

R V SARSIA CRUISE 1/77

10-21 January 1977

Vibrocoreing and suspended sediment/velocity
profile measurements in Swansea Bay

Cruise Report
No 55A

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Institute of Oceanographic Sciences
Crossway
Taunton
Somerset

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SCIENTIFIC STAFF

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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 co-ordinates of all vibrocore samples are shown in Table 1.

EQUIPMENT PERFORMANCE

Vibrocoring equipment

No serious problems occurred with the vibrocoring 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 vibrocoring rig are too long for ease of handling over the side of the ship without topping the derrick. On 12 and 13 January the vibrocoring 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 vibrocoring 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 vibrocoring 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 vibrocoring 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 vibrocoring 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 vibrocoring 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 vibrocoring 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	0820	Weighed anchor and proceeded to vibrocoreing stations.
17 January	0840	Started vibrocoreing.
	1435	Abandoned vibrocoreing work due to fault on generator and proceeded to Swansea.
	1520	Anchored off Fairway buoy waiting to enter Swansea.
	1630	In locks.
	1700	Berthed at 'A' shed, King's Dock.
	1800	C N Puckett returned to Taunton to collect P Brunsch to carry out repairs to generator.
Tuesday	0015	C N Puckett returned to ship with P Brunsch and checked over vibrocorer electrical systems.
18 January	0205	P Brunsch left ship to return to Taunton.
	1300	Waiting to sail from Swansea.
	1550	Left berth at 'A' shed.
	1600	In locks.
	1615	Left locks and proceeded to vibrocoreing station.
	1920	Abandoned further vibrocoreing due to poor weather and proceeded to Swansea.
	2010	In locks.
	2033	Berthed at 'A' shed.
Wednesday	0800	Left berth.
19 January	0811	In locks.
	0903	Left locks and proceeded to vibrocoreing stations.
	0943	Started vibrocoreing.
	2155	Abandoned vibrocoreing due to bent barrel and inoperative bow thruster.
	2315	Cleared rig from side of ship and decided to remain at anchor overnight in readiness for further vibrocoreing work at 0400 on 20 January.
Thursday	0350	Decided to abandon all further vibrocoreing work due to rapidly deteriorating weather conditions.
20 January	0435	Weighed anchor and sailed for Plymouth.
	1638	Anchored in St Ives Bay sheltering from S gale.
Friday	0655	Weighed anchor and sailed for Plymouth.
21 January	1800	Arrived Plymouth. IOS Taunton party left ship and returned to Taunton.
Monday		All IOS equipment removed from ship and returned to Taunton.
24 January		

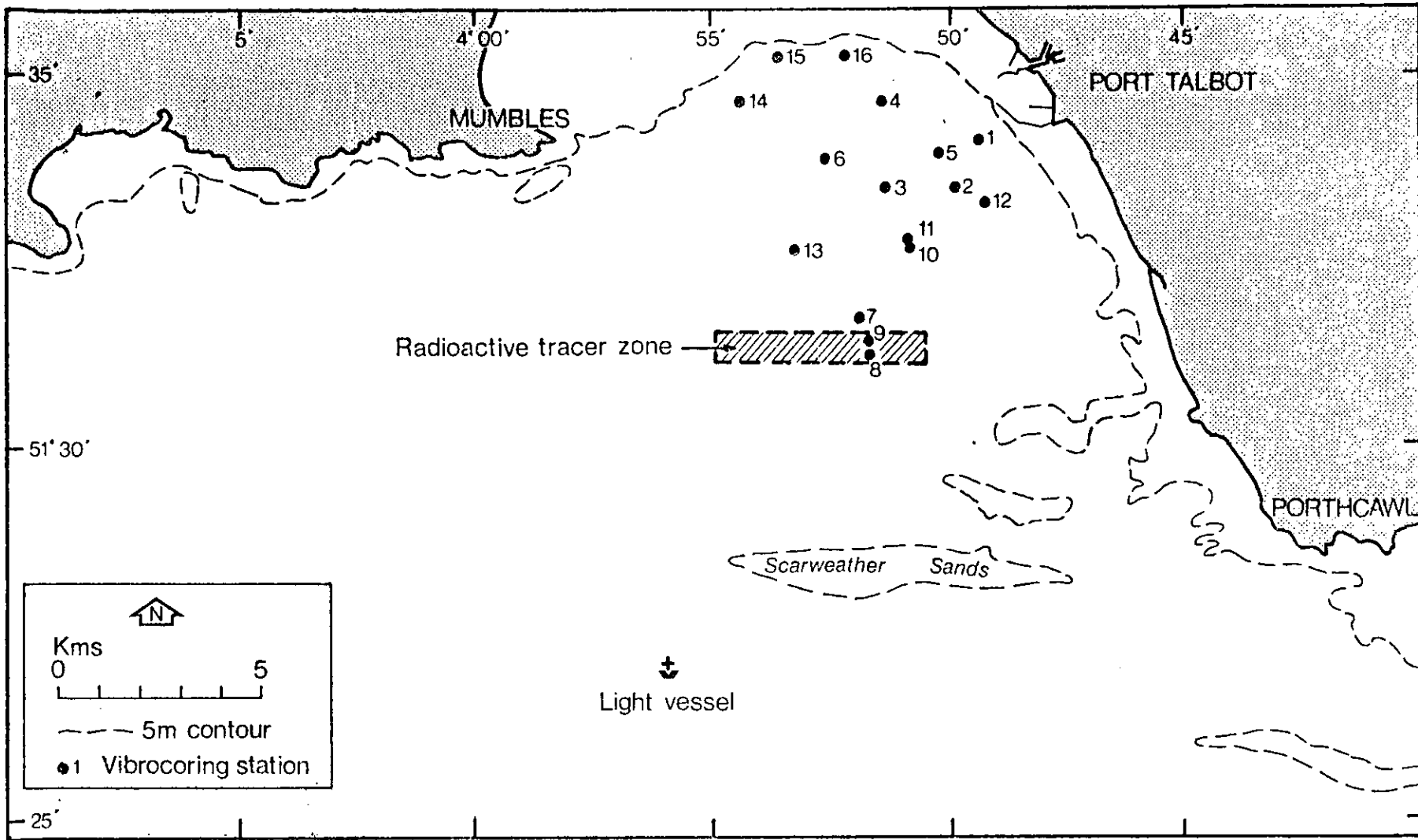


Fig.1

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

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

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 52
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