I.O.S.

RV EDWARD FORBES CRUISE 11/17

9 July – 24 July 1977

SIZEWELL – DUNWICH BANK FIELD STUDY

Cruise Report No. 56
1977

NATURAL ENVIRONMENT RESEARCH COUNCIL
INSTITUTE OF OCEANOGRAPHIC SCIENCES

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B J Lees
Institute of Oceanographic Sciences
Crossway
Taunton
Somerset

CONTENTS

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

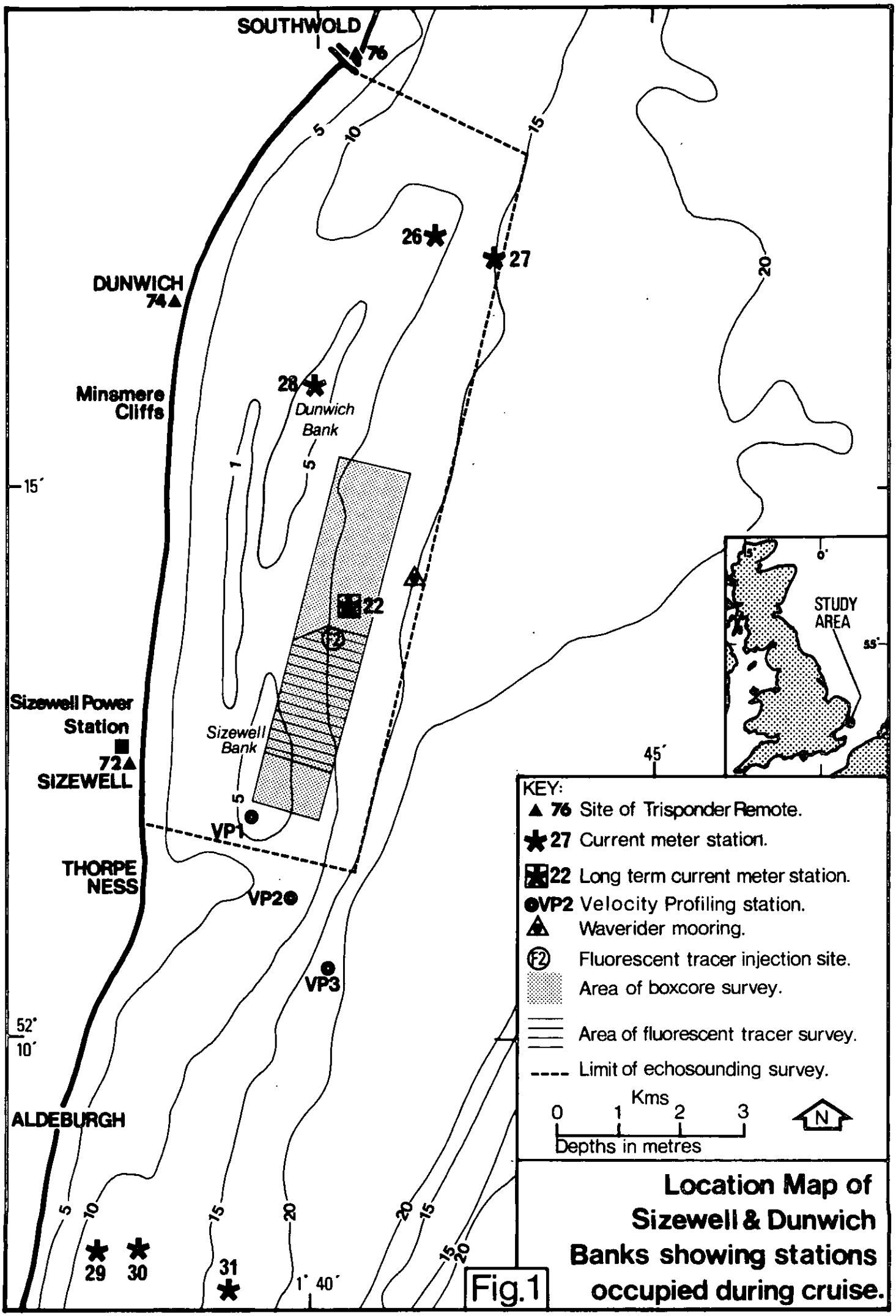


Fig.1

Location Map of Sizewell & Dunwich Banks showing stations occupied during cruise.

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.

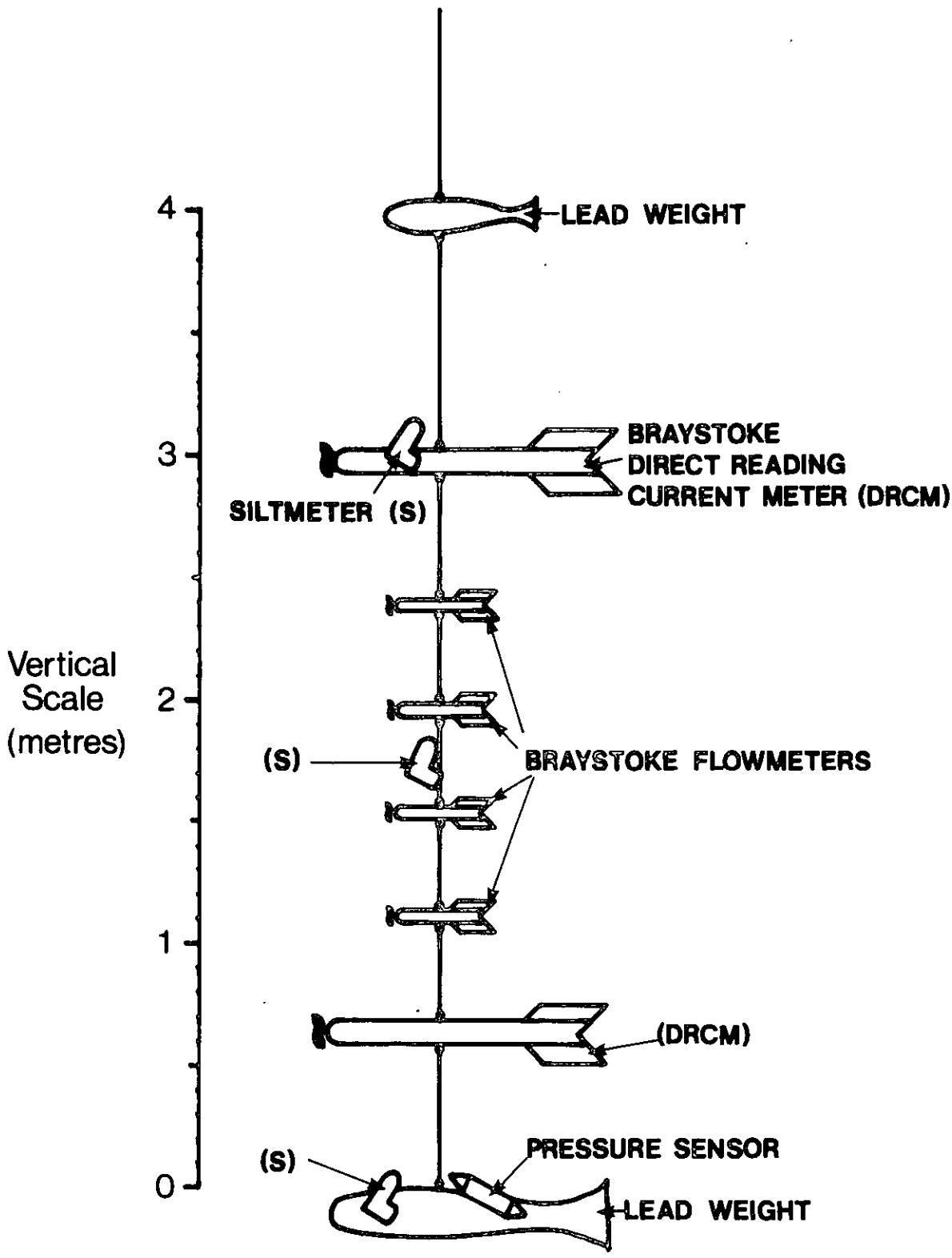
When the DMU (Distance Measuring Unit) is at 'Display On' the system is in standby, but with the last reading displayed. Pressing the Range button will update the reading. This facility is appreciated when undertaking manual logging as it is simple to leave a required reading on display long enough to 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 8 July	P M Hooper, A J Marks calibrated Trisponder ashore. B J Lees, H L King, M A S Moore, K A Reeves on board.
Saturday 9 July	PMH, AJM set up Trisponder Remotes ashore at Sizewell (72), 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 10 July to Wednesday 13 July	Wind N, NE 3-4. Three stations occupied for 25 hrs each whilst deploying velocity profiling array. Trisponder readings: VP1, 72-2131m, 76-12725m; VP2, 72-3321m, 76-14002m; VP3, 72-4472m, 76-15,072m.
Thursday 14 July	Wind N4. Velocity profiling array offloaded. HLK, MASM left for 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 15 July	Wind N4. Sampling continued at beginning of flood until turn of tide. Berthed at Lowestoft, evening. GWJ Miller and P Taylor arrived.
Saturday 16 July	Wind SW3. 4 current meter rigs loaded. 3 current meter rigs 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 17 July	Wind W3. Three current meter rigs loaded, 2 deployed at stations 26, 74-4303m, 76-3344m, and 27, 74-5496m, 76-4272m.
Monday 18 July	Wind SW3. S Bacon and J Carter from Dunwich and East Anglian 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	BJL, 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. BJL, KAR returned to Taunton.
Monday	RV Edward Forbes sailed for Harwich.
25 July	

CRUISE REPORTS

RRS DISCOVERY

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* 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

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