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**I.O.S.**

**R V SARSIA  
Cruises 1/77 and 3/77**

**10 – 21 January 1977  
and  
21 March – 7 April 1977**

**Vibrocoring and suspended sediment/velocity  
profile measurements in Swansea Bay**

**Cruise Report No. 55  
1977**

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

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R V SALSIA CRUISE 1/77

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Crossway  
Taunton  
Somerset

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SCIENTIFIC STAFF

Dr A P Carr	(Principal Scientist)	10-15	January	1977
Dr A D Heathershaw	(Principal Scientist)	15-21	"	"
M W L Blackley		10-15	"	"
C N Puckett		10-21	"	"
Dr R Kirby		11-13	"	"
G P Le Good		15-21	"	"
T Upham		15-21	"	"
Dr M Ivanovich (AERE Harwell)		15-18	"	"

SHIP'S OFFICERS

Captain E Dowell (Master)  
N Bryant (Mate)  
I Jude (Fishing Mate)  
R Young (Chief Engineer)  
G Parker (2nd Engineer)  
J Taylor (3rd Engineer)

## OBJECTIVES

The objectives of this cruise were threefold:

1. To obtain sediment core samples from the Swansea Bay area (see Fig 1) for dating, particle analysis, structural analysis and for determinations of the thickness of potentially mobile material.
2. To obtain core samples from the radioactive tracer zone (see Fig 1) for depth of burial estimates.
3. To carry out suspended sediment and velocity profile measurements near the sea bed for determination of sediment fluxes and bed shear stresses.

These observations form part of a larger integrated study being carried out in the Swansea Bay area by IOS (Taunton) which is directed towards identifying and possibly quantifying those processes responsible for the erosion of the foreshore between Port Talbot and Porthcawl.

Due to the extremely poor weather conditions which prevailed throughout most of the cruise the objectives of this exercise were severely limited and this report describes only vibrocoring work.

## EQUIPMENT AND METHODS

Sediment core samples were taken with the IOS Vibrocorer. This equipment is described in detail in Unit of Coastal Sedimentation\* Report No UCS/10/1972. A number of minor alterations have been carried out to the equipment since that report was written but these are not sufficiently fundamental as to warrant description here.

At each vibrocoring site the ship was positioned on station using Decca Main Chain co-ordinates and trackplotter and then anchored with a single bow anchor. The vibrocoring equipment was then handled over the side with the ship's derrick and winches.

\*The Unit of Coastal Sedimentation became the Taunton Laboratory of the Institute of Oceanographic Sciences on 1 June 1973.

Initially samples were recovered by bringing the entire vibrocoring rig inboard. However later samples were obtained by removing the barrel over the side of the ship with the rig secured in the outboard position. This technique was found to give considerable savings in time and to be satisfactory even when weather conditions were not ideal. The position co-ordinates for each core sample were recorded using HiFix and Decca Main Chain position fixing systems.

To obtain cores in the radioactive tracer zone the ship was positioned on station using the Decca Main Chain system. Since the tracer was confined to a small area of the sea bed it would have been preferable to have carried out this operation using the more accurate HiFix system in conjunction with a HiFix trackplotter, had the latter been available. Consequently the ship could not be positioned with the accuracy normally required for this work.

Prior to the cores being taken, the activity levels on the sea bed on both sides of the ship were determined using the AERE Harwell scintillation counter equipment (see IOS Cruise Report No 31, 1975 for further details).

The usual procedures were adopted to avoid contamination of the ship and equipment by radioactive material and film badges were issued to those personnel involved directly with the handling of the cores from the tracer zone.

## RESULTS

A total of 16 cores was obtained during the cruise, over a period of four days (not continuous) these being the only times when weather conditions permitted vibrocoring work to be carried out.

Of the cores obtained outside the tracer zone good penetration was achieved and cores, frequently 3-5m length, were obtained mostly in muddy sand, sand and clay. The majority of these cores have suggested a layer (possibly up to 1m thick) of muddy sand and silt overlying several metres of clean sand. In some cases there was evidence of intercalation and cross-bedding.

The two cores obtained in the tracer zone had reasonably good penetration of some 3m. The top 0.5m of each of these cores was removed and returned to AERE Harwell for subsequent analysis using gamma spectroscopy to determine the vertical tracer



concentration profiles. Preliminary measurements have indicated that while activity levels in these cores were low they were sufficiently in excess of background activity for the full analysis to be carried out.

Comparative sedimentological analysis of all cores remains to be completed.

The position-coordinates of all vibrocore samples are shown in Table 1.

#### EQUIPMENT PERFORMANCE

##### Vibrocoreing equipment

No serious problems occurred with the vibrocoreing equipment during the cruise although there were a number of minor difficulties; in particular the earth monitoring system on the generator indicated an earthing fault. However it could not be determined at the outset whether this was real or apparent. Subsequent inspection of the system and a similar fault at a later stage in the cruise suggested that there may have been an earthing fault in the main power cable/power tail connector.

The 18ft legs used on the vibrocoreing rig are too long for ease of handling over the side of the ship without topping the derrick. On 12 and 13 January the vibrocoreing overbalanced hitting the derrick on the first occasion and narrowly missing the ship's bridge on a second. If shorter cores were acceptable for this type of work, as they are in the tracer area where only the top 0.1-1.0m of sediment is required, then the use of the 10ft vibrocoreing rig would greatly improve the handling.

On 19 January the rig was recovered with a badly bent barrel and with the motor jammed in the down position, the barrel protruding some 4m below the rig. Since the lifting wire was attached to the motor, thereby taking the full weight of the rig, it was decided not to attempt to lift it without first securing the motor to the legs. This was accomplished by drilling through one of the motor guides into a leg and securing the motor with bolts. The rig was then lifted inboard and the bent barrel removed (the core in this barrel was later removed intact).

In future vibrocoreing work some provision should be made for clamping the motor in any position on the legs, possibly with collars bolted and secured above and

below the motor.

#### HiFix Equipment

HiFix receiver 957 (on loan from MSES Barry) repeatedly blew one of its 5 amp fuses (F1) and was eventually replaced by receiver 937 (MSES), which was used on the second half of the cruise with receiver 277 (IOS Taunton). Some difficulty was experienced initially with locking in 937 and the fault was eventually traced to the earthing on the aerial, the latter requiring an earthing strap to be connected.

The HiFix trackplotter, on loan from the British Transport Docks Board, failed to operate and was returned to the BTDB for repair via their survey launch 'Soniarius'. This equipment was not returned to RV Sarsia.

The lack of a HiFix trackplotter seriously affected the ease with which the ship could be brought on station in the tracer zone where the tracer was confined to a small area of the sea-bed.

#### AERE Harwell equipment

The AERE Harwell radioactivity detectors, winches and electronics operated satisfactorily although only given limited use. The absence of the pulley blocks, needed to run the cable out over the side of the ship, and usually provided by AERE necessitated the use of larger and unsatisfactory blocks from the ship.

#### SHIP PERFORMANCE

No serious difficulties were encountered with the ship's equipment except at the end of the cruise when the bow thruster broke down. This would have undoubtedly affected progress with further vibrocoring work (had this been possible) since it is necessary to position the ship over the top of the vibrocoring rig, during recovery, to achieve a 'straight pull'. It is possible that fore and aft anchoring would have enabled the work to continue if weather conditions had permitted this.

The derrick head block on 'Sarsia' is rated at 3 tons SWL; this was not considered entirely adequate for the job, particularly under the marginal sea states which were encountered, there being some tendency for the ship to "snatch" at the rig.

This problem would be overcome to some extent if the head block were replaced with an accumulator to absorb shock loadings of this nature.

#### CONCLUSIONS

The overall results of this cruise were disappointing both because of the actual down-time and the fact that the scope of the work was severely limited by the poor weather conditions which prevailed for much of the time. Only four days' work was completed during which 16 cores from a planned total of 30-40 were obtained.

The results which were obtained with the vibrocoreing equipment were pleasing and it should be possible in March to obtain good cores from the Kenfig Patches and Scarweather Sands which together constitute a large and important area of potentially mobile sediment.

With priority being given to the vibrocoreing work it was not possible to carry out any suspended sediment and velocity gradient measurements and it is hoped that this work, together with the outstanding coring will be completed during a later cruise on the 'Sarsia' in March-April 1977.

Despite these setbacks the experience gained on this cruise has been extremely useful; in particular it has become apparent that the requirements of vibrocoreing work and suspended sediment/velocity gradient measurements are not entirely compatible. The large amount of equipment needed for both types of work (a total of 7-8 tons) really requires a changeover period of at least a day, with shoreside crane facilities and possibly with only one set of equipment on the ship at any one time.

#### ACKNOWLEDGEMENTS

We are grateful to Captain E Dowell and the Officers and Crew of the RV Sarsia for their generous co-operation throughout this cruise. We are especially grateful to Chief Engineer R Young for his assistance with the vibrocoreing equipment. Finally we would like to thank Captain M Perry for making all necessary arrangements to use the ship and Dr E Denton, Director of the Marine Biological Association Laboratory, for permission to carry out this work on the RV Sarsia.

TABLE 1

SWANSEA BAY VIBROCORE SITES (RV Sarsia Cruise 10-21 January 1977)

Sample No	Decca Main Chain		Lat	Long	approximate core length in m
	G	P	N	S	
SWB 1/77 VC1/A-E	39.98	73.95	3°49.27'	51°34'	5
SWB 1/77 VC2/A	40.00	72.13	3°49.71'	51°33.38'	1
SWB 1/77 VC3/A-C	41.03	69.95	3°51.23'	51°33.36'	3
SWB 1/77 VC4/A-D	41.60	71.58	3°51.30'	51°34.52'	4
SWB 1/77 VC5/A-C	40.48	72.26	3°50.10'	51°33.83'	3
SWB 1/77 VC6/A-B	42.07	68.89	3°52.55'	51°33.74'	2
SWB 1/77 VC7/A-B	40.66	66.07	3°51.78'	51°31.62'	1
SWB 1/77 VC8/A-C*	40.26	65.50	3°51.60'	51°31.12'	3
SWB 1/77 VC9/A-C*	40.35	65.73	3°51.65'	51°31.26'	3
SWB 1/77 VC10/A	40.30	69.40	3°50.68'	51°32.55'	1
SWB 1/77 VC11/A-D	40.32	69.43	3°50.70'	51°32.60'	4
SWB 1/77 VC12/A-E	39.50	72.78	3°49.06'	51°33.18'	5
SWB 1/77 VC 13/A-B	41.96	65.77	3°53.12'	51°32.50'	1
SWB 1/77 VC14/A-D	43.72	67.24	3°54.31'	51°34.52'	4
SWB 1/77 VC15/A-D	44.41	69.45	3°53.49'	51°35.14'	4
SWB 1/77 VC16/A-C	42.48	71.26	3°52.12'	51°35.14'	3

\* Samples taken for radioactive tracer profile analysis

The top 0.5m of these cores was removed for analysis at AERE Harwell.

Note: Decca Chain is 1B/MP (SW British).

APPENDIX I

Narrative

Friday 7 January		Loaded equipment.
Sunday 9 January	1900	IOS Taunton party joined ship in Plymouth.
Monday 10 January	0820 0830 1210 1310 1510	Ship moved out of Millbay Inner Basin. Made fast outside to set up HiFix and corer. Ship sailed for Cawsand Bay to test vibrocorer. Test vibrocorer. Sailed from Cawsand Bay for Swansea.
Tuesday 11 January	0900 1445 1530	On passage. Arrived Swansea Bay R Kirby joined ship with HiFix trackplotter. Continued setting up HiFix Remained at anchor overnight.
Wednesday 12 January	0800  0845 0855 0940  0950 2045 2100 2110 2135	Weighed anchor and proceeded to Port Talbot to calibrate HiFix. Calibrated HiFix. Proceeded to vibrocoring position Trackplotter non-operational: taken off ship by 'Soniarius' following radio call to W Coulman (BTDB) Started vibrocoring. Completed vibrocoring and proceeded to Swansea Checked HiFix at approach jetty Locked in Swansea Berthed at 'A' shed King's Dock
Thursday 13 January		Weather bound in Swansea Tested feasibility of changing barrel etc without bringing vibrocorer inboard.
Friday 14 January	0830 0915 0920 1000  1035 1105	Left 'A' shed berth. R Kirby left ship, A D Heathershaw joined ship. Left Swansea locks. Calibrated HiFix. Anchored on vibrocoring station but too rough to work. Proceeded to Swansea. Locked in. Berthed in King's Dock.
Saturday 15 January	1630 1800	Weatherbound in Swansea. G P Le Good, and T Upham joined ship. A P Carr and M W L Blackley left ship.
Sunday 16 January	0920 1227 1335 1413 1511 2100	Calibrated HiFix Left berth in King's Dock In locks Left locks and proceeded to vibrocoring stations Started vibrocoring Completed vibrocoring and remained at anchor overnight.

Monday 17 January	0820 0840 1435  1520 1630 1700 1800	Weighed anchor and proceeded to vibrocoring stations. Started vibrocoring. Abandoned vibrocoring work due to fault on generator and proceeded to Swansea. Anchored off Fairway buoy waiting to enter Swansea. In locks. Berthed at 'A' shed, King's Dock. C N Puckett returned to Taunton to collect P Brunsch to carry out repairs to generator.
Tuesday 18 January	0015  0205 1300 1550 1600 1615 1920  2010 2033	C N Puckett returned to ship with P Brunsch and checked over vibrocorer electrical systems. P Brunsch left ship to return to Taunton. Waiting to sail from Swansea. Left berth at 'A' shed. In locks. Left locks and proceeded to vibrocoring station. Abandoned further vibrocoring due to poor weather and proceeded to Swansea. In locks. Berthed at 'A' shed.
Wednesday 19 January	0800 0811 0903 0943 2155  2315	Left berth. In locks. Left locks and proceeded to vibrocoring stations. Started vibrocoring. Abandoned vibrocoring due to bent barrel and inoperative bow thruster. Cleared rig from side of ship and decided to remain at anchor overnight in readiness for further vibrocoring work at 0400 on 20 January.
Thursday 20 January	0350  0435 1638	Decided to abandon all further vibrocoring work due to rapidly deteriorating weather conditions. Weighed anchor and sailed for Plymouth. Anchored in St Ives Bay sheltering from S gale.
Friday 21 January	0655 1800	Weighed anchor and sailed for Plymouth. Arrived Plymouth. IOS Taunton party left ship and returned to Taunton.
Monday 24 January		All IOS equipment removed from ship and returned to Taunton.

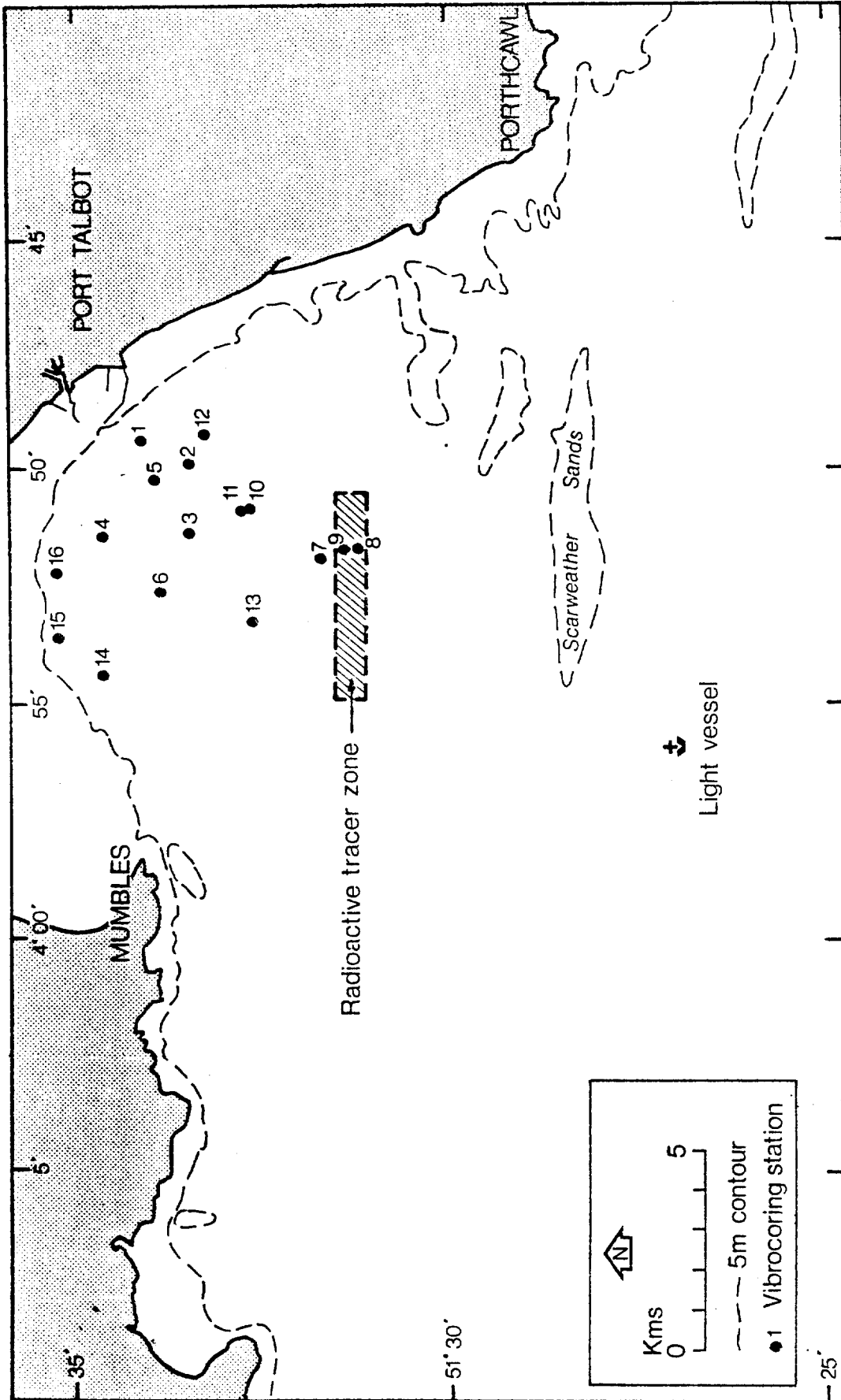


Fig.1

Positions of Vibrocoring stations in Swansea Bay during R.V. Sarsia cruise 10 - 21 January 1977. Position co-ordinates are given in Table 1.

CRUISE REPORTS

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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
70	TO	70
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



R V Sarsia  
Cruise 3/77

21 March - 7 April 1977

Vibrocoring and suspended sediment/velocity  
profile measurements in Swansea Bay

Cruise Report No 55B

1977

Institute of Oceanographic Sciences  
Crossway  
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SCIENTIFIC STAFF

Dr A P Carr	(Principal Scientist)	21 March - 26 March
Dr A D Heathershaw*	(Principal Scientist)	23 March - 7 April
R Paske	(AERE, Harwell)	23 March - 25 March
C N Puckett		21 March - 7 April
T Upham		21 March - 23 March
P Hooper		26 March - 7 April
G Le Good		26 March - 1 April
M Lees		1 April - 7 April

\*Principal Scientist from 26 March - 7 April

SHIP'S OFFICERS

Captain E Dowell (Master)  
N Bryant (Mate)  
I Jude (Fishing Mate)  
R Young (Chief Engineer)  
G Parker (2nd Engineer)  
J Taylor (3rd Engineer)

## OBJECTIVES

The objectives of this cruise were as follows:

- (1) To carry out vibrocoreing at various locations in Swansea Bay (see Fig 1) to determine the thickness and structure of potentially mobile sediment and in the radioactive tracer zone to determine the depths of burial of tracer (the latter in conjunction with AERE Harwell);
- (2) In conjunction with AERE Harwell to carry out spectral degradation measurements to determine the depths of burial of the tracer;
- (3) To determine near-bed suspended sediment concentrations and particle size distributions at locations offshore between Port Talbot and Porthcawl (Fig 2);
- (4) To make near-bed velocity profile measurements at those locations in (3) to enable sediment flux rates and bed shear stresses to be calculated.

## EQUIPMENT AND METHODS

Sediment core samples were taken with the IOS vibrocorer. This equipment is described in detail in Unit of Coastal Sedimentation (now IOS Taunton) Report No UCS/10/1972.

Suspended sediment and velocity profile measurements were made using the IOS boundary layer rig. This is described in some detail in IOS Cruise Report No 44, 1976, and shown schematically in Fig 3 of this report. No further description of this equipment will be given here.

At vibrocoreing stations the ship was positioned using Decca Main Chain and HiFix position fixing systems. The ship was then anchored with a single bow anchor. The vibrocoreing equipment was handled over the side with the ship's derrick and winches in the usual manner.

The practice, developed during the previous cruise (RV Sarsia, 10-21 January 1977) of changing the vibrocorer barrel over the side of the ship with the rig secured in the outboard position was continued on this cruise. This was again found to give considerable savings in time.

The position co-ordinates for each sediment sample were recorded using both the Main Chain and HiFix systems.

Prior to cores being taken in the radioactive tracer zone, activity levels on the sea-bed were measured using an AERE Harwell scintillation counter. Some spectral degradation measurements were also made. The activity levels in some core samples from the tracer zone were monitored with the sample in the barrel and when the core had been removed from the barrel. The usual precautions were taken when handling this material.

Before suspended sediment and velocity profile measurements could be made the majority of the vibrocoreing equipment had to be removed from the ship and the platform for the suspended sediment and velocity profiling rig erected over the anchor cables and wires in the usual manner.

These measurements were made with the ship anchored fore and aft, (two bow anchors and a single stern anchor) and equipment was lowered onto the seabed using the ship's derrick and winches. Associated electronic and pumped sampling equipment was operated from the ship's forward laboratory.

Measurements with the suspended sediment and velocity profiling rig were of the mean flow ( $\bar{u}$ ) every minute at elevations of .15, .40, 1.00 and 1.80m above the seabed, and the suspended sediment every half hour at elevations of .10, .15, .25, .40, .80 and 1.80m. The total depth was recorded every half hour approximately. The mean flow speed and direction were also recorded every 10 minutes using a Braystoke Direct Reading current meter suspended at 5m below the surface.

## RESULTS

10 core samples were obtained at the locations shown in Fig 1. Two of these core samples were from the radioactive tracer zone and the top section of each was later sent to AERE for gamma spectroscopy measurements. The full analysis of these cores remains to be completed. Position co-ordinates for core samples are given in Table 1.

Attempts to take vibrocore samples at other locations were curtailed on 24.3.77 when the main lifting wire became detached from the vibrocoreing rig. With the assistance of divers (see APPENDIX 1: NARRATIVE) the cable was re-attached and the rig successfully recovered with a badly bent barrel. However the vibrocorer electrical cable was severely damaged and no further coring could be carried out.

From those locations shown in Fig 2 a total of 579 filtered sediment samples (material coarser than  $40 \mu m$ ) and 579 water samples (containing material finer than  $40 \mu m$ ) were obtained. These samples are at present being analysed.

Where possible suspended sediment and velocity profile measurements were carried out over periods of at least 12.5 hours at each location. However there were inevitable gaps in these records due to the rig being inboard as the tide turned or for repairs to damaged sensors and cables.

## EQUIPMENT PERFORMANCE

### Vibrocoring equipment

Similarly to the previous cruise on the RV Sarsia (10 - 21 January 1977) no serious difficulties were experienced with the vibrocoring equipment. The same minor problems due to the 18ft legs on the vibrocoring rig being too long to clear the ship's side, were experienced on this cruise. However the practice of changing the barrel over the side of the ship, reduced the number of times that the rig needed to be lifted inboard and outboard so that no serious delays were experienced.

For this cruise a compass and inclinometer were fitted to the vibrocoring rig to provide information on the orientation of cores and their deviation from the vertical. However only the compass operated satisfactorily there being a fault on the inclinometer cable.

Bent barrels were again a cause of minor delays on this cruise. However the most serious difficulties were experienced when trying to remove cores from the barrels even when these were straight and when all the necessary precautions had been taken; the time taken to extract cores, cut, cap and label them, really governs the rate at which cores can be taken when working on a closely spaced grid of stations.

The main lifting wire, attached to the vibrocoring rig with a shackle, became detached during this cruise, the only remaining contact with the rig being the electrical umbilical cable. Every precaution should be taken on future cruises to ensure that the shackle is properly secured and seized.

### Suspended sediment and velocity profile measuring equipment

The shipboard pumped sampling equipment operated satisfactorily throughout the cruise with pumps and filters being run, more or less continuously, for periods of 12 - 14 hours.

However there were frequent delays as a result of damage to electrical cables and damage to the Braystoke rotors and pumped sampler nozzles on the rig. All the electrical cables (Braystoke cable, inclinometer cable and solenoid box cable) were completely severed at various stages of the experiment, and the pumped sampler hose was punctured on one occasion. Braystoke rotor spindles were damaged on no fewer than 7 occasions and 1 reed switch was damaged beyond repair. Pumped sampler nozzles were on various occasions bent out of alignment. The subsequent repairs to this equipment caused considerable delays.

It is not clear why so much damage to the rig occurred during this cruise. However considerable difficulty was experienced in keeping the ship on station, the bow anchors dragging on a number of occasions, and this may have resulted in the electrical and lifting cables becoming fouled on the rig. An examination of the Braystoke electrical cable revealed that the flooding of this cable may have occurred on a previous occasion as conductors and screening were badly corroded.

Difficulty was also experienced as a result of a faulty circuit board in the Braystoke Interface. This was eventually corrected but resulted in a partial loss of information from two rotors.

#### AERE Harwell equipment

This operated satisfactorily throughout the cruise. The results of the spectral degradation measurements are not known at the moment and this work was in any case a development of this technique. It is hoped that in future the spectral degradation method will provide much additional information on the depths of burial of radioactive tracer.

#### HiFix Equipment

On this cruise a HiFix trackplotter was used to position the ship on vibrocoring stations (great accuracy being required when positioning a ship in the radioactive tracer zone). This and all other HiFix equipment operated satisfactorily.

#### SHIP PERFORMANCE

While it has been possible on this and previous cruises on the RV Sarsia to partially carry through the planned objectives of the study it has become apparent that there are limitations on the scope of the work imposed by the ship and its machinery.

In particular there can be little doubt that greatly improved anchoring facilities are required; measurements of the type described in this report in which it is necessary to deploy equipment on the sea-bed and remain in position above it require better anchoring facilities than are available on the RV Sarsia, particularly, as is the case in Swansea Bay, when working in difficult conditions of wind and tide. It is a credit to the ship's officers and crew that any results were achieved at all.

As has been previously stated the facilities for handling the vibrocoring

rig on the Sarsia are not entirely suitable. Firstly there is insufficient space on deck and secondly the lifting facilities are inadequate. The derrick head block on the ship is rated at 3 tons SWL. During this cruise a load of at least 5 tons (possibly greater) was experienced when trying to pull the rig out of the sea-bed. Better facilities are also required for handling the barrels on deck.

#### CONCLUSIONS

The overall results of this cruise were reasonably pleasing but only as a result of the perseverance of the scientists and the ship's officers and crew.

Only two cores could be obtained from the radioactive tracer zone, further attempts being curtailed by the rig cable becoming detached and the subsequent damage to the electrical cable during recovery. This was particularly disappointing as these cores were urgently required for estimates of the depth of burial of the tracer.

The results of the suspended sediment and velocity profile measurements are not known at the moment. However due to weather conditions and damage to equipment the hoped-for coverage of stations in Swansea Bay could not be achieved. The data which were obtained should enable estimates to be made of the variations in the concentration of suspended sediment and the bed shear stress over a tidal cycle. It is also hoped that the two sets of measurements from Stn PS2 will enable some general conclusions to be drawn regarding the Neap/Spring variations in suspended sediment and the bed shear stress.

#### ACKNOWLEDGEMENTS

We are once again indebted to Captain E Dowell and the Officers and Crew of the RV Sarsia for their cheerful co-operation throughout this cruise, particularly through the tense moments when the vibrocore rig was being recovered by divers. We are grateful to Captain B Davies of the RV Ocean Crest, HM Coastguard at Mumbles, University College Swansea and the Swansea Pilotage Authority for their assistance with the recovery operation. Finally we would like to thank Dr C F Wooldridge, and Mr C R Price for carrying out the diving operations under the most difficult of conditions.

Captain M Perry made all necessary arrangements for our use of the ship and the work was carried out with the permission of Dr E Denton, Director of the Marine Biological Association.

A D HEATHERSHAW

A P CARR



TABLE 1

SWANSEA BAY VIBROCORE SITES (RV SARSIA CRUISE - 23 MARCH to 7 APRIL 1977)

Sample No	Decca Main Chain		Lat	Long	Approximate core length(m)
	G	P	N	W	
SWB 3/77 VC17/A-B	37.55	68.18	51°30.05'	3°48.90'	2
SWB 3/77 VC18/A	37.80	68.08	51°30.18'	3°48.70'	1
SWB 3/77 VC19/A-B	39.14	63.20	51°29.60'	3°51.03'	2
SWB 3/77 VC20/A-B	40.92	59.97	51°29.80'	3°53.45'	2
SWB 3/77 VC21/A	42.23	56.77	51°29.60'	3°55.32'	1
SWB 3/77 VC22/	38.52	76.80	51°31.97'	3°48.50'	No sample <sup>(a)</sup>
SWB 3/77 VC23/A-D	38.40	73.97	51°32.73'	3°47.90'	4
SWB 3/77 VC24/A-B	41.17	73.14	51°34.80'	3°50.45'	2
SWB 3/77 VC25/	37.85	67.58	51°30.05'	3°48.95'	No sample <sup>(a)</sup>
SWB 3/77 VC26/A	38.04	68.28	51°30.40'	3°48.95'	1
SWB 3/77 VC27/A-C	40.45	65.59	51°31.18'	3°51.73'	3 <sup>(b)</sup>
SWB 3/77 VC28/A-B	40.65	65.08	51°31.12'	3°52.00'	2 <sup>(b)</sup>
SWB 3/77 VC29/	40.39	65.71	51°31.05'	3°51.45'	No sample <sup>(a)</sup>

(a) No core sample was obtained either as a result of poor or inadequate penetration or of the core being lost from the barrel.

(b) Cores containing radioactive tracer.

Note: Decca chain is 1B/MP (SW British)

APPENDIX 1

Narrative

Friday		Loaded equipment onto RV Sarsia at Millbay Dock.
18 March		
Sunday	2045	IOS Taunton party join ship in Plymouth.
20 March		
Monday	0745	RV Sarsia moved to outer harbour. C Puckett joined ship.
21 March		MSES HiFix delivered to ship by D Joyce. Sailing delayed due to faulty Decca.
	1215	A D Heathershaw arrived with additional HiFix equipment.
	1340	Sailed for Swansea Bay. Continued setting up HiFix on passage.
	2055	Anchored off Porthleven due to weather conditions.
Tuesday	0730	Weighed anchor and continued on passage.
22 March	2310	Arrived Swansea Bay and anchored off North Kenfig Patches.
Wednesday	0815	Weighed anchor and proceeded to Swansea.
23 March	1012	Commenced vibrocoreing.
	2025	Finished vibrocoreing for day. Proceeded to Swansea.
	2305	Berthed at No 11 Hoist, King's Dock. R Paske and A D Heathershaw joined ship. C Puckett and T Upham returned to Taunton.
Thursday	0635	Left quay.
24 March	0723	Calibrated HiFix and proceeded to vibrocoreing stations.
	0852	Commenced vibrocoreing on Kenfig Patches.
	1235	Vibrocoreing in radioactive tracer zone.
	1515	Lifting cable parted from vibrocoreing rig.
		Contacted HM Coastguard, Mumbles, via RV Ocean Crest requesting assistance from divers immediately.
	1900	Divers (C F Woolfidge and C R Price) put on board by MV Seamark.
	1915	Divers down with line and shackle.
	1925	Divers inboard - current too strong.
Friday	0010	Further attempts at recovery by divers abandoned
25 March		following two abortive dives.

Friday	0400	Divers prepared for further recovery attempt.
25 March	0507	Divers inboard after C R Price successfully attached lifting wire to rig. Decided to wait for daylight before lifting rig.
(continued)	0650	Decided to lift rig due to deteriorating weather conditions.
	0822	Rig onboard but electrical cable severed as result of fouling anchor. Proceeded to Swansea.
	1000	Berthed at 'C' shed, King's Dock. C Puckett rejoined ship. R Paske returned to AERE Harwell.
Saturday		In port. Crew rest day and scientist changeover.
26 March		Unloaded vibrocoring equipment. Set up platforms and repositioned pumped sampling equipment. P Hooper and G Le Good joined ship. A Carr returned to Taunton. D Joyce from and to Taunton with lorry. HiFix equipment transferred to RV Ocean Crest. Finished setting up pumped sampling equipment.
Sunday	1020	Sailed Swansea.
27 March	1402	Started suspended sediment measurements at PS2.
Monday	0230	Finished measurements at PS2 and remained at anchor.
28 March	0900	Difficulty with Braystoke interface.
	1050	Decided to return to Swansea to get assistance with interface.
	1305	Berthed at No 11 Hoist, King's Dock.
	1530	Problem with interface resolved after telephone calls to A Salkield. Decided to sail am on 29 March.
Tuesday	1045	Left berth.
29 March	1115	Sailed Swansea.
	1250	Started suspended sediment and velocity profile measurements at PS2.
Wednesday	0230	Finished measurements at PS2 and remained at anchor overnight.
30 March	0845	Weighed anchor and proceeded to PS5.
	0936	Anchored at PS5.
	1020	Started suspended sediment and velocity profile measurements.

Wednesday	1624	Anchors dragged, rig dragged, rig brought on deck.
30 March	1643	Re-anchored but anchors still dragging .
(continued)	1700	Rig down .
	1733	Rig up due to deteriorating weather conditions and dragging anchors.
	1750	Weighed anchor and proceeded to Swansea for shelter.
	1905	Berthed alongside 'C' shed, King's Dock.
Thursday	0630	Decided to stay in port due to weather conditions (Lundy - SW gales Force 6/8).
31 March	1355	Forecast still giving SW Gales Force 6/8 for Lundy. Decided to delay sailing until Saturday and to spend Friday in port taking on fuel and water.
Friday		In port. Crew rest day. Scientist changeover.
1 April		G Le Good returned to Taunton and M Lees joined ship.
Saturday	0730	Sailed Swansea and proceeded to Stn PS5 .
2 April	0900	Tried anchoring at PS5. Fault on bow thruster. Tried anchoring again but not successful.
	1005	Abandoned PS5 due to weather conditions.
	1105	Anchored off Mumbles Head. Anchor dragged. Re-anchored.
	1355	Decided to remain at anchor overnight due to weather conditions.
Sunday	0615	Weighed anchor and proceeded to Stn PS5.
3 April	0710	Anchored and rig down .
	0713	Started suspended sediment and velocity profile measurements.
	1632	Decided after 3 attempts at re-anchoring and extensive damage to electrical cables on rig to abandon PS5.
	1650	Decided to go into Swansea due to deteriorating weather conditions.
	1810	Berthed in King's Dock, No 6 berth.
Monday	0847	Left berth (Pilot 2 hours late) .
4 April	0928	Sailed Swansea .
	1030	Anchored Stn PS2 .
	1055	Rig down .
	1100	Started suspended sediment and velocity profile measurements.
	1302	Rig up while tide turned .

Monday	1500	Rig down .
4 April	1540	Rig up with electrical cables parted .
(continued)	1720	Rig down after repairs .
	1926	Rig up for tide to turn and repairs .
	2125	Rig down .
	2400	Rig up. Finished measurements at PS2. Remained at anchor overnight.
Tuesday	0645	Started repairs to damaged rotor .
5 April	0750	Anchored at Stn PS4 .
	0930	Rig down following delay due to repairs .
	0937	Started measurements on PS4 .
	1307	Rig up while tide turned .
	1459	Rig down.
	1930	Rig up while tide turned .
	1940	Re-anchored .
	2125	Rig down .
	2230	Rig up. Finished measurements at PS4 .
	2250	Weighed anchor and departed from Swansea Bay for Plymouth.
Wednesday	.	On passage.
6 April	1845	Berthed Plymouth. Unloaded ship. IOS equipment and personnel returned to Taunton.

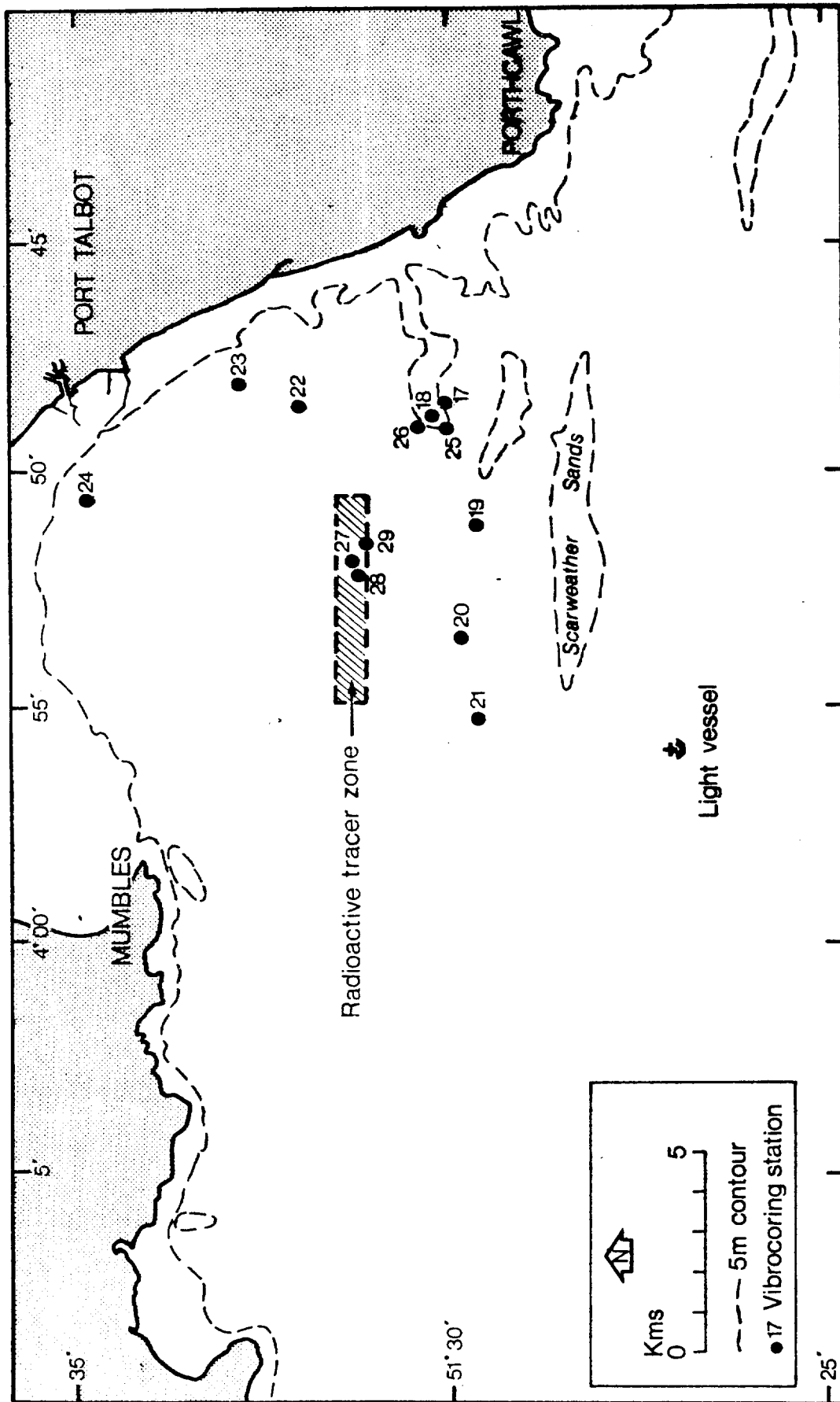
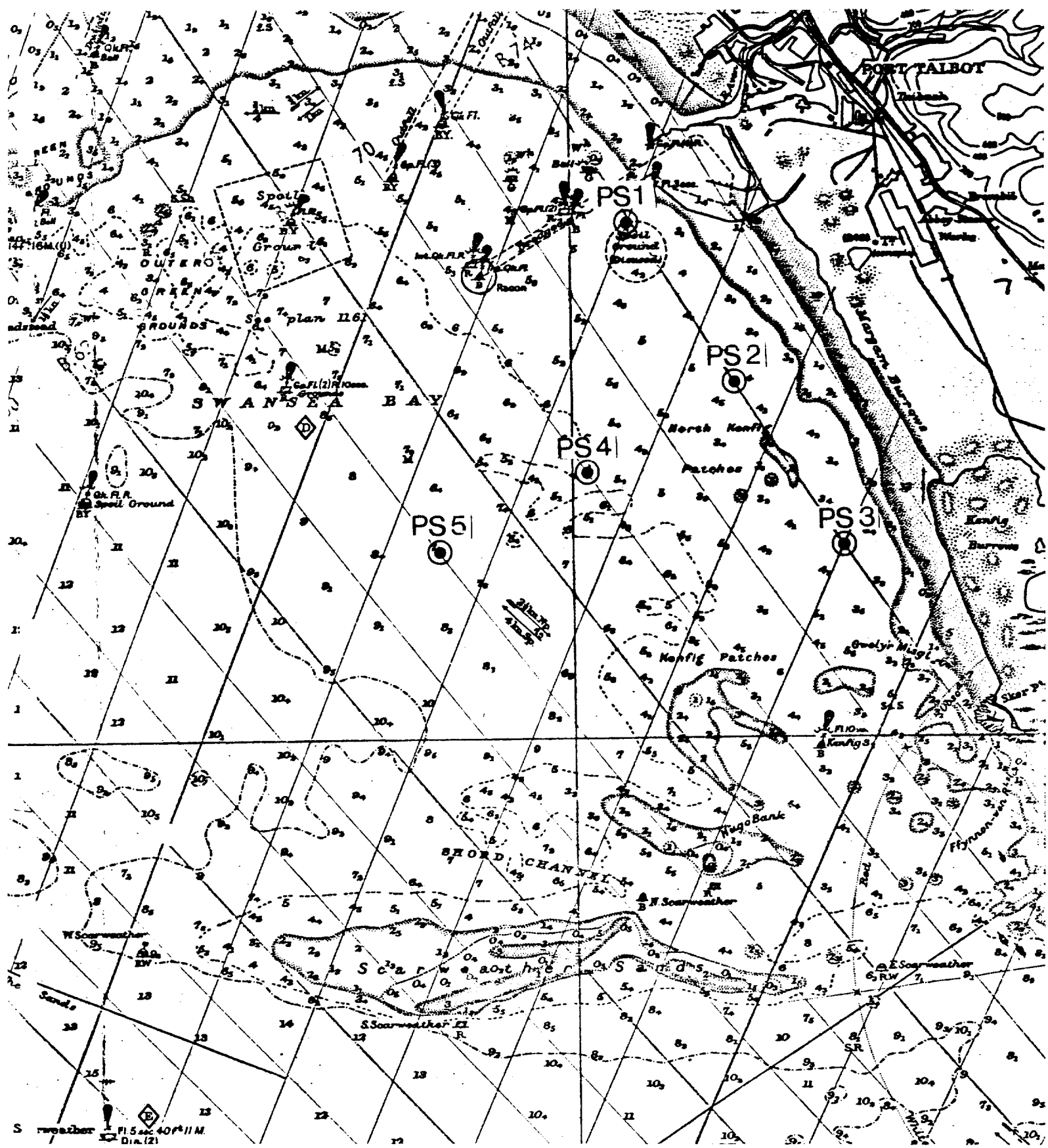


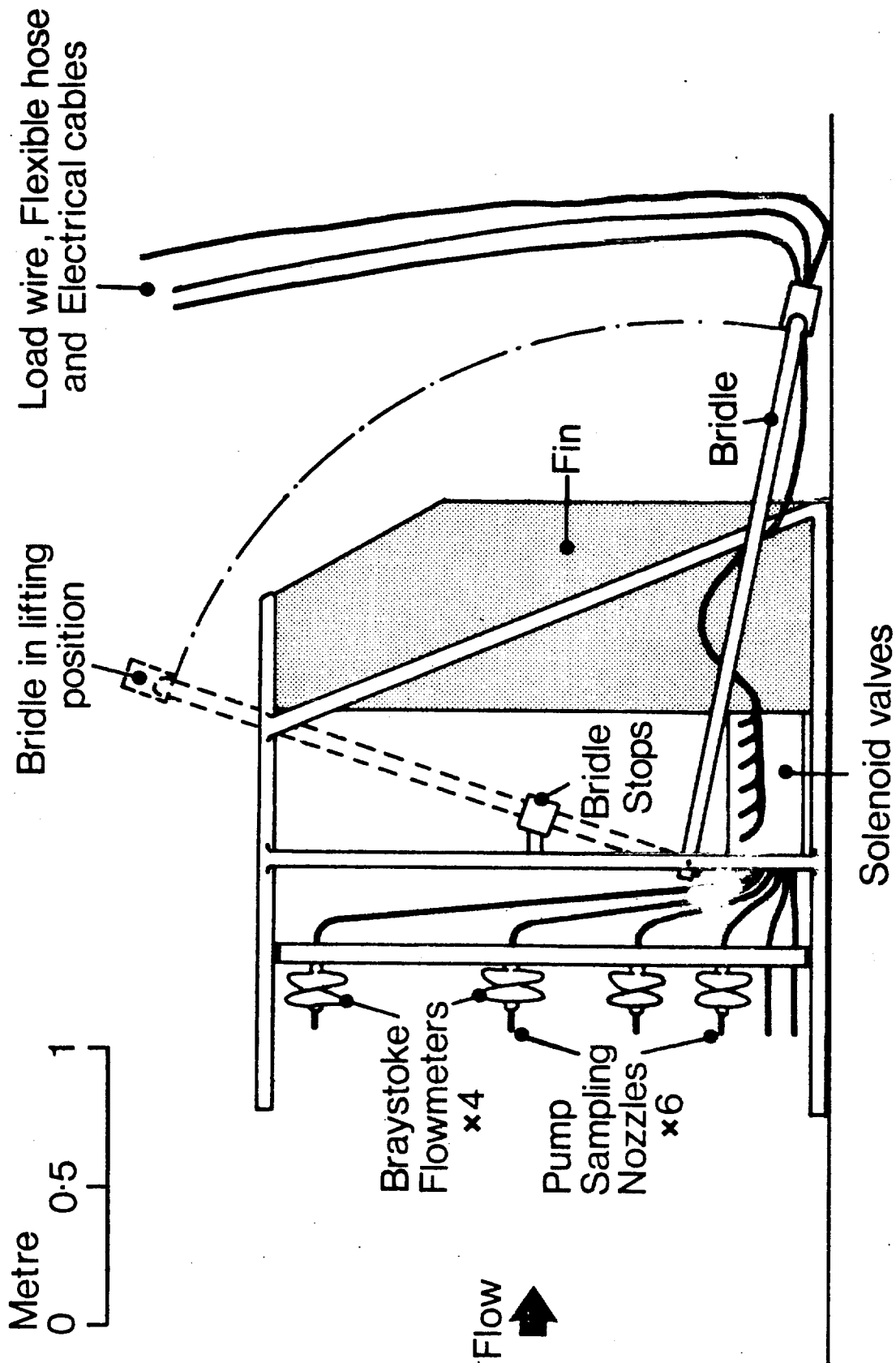
Fig.1

Positions of Vibrocoring stations in Swansea Bay during R.V. Sarsia cruise 21 March - 7 April 1977. Position co-ordinates are given in Table 1.



⊙ Pumped Sampling Stations

Pumped Sampling Stations.  
Fig. 2



Schematic diagram of Pumped Sampling Apparatus.

Fig. 3



CRUISE REPORTS

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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
TO	TO	TO
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  
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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 1975	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