RED	GREEN	PURPLE
	-	B41.04	H52.26

Recovery started 07.25 20 Aug. 75

Surface buoy on deck 07.27

" " anchor on deck 07.36

Sub-surface buoy anchor on deck 07.41

Bottom CM on deck 07.43

Top CM on deck 07.45

Sub-surface buoy on deck 07.48
and recovery complete.

Both current meters were in good condition and still operating, although the tapes had fully transported and the main batteries were low.

c) Bottom mounted current meter rig (temporary) :-

<u>Surface buoy</u>	<u>Pellets buoy</u>	<u>Meter</u>
Toroid No.3 with no.5 flasher	2 large white pellet floats	566

Water depth at launch 80m

Decca positions

RED	GREEN	PURPLE	RED	GREEN	PURPLE
-	B40.60	H52.02	-	B40.58	H52.14

Deployment started at 13.31 17 Aug 75

Deployment complete 13.47

Recovery position	RED	GREEN	PURPLE
	-	B40.50	H52.18

Recovery started 08.08 20 Aug. 75

Bottom frame on deck 08.13

Surface buoy on deck 08.25
and recovery complete

The current meter was externally in good condition but had leaked through remote start terminal and only collected about 2½ hours data.

Station C

Current meter rig with 3 meters

<u>Surface buoy</u>	<u>Sub-surface buoy</u>	<u>Meters</u>
Toroid No 13 with No.18 flasher	Steel sphere Barry No.3	568 TOP 1001 MID 1138 BOTTOM

Water depth at launch 62m

Decca positions

RED	GREEN	PURPLE	RED	GREEN	PURPLE
G00.02	A47.86	I56.50	G00.01	A47.68	I56.56

Deployment started at 15.30 16 Aug 75

Deployment complete 15.42

CTD profile No.3

Station D

Current meter rig with 2 meters

<u>Surface buoy</u>	<u>Sub-surface buoy</u>	<u>Meters</u>
Toroid No.3 with No.5 flasher	Steel sphere Bidston A	1508 TOP 1139 BOTTOM

Water depth at launch 64m

Decca positions

RED	GREEN	PURPLE	RED	GREEN	PURPLE
A6.20	F 46.76	I60.60	A6.25	F46.63	I60.80

Deployment started at 07.15 21 Aug 75

Deployment complete 07.31

CTD profile No. 96

Station E

Current meter rig with 2 meters

<u>Surface buoy</u>	<u>Sub-surface buoy</u>	<u>Meters</u>
Toroid No.1	Steel sphere	1002 TOP
with No.16 flasher	Bidston B	1140 BOTTOM

Water depth at launch 75m

Decca positions

RED	GREEN	PURPLE	RED	GREEN	PURPLE
A12.72	C38.76	D68.26	A12.62	C38.70	D68.31

Deployment started at 07.13 18 Aug 75

Deployment complete 07.30

CTD profile No.35

Station H

Current meter rig with 2 meters, 1 thermistor chain and 1 acoustic command pinger

<u>Surface buoy</u>	<u>Sub-surface buoy</u>	<u>Meters</u>
Toroid No.12	Free-flooding	295 TOP
with No.6 flasher	Slingsby No.2	T179 Logger
		175 chain
		567 BOTTOM
		CP013 Pinger

Water depth at launch 106m

Decca positions

RED	GREEN	PURPLE	RED	GREEN	PURPLE
H1.86	J36.12	I73.29	H1.84	J35.99	I73.48

Deployment started at 10.35 16 Aug 75

Deployment complete 11.05

CTD profile No. 2.

Station J

Current meter rig with 3 meters

<u>Surface buoy</u>	<u>Sub-surface buoy</u>	<u>Meters</u>
Toroid No.11 with No.19 flasher	Metal sphere Barry 4	1748 TOP 1746 MIDDLE 1749 BOTTOM

Water depth at launch 96m

Decca positions

RED	GREEN	PURPLE	RED	GREEN	PURPLE
-	I42.28	J62.96	-	I42.14	J63.27

Deployment started at 07.50 16 Aug 75

Deployment complete 08.16

CTD profile No.1

Station report Leg 3 (recovery)

(Decca - 1 B/MP S.W. British)

Station A

Current meter rig with 2 meters, 1 thermistor chain and 1 command pinger

Meter No. 417 TOP
1507 BOTTOMThermistor chain logger No.T111
" " (50m) No. 139

command pinger No. CP9

	RED	GREEN	PURPLE
Deployed position	-	J45.48	H51.52
Recovery position		J45.54	H51.78

Rig recovered by dragging

Recovery started	15.30	14 Oct.
Sub-surface anchor on deck	15.50	
Bottom meter on deck (1507)	15.53	
Pinger on deck	15.54	
Recovery complete	15.58	

Both the CM meter and pinger were in good condition on recovery and still operating.

CTD profile No. 100	carried out at	18.09	11 Oct
No. 110	" "	16.45	14 Oct

Station B

- a) Current meter rig with 2 meters and 1 thermistor chain
- b) Temporary current meter rig. 2 meters
- c) Temporary bottom mounted CM rig

- a) Current meter rig (permanent):-

Meter No. 1509 TOP
1506 BOTTOMThermistor chain logger No.T178
" " (50m) No. 212

	RED	GREEN	PURPLE
Deployed position	-	B39.60	H52.34
Recovery position	-	B39.60	H52.34
Recovery started	07.30	12 Oct	
Surface buoy on deck	07.38		
Surface buoy anchor on deck	07.50		
Sub-surface anchor on deck	07.58		
Bottom CM on deck	08.00		
Top CM and thermistor chain on deck	08.06		
Sub-surface buoy on deck and recovery complete	08.08		

All equipment in good condition and operating normally.

- b) Temporary current meter rig (in position 11 Oct to 12 Oct 1975)

<u>Surface buoy</u>	<u>Sub-surface buoy</u>	<u>Meter</u>
Toroid No.3 with No.5 flasher	Steel sphere Bidston A	1750 TOP 570 BOTTOM (continuous sampling with scan counter)

Decca positions

RED	GREEN	PURPLE	RED	GREEN	PURPLE
-	B41.22	H51.07	-	B40.82	H51.32
Deployment started at	00.01	11 Oct			
Deployment complete	00.35				
Recovery position	RED -	GREEN B41.42	PURPLE H50.76		
Recovery started		08.48	12 Oct		
Surface buoy on deck		08.52			
Surface buoy anchor on deck		08.55			
Sub-surface buoy anchor on deck		09.00			
Bottom CM on deck		09.02			

Top CM on deck 09.04

Sub-surface buoy on deck 09.06
and recovery complete

No damage to any equipment, still operating normally.

- c) Temporary bottom mounted current meter rig
(in position 11 Oct to 12 Oct 1975)

<u>Surface buoy</u>	<u>Meter in bottom frame</u>
Toroid No.2 with No.11 flasher	1747 (30 sec sampling interval)

Decca positions

RED	GREEN	PURPLE	RED	GREEN	PURPLE
-	B43.33	G78.20	-	B43.55	G77.75
Deployment started at				01.30	11 Oct
Deployment complete				01.52	
Recovery position			RED	GREEN	PURPLE
				B 43.40	H78.02
Recovery started at				09.30	12 Oct
Surface buoy on deck				09.32	
Surface buoy anchor on deck				09.43	
Frame on deck				09.47	
Recovery complete				09.50	

All equipment in good condition and still operating

CTD profiles No.99 at 02.06 11 Oct
No.101 09.56 12 Oct

Station C

Current meter rig with 3 meters No. 568 TOP
1001 MID
1138 BOTTOM

Deployed position	RED	GREEN	PURPLE
	G00.02	A47.56	I56.50

This station was not visited on this leg since a fishing trawler had recovered the sub-surface buoy and top two current meters on 19 September.

Station D

Current meter rig with 2 meters	No. 1509	TOP	
	1139	BOTTOM	
	RED	GREEN	PURPLE
Deployed position	A6.20	F46.76	I60.60
Recovery position	A6.10	F46.85	I60.56
Recovery started at		14.30	10 Oct
Surface buoy on deck		14.32	
Surface buoy anchor and bottom meter on deck		14.40	
Top meter on deck		14.44	
Sub-surface buoy on deck and recovery complete		14.47	

The surface buoy anchor was missing from the rig and the bottom meter had become entangled with the ground line and anchor. Also both current meters had their rotor missing.

CTD profile No.98 carried out at 15.00 10 Oct.

Station E

Current meter rig with 2 meters	No. 1002	Top	
	1140	Bottom	
	RED	GREEN	PURPLE
Deployed position	A12.72	C38.76	D68.26

This station was not visited on this leg due to bad weather. However, at a previous time the surface buoy had been deliberately cut off by an off-shore rescue vessel and landed in Belfast. The sub-surface buoy, with one meter attached, was recovered by an Irish fishing trawler on 3 Nov 1975.

Station H

Current meter rig with 2 meters, 1 thermistor chain and 1 command pinger.

Meter No.	295	Top	
	567	Bottom	
Thermistor chain logger	No. T	179	
"	"	(50m) No.	175
Command pinger	No.	CP13	

	RED	GREEN	PURPLE
Deployed position	H1.86	J36.12	I73.29
Recovery position	-	J36.12	I73.35

Rig recovery by dragging

Recovery started	15.00	12 Oct
Sub-surface buoy on deck	15.12	
Bottom meter and pinger on deck, recovery complete	15.13	

No further equipment recovered from this rig. Meter wire and thermistor chain cut at about mid-water depth.

CTD profile No. 102 carried out at 15.37

Station J

Current meter rig with 3 meters No. 1748 Top
1746 Mid
1749 Bottom

	RED	GREEN	PURPLE
Deployment position	H4.28	I42.29	J62.93
Recovery position	-	I43.00	J61.87

Rig recovered by dragging 09.18 13 Oct

Recovery started at	
Bottom meter on deck	09.39
Middle " " "	09.41
Top " " "	10.00
Sub-surface buoy on deck and recovery complete	10.05

Nothing further recovered from this station.
CTD profile No. 107 carried out at 10.23 13 Oct.

Equipment losses

Current meters : Aanderaa No. 295
 417
 1138
 1140

Thermistor Aanderaa Logger No. 111
 chains : 179
 Chain No. 139
 175

Flashing Lights : No. 17

Sub-surface buoys : Free-flooding Slingsby No. 2
 No. 4

One overside acoustic transducer

Comments on ship

The ship is well suited for laying and recovering the type of rigs used and all the equipment worked satisfactorily.

Acknowledgements

We would like to thank the Master, Officers and crew of R.R.S. John Murray for their co-operation and assistance in carrying out the work of these cruises.

TABLE 1

LIST OF STATION POSITIONS AND CORRESPONDING DEPTHS

STATION	LAT.N.	LONG.W.
A	51 ⁰ 40'	6 ⁰ 05'
B	51 ⁰ 28'	6 ⁰ 35'
C	51 ⁰ 56.5'	6 ⁰ 47'
D	51 ⁰ 19'	4 ⁰ 44'
E	50 ⁰ 27'	5 ⁰ 54'
H	51 ⁰ 55'	5 ⁰ 58'
J	52 ⁰ 05'	5 ⁰ 46'

	Estimated depth below chart datum (m)	Height of meter above sea floor
A	109	90, 88-38, 15
B	79	62, 60-10, 10
C	62	40, 35, 15
D	60	35, 15
E	73	55, 15
H	100	80, 78-28, 15
J	91	71, 56, 15

TABLE 2
List of equipment deployed

1.	<u>Surface buoys</u>	Toroids no. 1, 2, 3, 7, 10, 11, 12, 13	Manufactured by Cosalt Ltd., Lowestoft. 1.8m dia., 600 Kg buoyancy
2.	<u>Sub-surface buoys</u>	(a) Free-flooding Slingsby No. 2, 3, 4	Manufactured by Vickers. 1m dia.sphere, 225 Kg buoyancy
		(b) 5 steel spheres	Hollow steel spheres. 0.8m dia., 175 Kg buoyancy
3.	<u>Current meters</u>	295, 417, 566, 567, 568, 570, 1001, 1002, 1138, 1139, 1140, 1506, 1507, 1508, 1509, 1746, 1747, 1748, 1749, 1750.	Manufactured by Aanderaa Ltd Norway Type RCM4
4.	<u>Thermistor chains</u>	Loggers No. 111, 178, 179 50m chains No. 139, 212, 175	Manufactured by Aanderaa Ltd., Norway Type TR-1
5.	<u>Flashing lights</u>	Flasher no. 5, 6, 11, 15, 16, 17, 18, 19.	Manufactured by Stone- Platt Ltd., Crawley
6.	<u>Acoustic Command Pingers</u>	CP9, CP13	Manufactured by IOS, Wormley

TABLE 3. LIST OF CTD PROFILES

PROFILE NUMBER	DATE	TIME STARTED	POSITION		RIG
			LATITUDE	LONGITUDE	
1	16/ 8/75	8.25	N 52 2.4	W 5 51.1	J
2	16/ 8/75	11.30	N 51 53.3	W 5 59.1	H
3	16/ 8/75	15.45	N 51 57.0	W 6 47.6	C
4	16/ 8/75	16.45	N 51 56.9	W 6 35.7	
5	16/ 8/75	17.50	N 51 56.5	W 6 24.0	
6	16/ 8/75	18.50	N 51 56.5	W 6 12.4	
7	16/ 8/75	19.40	N 52 0.9	W 6 7.6	
8	16/ 8/75	20.33	N 52 4.5	W 6 2.6	
9	16/ 8/75	21.23	N 52 7.4	W 5 55.6	
10	16/ 8/75	22.29	N 52 11.5	W 5 52.4	
11	16/ 8/75	23.38	N 52 17.3	W 5 46.7	
12	17/ 8/75	0.35	N 52 16.8	W 5 38.2	
13	17/ 8/75	1.12	N 52 13.3	W 5 43.1	
14	17/ 8/75	1.56	N 52 9.3	W 5 47.8	
15	17/ 8/75	2.55	N 52 5.2	W 5 53.0	
16	17/ 8/75	3.50	N 52 1.6	W 5 58.2	
17	17/ 8/75	4.50	N 51 57.5	W 6 3.5	
18	17/ 8/75	5.58	N 51 49.5	W 6 3.6	
19	17/ 8/75	8.21	N 51 39.7	W 6 4.3	A
20	17/ 8/75	13.56	N 51 28.4	W 6 36.4	B
21	17/ 8/75	15.17	N 51 21.8	W 6 43.7	
22	17/ 8/75	16.10	N 51 16.4	W 6 50.8	
23	17/ 8/75	17.17	N 51 10.8	W 6 57.2	
24	17/ 8/75	18.31	N 51 5.4	W 7 4.5	
25	17/ 8/75	19.45	N 50 59.9	W 7 12.7	
26	17/ 8/75	20.23	N 50 56.5	W 7 16.5	
27	17/ 8/75	21.33	N 50 55.1	W 7 10.5	
28	17/ 8/75	22.34	N 50 49.6	W 6 56.0	
29	17/ 8/75	23.38	N 50 46.0	W 6 47.0	
30	18/ 8/75	0.34	N 50 41.9	W 6 35.8	
31	18/ 8/75	1.44	N 50 38.6	W 6 26.4	
32	18/ 8/75	2.41	N 50 34.8	W 6 16.5	
33	18/ 8/75	3.47	N 50 31.6	W 6 6.2	
34	18/ 8/75	4.56	N 50 27.6	W 5 56.6	
35	18/ 8/75	7.34	N 50 26.0	W 5 54.6	
36	18/ 8/75	8.49	N 50 34.1	W 5 53.7	E
37	18/ 8/75	9.43	N 50 40.9	W 5 52.6	
38	18/ 8/75	10.40	N 50 47.9	W 5 51.1	
39	18/ 8/75	11.43	N 50 54.7	W 5 50.4	
40	18/ 8/75	12.39	N 51 1.6	W 5 49.3	
41	18/ 8/75	13.31	N 51 8.5	W 5 48.0	
42	18/ 8/75	14.38	N 51 15.2	W 5 47.0	
43	18/ 8/75	15.30	N 51 22.3	W 5 45.6	
44	18/ 8/75	16.29	N 51 29.3	W 5 45.0	
45	18/ 8/75	17.23	N 51 36.0	W 5 44.1	
46	18/ 8/75	18.23	N 51 42.8	W 5 43.4	
47	18/ 8/75	19.14	N 51 49.6	W 5 40.2	
48	18/ 8/75	19.40	N 51 51.5	W 5 39.3	
49	18/ 8/75	20.21	N 51 55.7	W 5 34.2	
50	18/ 8/75	21.10	N 51 59.0	W 5 29.4	

PROFILE NUMBER	DATE	TIME STARTED	POSITION			RIG	
			LATITUDE	LONGITUDE			
51	18/ 8/75	21.53	N 52	3.7	W 5	24.6	
52	18/ 8/75	22.49	N 52	7.5	W 5	20.1	
53	18/ 8/75	23.35	N 52	11.4	W 5	15.5	
54	19/ 8/75	0.33	N 52	15.7	W 5	11.6	
55	19/ 8/75	1.12	N 52	15.8	W 5	19.5	
56	19/ 8/75	1.57	N 52	11.4	W 5	24.5	
57	19/ 8/75	2.34	N 52	7.2	W 5	28.8	
58	19/ 8/75	3.23	N 52	3.1	W 5	33.4	
59	19/ 8/75	4.15	N 51	59.6	W 5	38.7	
60	19/ 8/75	5.21	N 51	55.1	W 5	42.9	
61	19/ 8/75	6.22	N 51	51.2	W 5	47.5	
62	19/ 8/75	7.38	N 51	47.2	W 5	52.8	
63	19/ 8/75	8.35	N 51	42.9	W 5	57.9	
64	19/ 8/75	9.37	N 51	43.2	W 6	6.2	
65	19/ 8/75	10.31	N 51	43.4	W 6	13.5	
66	19/ 8/75	11.19	N 51	42.9	W 6	21.6	
67	19/ 8/75	12. 4	N 51	47.2	W 6	17.2	
68	19/ 8/75	13.15	N 51	50.9	W 6	12.4	
69	19/ 8/75	14.11	N 51	55.1	W 6	7.6	
70	19/ 8/75	15. 8	N 51	59.7	W 6	2.6	
71	19/ 8/75	15.49	N 52	3.6	W 5	57.6	
72	19/ 8/75	16.35	N 52	7.9	W 5	52.8	
73	19/ 8/75	17. 9	N 52	12.0	W 5	48.2	
74	19/ 8/75	18. 7	N 52	9.7	W 5	42.5	
75	19/ 8/75	20.15	N 52	4.5	W 5	50.1	
76	19/ 8/75	21.36	N 51	58.6	W 5	57.0	
77	19/ 8/75	22.46	N 51	53.1	W 6	4.2	
78	19/ 8/75	23.47	N 51	47.7	W 6	11.3	
79	20/ 8/75	0.55	N 51	41.3	W 6	20.7	
80	20/ 8/75	2.16	N 51	35.6	W 6	27.4	
81	20/ 8/75	3.39	N 51	29.8	W 6	33.2	
82	20/ 8/75	8.31	N 51	28.1	W 6	38.1	B
83	20/ 8/75	9.29	N 51	35.1	W 6	40.7	
84	20/ 8/75	10.34	N 51	42.0	W 6	42.5	
85	20/ 8/75	11.31	N 51	48.3	W 6	44.3	
86	20/ 8/75	12.34	N 51	55.0	W 6	46.7	C
87	20/ 8/75	13.59	N 51	52.8	W 6	37.5	
88	20/ 8/75	14.53	N 51	48.9	W 6	27.6	
89	20/ 8/75	15.50	N 51	45.2	W 6	18.1	
90	20/ 8/75	16.54	N 51	41.6	W 6	8.1	
91	20/ 8/75	17.39	N 51	39.9	W 6	4.4	A
92	20/ 8/75	18.33	N 51	37.2	W 5	54.2	
93	20/ 8/75	19.53	N 51	34.7	W 5	43.4	
94	20/ 8/75	21. 2	N 51	31.8	W 5	33.8	
95	20/ 8/75	22.16	N 51	29.4	W 5	23.1	
96	21/ 8/75	7.35	N 51	19.3	W 4	45.2	D
98	10/10/75	14.51	N 51	19.7	W 4	45.4	D
99	11/10/75	2. 4	N 51	24.6	W 6	39.4	B
100	11/10/75	18. 9	N 51	38.0	W 6	3.1	A
101	12/10/75	9.51	N 51	25.7	W 6	39.7	B
102	12/10/75	15.37	N 51	53.4	W 5	59.7	H
103	12/10/75	19.19	N 52	3.2	W 5	48.9	J
104	12/10/75	21.27	N 52	11.8	W 5	38.4	

PROFILE NUMBER	DATE	TIME STARTED	POSITION		RIG
			LATITUDE	LONGITUDE	
105	12/10/75	23.26	N 52 20.6	W 5 28.3	
106	13/10/75	1.36	N 52 28.7	W 5 19.0	
107	13/10/75	10.15	N 52 3.0	W 5 48.3	J
108	13/10/75	11.18	N 51 58.7	W 5 52.9	
109	13/10/75	12.49	N 51 49.3	W 6 5.0	
110	14/10/75	16.33	N 51 40.9	W 6 4.3	A
111	14/10/75	17.45	N 51 45.5	W 6 13.1	
112	14/10/75	19.56	N 51 35.1	W 6 26.5	
113	14/10/75	21.55	N 51 25.6	W 6 39.6	

Abbreviations

CM current meter

S/S subsurface buoy

CTD Conductivity, temperature, depth

CURRENT METER MOORING SYSTEM
INSTITUTE OF OCEANOGRAPHIC SCIENCES, BIDSTON

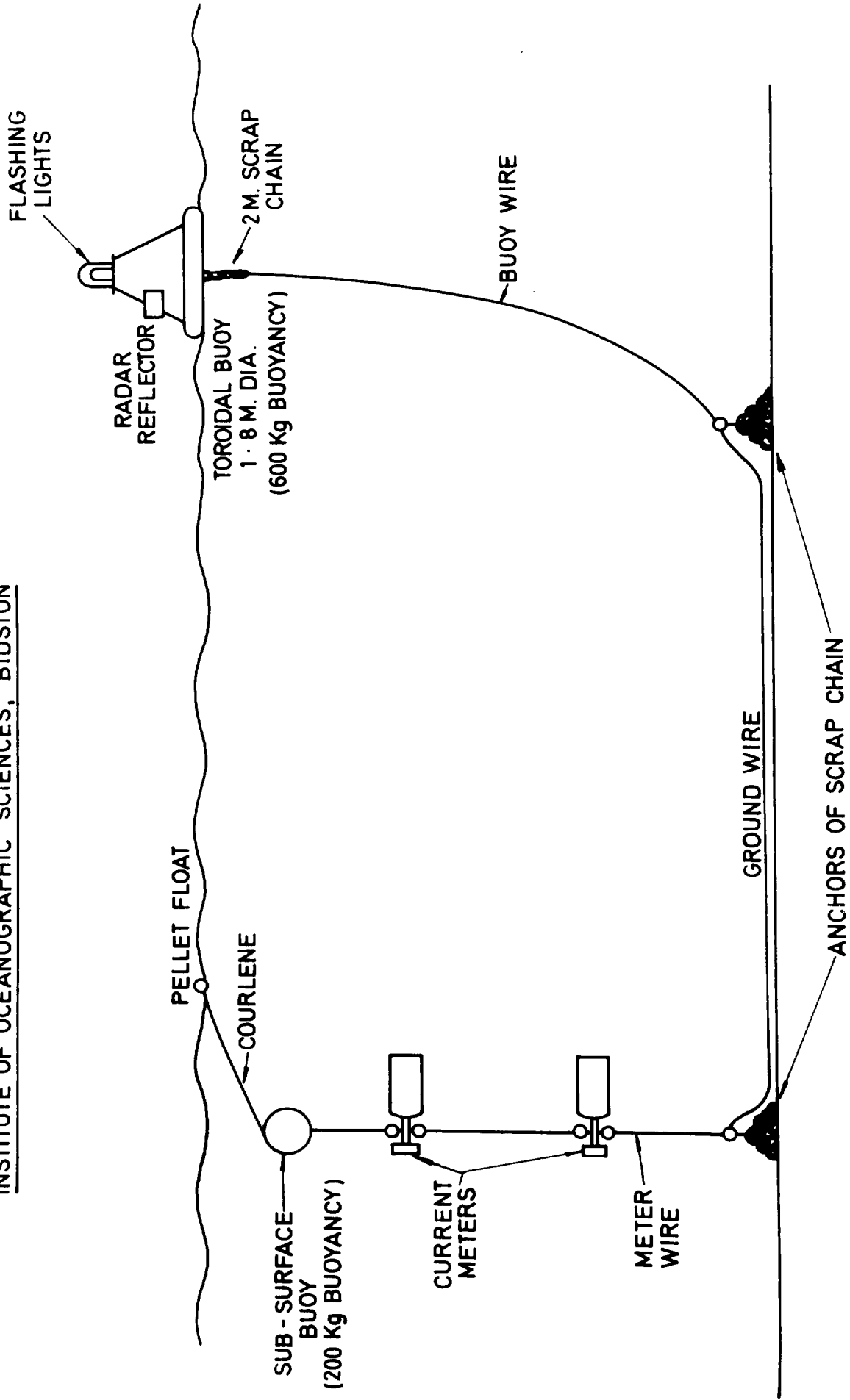


FIGURE 1..

BOTTOM MOUNTED CURRENT METER MOORING SYSTEM
INSTITUTE OF OCEANOGRAPHIC SCIENCES BIDSTON

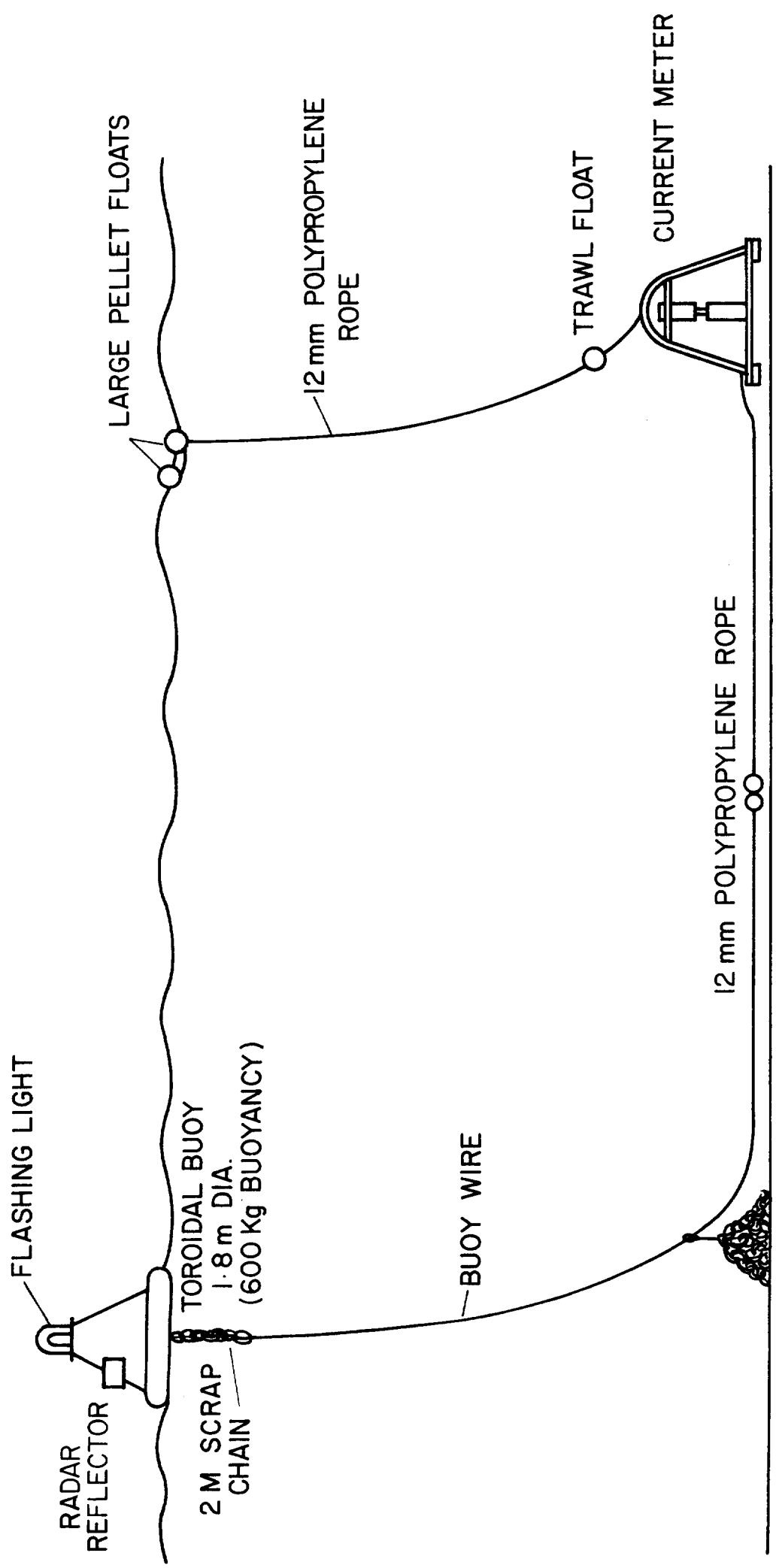


FIGURE 2.

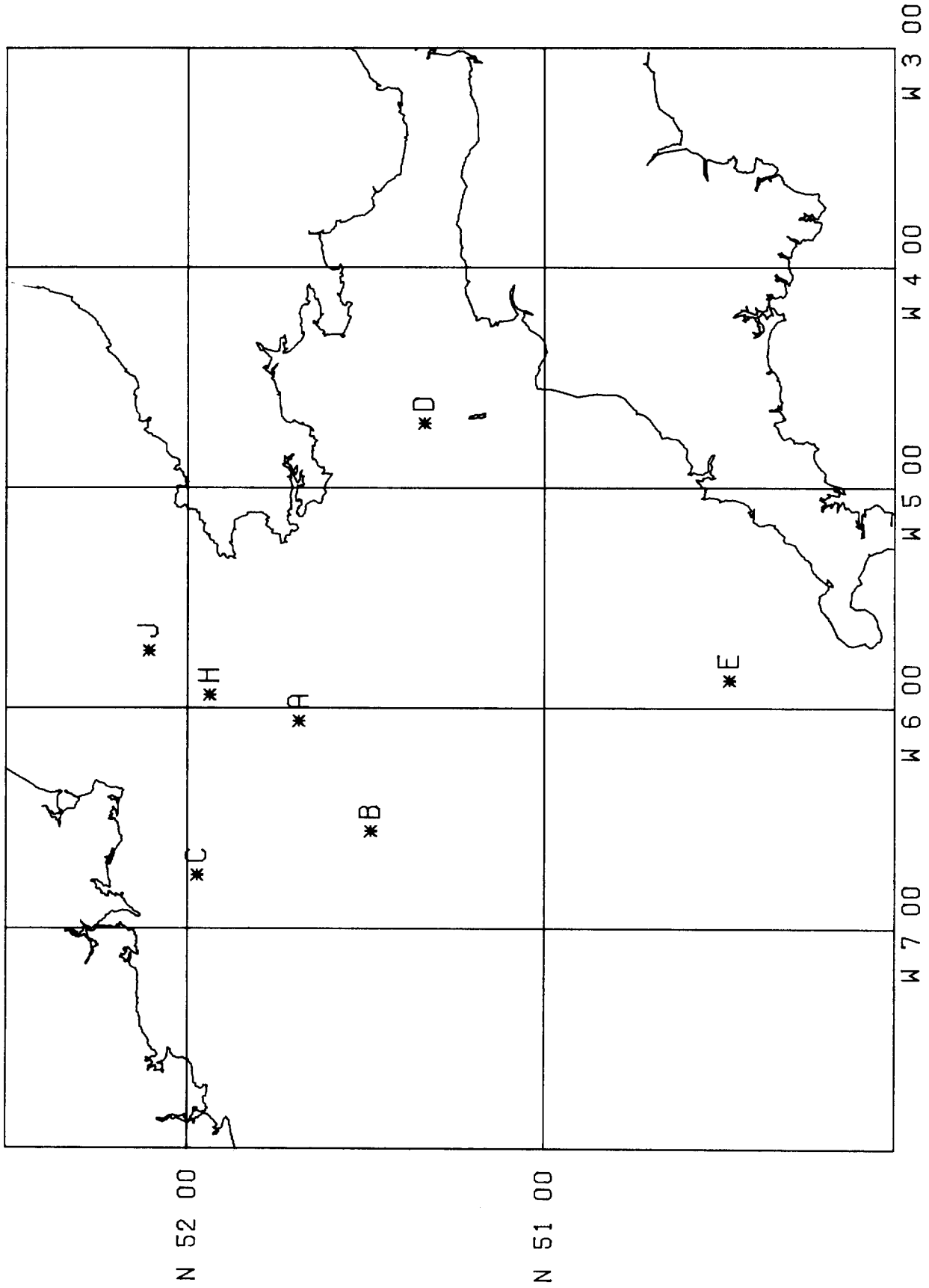


Figure 3. Map showing station positions

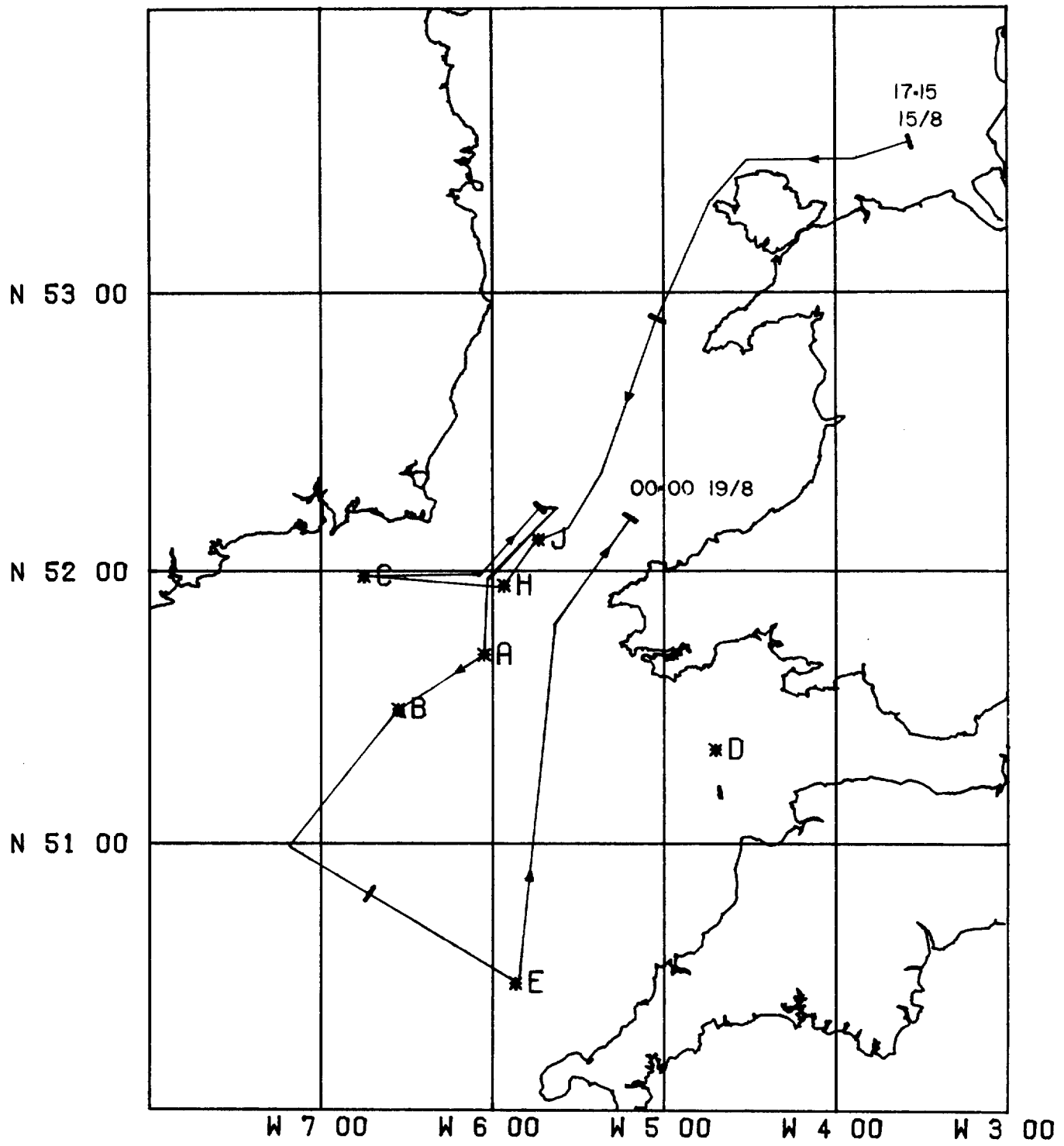


Figure 4. Track chart leg I 15 Aug to 18 Aug

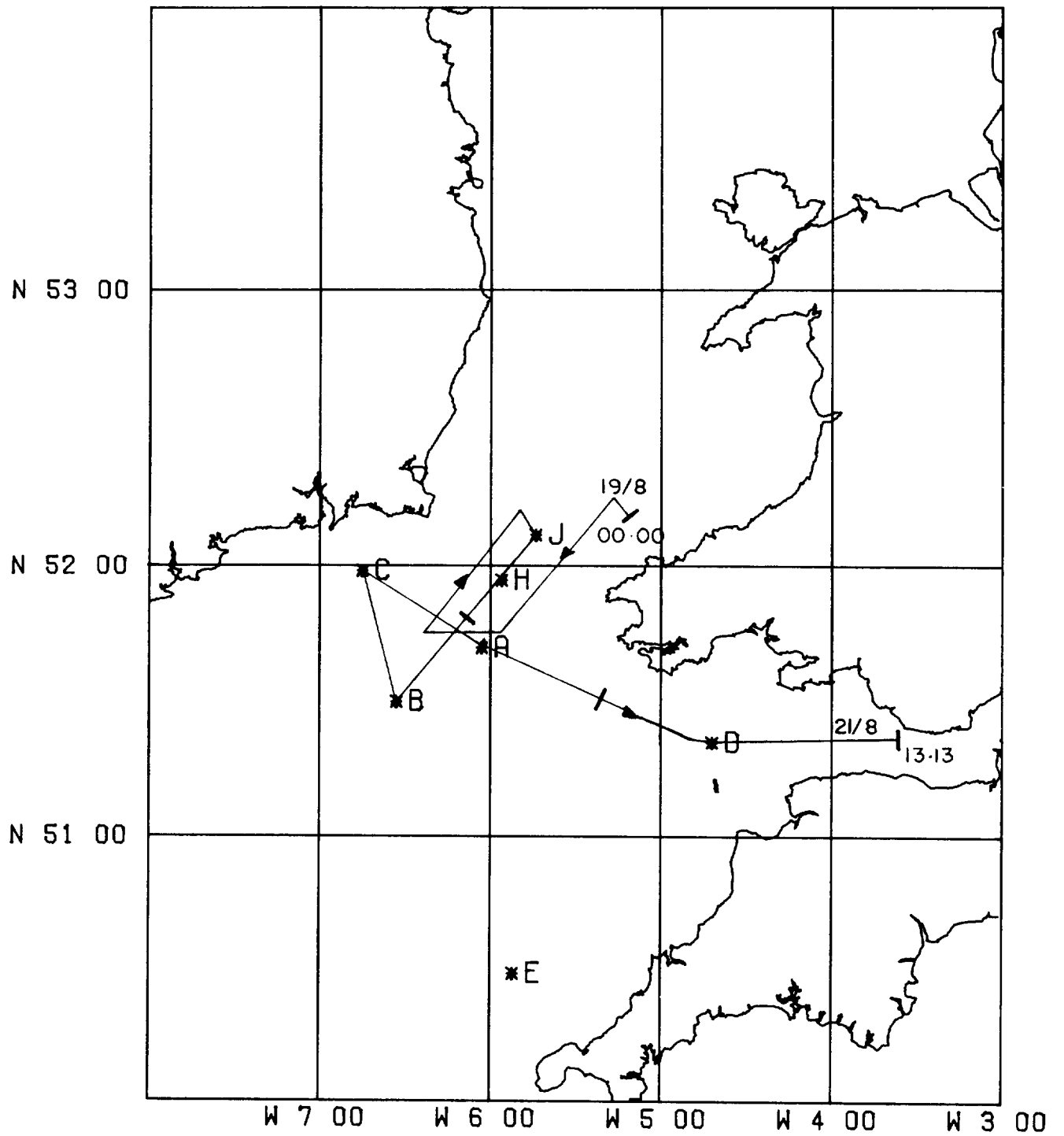


Figure 5. Track chart leg I 19Aug to 21Aug

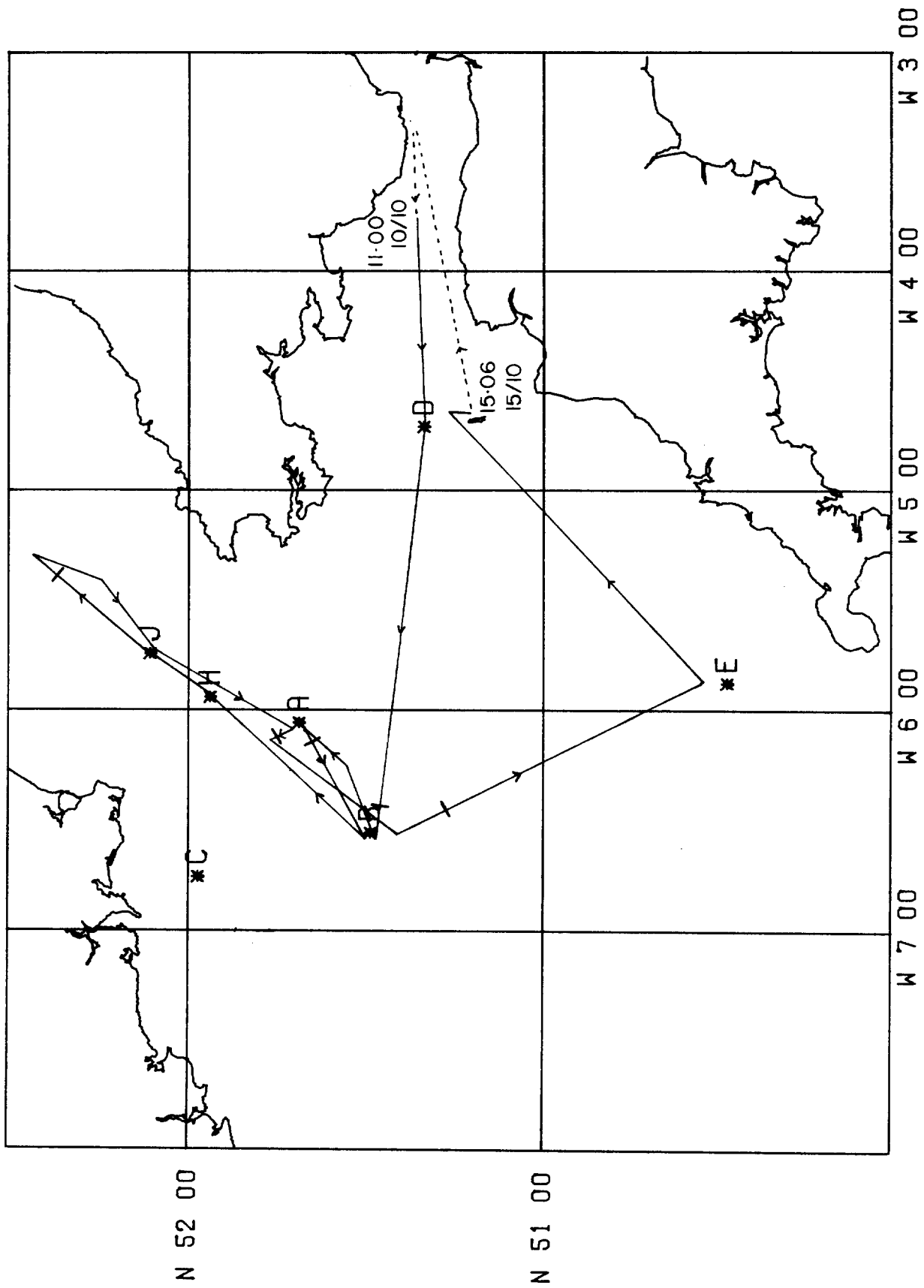


Figure 6. Track chart leg 3 10 Oct to 15 Oct

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2	(Indian Ocean)	distributed by the
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NIO CR¹

4	February-March 1965	4
37	November-December 1970	37
38	January-April 1971	41
39	April-June 1971	40
40	June-July 1971	48
41	August-September 1971	45
42	September 1971	49
43	October-November 1971	47
44	December 1971	46
45	February-April 1972	50
46	April-May 1972	55
47	June-July 1972	52
48	July-August 1972	53
49	August-October 1972	57
50	October 1972	56
51	November-December 1972	54
52	February-March 1973	59
53	April-June 1973	58

IOS CR²

54	June-August 1973	2
55	September-October 1973	5
56	October-November 1973	4
57	November-December 1973	6
58	December 1973	4
59	February 1974	14
60	February-March 1974	8
61	March-May 1974	10
62	May-June 1974	11
63	June-July 1974	12
64	July-August 1974	13
65	August 1974	17
66	August-September 1974	20
68	November-December 1974	16
73	July-August 1975	34
74	September 1975	33

¹NIO CR National Institute of Oceanography, Cruise Report

²IOS CR Institute of Oceanographic Sciences, Cruise Report

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R.R.S. "CHALLENGER"	
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March-May 1975	IOS CR 24
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July-August 1975	IOS CR 37
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D.E. "VICKERS VOYAGER" AND "PISCES III"	
June-July 1973	IOS CR 1

* Not distributed