

710

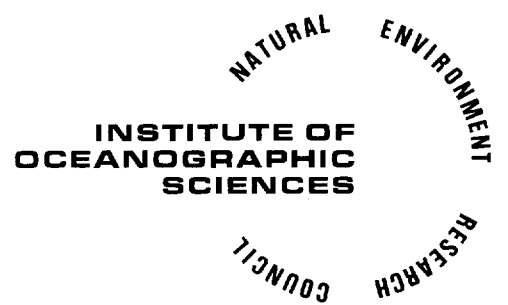
**I.O.S.**

**RV EDWARD FORBES CRUISE 11/17**

**9 July - 24 July 1977**

**SIZEWELL - DUNWICH BANK FIELD STUDY**

**Cruise Report No. 56  
1977**



**INSTITUTE OF OCEANOGRAPHIC SCIENCES**

**Wormley, Godalming,  
Surrey, GU8 5UB.  
(0428 - 79 - 4141)**

**(Director: Dr. A.S. Laughton)**

**Bidston Observatory,  
Birkenhead,  
Merseyside, L43 7RA.  
(051 - 653 - 8633)**

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

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

**(Assistant Director: M.J. Tucker)**

---

*On citing this report in a bibliography the reference should be followed by  
the words UNPUBLISHED MANUSCRIPT.*

RV EDWARD FORBES CRUISE 11/77

9 July - 24 July 1977

SIZEWELL - DUNWICH BANK FIELD STUDY

Cruise Report No 56

1977

B J Lees  
Institute of Oceanographic Sciences  
Crossway  
Taunton  
Somerset

## CONTENTS

	<u>Page</u>
Scientific Personnel	1
Ship's Officers	1
Objectives	1
Equipment and Methods	2
Results	5
Equipment Performance	5
Ship Performance	6
Conclusions	6
Acknowledgements	6
Reference	7
Appendix 1	8

#### SCIENTIFIC PERSONNEL

##### IOS (Taunton)

Mrs B J Lees (Principal Scientist)	8 - 24 July
P M Hooper	8 - 10 July
J D Humphery	21 July
H L King	8 - 13 July
A J Marks	8 - 10 July
M A S Moore	8 - 13 July
K A Reeves	8 - 24 July
T A Upham	19 - 20 July

##### IOS (Barry)

G W J Miller	16 - 18 July
P Taylor	16 - 18 July

#### SHIP'S OFFICERS

P Coombs (Master)  
P Tilbury (1st Officer)  
P Oldfield (2nd Officer)  
I McGill (Chief Engineer)

#### OBJECTIVES

To continue the multidisciplinary study which has the main aim of resolving the sediment transport system of the Sizewell-Dunwich Banks. In particular:

1. To lay five Plessey self-recording current meter rigs of standard configuration, plus one designed for shallow water, and also to change the long term current meter mooring. Recovery to be undertaken after two months, but with a locally chartered vessel. The rigs to be sited primarily so that data coverage can be obtained in areas where the previous year's data is non-existent or of a quality below the required standard. The meters all to be near midwater level in order to provide data suitable for input to the mathematical model (Project S33).
2. To use a fixed array of flowmeters to measure points synchronously on the water velocity profile over two tidal cycles, at each of three selected stations. This further investigation (see Cruise Report No 44, 1976) of the water velocity profile to be part of the input to the mathematical model

#### SCIENTIFIC PERSONNEL

##### IOS (Taunton)

Mrs B J Lees (Principal Scientist)	8 - 24 July
P M Hooper	8 - 10 July
J D Humphery	21 July
H L King	8 - 13 July
A J Marks	8 - 10 July
M A S Moore	8 - 13 July
K A Reeves	8 - 24 July
T A Upham	19 - 20 July

##### IOS (Barry)

G W J Miller	16 - 18 July
P Taylor	16 - 18 July

#### SHIP'S OFFICERS

P Coombs (Master)  
P Tilbury (1st Officer)  
P Oldfield (2nd Officer)  
I McGill (Chief Engineer)

#### OBJECTIVES

To continue the multidisciplinary study which has the main aim of resolving the sediment transport system of the Sizewell-Dunwich Banks. In particular:

1. To lay five Plessey self-recording current meter rigs of standard configuration, plus one designed for shallow water, and also to change the long term current meter mooring. Recovery to be undertaken after two months, but with a locally chartered vessel. The rigs to be sited primarily so that data coverage can be obtained in areas where the previous year's data is non-existent or of a quality below the required standard. The meters all to be near midwater level in order to provide data suitable for input to the mathematical model (Project S33).
2. To use a fixed array of flowmeters to measure points synchronously on the water velocity profile over two tidal cycles, at each of three selected stations. This further investigation (see Cruise Report No 44, 1976) of the water velocity profile to be part of the input to the mathematical model

study, Project S33. Of the three stations selected, one to be on the Sizewell Bank, one off the bank, and the third between the two and therefore in an area likely to be turbulent. The array also to include two direction reading meters, three siltmeters and a pressure sensor.

3. To deploy a Waverider buoy on the seaward side of the banks in 16m water.
4. To undertake the fluorescent tracer experiment postponed from August 1976. (Cruise Report No 44, 1976). To carry out a boxcore survey in the area where the fluorescent tracer would be expected to occur five days (ie 10 tidal cycles) after injection.
5. To use any remaining time for a bathymetric survey of the banks.

The position fixing system to be used for the series of experiments to be the Del Norte Trisponder, with Remote stations set up onshore at Sizewell, Dunwich and Southwold.

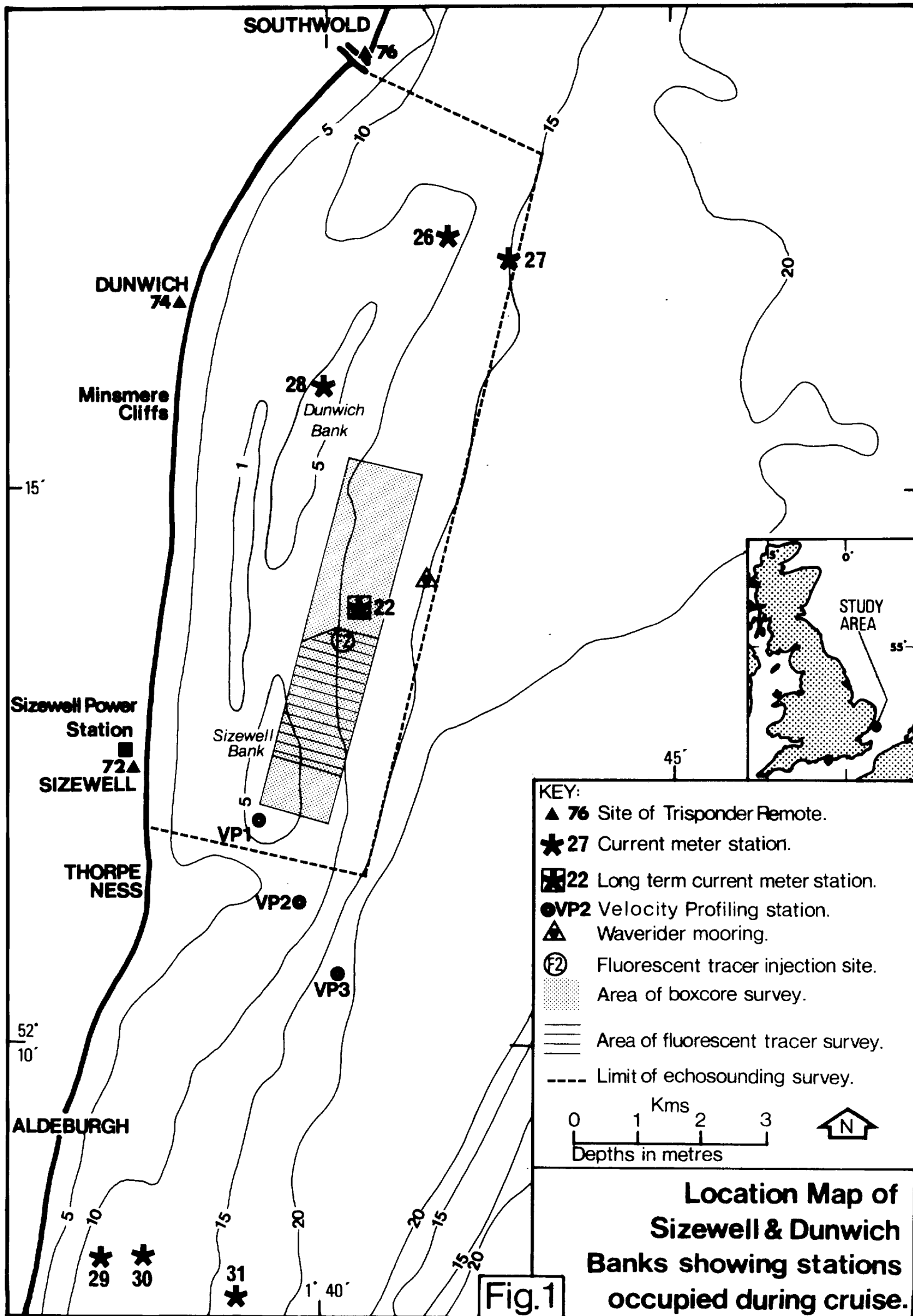
#### EQUIPMENT AND METHODS

##### Del Norte Trisponder

Progressive improvement in positional accuracy has been achieved during the 3 year period in which research has been undertaken in the Sizewell-Dunwich area. The latest equipment in use is the Del Norte Trisponder which gives distances in metres from Remotes set up on shore. It has a range resolution of 1m, and a range accuracy of  $\pm 3m$ . Experiments performed by IOS colleagues in Start Bay indicate that the accuracy also can approach  $\pm 1m$ .

The system itself functioned without fault, although it was realised in retrospect that the site chosen for Remote No 74 was not ideal (Fig 1). The small cliffs immediately south of the beach cafe where the equipment was housed, masked the signal when the ship was in the southern part of the study area. However it was noted that in this same area lines of sight to the other two Remotes (Nos 72 and 76) were almost at the ideal right angles to one another. The codes 72, 74 and 76 are abbreviations of the Pulse Repetition Interval to which each Remote is set, and on which it operates. With the lack of other suitable secure sites at sealevel along this particular stretch of coast it may be necessary to select an island site for any future survey using three Remotes.

During current meter rig deployment on 16 July at 1500 hours, it was noticed that the digit 3, and later 2 as the vessel moved S, was appearing spasmodically in the first column, ie in the 10,000's of metres column, of the



**Fig.1**



display relating to Remote 76 at Southwold. At the time the vessel was approximately 5 kms from this unit. A possible explanation is that there was a second such unit situated in the Orfordness area, causing interference. This lasted for a few minutes only, although a similar phenomenon occurred briefly later in the cruise, again in connection with the Southwold Remote.

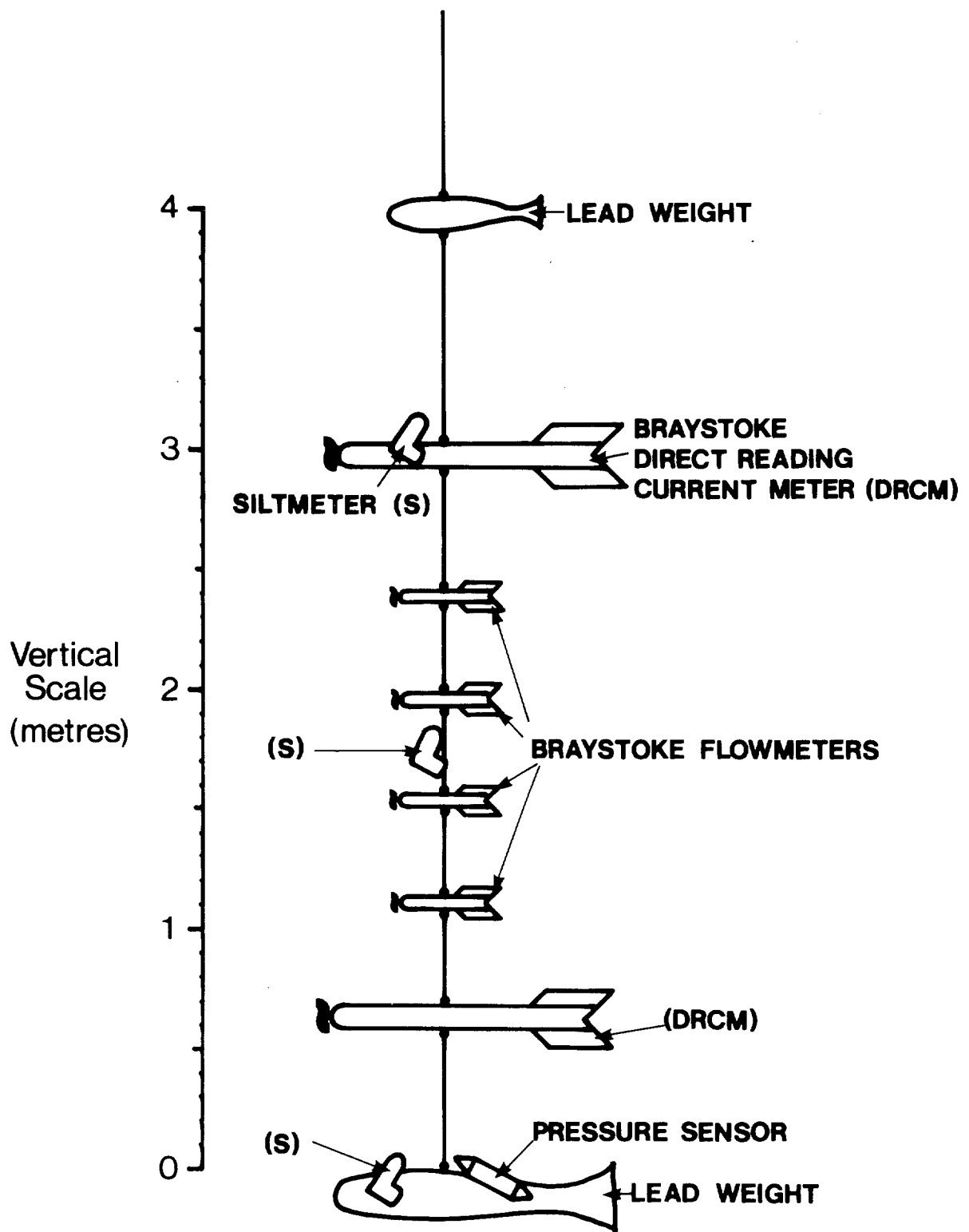
When the DMU (Distance Measuring Unit) is at 'Display On' the system is in standby, but with the last reading displayed. Pressing the Range button will update the reading. This facility is appreciated when undertaking manual logging as it is simple to leave a required reading on display long enough to record it.

#### Current Meter Moorings

Six rigs, including the shallow water one, were laid, and the long term mooring was changed, all without problems. This long term station has now been occupied for ten months. The three stations south of Aldeburgh (see Fig 1) were sited even further south than originally planned. This was in order to avoid placing equipment on the sole fishing grounds where it would be at risk from the activities of local fishermen.

#### Velocity Profile Measurements

The array used was based on the IOS designed rig used earlier in the Severn Estuary. It comprised a lead weight with attached depth sensor and siltmeter, a direct reading Braystoke current meter which measures velocity and direction, four Braystoke flowmeters plus one siltmeter and finally at the top a second Braystoke DRCM with siltmeter, followed by a second, smaller lead weight (See Fig 2). The whole array was 4.0m long. It was suspended as near the seabed as possible, but ensuring that the ship's movement did not cause contact with the bottom. The meters in the array were connected as closely together as practicable whilst making certain that there was no chance of mutual fouling. Each was interfaced to the PDP8 computer housed in the ship's laboratory with the printout from the teletype showing the number of revolutions of each rotor, each minute. Pre- and post-cruise calibrations of the meters were made. A bank of monitors displayed the siltmeter readings. At half hourly intervals the DRCM connections were changed to give direction readings, which were recorded manually. The depth sensor reading was noted at the same time. The siltmeter readings were invariably very small, but as a check a fourth siltmeter was allowed to free fall from the water surface so that profiles could



**Array used in velocity profile measurement experiments.**

**Fig. 2**

be logged by the Bryan's Recorder.

#### Waverider Mooring

The intended position of the Waverider buoy was changed to approximately 1 km further south because of the proximity of a wreck, which sank on 8 July 1977. The deployment was straightforward. During the following week it became increasingly apparent that the Waverider was at risk from the local trawlers. After negotiation with the Fisheries Inspector of MAFF, the local fishermen and Trinity House the waverider was moved during the week following the cruise, on 29 July, back to the original station near the wreck. The Decca Main Chain coordinates are Red J 5.02 and Green C 37.15 (Fig 1).

#### Fluorescent Tracer and Box Cores

Early in the cruise 272 kg of red fluorescent sand were wetted, bagged and frozen. At slack water prior to the flood tide at 1750 hours on 14 July and with the ship's engine declutched the bags were removed and the frozen blocks released overboard. A sampler, borrowed from Prof J Murray of Exeter University was used to sample on a grid in the area of the injection, and to the S (See Fig 1). The intersections were at intervals of 0.2 Red Decca lane, and 0.1 Green Decca lane, but positions were fixed using the Trisponder. A calibration curve for use with the sampler gives the area of seabed sampled from the known sample volume. The survey was continued for the duration of the flood tide, discontinued during the ebb flow and recommenced for the following flood, giving over 12 hours of sampling.

The box coring programme was completed within the time allocated. The cores were taken in an area 6 kms by just over 1 km, to the NNE and SSW of the tracer injection site (see Fig 1), over which the fluorescent tracer injected c.10 tidal cycles earlier, might be expected to be found. Thirty two cores were obtained and 36 subsamples taken. Under the favourable weather conditions encountered cores were being retrieved at the rate of one every ten minutes.

#### Echosounding

A considerable advance was made this year in the detailed topographic survey of the seabed. Firstly sufficient time was available to enable the whole of the area to be covered including traverses at 0.2 Red Decca lane intervals across the banks. Secondly, position fixing accuracy has been improved by using the Trisponder system.

At the beginning of the survey a "bar check" of the MS36 used for the survey was carried out. The survey data were recorded using the Maglog. The digitiser which would enable chart depths on the echosounder to be recorded was not functioning, but time, Decca and Trisponder coordinates were logged at 1 second intervals, with fix lines automatically drawn on the echosounder chart at 30 second intervals. Tidal height corrections will be provided by the three pressure transducers, situated offshore from Southwold, Dunwich and Aldeburgh. These were modified for the duration of the cruise to sample continuously instead of at the usual three hourly intervals.

## RESULTS

All the data obtained need some form of data processing before results are apparent and therefore these are not yet available.

Logging the readings from a free falling siltmeter with a Bryan's Recorder showed that wherever this was tried, there were no readings until the meter was within a few centimetres of the seabed. Certainly there was no evidence of stratification of turbidity in the water column.

## EQUIPMENT PERFORMANCE

### MSES Equipment

The MS36 echosounder operated satisfactorily.

The seven current meter rigs were deployed without problem. The meter from the recovered rig was still working, but it has since been learned that it suffered from an encoder fault and only three weeks' data out of a possible two months were recorded.

### IOS(Taunton) Equipment

The newly acquired Trisponder system is simple to calibrate and set up. It was used throughout the cruise without fault.

During the velocity profiling experiments almost 20% of the total deployment time was lost because of the necessity to bring the array inboard each time a fault developed. The positions of the reed switches in the Braystoke flowmeters appeared to be very critical and needed frequent adjustment. It was suspected that on at least one occasion the array had turned enough on its axis to cause the many cables to twist round the strops, and thereby possibly strain the cables to each individual meter. This could be obviated in future by adding a swivel at the top of the array. The arrangement involving up to 10 individual cables

taped together could probably be improved by the construction of one multicored cable. The Braystoke/PDP8 interfaces, computer and teletype performed faultlessly.

Monitoring at the Waverider receiver has shown some radio interference which it appears cannot be avoided.

The seabed sampler loaned from the Department of Geology at Exeter University functioned well, as did the IOS Reineck boxcorer.

Many attempts had been made before the cruise began to repair the Maglog digitiser, but they were unsuccessful. Although the printout mechanism deteriorated and then failed during the survey, the data were recorded on magnetic tape. It will be a straightforward matter to extract the required times and Trisponder readings from these data.

#### SHIP PERFORMANCE

There were difficulties on several occasions in starting the ship's engines because of battery problems. However, due to the efforts of the engineer the scientific programme was not hampered. Part of one morning was lost whilst repairs were made to the galley stove.

A new echosounder (Simrad) has been installed on the bridge and this has improved considerably the ability of the ship to work in shallow water. The banks were traversed wherever required by making use of high water.

#### CONCLUSIONS

The cruise was ideal from the point of view of sea and weather conditions. All parts of the programme were completed on schedule, and although there were inevitably some equipment problems, none was major.

#### ACKNOWLEDGEMENTS

The cooperation of the Master, Officers and crew of the RV Edward Forbes is much appreciated and it is a pleasure to work with them. We are grateful to Dr B D'Olier of the North London Polytechnic for time to move the Waverider on 29 July 1977 during his RV Edward Forbes cruise. Every effort was made on that day by the officers to ensure that this equipment was moved safely under difficult conditions. We are indebted to the staff at IOS (Barry) responsible for current meter preparation and deployment. We express our gratitude to Captain Sellers of MAFF for the use of their Lowestoft facilities and to Prof. J W Murray of the Geology Department at Exeter University for the loan of his sampler. We also

thank Mr Mutimer of the British Transport Docks Board for the use of their quay and storage space.

REFERENCE

RV Edward Forbes Cruise 16/76. 24 August - 17 September 1976. Sizewell-Dunwich Bank Field Study. IOS Cruise Report No 44. 1976.

APPENDIX 1

NARRATIVE

Friday P M Hooper, A J Marks calibrated Trisponder ashore.  
8 July B J Lees, H L King, M A S Moore, K A Reeves on board.

Saturday PMH, AJM set up Trisponder Remotes ashore at Sizewell (72),  
9 July Dunwich (74) and Southwold (76) and Master on board ship.  
BJL, HLK, MASM, KAR loaded, set up and tested velocity profile  
array. Wetted and bagged 272kg fluorescent sand for freezer.  
Calibrated depth sensors.

Sunday Wind N, NE 3-4. Three stations occupied for 25 hrs each whilst  
10 July deploying velocity profiling array. Trisponder readings:  
to VP1, 72-2131m, 76-12725m; VP2, 72-3321m, 76-14002m;  
Wednesday VP3, 72-4472m, 76-15,072m.  
13 July

Thursday Wind N4. Velocity profiling array offloaded. HLK, MASM left for  
14 July Taunton. BJL, KAR aboard. Morning in port for repairs to galley  
stove.  
1730 hrs. Injection at slack water, with engine declutched, of  
272kg red, frozen, fluorescent tracer. Trisp. 72-4106m,  
76-9677m. Sampling until turn of tide.

Friday Wind N4. Sampling continued at beginning of flood until turn of  
15 July tide. Berthed at Lowestoft, evening. GWJ Miller and P Taylor  
arrived.

Saturday Wind SW3. 4 current meter rigs loaded. 3 current meter rigs  
16 July deployed at Stations 29, Decca Red I 11.26, Green C40.85,  
30, RI 11.84, GC40.97, 31, RI 12.05, GC 41.90. (Too far south for  
accurate Trisponder readings). Berthed at Lowestoft, evening.

Sunday Wind W3. Three current meter rigs loaded, 2 deployed at stations  
17 July 26, 74-4303m, 76-3344m, and 27, 74-5496m, 76-4272m.

Monday Wind SW3. S Bacon and J Carter from Dunwich and East Anglian  
18 July Underwater Exploration Group on board for day as observers.

Monday Deployed shallow mooring rig at Station 28, 74-2428m, 76-5370m.  
18 July Changed longterm mooring at Station 22, 72-4775m, 76-8974m.  
(continued) Berthed at Lowestoft, evening. GWJM and PT departed.  
T A Upham arrived. Box corer loaded.

Tuesday Wind 2-3. Box cores obtained from 32 stations at points  
19 July on grid N & S of fluorescent tracer injection site.  
and Wednesday Berthed at Lowestoft Wednesday evening. J D Humphery arrived.  
20 July

Thursday Offloaded anchor clump from long term current meter, box corer.  
21 July Loaded waverider. TU departed.  
Waverider deployed Decca Red J3.35, Green C37.72.  
Echosounding survey commenced, at S end of area, running lines  
normal to shore at 0.2 Red Decca lane, fixing with Trisponder.  
Speed 5 knots.  
Berthed at Lowestoft, evening. JDH departed.

Friday BJJ, KAR aboard. Echosounding survey continued.  
22 July Completed 1650 hours 23.7.77.  
and Berthed at Lowestoft. Edward Forbes partly offloaded and  
Saturday Transit partially loaded.  
23 July

Sunday Offloading of RV Edward Forbes completed.  
24 July Loading of Transit completed. Trisponder Remotes recovered from  
Southwold, Dunwich and Sizewell. BJJ, KAR returned to Taunton.

Monday RV Edward Forbes sailed for Harwich.  
25 July



CRUISE REPORTS

RRS DISCOVERY

CRUISE NO		REPORT NO
1	JUN - AUG 1963	1*
2	AUG - DEC 1963	2*
3	DEC 1963 - SEP 1964	3*
NIO CR**		
4	FEB - MAR 1965	4
10	TO	10
37	NOV - DEC 1970	37
38	JAN - APR 1971	41
39	APR - JUN 1971	40
40	JUN - JUL 1971	48
41	AUG - SEP 1971	45
42	SEP 1971	49
43	OCT - NOV 1971	47
44	DEC 1971	46
45	FEB - APR 1972	50
46	APR - MAY 1972	55
47	JUN - JUL 1972	52
48	JUL - AUG 1972	53
49	AUG - OCT 1972	57
50	OCT 1972	56
51	NOV - DEC 1972	54
52	FEB - MAR 1973	59
53	APR - JUN 1973	58
IOS CR***		
54	JUN - AUG 1973	2
55	SEP - OCT 1973	5
56	OCT - NOV 1973	4
57	NOV - DEC 1973	6
58	DEC 1973	4
59	FEB 1974	14
60	FEB - MAR 1974	8
61	MAR - MAY 1974	10
62	MAY - JUN 1974	11
63	JUN - JUL 1974	12
64	JUL - AUG 1974	13
65	AUG 1974	17
66	AUG - SEP 1974	20
68	NOV - DEC 1974	16
69	JAN - MAR 1975	51
73	JUL - AUG 1975	34
74/1+3		35
	SEP - OCT 1975	
74/2		33
75	OCT - NOV 1975	43
77	JUL - AUG 1976	46
78	SEP - OCT 1976	52
79	OCT - NOV 1976	54
82	MAR - MAY 1977	59
83	MAY - JUN 1977	61
84	JUN - JUL 1977	60
86	SEP 1977	57
87	OCT 1977	58
88	OCT - NOV 1977	65
89	NOV - DEC 1977	67
90	JAN - MAR 1978	68
91	MAR 1978	69

\* REPORTS 1 TO 3 WERE PUBLISHED AND DISTRIBUTED BY THE ROYAL SOCIETY FOLLOWING THE INTERNATIONAL INDIAN OCEAN EXPEDITION

\*\* NIO CR: NATIONAL INSTITUTE OF OCEANOGRAPHY, CRUISE REPORT

\*\*\* IOS CR: INSTITUTE OF OCEANOGRAPHIC SCIENCES, CRUISE REPORT

CRUISE REPORTS  
-----

CRUISE DATES	REPORT NO
 RRS "CHALLENGER"	
AUG - SEP 1974	IOS CR 22
MAR - APR 1976	IOS CR 47
 RV "EDWARD FORBES"	
OCT 1974	IOS CR 15 X
JAN - FEB 1976	IOS CR 19
APR 1975	IOS CR 23
MAY 1975	IOS CR 32
MAY - JUN 1975	IOS CR 28
JUL 1975	IOS CR 31
JUL - AUG 1975	IOS CR 36
AUG - SEP 1975	IOS CR 41
AUG - SEP 1975	IOS CR 44
FEB - APR 1976	IOS CR 48
APR - JUN 1976	IOS CR 50
MAY 1976	IOS CR 53
 RRS "JOHN MURRAY"	
APR - MAY 1972	NIO CR 51
SEP 1973	IOS CR 7
MAY - APR 1974	IOS CR 9
OCT - NOV & DEC 1974	IOS CR 21
APR - MAY 1975	IOS CR 25
APR 1975	IOS CR 39
OCT - NOV 1975	IOS CR 40
AUG - OCT 1975	IOS CR 42
OCT - NOV 1976	IOS CR 53
MAR - APR 1977	IOS CR 66
 NC "MARCEL BAYARD"	
FEB - APR 1971	NIO CR 44
 MV "RESEARCHER"	
AUG - SEP 1972	NIO CR 60
 RV "SARSIA"	
MAY - JUN 1975	IOS CR 30
AUG - SEP 1975	IOS CR 38
MAR - APR 1976	IOS CR 44
 RRS "SHACKLETON"	
AUG - SEP 1973	IOS CR 3
JAN - FEB 1975	IOS CR 18
MAR - MAY 1975	IOS CR 24
FEB - MAR 1975	IOS CR 29
JUL - AUG 1975	IOS CR 37
JUN - JUL 1976	IOS CR 45
OCT - NOV 1976	IOS CR 49
JUL 1977	IOS CR 62
 MV "SURVEYOR"	
FEB - APR 1971	NIO CR 38
JUN 1971	NIO CR 39 X
AUG 1971	NIO CR 42 X
 DE "VICKERS VOYAGER" AND "PISCES III"	
JUN - JUL 1973	IOS CR 1