I.O.S.

CRUISES UNDERTAKEN BY THE INSTITUTE OF OCEANOGRAPHIC SCIENCES TAUNTON 1977-1979

Cruise Report No 101

NATURAL ENVIRONMENT RESEARCH COUNCIL

INSTITUTE OF OCEANOGRAPHIC SCIENCES

INSTITUTE OF OCEANOGRAPHIC SCIENCES

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CRUISES UNDERTAKEN BY THE

INSTITUTE OF OCEANOGRAPHIC SCIENCES

TAUNTON

1977–1979

Cruise Report No 101

Institute of Oceanographic Sciences
Crossway
Taunton, Somerset.

1980

CONTENTS

VESSEL R.V. SARSIA

CRUISE PERIOD 21 October - 31 October 1977

PERSONNEL

R.L. Soulsby	HSO	Senior Scientist	21 - 31 Oct.
K.R. Dyer	PSO		24 - 27 Oct.
A.P. Salkield	SSO		22 - 27 Oct.
J.A. Crabb	HSO		27 - 31 Oct.
A.J. Marks	HSO		27 - 31 Oct.
P.M. Hooper	SO		27 - 31 Oct.
M.R. Lees	SO		21 - 31 Oct.
G.P. Le Good	SO		21 - 27 Oct.

ITINERARY The stations occupied are shown in Fig. 1.

Friday	21 Oct.	RLS, MRL and GPLeG, travelled to Plymouth and unloaded equipment.
Saturday	22 Oct.	Set up equipment. 1500 Vessel moved to outer basin. APS joined ship.
Sunday	23 Oct.	Handling tests of multicore cable and tests of instruments while berthed. 1630 Proceeded to Start Bay, anchored inside Skerries Bank. Test of instruments on sea bed.
Monday	24 Oct.	3 - point anchor at Stn. SB 7. Commenced CUVW experiment. 1520 Port anchor lost while weighing anchor. Put into Kingswear. 2015 KRD joined ship.
Tuesday	25 Oct.	0800 Proceeded to Stn. SB 1 and anchored. Continued CUVW experiment. 1300 MBA divers arrived and recovered port anchor. 1745 continued CUVW experiment.
Wednesday	26 Oct.	Continued CUVW experiment.
Thursday	27 Oct.	0000 Proceeded to Weymouth. Berthed at 0830. KRD, APS, GPLeG left; JAC, AJM, PMH joined ship. Loaded and set up gear for Reference experiment.
Friday	28 Oct.	0830 Proceeded into Weymouth Bay and 3 - point anchored at Stn. WB 3. Poor holding ground. Moved to Stn. WB 2. Commenced Reference experiment.
Saturday	29 Oct.	1000 Proceeded to Lyme Bay, anchored at Stn. LB 2. Continued Reference experiment.
Sunday	30 Oct.	Grab sample taken and echo-sounder survey made over Stn. LB 2. 0845 Proceeded to Plymouth and docked at 1830. Stripped down equipment.
Monday	31 Oct.	Unloaded equipment and returned to Taunton.

OBJECTIVES This cruise was made as part of a study of the processes of sand movement by tidal currents. The detailed aims were:
a. Handling trials and shakedown of new multicore cable.
b. Sea trials of sand transport probe.
c. To make simultaneous measurements of the turbulent components of velocity and suspended sediment concentration, to allow turbulent sediment fluxes to be calculated (CUVW experiment).

OBJECTIVES contd.

d. To make turbulent velocity measurements under known simple conditions, as a basis for comparison with the more complicated conditions encountered when sediment is moving over a duned sea bed (Reference experiment).

PROCEDURE AND METHODS

a. Various configurations for leading the multicore cable over the ship's side were tried, and a satisfactory one found in which the cable led over two 20 in. sheaves slung from the peak of the derrick and the port derrick boom.
b. and c. Measurements of the horizontal and vertical turbulent components of velocity were made at two heights using electromagnetic (E/M) current meters, with 10 cm diameter sensors, mounted as shown in Fig. 2. The results were recorded on an analogue tape recorder and a chart recorder. Shrouds were mounted over the sensors at slack water to establish zeroes. The mean velocities at four heights were measured with Braystoke rotors mounted on the rig and recorded every minute in printed form and on punched paper tape controlled by a PDP-8 computer.
The sand transport probe (STP) was mounted low down on the turbulence rig, and its output recorded in analogue form on the chart recorder and simultaneously as one minute or 10 s counts of impacts using the PDP-8 computer. Pumped suspended sediment samples from the same height as the STP were taken every 5 minutes for subsequent comparison with the corresponding STP output.
Video tapes of the STP and surrounding sea bed were taken when sediment was moving.
d. The sites in Weymouth and Lyme Bays were chosen as having a flat horizontal bed with deep water to avoid disturbance from the ship's hull and fast currents to minimise surface wave effects. Measurements with the E/M current meters and Braystoke rotors were made as in (b) and (c). In addition the E/M outputs were recorded in digital form every 0.2 s using a second PDP-8 computer in an effort to circumvent drift of the analogue tape recorder. Background information was collected as follows:

i) Current velocity and direction profiles were measured every 30 minutes throughout the water depth.
ii) Profiles of temperature and salinity were made simultaneously with the above.
iii) Water depth was recorded every 30 mins.
iv) Photographs were taken of the sea bed as seen on the TV monitor.

EQUIPMENT PERFORMANCE

The E/M current meters behaved satisfactorily, but one head leaked on 26th Oct. and had to be rewired.
On 24th Oct. the pumped sampling solenoid cable broke at a previous repair joint and had to be remade.
The direct digitization of the E/M outputs failed completely due to a fault in the tape deck. This was only detected on return to the laboratory. At the same time the back-up analogue tape recorder became faulty and could not be

EQUIPMENT PERFORMANCE contd.

repaired on board.
All other equipment performed satisfactorily.

RESULTS

a. The multicore cable and the Kevlar lifting rope proved very successful.
b. Subsequent analysis of the STP output and pumped samples showed a good correlation. It was shown that the STP responded to grains larger than 125μm, but that the sampling cross-sectional area was only 1/30 the area of the ceramic disc sensor. This meant that the frequency response was poorer than hoped for. The STP output was in reasonable agreement with the observations of sediment movement from the video tapes.
c. A reasonable quantity of data was obtained, though the poor frequency response of the STP will limit the kinds of analysis which can be performed. The Braystoke current profiles and video tapes have given information on the threshold of movement of sand, and the pumped samples have shown the functional dependence of concentration on bed shear stress.
d. The failure of both the direct digitization and the tape recorder meant that no turbulence data was recorded for the Reference experiment. The full depth velocity profiles have shown evidence of Ekman-like veering of the tidal currents. The T-S profiles have been used to estimate stratification for earlier turbulence measurements at the same site and time of year.

STATION LIST

Station	SB 1	50° 14.3' N	3° 37.9' W
	SB 7	50° 14.7' N	3° 37.8' W
	WB 2	50° 34.4' N	2° 20.4' W
	WB 3	50° 33.5' N	2° 16.4' W
	LB 2	50° 31.5' N	2° 31.4' W

PREPARED BY : R L Soulsby (R L SOULSBY)

APPROVED BY : K R Dyer (K R DYER)

DATE : 22nd Feb 1980 22 February 1980

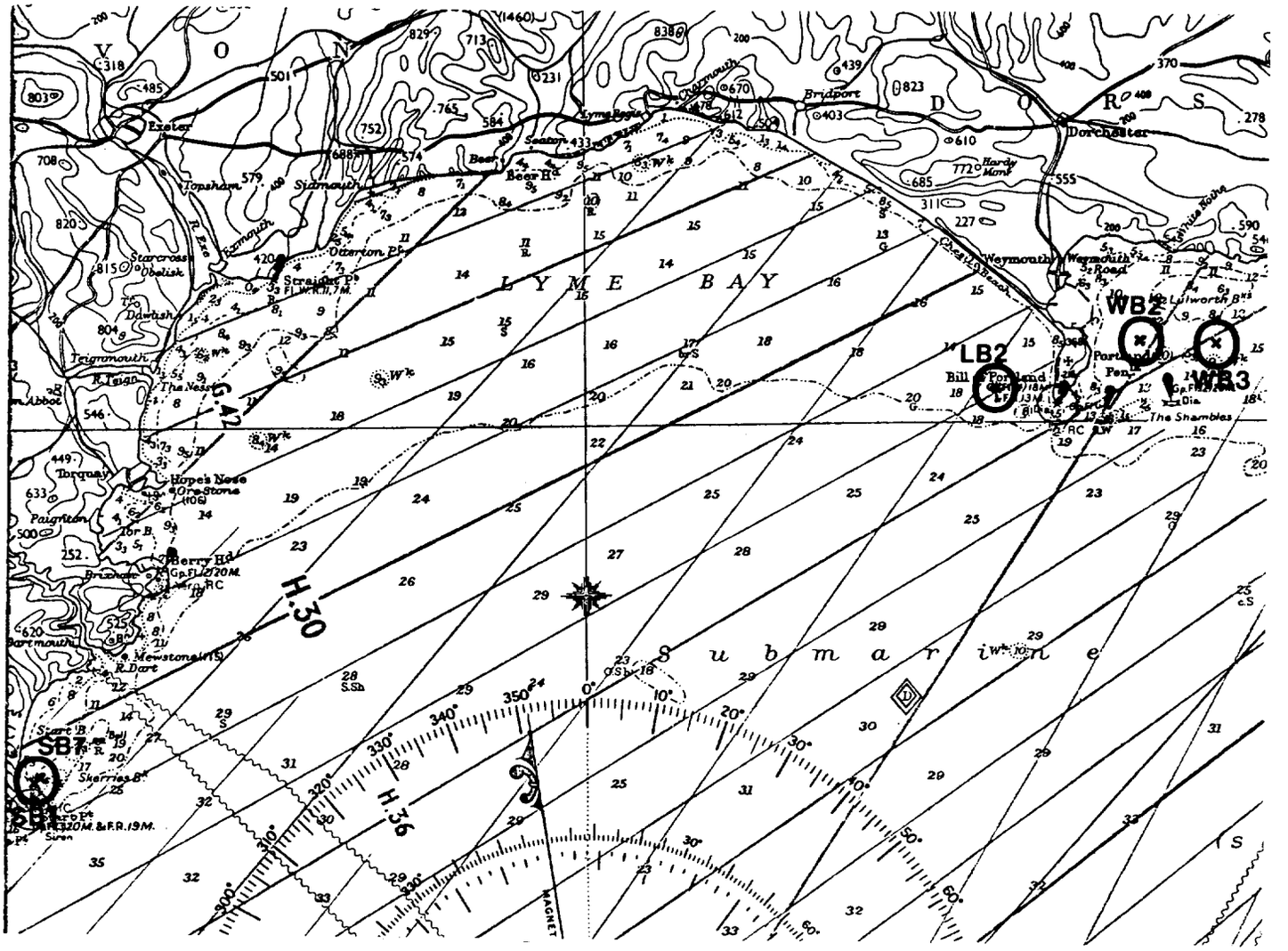


Fig. 1 Location of Stations

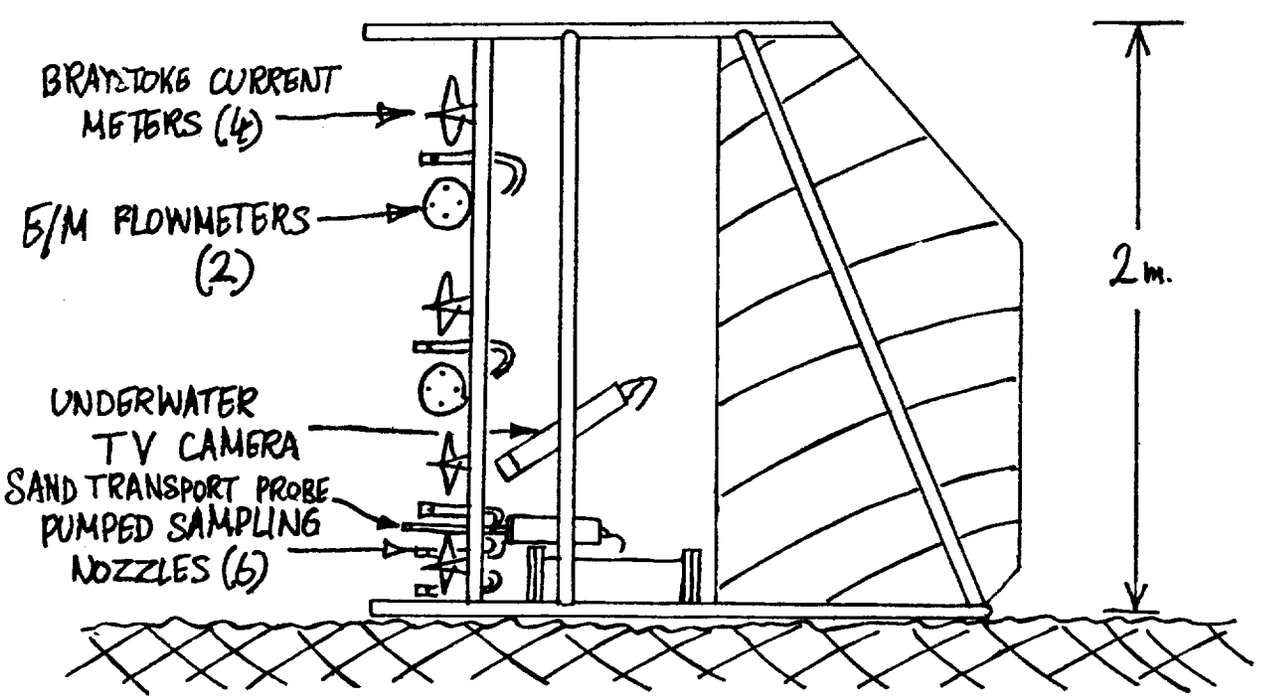


Fig. 2 Turbulence Rig

VESSEL — R.V. SARSIA

CRUISE PERIOD — 4 March - 18 March 1978.

PERSONNEL

B.J. Lees	HSO Senior Scientist
J.E. Blower	ASO
R. Bryant	EO
R. Kirby	SSO
M.R. Lees	SO
M.A.S. Moore	SO
K.A. Reeves	ASO
T.A. Upham	ASO

ITINERARY — A copy of the relevant part of Admiralty Chart No. 1543 is attached.

Saturday	4 March	Loaded equipment at Plymouth.
Sunday	5 March)	
Monday	6 March)	Sailing to Lowestoft.
Tuesday to Friday	7 March to 10 March	Sailed at 1000 hrs. Carried out pumped sampling experiments at five stations in Sizewell-Dunwich area.
Saturday	11 March	Offloaded pumped sampling gear. Loaded vibrocorer.
Sunday and Monday	12 March and 13 March	Sailed at 1430 hrs. Vibrocored at 7 stations.
Tuesday	14 March)	Gale force winds. Too rough to
Weds.	15 March)	sail. Worked on deck.
Thursday	16 March	Sailed at 0800 hrs. 0900 hrs weather deteriorating rapidly. Returned to port. Packed equipment.
Friday	17 March)	
Saturday	18 March)	Sailing to Plymouth.

OBJECTIVES — To continue sediment transport studies in the Sizewell-Dunwich Banks area by 1) making suspended sediment transport measurements and 2) taking cores of the seabed to supplement geophysical and grab sampling data.

PROCEDURE AND METHODS — The IOS (T) pumped sampling equipment was used at the 5 stations shown, for 1 tidal cycle at each, sampling the complete profile at 6 levels every ½ hr. This apparatus measures the quantity of sediment passing through at each height, and current speeds at 4 levels. The vibrocorer was used to obtain sediment cores 8 cm in diameter and up to 4.2 m long, at the stations shown.

EQUIPMENT PERFORMANCE — No insoluble problems were encountered with either set of equipment.

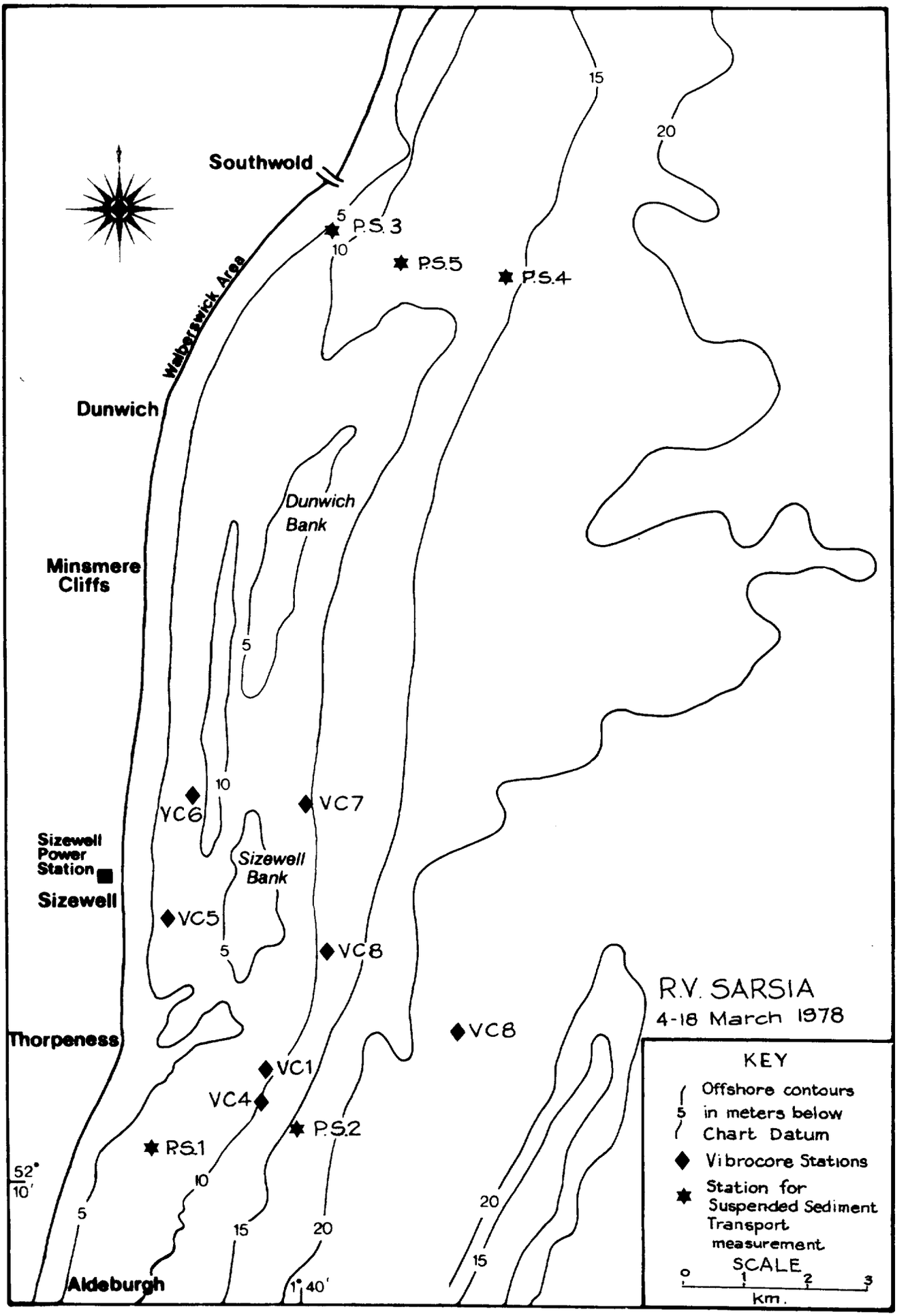
RESULTS

Suspended sediment results incorporated in paper read at IAS Conference on Holocene Sedimentation in the North Sea at Texel, Netherlands, in September 1979. Published in Abstracts, No 37. Vibrocore results incorporated in Sizewell-Dunwich Banks Field Study, Topic Report : 1, Introduction and geological background. IOS Report No. 88.

PREPARED BY : Barbara J. Lees. (B J LEES)

APPROVED BY : (A P CARR)

DATE : 22.2.80 22 February 1980


Southwold
Walberswick Area
Dunwich
Minsmere Cliffs
Dunwich Bank
Sizewell Power Station
Sizewell
Sizewell Bank
Thorpeness
Aldeburgh
52° 10'
1° 40'
P.S.1
P.S.2
P.S.3
P.S.4
P.S.5
VC1
VC4
VC5
VC6
VC7
VC8
VC8
5
10
15
20
R.V. SARSIA
4-18 March 1978
KEY
Offshore contours in meters below Chart Datum
Vibrocore Stations
Station for Suspended Sediment Transport measurement
SCALE
0 1 2 3
km.

VESSEL R.V. SARSIA

CRUISE PERIOD 29 March - 7 April 1978

PERSONNEL

Dr. K.R. Dyer	PSO	Senior Scientist	29.3 - 6.4.78
Dr. R.D. Flood (US)	NATO	Post Doctoral Fellow	29.3 - 7.4.78
A.J. Marks	HSO		29.3 - 2.4.78 & 6.4.78
M.R. Lees	SO		29.3 - 2.4.78
M.A.S. Moore	SO		1.4 - 3.4.78
G. Le Good	SO		3.4 - 7.4.78
P. Taylor (MSES)	SO		29.3 - 7.4.78
J.O. Malcolm	HSO		1.4 - 2.4.78 & 6.4.78
E.J. Moore	HGCD		1.4 - 2.4.78

ITINERARY

29 March	Loaded equipment in Plymouth. Set up and tested equipment in Plymouth Sound.
30 March	0730 hrs sailed for Southampton Water. On passage completed oblique asdic surveys and 5 camera stations
31 March	in areas of furrows in Central English Channel. Docked Southampton 1900 hrs.
1 April	Anchored fore and aft at Position A in Southampton Water. Divers installed current meters in a furrow and obtained core samples. Commenced measurements of velocity, salinity and temperature. Divers laid barium powder. Detailed oblique asdic surveys within Southampton Water.
2 April	Measurements continued at Position A.
3 April	Measurements at Position A completed at 0120 hrs. 1145 hrs vessel anchored fore and aft at Position B. Velocity and salinity measurements commenced 1440 hrs.
4 April	Measurements continued at Position B.
5 April	Measurements at Position B completed 1410 hrs. 1500 hrs berthed Southampton. Reanchored at Position A 1800 hrs.
6 April	Measurements of velocity and salinity commenced 0422 hrs. Divers installed current meters in furrows at 1315 hrs. Measurements completed at 1650 hrs. Divers and equipment unloaded at Southampton. Vessel on passage to Plymouth 1730 hrs.
7 April	Docked Plymouth, cleared ship and returned to Taunton.

OBJECTIVES

1. Sidescan sonar and underwater photography of furrows in central English Channel.
2. Velocity and suspended sediment measurements across furrows in Southampton Water to examine the processes of their formation.
3. Lay barium markers across furrows in Southampton Water for sedimentation rate measurements.
4. Sampling and coring across furrows.
5. Continuous salinity and velocity measurements throughout the water column to study the mixing processes.

PROCEDURE AND METHODS

An EG and G dual sidescan sonar was used together with an UW camera (MSES) in the English Channel. In Southampton Water a Bissett Berman STD sensor (loaned by Dr. R.D. Pingree) together with shipboard units developed by MSES were used to measure salinity and temperature continuously at a fixed depth. Frequent profiles were obtained with a Robertson Research Labs. recording conductivity meter and an Electronic Switchgear MS5 T-S bridge. At Position A 3 Braystoke DRCM's were spaced at fixed heights in the water column. Three additional Braystoke rotors, mounted on small stands, were placed on either side and in the middle of a furrow. Partech silt meter sensors were also mounted on the stands. At Position B four DRCM's were used spaced through the water column. Velocities were recorded averaged every minute.
A Bell and Howell 7 track instrumentation tape recorder was used to record the STD and silt meter information.

EQUIPMENT PERFORMANCE

The sensor of the Robertson Research conductivity probe leaked after about 36 hours use.
The cooling fan for the Bell and Howell recorder failed and had to be replaced. This restricted recording of the STD to a chart recorder for 1½ days. The directions on the DRCM's all failed after a few hours. This did not detract from the results obtained however.

RESULTS

The current measurements will be analysed to give the shear stresses inside and outside the furrows, the Richardson number distribution in the body of the flow and the residual circulation. The STD records will be analysed to estimate the contributions at different frequencies to the mixing processes.
Cores of the sea bed will be examined to determine the sedimentary structure beneath the furrows and subsequent surveys will be made in Autumn 1978 and Spring 1979 to determine the depth of burial of the barium layer.

PREPARED BY :  (K R DYER)

APPROVED BY :  (K R DYER)

DATE : 14 March 1980 14 March 1980

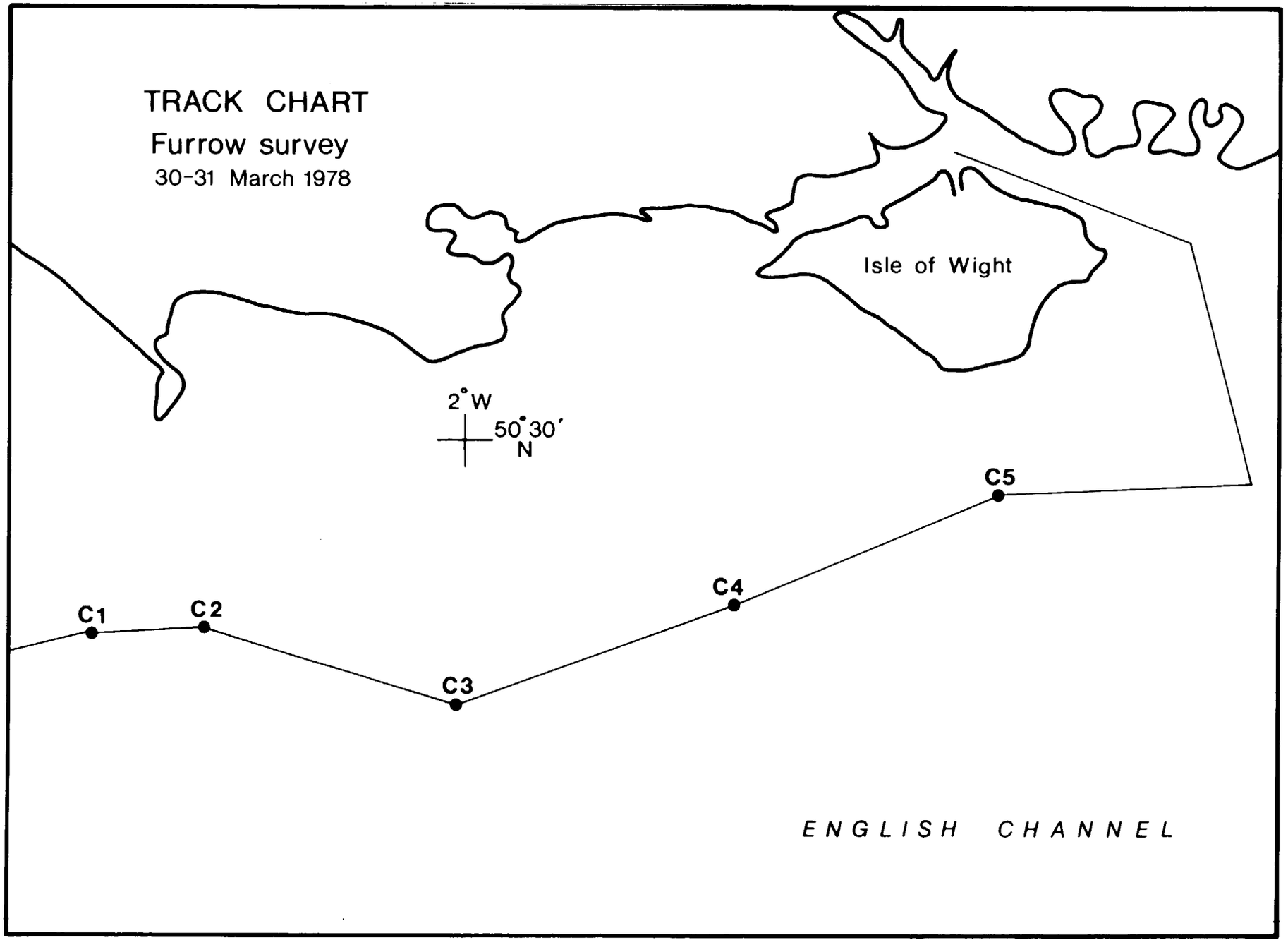
STATION LIST

ENGLISH CHANNEL

CAMERA	Station 1	50° 19' N	2° 32' W
	2	50° 19' N	2° 22' W
	3	50° 15' N	2° 01' W
	4	50° 21' N	1° 36' W
	5	50° 27' N	1° 15' W

SOUTHAMPTON WATER

POSITION A	50° 51.63' N	1° 21.85'W
POSITION B	50° 51.82' N	1° 21.67'W


TRACK CHART
Furrow survey
30-31 March 1978
Isle of Wight
2°W
50°30'N
C1
C2
C3
C4
C5
ENGLISH CHANNEL

VESSEL R.V. EDWARD FORBES

CRUISE PERIOD 24 April - 9 May 1978

PERSONNEL

R. Kirby	SSO Senior Scientist	24.4 - 9.5.78
M.A.S. Moore	SO	24.4 - 9.5.78
M.R. Lees	SO	24.4 - 1.5.78
G. Le Good	SO	24.4 - 1.5.78
Mrs. C. Kirk	ASO	1.5 - 9.5.78
Miss J. Blower	ASO	1.5 - 9.5.78

Day visitors

T.J. Smith	HSO
G. Austin	Oxford University
K. Dempster	Southampton University

ITINERARY

23.4.78	Travel to Barry and set up equipment.
24 to 27.4.78	Sail Barry 0800 hrs for silt meter profiling along IOS standard cross-sections. Entered Barry 2000 hrs.
28.4.78	Trisponder and densimeter set up. Sailed 1000 hrs for Bridgwater Bay. Gravity coring accompanied by density profiles for Oxford University at 3 stations.
29.4.78	Anchored in Bridgwater Bay and laid Barium Sulphate at site of sedimentation rate experiment. Also gravity cores obtained.
30.4.78	Sailed for Newport Deep for Vacuum sampler trials.
1.5.78	Siltmeter profiles along cross-section of the estuary.
2.5.78	In Barry for crew leave and change scientific personnel.
3 to 6.5.78	Siltmeter profiling along cross-sections of the estuary.
7.5.78	Siltmeter profiles along cross-section of the estuary followed by echo sounder line from Gore Buoy into Burnham and back along Parrett approach channel.
8.5.78	Gravity coring in co-operation with Southampton University.
9.5.78	Siltmeter profiling. Entered Barry 2115 hrs.
10.5.78	Return to Taunton.

OBJECTIVES

1. Study of fine sediment distribution in the area between Hinkley Point and English and Welsh Lightfloat based on vertical profiles of suspended sediment.
2. Test of new design Partech siltmeter.
3. Laying Barium Sulphate at site of sedimentation experiment in Bridgwater Bay.
4. Gravity coring of settled mud at site of sedimentation experiment and in co-operation with Oxford and Southampton Universities.

PROCEDURE AND METHODS

Suspended sediment data was obtained by repeated traverses along standard cross-section lines making vertical profiles at standard stations along the line.
Barium Sulphate was laid both as a slurry poured down a flexible tube held 1 m above the bed at the experiment site and also spread as a powder at slack water from the water surface.
Gravity cores were obtained using both 60 mm and 100 mm barrels from Edward Forbes. For the Oxford University work the radioactive transmission density gauge was attached to the gravity core shoe. For the Southampton University sampling an orientation camera was fitted after the corer was swung to record compass deviations caused by the chassis.
Vacuum sampler bottles were arranged on a modified siltmeter profiling frame and triggered at required depths as indicated by a depth sensor output.

EQUIPMENT PERFORMANCE

1. No problems were encountered with the IOS siltmeter profiling array until 5.5.78 when the array was inadvertantly hauled up into the sheave on the head of the derrick parting the lifting cable. The equipment was recovered by hauling on the electric cables.
2. The experimental Partech siltmeter failed on many occasions owing to sea water ingress. The trial was finally abandoned.
3. The Barium Sulphate lay was successful. Attempts to obtain gravity cores and simultaneous density profiles proved completely impossible. The corer had to be traversed so slowly that it persistently fell over.
4. Gravity cores for analysis by Oxford University, Southampton University and IOS were obtained without problems.
5. Vacuum sampler trials were successful.
6. The Decca Trisponder performed faultlessly.
7. The Edward Forbes could not anchor in the Bridgwater Bay settled mud area.

RESULTS

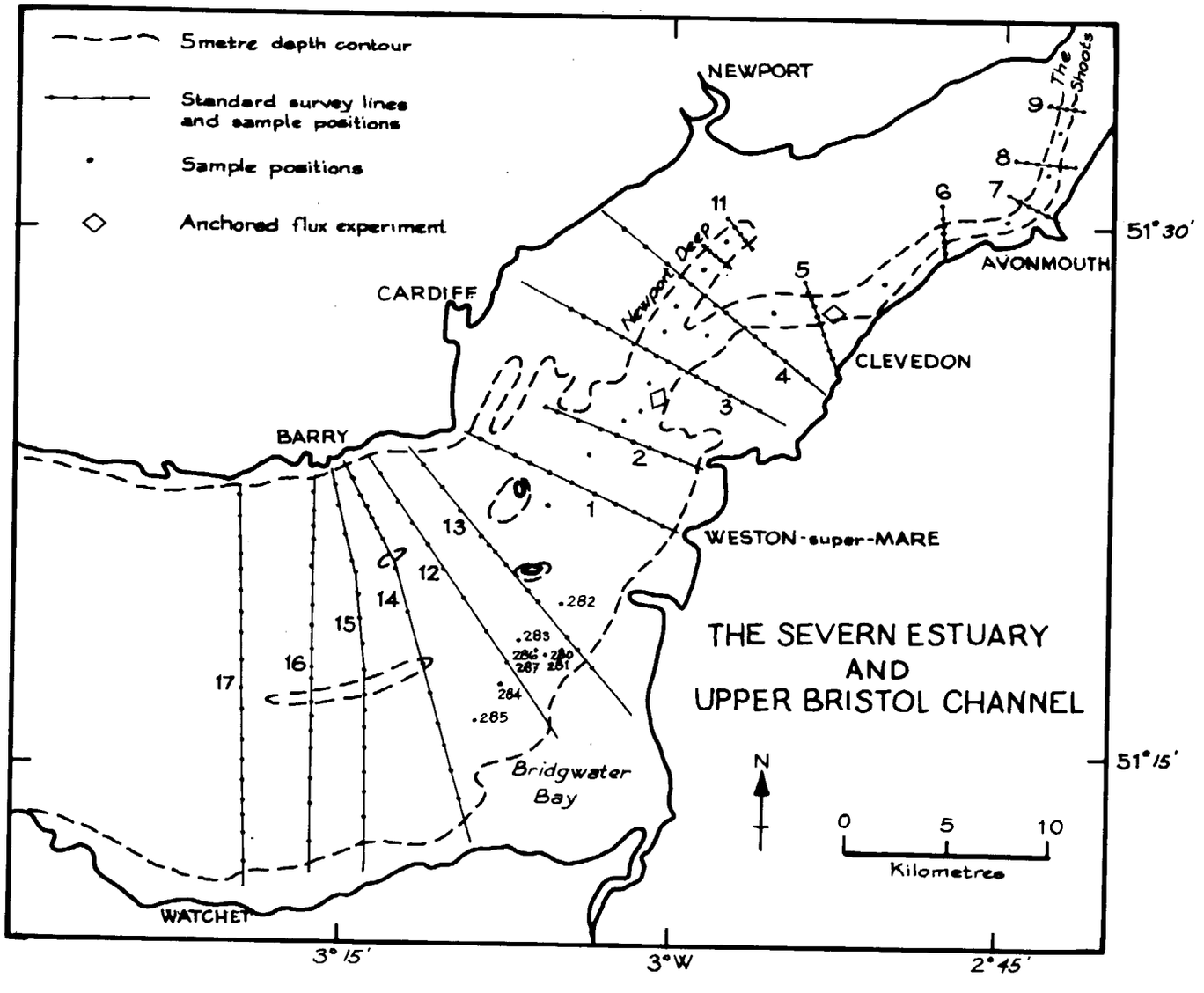
Good weather conditions attended the survey throughout and a large amount of siltmeter, data was collected between the Holmes Islands and $3^{\circ}30$ W. This confirmed earlier work which showed that dense suspensions were encountered only along the English Coast.

Track Charts and Stations.

PREPARED BY : (R KIRBY)

APPROVED BY : (K R DYER)

DATE : 25 February 1980


5metre depth contour
Standard survey lines and sample positions
Sample positions
Anchored flux experiment
NEWPORT
The Shoots
CARDIFF
Newport Deep
AVONMOUTH
CLEVEDON
BARRY
WESTON-super-MARE
THE SEVERN ESTUARY AND UPPER BRISTOL CHANNEL
Bridgwater Bay
WATCHET
N
0 5 10
Kilometres
51°30'
51°15'
3°15'
3°W
2°45'

VESSEL: RV Sarsia

CRUISE PERIOD: 2-10 June 1978

PERSONNEL:
Dr W R Parker - Senior Scientist
Dr A P Salkield
Dr T J Smith
Mrs C A Kirk
Mr M A S Moore

ITINERARY:

Friday 2 June	Travel to Plymouth. Prepare Sarsia and install equipment.
Saturday 3 June	Continue installation of computers etc. At 1710 BST crewman W Seymour collapsed and died.
Sunday 4 June	Remain in port for statement etc. Continue setting up equipment.
Monday 5 June	Remain in port. Visit Board of Trade inspector. Continue setting up equipment.
Tuesday 6 June	Finish setting up. Test samplers etc in dock. Test remote controlled winch. Sail 1700. Proceed Start Bay. Anchor 2000.
Wednesday 7 June	Trials of boundary layer rig and mid-water array deployment system. Depart Start Bay 1800. Berth Plymouth 2000.
Thursday 8 June	Clear ship. Attend memorial and funeral service for W Seymour. Return to Taunton 1700.

OBJECTIVES: The original objectives of this cruise were:

(1) To undertake joint observations with I.M.E.R. of velocity, salinity, temperature and turbidity at a number of stations in the Severn Estuary.

(2) To test new equipment and deployment techniques for the forthcoming Locater Cruise (August-September 1978).

These were revised consequent upon the events of Saturday 3 June. They were reduced to trials of a new 3 metre boundary layer rig and the trials of the string designed for synchronous flow measurement in the lower 10 metres of water (low water prism).

PROCEDURES AND METHODS: The boundary layer rig was fitted with inclinometers and the rig attitude checked during lowering and on landing. The low water prism array was designed for work in the Bristol Channel and consisted of a ballast tube and bottom contactor, short wire strops and interconnecting flow-meter swivel mounts. The whole had been proof tested. The objective was to allow this soft array to be deployed in one pass. The Braystoke flow meters were found to be best fitted before launching. The interfaces for logging the Braystoke flow meters were also checked out during the short experimental day.

EQUIPMENT PERFORMANCE: The boundary layer rig and low water prism array functioned satisfactorily. It was decided to fit guide frames around the flow meter locations on the low water array to carry and cables from lower sensors around higher sensor positions.

Prepared by: W R PARKER

Approved by: K R DYER

Date: 23 September 1980

VESSEL R.V. EDWARD FORBES Cruise No. 10/78

CRUISE PERIOD 4- 14 July 1978

PERSONNEL

D.N. Langhorne	SSO (Senior Scientist)
A.J. Marks	HSO
E.J. Moore	HGCD
P.M. Hooper	SO
P.J. Hardcastle	SSO (Installation of Waverider recorder)

ITINERARY

1 - 3 July	Travelled to Cromer a. Calibrated and set up Trisponder remotes. b. Set up and levelled Tide gauge on Cromer lifeboat pier.
4 July	Joined R.V. Edward Forbes at Great Yarmouth. Set up equipment on board.
5 July	Sailed for N. Haisborough Bank. Layed Waverider buoy. Started sandwave survey in area of submarine gas pipelines. Abandoned survey owing to adverse sea conditions. Returned to Great Yarmouth.
6 July	0715 sailed for Haisborough Bank. Sea conditions bad, returned to Great Yarmouth.
7 July	Remained in Great Yarmouth because of bad weather.
8 July	Remained in Great Yarmouth because of bad weather. P.J. Hardcastle set up Waverider recorder at Happisburgh. PM sea conditions moderated. 1800 sailed from Great Yarmouth. Ship remained at sea over night, though too rough to work.
9 July	0800 - 2330 Survey of the sandwave area.
10 July	0630 - 2200 Survey of the sandwave area.
11 July	0700 - 2000 Survey of the sandwave area.
12 July	PM completed survey operations. Returned to Great Yarmouth.
13 July	R.V. Edward Forbes sailed for Barry. IOS (T) staff recoverd tide gauge and Trisponder remotes.
14 July	Completed recovery of equipment. Returned to Taunton.

OBJECTIVES Five submarine gas pipelines pass through the sandwave field at the N end of the Haisborough Bank. Concern has been expressed for the vulnerability of these pipes to damage as a result of exposure brought about by sandwave movement. The objective of the cruise was to undertake the first of a series of surveys of the sandwave field (and the pipes) in relation to tide and wave conditions. The results of these surveys would be used to study the mobility of the sandwaves and its effect on pipe exposure.

PROCEDURE AND METHODS

A close line (100 m line spacing) echo-sounding and sidescan sonar survey was conducted in the sandwave field at the head of N. Haisborough Bank. A Waverider buoy was laid to the E of the Bank and its recorder installed at Happisburgh Coastguard Station. Survey lines, controlled by sidescan sonar, were run along the individual pipes to study their exposure. Particular attention was paid to sandribbons which were cut by pipes and those which had reformed to cross the pipe tracks.

Horizontal position control:- Decca Trisponder, with remotes installed at Cromer lifeboat pier, Winterton and Happisburgh Coastguard stations.
Depth measurement:- Raytheon DE-719 Echo-sounder interfaced to an Actif digitizer (on loan for evaluation) and Decca Maglog.
Sidescan sonar:- EG + G Dual channel sidescan sonar.
Wave recording:- Datawell Waverider System.

EQUIPMENT PERFORMANCE

1. Frequent faults occurred on the aged Decca Maglog This was not only in its operation at sea, but also persistent errors occurred on the mag. tape print out.
2. Decca Trisponder generally performed well. Interference occurred in the area close to the Haisborough Bank Lightvessel. Ranges ofup to 33 km were obtained from Winterton remote station. The remote at Cromer failed during the survey. This was found to be due to failure of the power supply unit.
3. The Actif echo-sounder digitizer proved to be effective, but the use of such equipment requires a good data logger and software support.

RESULTS

The survey of the sandwave field was completed, though the records obtained were not good owing to poor sea conditions which introduceda lot of ship motion. It proved to be possible to 'con' the ship along particular pipelines using sidescan sonar. Because of the time lost due to adverse weather, the study of individual pipelines was limited and no sediment sampling nor flow measurement was carried out.

PREPARED BY : (D N LANGHORNE)

APPROVED BY : (K R DYER)

DATE : 5 March 1980

5 March 1980

VESSEL R.V. EDWARD FORBES

CRUISE PERIOD 16 August - 30 August 1978. Cruise No 13/78.

PERSONNEL

B.J. Lees	HSO	Senior Scientist
A.P. Carr	PSO	
M.W.L. Blackley	HSO	
J.E. Blower	ASO	
D.H. Joyce	Ind	
K.A. Reeves	ASO	
G. McNelly	P & TO	
G.W.J. Miller	HSO	(RVS Barry)
D. Tennant	SSO	(MAFF, Lowestoft)

ITINERARY A copy of the relevant part of Admiralty Chart No. 1543 is attached.

Wednesday	16 August	Vessel berthed at Lowestoft. Current meter rigs loaded.
Thursday	17 August	Deployed 2 current meter moorings. Changed longterm mooring.
Friday	18 August)	Grab sampled for background survey to
Saturday	19 August)	fluorescent tracer experiment.
Sunday	20 August	Set up and checked equipment for fluorescent tracer sand injection.
Monday	21 August	Ship unable to sail due to oil in engine freshwater cooling system. Finally sailed 2100 hrs.
Tuesday	22 August)	Tracer sand injected. 4 post injection
to	)	grab sampling surveys carried out. Box
Monday	28 August)	coring undertaken until A-frame failed. 9 cores obtained.
Tuesday	29 August)	Packed up. Ship sailing to Barry.
Wednesday	30 August)	

OBJECTIVES To continue sediment transport studies in the Sizewell-Dunwich Banks area by measuring bedload transport, using a fluorescent tracer technique. To deploy current meters to measure current speeds and directions during the experiment, and to box core to measure the depth of mixing of the tracer after the first survey.

PROCEDURE AND METHODS Plessey M021 current meters were deployed at midwater level on conventional U-shaped rigs. 0.75 tonne fluorescent tracer sand was injected by making it into a slurry and pumping it down a plastic pipe to the seabed. The tracer cloud was subsequently delineated by Shipek grab sampling, examining the samples under UV light on retrieval, and modifying the sampling pattern according to the amount of tracer found. Part of each sample was packed for return to the laboratory and accurate counting. A MAFF designed box corer was used to measure the depth of tracer mixing.

EQUIPMENT PERFORMANCE

No problems were encountered with either IOS(T), or MAFF equipment. The ship's A-frame failed, curtailing the box coring programme. However, a plus mark to Master and Officers for excellent tight navigation during the surveys.

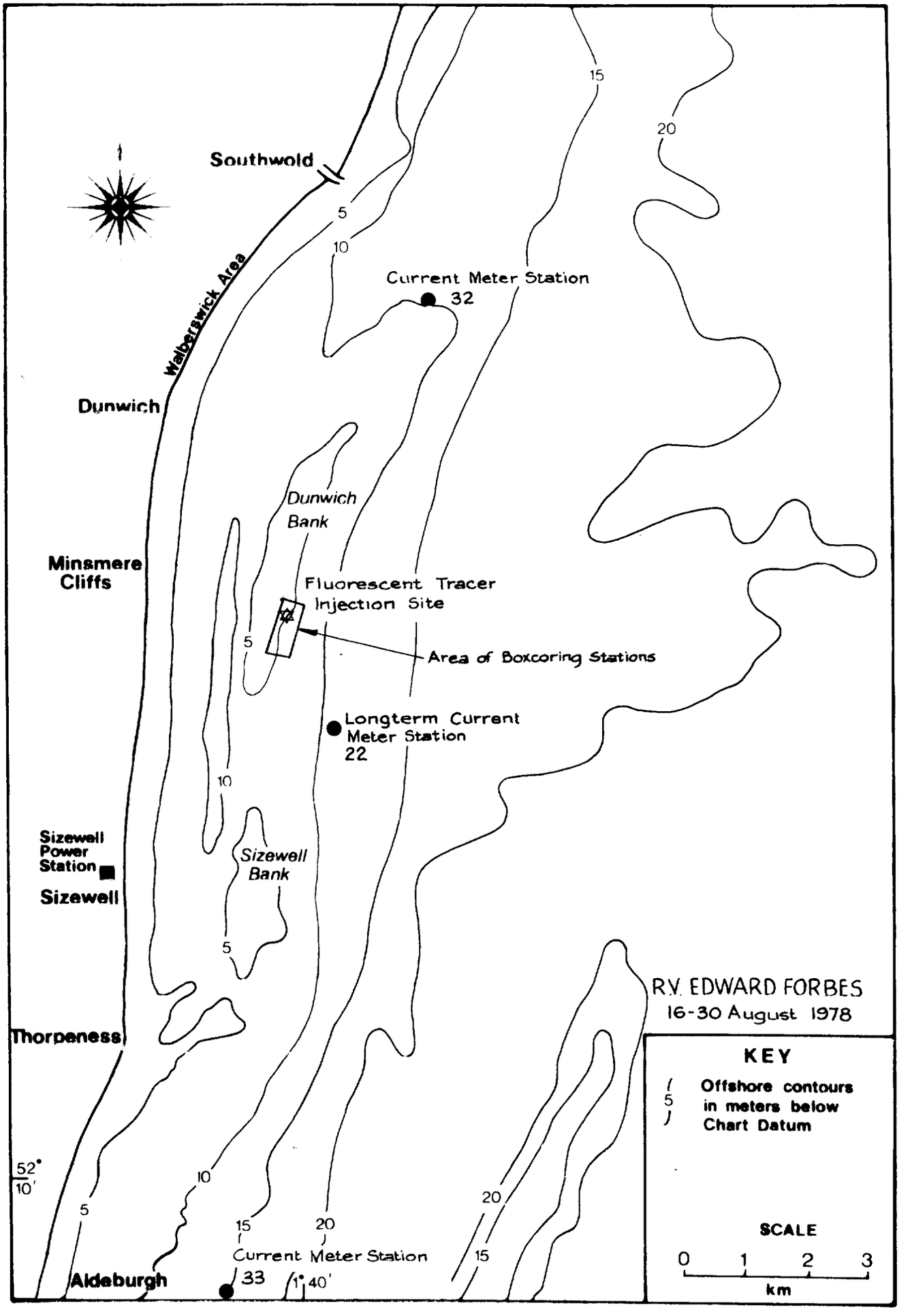
RESULTS

Bedload transport measurement results incorporated in paper read at IAS Conference on Holocene Sedimentation in the North Sea, at Texel, Netherlands, in September 1979. Published in Abstracts, No. 37.

PREPARED BY : Barbara J. Lees. (B J LEES)

APPROVED BY : (A P CARR)

DATE : 22-2-80. 22 February 1980


Southwold
Walberswick Area
Dunwich
Minsmere Cliffs
Sizewell Power Station
Sizewell
Thorpeness
Aldeburgh
Dunwich Bank
Sizewell Bank
Current Meter Station 32
Fluorescent Tracer Injection Site
Area of Boxcoring Stations
Longterm Current Meter Station 22
Current Meter Station 33
5
10
15
20
52° 10'
1° 40'
R.V. EDWARD FORBES
16-30 August 1978
KEY
Offshore contours in meters below Chart Datum
SCALE
0 1 2 3
km

VESSEL: M V Gardline Locater

CRUISE PERIOD: 30 August-26 September 1978

PERSONNEL: IOS and collaborating Scientists:

Dr W R Parker - Senior Scientist
Dr G C Sills, Oxford University - Senior Scientist
Dr R Kirby - Scientist I.C. Deck
Dr A P Salkield - Scientist I.C. Instrumentation
Mrs C A Kirk - Data Analysis Supervisor
Mr M R Lees
Mr G P Le Good
Mr M A S Moore
Dr T J Smith
Mr N Dillon
Mr S Edmeades
Miss J Blower
Mrs J Wolff, IOS Bidston
Mr R Bryant - Swansea University
Dr A E James - " "
Dr A Roche - " "

VISITING SCIENTISTS: Professor E Partheniades, University of Florida
Ir W Vlemmix, Netherlands Rijkswaterstaat

ITINERARY:

Wednesday 30 August	Staff and equipment assemble in Barry. Run up and check containers.
Thursday 31 August	All gear ready on wall by 0830. Start loading frames and laboratory items 1600.
Friday 1 September	Site containers. Proof test all lifting equipment. Fit compressors.
Saturday 2 September with	Vessel sails 0930. Proceed to station 2.2 off Clevedon (Fig 1). Vessel fouls screws with anchor wire during anchoring. No work possible.
Sunday 3 September	Further attempts at anchoring but again anchors fouled. No work on deck possible. Starboard bow anchor lost at 1345. No further work possible. Decide to steam to Bridgwater Bay to test piezometer equipment. Start to anchor in Bridgwater Bay 1400. Anchors drag. By 2330 stern anchors twisted.
Monday 4 September	Continue attempts to anchor. Anchors again dragging - no outside work possible.
Tuesday 5 September	0300 start re-anchoring. 0500 anchoring manoevres still not successful. 0730 ship still dragging anchors. Decide to try some work with existing anchor spread. 1000 shear vane apparatus tested from starboard derrick.

	1520 Divers preparing to examine sterngland for wire damage. 1620 Piezometer rig launched o/stern. Brought inboard after 10 minutes due to ship's stern swinging and closing wires against stern. Test of LW prism array on starboard derrick.
Wednesday 6 September	Enter Barry 0630. Divers examine stern gland. Various modifications made to installations on deck. Oxford party depart. IOS staff arrive. Test remote control winch and recalibrate depth sensors. New Master arrives. Professor E Partheniades and Ir W Vlemmix arrive. Anchoring procedure agreed with new Master.
Thursday 7 September	Piezometer rig and platform transferred to forrard hatch. Service overside arrays: Sail 1230 for station 2/2 off Clevedon. Anchor. All array checks completed by 2000.
Friday 8 September	am - check headings on ebb and flood tides and adjust anchors to heading 208°. Ship settling between 205° and 220°T. pm - deploy all O/S gear and run up systems. 1930 - wind increases to W7/8. All gear inboard and secured. 2100 - staff seminar on data processing methods.
Saturday 9 September	am - wind W5/7: visitors arrive 1000: Dr Williams Swansea University. 1100 Visitors plus M R Lees depart for Barry. M R Lees to visit Dentist. pm - wind W6/7 - big swell - no work possible. 1800 sea decreases - boundary layer rig and boundary layer sampler tested. Boundary layer sampler damaged on recovery. 2000-2100 Staff seminary on recording procedure. 2100 - wind W7/8.
Sunday 10 September	am Wind W6/7 still no work possible. pm Sea moderated: 1500 port quarter array deployed. Profiling systems run up. 1940 M R Lees returns on board. 2000 wind increasing 6/7: all gear inboard.
Monday 11 September	am Wind W8/9 no work possible. Adjust anchors to maintain heading. Use Bowthruster to maintain position and heading. pm Wind 8/9. No work possible. Forecast bad.
Tuesday 12 September	am: weather much improved: 0700 all systems in water and running. Start experiment.

12 September continued	0755: staff continue on sea watches.
Wednesday 13 September	am: weather good - local squally showers. 0540 M R Lees lost overboard. Work terminated for search. 1054: search halted. pm: heave anchors. Return Barry roads. Berth Barry 0100.
Thursday 14 September	am Clew up all IOS equipment. pm IOS party departs 1600.
Friday 15 September	am Oxford party arrive pm Remainder IOS party depart 1500.
Saturday 16 September	am Vessel departs Barry 0915. Proceed to Bridgwater Bay. pm 1500 start anchoring. 1650 Anchoring completed smoothly without incident.
Sunday 17 September	am Piezometer rig O/S 0945. Experiment starts 1100. pm Experiment continues smoothly.
Monday 18 September	am Experiment continues pm 1515 Lift piezometer rig: check for status of equipment and cable damage. 1530 Reposition ship on anchors to find another gas pocket. 1610 Rig replace onto sea bed. Restart experiment.
Tuesday 19 September	am Core samples to compare with piezometer data. pm Raise rig at 1530 1630 Proceed Barry roads 2000 Berth Barry Oxford party depart IOS party arrives on board. 2200 Depart Barry for station 2.2 off Clevedon
Wednesday 20 September	am Lay 4 anchor pattern. Set up lab. systems. Recalibrate depth sensors. 0950 Body sighted in water passing with flood tide 300' to starboard. Mate and Dr Salkield proceed in ship's rescue inflatable to investigate. Body identified as probably M R Lees. Brought back to ship. Scientists stood down. RVS informed. pm 1240 Barry Lifeboat arrives to remove body. 1307 Lifeboat departs 1430 Scientific party decide to continue with reduced programme.

Thursday 21 September	am Continue setting up for experiment. 1015 Report HRS wave recorder buoy off station by 2 miles. Advised by HRS that unconventional mooring in use. pm Start equipment run up. 1500 Start vertical profiles 1650 Sampling from high concentration suspensions. Experiment 1 data processing completed. 1700 Boundary layer sampler fouls ship below water line - damage to A frame and rig. Both refurbished.
Friday 22 September	am All system checks completed. pm 1400 Start experiment 2A 1930 End experiment 2A.
Saturday	am 0000 GMT. Start experiment 2B. pm 1820 Braystoke flowmeter interface fails. End of whole depth experiment. Boundary layer experiment continues.
Sunday 24 September	am Vertical profiles continue for high concentration suspensions. Boundary layer experiment continues. pm 1830 End of experiments 1900 All equipment on board 2045 Break out anchors 2345 Berth Barry
Monday 25 September	Clear ship and offload containers. All staff return to Barry.

OBJECTIVES:

To observe the velocity and concentration field at a station for periods of up to 24 hours.
Measurements of pore pressure in gassy sea beds.

PROCEDURES AND METHODS:

Velocity and concentration at fixed heights were measured using 3 arrays. 1. A boundary layer array of EM flowmeters at 5 heights logarithmically spaced over the bottom 3 metres of of flow. This rig also had turbidity sensors and pressure sensors.

2. An "intertidal" array, deployed at fixed depth below the ship measured velocity and concentration at 3 levels in the top 10 metres of the flow.

3. A "low water prism" array, deployed on a ballasted wire, measured velocity at 5 fixed heights and concentration at 3 fixed heights up to 10 m above the bed.

The whole concentration field was observed by continuous vertical turbidity profiles taken in blocks of 3 at 15 minute intervals.

Data from the boundary layer rig was collected continuously and digitized on line.

Data from the other arrays was logged continuously for 5 minutes at 15 minute intervals. During each 5 minute data block 3 vertical turbidity profiles, five 1 minute mean velocities and the concentration temperature and salinity were recorded. Samples of the suspended solids in the bottom 3 metres were taken using a rig designed and built by Swansea University. An illustration showing the data from one such data block is shown in Fig 2. The general arragnement of the experiment is shown in Fig 3.

EQUIPMENT PERFORMANCE: Most items functioned well under adverse conditions. The Braystoke interface proved troublesome and is likely to need replacement with an alternative system. Further developments of sampling are required.

Prepared by: W R PARKER

Approved by: K R DYER

Date: 22 September 1980

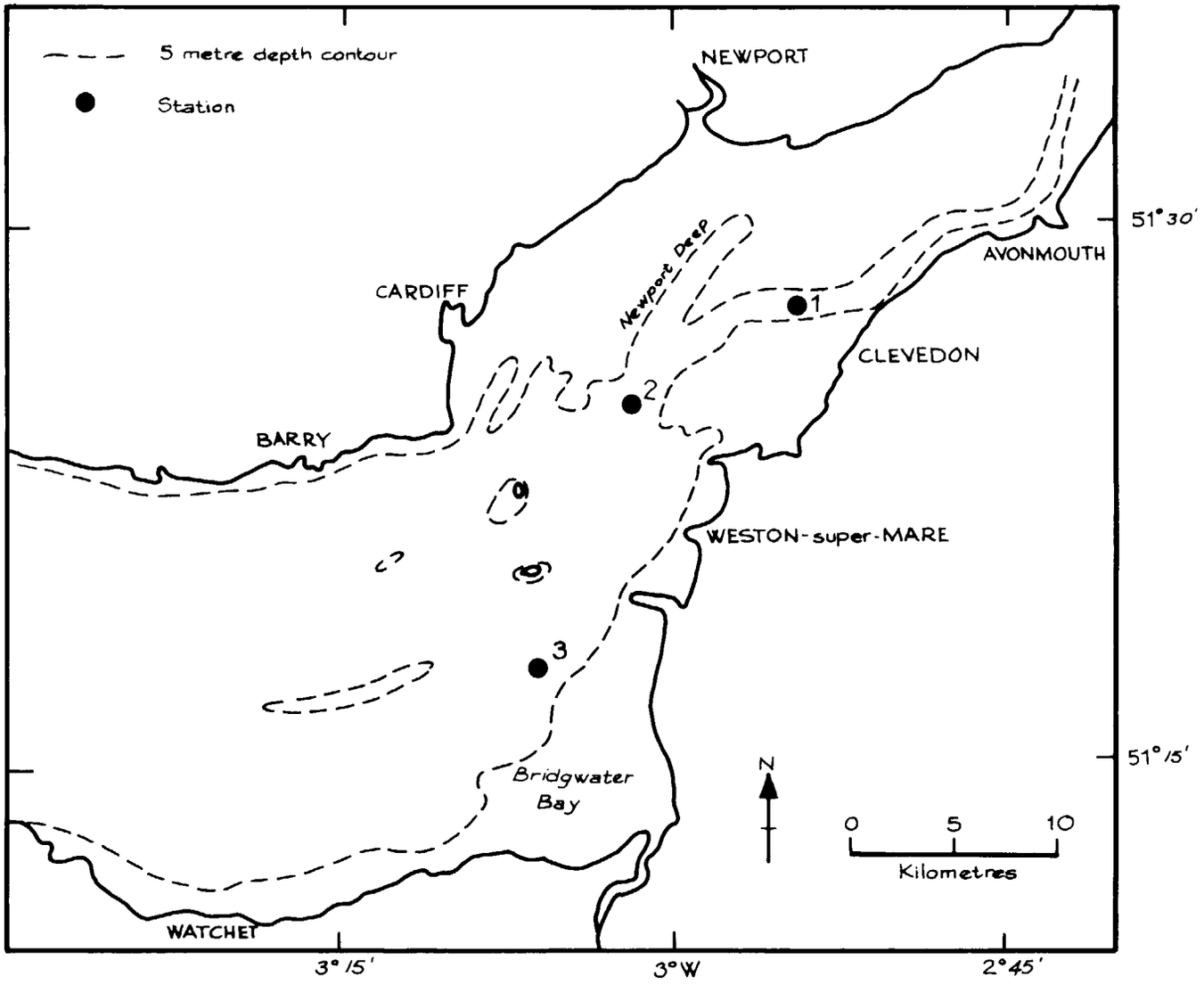

5 metre depth contour
Station
NEWPORT
CARDIFF
Newport Deep
AVONMOUTH
CLEVEDON
BARRY
WESTON-super-MARE
Bridgwater Bay
WATCHET
1
2
3
51°30'
51°15'
3°15'
3°W
2°45'
N
0
5
10
Kilometres

Figure 1.

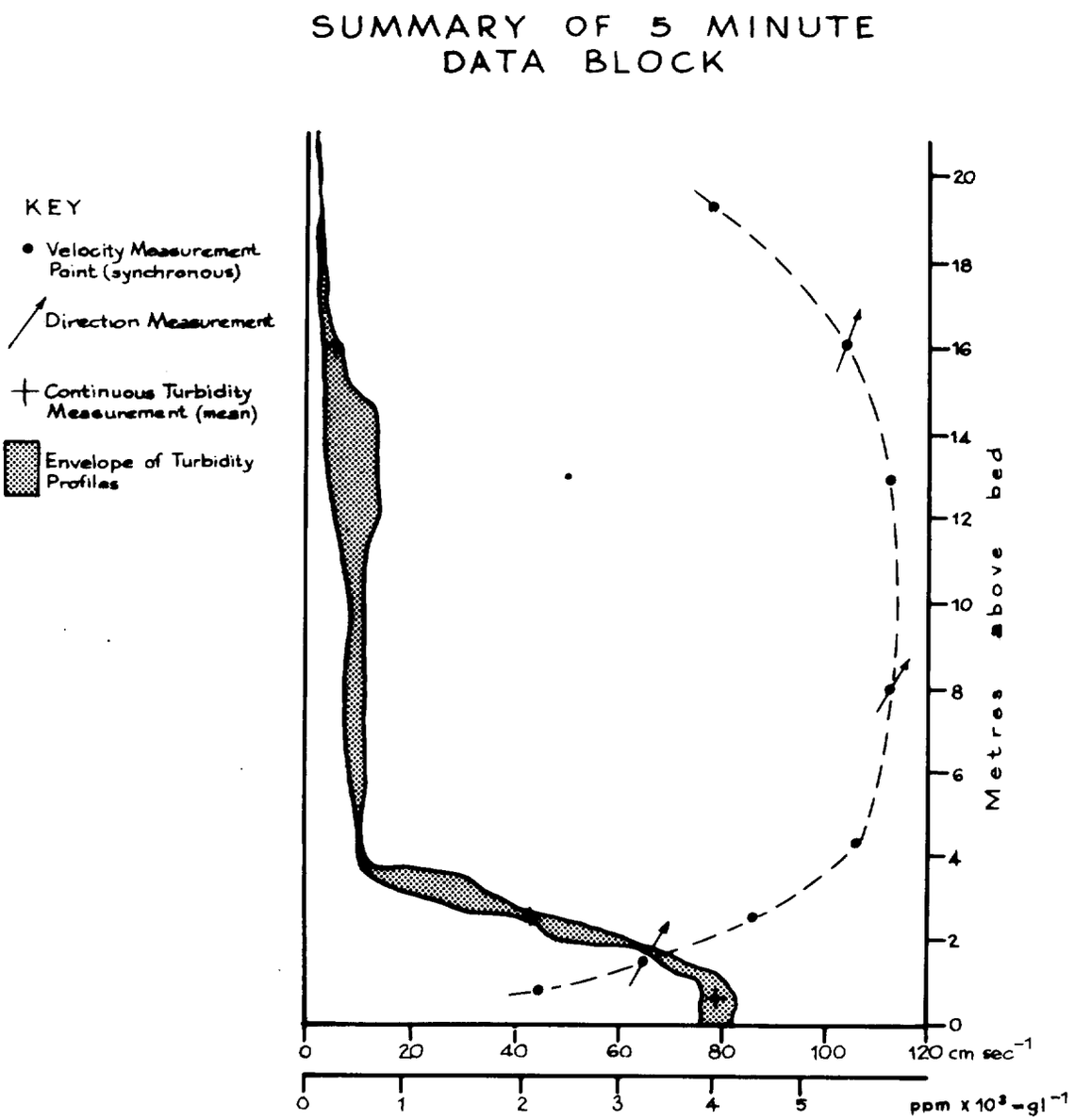
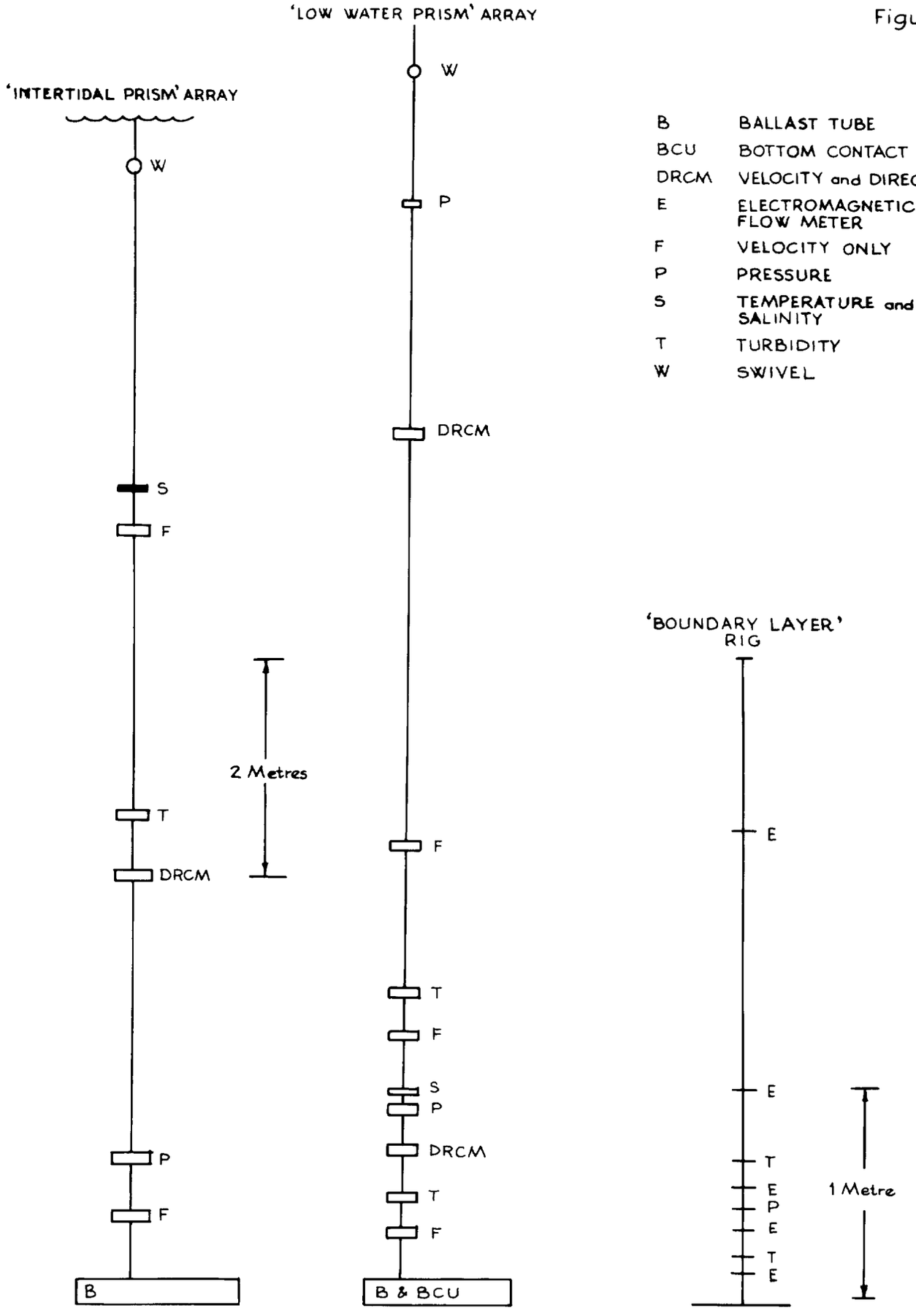


Figure 2. Diagrammatic summary of data from one 5-minute data sample. Velocities as the mean over 5 minutes. Continuous turbidity measurement is the mean over 5 minutes at a fixed height.

GENERAL ARRANGEMENT OF TRANSDUCERS

Figure 3.



VESSEL R.V. EDWARD FORBES Cruise No. 15/78

CRUISE PERIOD 14 - 28 September 1978

PERSONNEL

D.N. Langhorne	SSO (Senior Scientist)
A.J. Marks	SSO (Electronics and Diving Team)
E.J. Moore	HGCD (Diving Team Leader)
J.D. Humphery	HSO (Diving Team) 23-25.9.78
P.M. Hooper	SO
N. Dillon	ASO
I. Hayes	ASO (Diving Team)
L. Dominy	(AUWE) 20.9.78 only.
P. Bird	Contract Diver 16-19.9.78
K. McClean	Contract Diver 20-22.9.78

ITINERARY

R.V. Edward Forbes operated on a daily basis from Dartmouth.

13 Sept. A.J. Marks and P.M. Hooper joined R.V. Edward Forbes at Barry. Installed equipment.

14 Sept. Sailed from Barry. Abandoned attempts to investigate Furrows to the N of Ilfracombe owing to adverse sea conditions.

15 Sept. D.N. Langhorne and N. Dillon calibrated and set up Trisponder remote stations. R.V. Edward Forbes investigated the existence of Furrows to S of Prawle Point. Berthed at Dartmouth 2000.

16 Sept. 0930 Diving Team joined ship. Sailed for sandwave research area in Start Bay.
a. Laid 2, 1½ ton anchors with moorings on either side of the sandwave crest (to be used to hold the vessel steady for boundary layer flow measurements and underwater T.V.)
b. Divers obtained sea bed profiles across the sandwave crest using reference stakes.
c. Laid Plessey current meter on crest of sandwave (position controlled by divers).
d. Recovered existing Plessey current meter system.
e. 2200 changed wave recorder tapes at Start Point Lighthouse.

17 Sept. a. 0730 - 1930 Carried out boundary layer flow measurements using HRS bottom rig for the period of an ebb tide.
b. Routine sea bed profile measurements by divers.
c. Adjusted the position of the mooring anchors.

18 Sept. a. 0800 - 2200 Continued boundary layer flow measurements.
b. Carried out trials with prototype photocell stake.
c. Routine diver measurements.

19 Sept. a. 0800 - 2000 Continued boundary layer flow measurements.
b. Routine diver measurements.

20 Sept.	L. Dominy (AUWE) joined ship. a. 0800 - 2200 Sediment transport studies using boundary layer rig and underwater T.V. system. b. Routine diver measurements.
21 Sept.	a. 0800 - 2000 Boundary layer flow measurements made in conjunction with prototype photocell stakes and underwater T.V. b. Routine diver measurements.
22 Sept.	a. 0800 - 2130 Ripple evolution studies using underwater T.V. and photocell stake. b. Carried out measurements with reference to AUWE contract.
23 Sept.	a. 0830 - 2130 Recoverd AUWE equipment. b. Fluorescent tracer studies of sand dispersion from sandwave crest. c. Routine diver measurements.
24 Sept.	0830 - 2130 Continued fluorescent tracer studies and routine diver measurements.
25 Sept.	a. 0830 - 1830 Echo-sounding and sidescan sonar survey of the sandwave area. b. Relaid AUWE equipment and continued measurements. c. Routine diver measurements.
26 Sept.	a. 0830 - 1730 Recovered 1½ ton anchors and self recording current meter. b. Routine diver measurements.
27 Sept.	R.V. Edward Forbes sailed for Barry. IOS staff returned to Taunton.

OBJECTIVES

1. To investigate the existence and nature of Furrows (for Dr. R. Flood, Woods Hole Oceanographic Institute, USA. Project No. S13) off Ilfracombe and to the S of Prawle Point.
2. To continue the study of the mobility of sandwaves and sediment transport in relation to hydrodynamic conditions.
3. To continue measurements associated with the AUWE contract.

PROCEDURE

1. Furrows: Sidescan sonar was used to investigate the presence of Furrows in those areas requested by Dr. Flood.
2. Sandwave mobility and sediment transport:

a. The systematic movement of the crest of a sandwave was measured between Spring and Neap tides. Measurements were made by divers, before and after ebb tides, using a transverse line of sea bed reference stakes.
b. Boundary layer flow measurements were made at the crest of the sandwave using a vertical array of four flow sensors (on loan from HRS).
c. A self recording current meter was also laid at the crest of the sandwave.
d. Ripple mobility and bed roughness was studied using underwater T.V. and reference markers.
e. Sediment dispersion from the crest of the sandwave was measured using fluorescent sand. Divers emplaced plugs

of dyed sand up to 30 cms deep into the crest of the sandwave and measured the dispersion at night using an underwater Ultra-violet light.

f. Echo-sounding and sidescan sonar surveys were conducted to study the stability of the larger sandwave area.

g. Observations and measurements were made with reference to the AUWE contract.

h. Trials were carried out with a prototype self recording reference stake (using a vertical array of photocells connected to an onboard recorder).

RESULTS

1. Furrows: The survey to the N of Ilfracombe had to be abandoned on account of adverse sea conditions. The ships progress on passage was delayed owing to engine trouble and hence only a short time was spent on the investigation to the S of Prawle Point. During this time little evidence of Furrows was found in the designated area.

2. Sandwave mobility and sediment transport:

a. Routine measurements (using a line of 31 sea bed reference stakes) were made on a daily basis between 16 and 25 September. On most of these days measurements were made at slack water preceding and following an ebb tide.

b. Boundary layer flow measurements were obtained for the periods of ebb tide on three successive days. Experience showed that monitoring of the flow sensors for weed fouling using underwater T.V., provided information which considerably enhanced the quality of the data.

c. The self recording current meter failed. No data was obtained (Tape transport failure).

d. Techniques for emplacing fluorescent dyed sand and its subsequent tracking by night, using an underwater Ultra-violet light proved to be successful.

e. Pressure on time prevented significant progress with echo-sounding and sidescan sonar surveys.

f. Good progress was made on the AUWE contract.

g. The prototype self recording stake proved to be successful. The main difficulties encountered were associated with cable connections to the shipborne recorder.

PREPARED BY : (D N LANGHORNE)

APPROVED BY : (K R DYER)

DATE : 5 MARCH 1980 — 5 March 1980

VESSEL R.V. SARSIA

CRUISE PERIOD 2 April - 12 April 1979

PERSONNEL

B.J. Lees	HSO	Senior Scientist
M.W.L. Blackley	HSO	
J.E. Blower	ASO	
R. Bryant	EO	
A.P. Carr	PSO	
N. Dillon	ASO	
P.M. Hooper	SO	
R. Kirby	SSO	
E.J. Moore	HGCD	
B. Wainwright	ASO	

ITINERARY A copy of the relevant part of Admiralty Chart No. 1543 is attached.

Monday	2 April	Loaded equipment at Plymouth. Sailed 2030 hrs, on passage to Lowestoft.
Tuesday	3 April	On passage.
Wednesday to Friday	4 April to 6 April	Berthed Lowestoft 0800 hrs. Set up equipment. Sailed 1130 hrs. Obtained 13 vibrocores. See attached chart for details.
Saturday	7 April	Offloaded vibrocorer. Loaded current meter, box corer and grapnel. Sailed 1130 hrs. Searched unsuccessfully for longterm mooring. Deployed new longterm current meter rig.
Sunday	8 April	Fluorescent tracer search to delineate cloud resulting from injection in August 1978.
Monday	9 April	Search completed. Echosounding runs made over sandwave area to SE of Dunwich Bank along lines normal to crests.
Tuesday	10 April	8 box cores obtained. See attached chart for stations.
Wednesday Thursday	11 April) 12 April)	Loaded vibrocorer. Sailed for Plymouth. On passage to Plymouth.

OBJECTIVES 1) To complete the vibrocoring programme begun in March 1978, the cores being required to supplement the geophysical, grab and boxcoring programmes. 2) To complete the bedload transport measurements begun in August 1978 by making final measurements of the fluorescent tracer cloud concentrations, and boxcoring in order to be able to measure the depth of mixing of the tracer. 3 of the vibrocores also to be used for this purpose, should the box cores not prove deep enough. 3) To drag for the longterm mooring which had lost its toroidal buoy, and replace it with a new rig.

PROCEDURE AND METHODS

The vibrocorer was used to obtain cores 8 cm wide and up to 4.2 m long at the stations shown on the attached chart. Grab sampling, using a Shipek, was carried out as before. (See Cruise Report R.V. Edward Forbes 16 - 30 August 1978).

EQUIPMENT PERFORMANCE

No insoluble problems were encountered with the IOS equipment. It was felt that the Gifford grapnel used to drag for the current meter mooring was not of an ideal design.

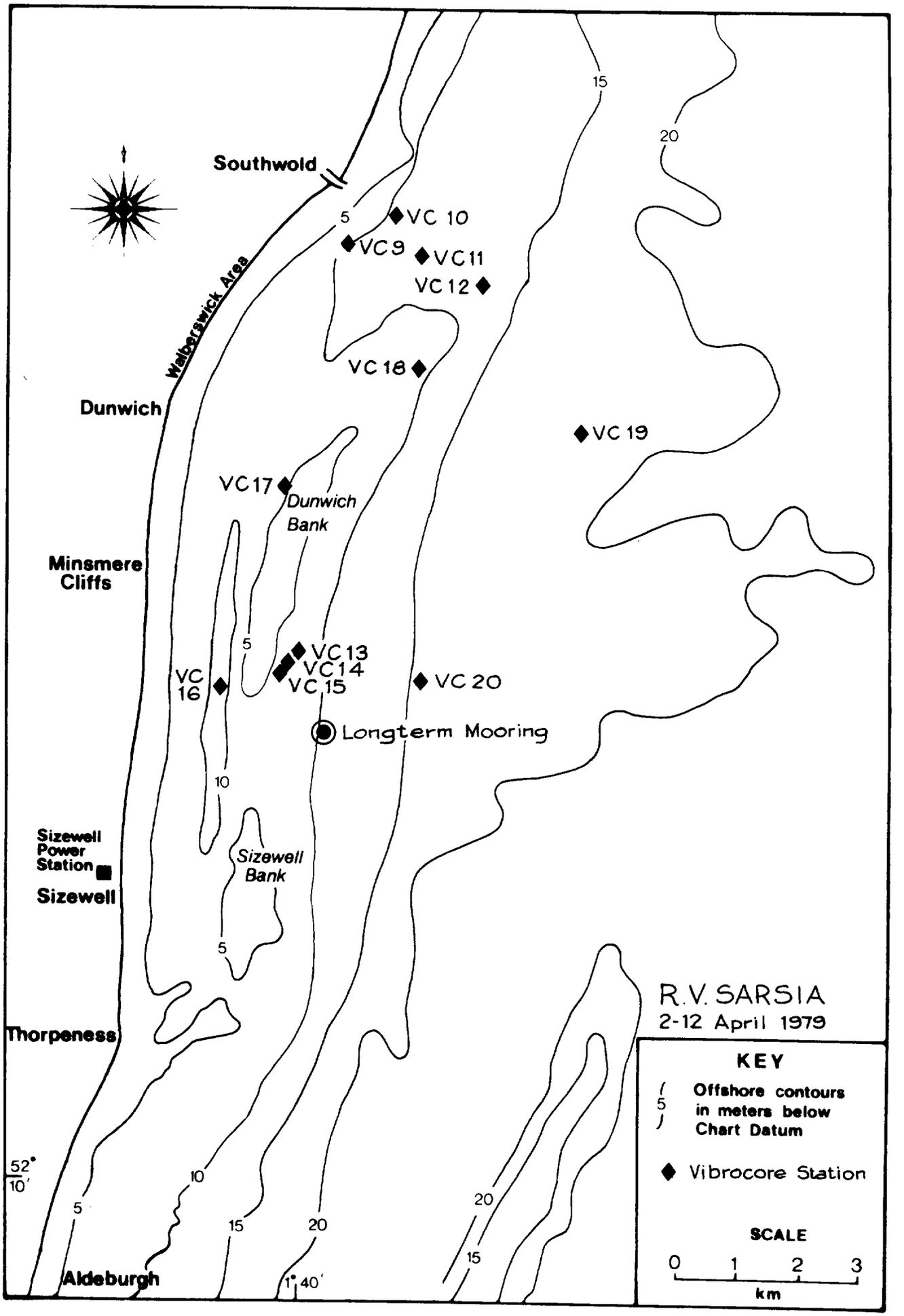
RESULTS

Vibrocore results incorporated in Sizewell-Dunwich Banks Field Study Topic Report : 1, Introduction and geological background. IOS Report No. 88. Bedload transport measurement results incorporated in paper read at IAS Conference on Holocene Sedimentation in the North Sea, at Texel, Netherlands in September 1979. Published in Abstracts, No. 37.

PREPARED BY : Barbara J. Lees. (B J LEES)

APPROVED BY : (A P CARR)

DATE : 22.2.80. 22 February 1980


Southwold
Walberswick Area
Dunwich
Minsmere Cliffs
Sizewell Power Station
Sizewell
Thorpeness
Aldeburgh
Dunwich Bank
Sizewell Bank
Longterm Mooring
VC 9
VC 10
VC 11
VC 12
VC 13
VC 14
VC 15
VC 16
VC 17
VC 18
VC 19
VC 20
5
10
15
20
52° 10'
1° 40'
R.V. SARSIA
2-12 April 1979
KEY
Offshore contours in meters below Chart Datum
Vibrocore Station
SCALE
0 1 2 3
km

VESSEL M.V. SAMUEL BAXTER

CRUISE PERIOD 20 April - 23 April 1979

PERSONNEL

T.J. Smith	HSO	Senior Scientist
E.J. Moore	HGCD	
P.M. Hooper	SO	
W.R. Parker	PSO)	Shore Party
A.J. Marks	SSO)	

ITINERARY

Wednesday 18 April)		Travelled to Whitehaven and installed
Thursday 19 April)		equipment.
Friday	20 April	Vessel sailed from Whitehaven 0500 hrs. Commenced side-scan sonar survey along Track 1 (see attached sketch map). Port channel unserviceable, completed Track 1 1630 hrs. Vessel docked Whitehaven 1730 hrs.
Saturday	21 April	Vessel sailed 0600 hrs. Strong swell running from NW made side-scan sonar survey impossible. Forecast W-NW 4-5 increasing 6-7 becoming gale 8 later, so returned to Whitehaven Vessel docked 0645. Dismantled side-scan sonar to find fault in port channel. Visited Trisponder slave sites at Silecroft, Selcar Point and St. Bees Head.
Sunday	22 April	Vessel sailed 0720 hrs. Commenced side-scan sonar survey along Track 2 using starboard channel only. Completed Track 2 at 1830 hrs. Vessel docked Whitehaven 2030 hrs.
Monday	23 April	Vessel sailed 0800 hrs. Strong swell running from N.W. Forecast W-NW 5-6 becoming 7 gale 8 later. Side-scan sonar record marginal so returned to Whitehaven. Vessel docked at 0900 hrs. Equipment packed and Trisponder slaves dismantled.
Tuesday	24 April	Returned to Taunton.

OBJECTIVES To conduct a preliminary side-scan sonar survey of the NE Irish Sea in the area north of 54°N and east of 4°W in preparation for a detailed survey in June 1979. To test the DECCA Trisponder navigation system in this area.

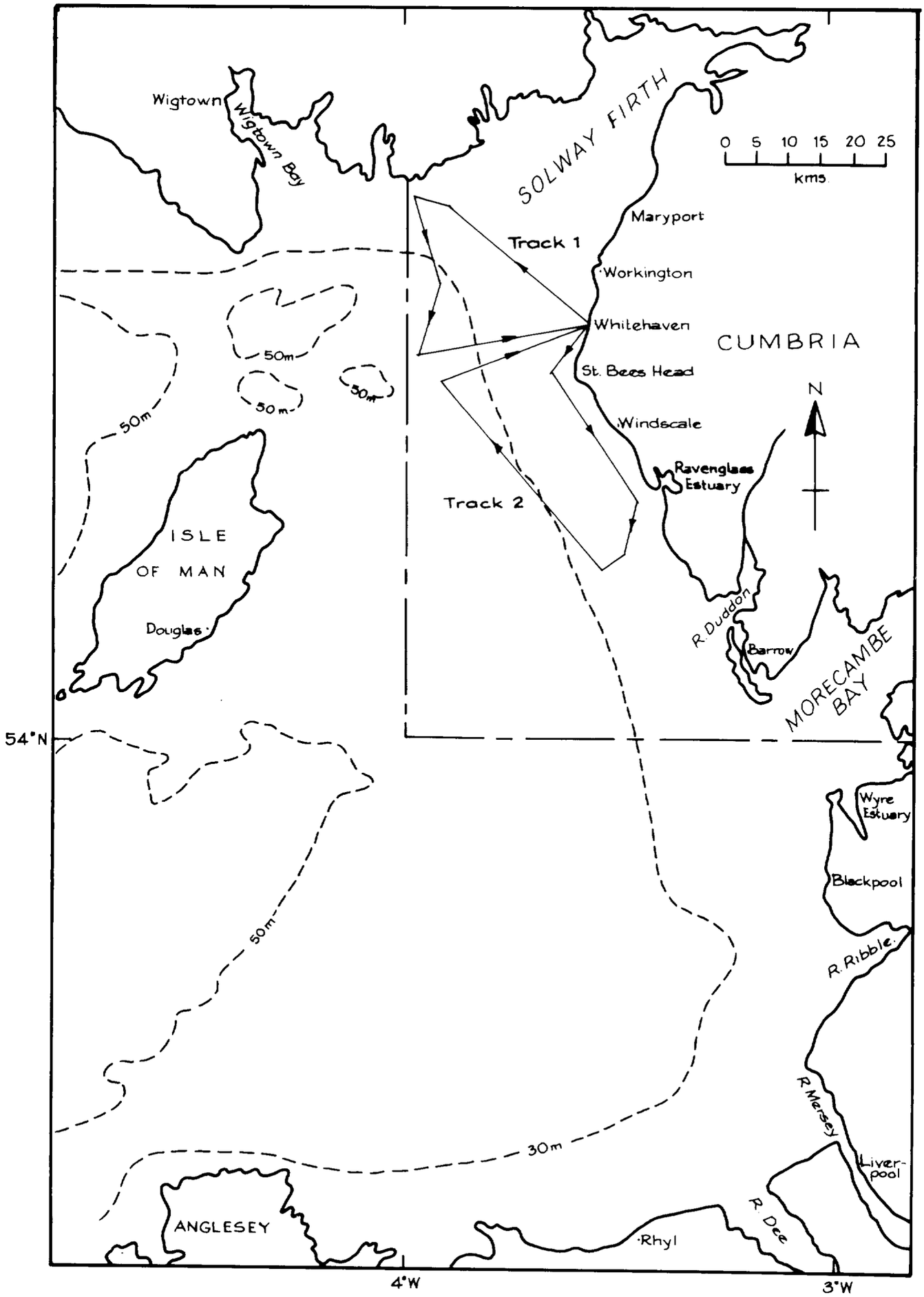
PROCEDURE AND METHODS Continuous EG and G side-scan sonar records along the tracks shown on the attached sketch map. Trisponder checks were made at each of the track turning points.

EQUIPMENT PERFORMANCE The port channel of the EG and G side-scan sonar provided by IOS(T) became unservicable soon after the start of the survey. This was traced to a fault in the cable which was unrepairable during the cruise. Some problems were experienced with the DECCA Trisponder system which were believed to be due to the positioning of the slave sites rather than an equipment fault.

PREPARED BY : T J Smith (T J SMITH)

APPROVED BY : K R Dyer (K R DYER)

DATE : 26th February 1980 26 February 1980



Side-scan sonar tracks - April 1979 M.V. Samuel Baxter.

VESSEL M.V. BON ACCORD

CRUISE PERIOD 12 June - 28 June 1979

PERSONNEL

R. Kirby	SSO	Senior Scientist	12 - 28.6.79
T.J. Smith	HSO		12 - 28.6.79
P.J. Hooper	SO		12 - 28.6.79
B. Norman	ASO		12 - 28.6.79
W.R. Parker	PSO		12 - 24.6.79
E.J. Moore	HCD		12 - 24.6.79
M. Kelly	Lancaster University		12 - 24.6.79
J. Archer	AUWE Portland		12 - 24.6.79

ITINERARY

11.6.79	Travelled to Workington.
12.6.79	M.V. Bon Accord docked at 1300 hrs. IGS gear offloaded. IOS gear installed.
13.6.79	Continued to set up geophysical and sampling gear. Sailed 1500 hrs and commenced surveying geophysical lines with sidescan. ORE pinger unserviceable. Trisponder unserviceable. Navigating by Decca Mk 21.
14.6.79	Using sidescan only in big swell. Survey abandoned owing to weather. 1800 hrs steamed to shelter. 2050 Hrs anchored Gorleston, Wigtown Bay.
15.6.79	Severe N/NW gale. No surveying. Tested sampling equipment.
16.6.79	0800 hrs raised anchor and sailed to continue geophysical lines with sidescan and ORE pinger.
17.6.79	Site survey of proposed sample locations. 3 stations visited. TV sweep followed by box core samples. Geophysical surveys continued during night.
18.6.79	3 stations visited. TV sweep followed by box core samples. Extended geophysical coverage during night.
19.6.79	5 stations visited. TV and box coring.
20.6.79	Continued geophysics with sampling during daylight hours.
21.6.79	Continued geophysics until 1600 hrs. Weather deteriorated SW 7 with big swell. Abandoned survey and steamed to Workington entered 2115 hrs.
22.6.79	Sailing cancelled owing to weather.
23.6.79	Sailed 0800 hrs to extend geophysics coverage.
24.6.79	Continued geophysics with sampling during daylight hours. 4 scientists WRP, EJM, MK and JA landed by pilot boat at Workington 1215 hrs. On passage to Bridgwater Bay.
25.6.79	Arrived Bridgwater Bay 2000 hrs. Grapnelled for seabed rig until 2230 hrs.
26.6.79	Grapnelled for seabed rigs. 1440 hrs winch wire entangled in ships propeller. Vessel anchored. All scientific work terminated.
27.6.79	Divers examined fouled propellers and made vessel ready for towing.
28.6.79	Vessel towed into Barry, docking at 1115 hrs. IOS gear offloaded. Scientists returned to Taunton.

OBJECTIVES

The cruise was an initial sedimentological reconnaissance of muddy areas in the NE Irish Sea. The project ultimately aims to establish the fate of fine sediment and the interaction of fine sediments with radionuclides as part of the study of low-level radioactive waste disposal from Windscale.

PROCEDURE AND METHODS

The geophysical equipment used included an EG and G sidescan and ORE 1036 Pinger. A wide spaced grid was established with tight line spacing over selected sample sites. Surveying was undertaken on a 24 hr basis. Each site chosen for detailed examination was photographed using AUWE still cameras, surveyed with underwater TV with areas of interest recorded on video. Finally 1 box core sample was taken at each site. Water samples were taken by Lancaster University for analysis of radio nuclide levels at surface and near bed on the same sites.

EQUIPMENT PERFORMANCE

1. The Decca Trisponder did not function satisfactorily either in the Irish Sea or Bridgwater Bay. In the Irish Sea this was partly explained by the extreme range on occasions, by the use of hired omnidirectional aerials, which were suspected of giving multiple reflections, and possibly due to the ship itself, since no problems had previously been encountered in Bridgwater Bay.
2. The EG and G sidescan operated satisfactorily throughout the survey.
3. The RVS ORE 1036 Pinger presented many problems and was unserviceable on several occasions. The transceiver unit was old and in need of refurbishing. The spares were old and some were unserviceable.
4. The AUWE camera system performed adequately although picture quality was poor owing to suspended material.
5. The TV system presented no problems.
6. The box corer and subsampling system worked satisfactorily.

RESULTS

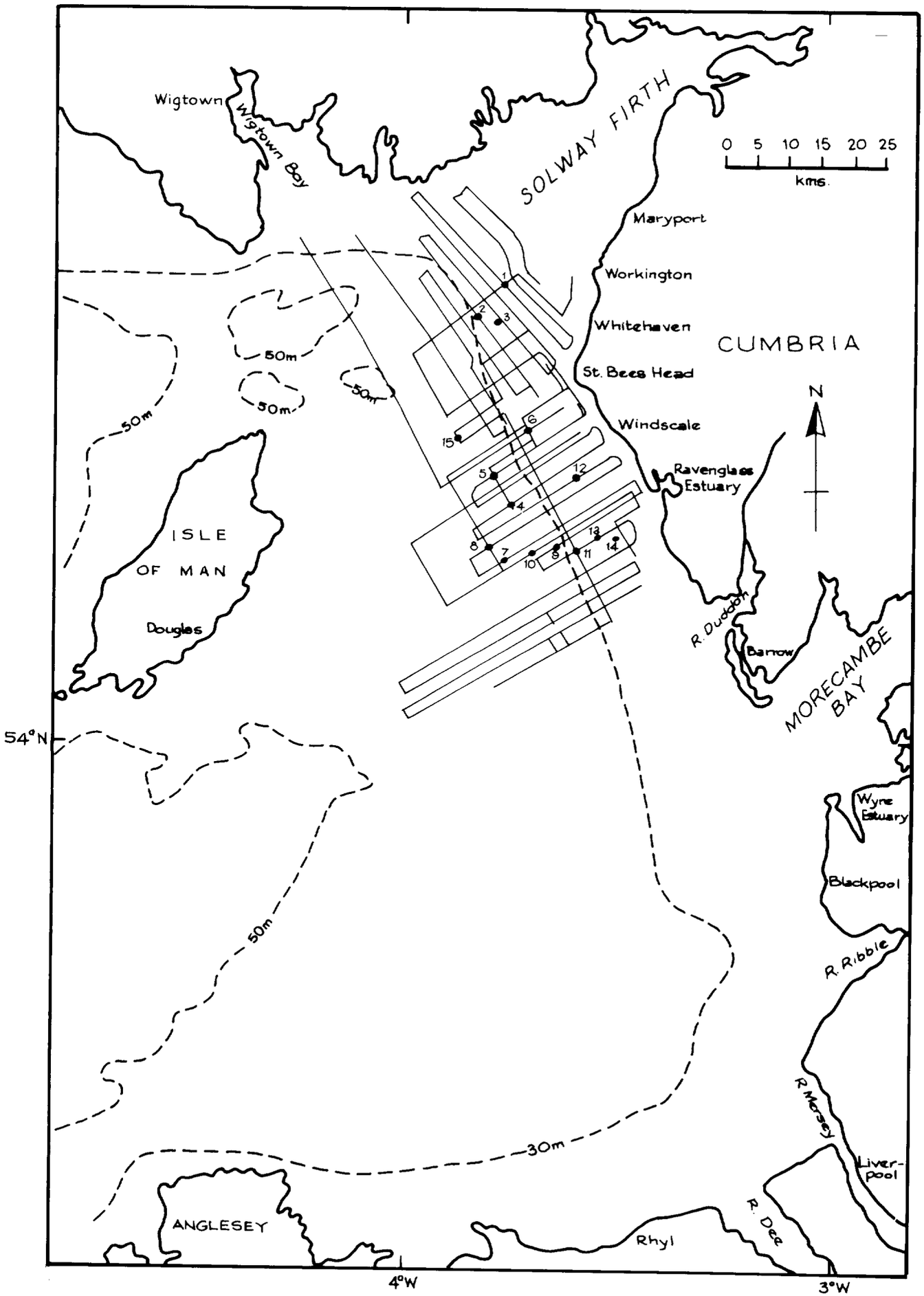
Extensive sidescan coverage was obtained but interpretation difficulties were encountered. Much of the seabed is smooth and featureless and it is not possible to distinguish mud from muddy sand. However the general boundary of the mud area was defined. The seabed was extensively disturbed by trawler marks.
The ORE record quality was generally good in the muddy areas and many reflectors were seen, testifying to the complex Flandrian history. Gas was commonly apparent on the records. The muds off Windscale appear to have accumulated E of a sandwave covered bank which has been progressively buried. The TV confirmed the frequent nature of trawl disturbance to the seabed. Otter board and ground chain marks were observed.
The degree and depth of bioturbation of the samples was something of a surprise but confirmed IGS information. Some

samples consisted entirely of pelleted mud. This highlighted the apparent disparity between the geochemical evidence obtained by MAFF and others, interpreted, from the isotope ratios, as showing progressive steady accretion, with the biological and sedimentological evidence which suggests frequent and rapid re-working. This apparent contradiction will be investigated jointly by MAFF and IOS on later cruises.

PREPARED BY : R Kirby (R KIRBY)

APPROVED BY : K R Dyer (K R DYER)

DATE : 25·2·80 25.2.80.



Geophysical Survey Track and Sample Stations 12-28 June 1979
Bon Accord

VESSEL M.V. DEVONIAN

CRUISE PERIOD 31 August - 15 September 1979

PERSONNEL

D.N. Langhorne	SSO (Senior Scientist)
A.J. Marks	SSO (Electronics and Diving Team)
E.J. Moore	HGCD (Diving Team Leader)
J.D. Humphery	HSO (Diving Team)
P.M. Hooper	SO (31.8 - 4.9.79 and 14.9 - 15.9.79)
I.J. Hayes	ASO (Diving Team)
N. Dillon	ASO
C. Wooldridge)	Cardiff University 13.9.79 only
I. McCallum)	

ITINERARY M.V. Devonian operated on a day running basis from Dartmouth.

31st Aug.	Set up equipment on board M.V. Devonian and Trisponder remote stations at Start Point lighthouse and Strete. The diving team proceded to the reasearch area to set up sea bed reference stakes.
1st Sept.	0800 -2100 a) laid self recording current meters (2) b) Carried out routine diver measurements c) Tested the system of (EPROM) self recording stakes.
2nd Sept.	0800 - 2000 Adverse sea conditions. Operations restricted to setting up EPROM stake line across the crest of the sandwave and testing diving equipment off Hallsands.
3rd Sept.	0800 - 1830 a) Routine diver measurements b) Echo-sounding and sidescan sonar survey.
4th Sept.	0800 - 1800 a) Routine diver measurements b) Echo-sounding and sidescan sonar survey.
5th Sept.	0730 - 2100 a) Routine diver measurements b) Tested underwater T.V. system c) Carried out checks on interference in Trisponder system.
6th Sept.	0800 -2400 Fog during the morning a) Routine diver measurements b) Fluorescent dyed sand emplaced on the crest of the sandwave at midday slack water (end of Flood tide). Night dives using underwater Ultra-violet light to track tracer plume.
7th Sept.	0800 - 2045 a) Routine diver measurements b) Tracer experiments c) Relaid ship's moorings
8th Sept.	0800 - 1930 a) Routine diver measurements b) Set up lighting system for EPROM stakes.
9th Sept.	0800 - 2015 a) Routine diver measurements b) Sidescan sonar survey of sandwave crest line.
10th Sept.	K.R. Dyer and J. Futcher joined ship as day visitors. 0930 - 2030 a) Routine diver measurements b) Echo-sounding survey, poor results due to Trisponder interference c) Sidescan sonar survey of sandwave crest line.
11th Sept.	0800 - 2130 a) Routine diver measurements b) Ripple movement studies using underwater T.V.

12th Sept.	0700 - 2130	a) Routine diver measurements. b) Underwater T.V. studies of ripple movement.
13th Sept.	0800 - 1800	a) Routine diver measurements b) Carried out trials with Cardiff University underwater towed vehicle.
14th Sept.	0800 - 1800	a) Routine diver measurements b) Sidescan sonar and Echo-sounding survey.
15th Sept.	0800 - 2000	a) Routine diver measurements b) Recovered self recording current meters. c) Recovered ship's moorings d) Sidescan sonar survey of the sandwave area.
16th Sept.		Removed equipment from M.V. Devonian and IOS staff returned to Taunton.

OBJECTIVES

a) To continue the study of sandwave movement and sediment transport in relation to hydrodynamic conditions.
b) To continue the AUWE contract.
c) To test a system of self recording (EPROM) stakes.
d) To carry out trials with the Cardiff University underwater towed vehicle.

PROCEDURE AND METHODS

a) A line of sea bed reference stakes was set up crossing the sandwave crestline at right angles (see Fig. 1). Using these stakes divers could obtain routine measurements of the movement of the crest of the sandwave over a Neap/Spring/Neap tidal period. Tidal flow was measured using 2 self recording current meters placed 1 m above the bed on the crest of the sandwave. Sediment dispersion from the crest of the sandwave was measured using fluorescent dyed sand and an underwater Ultra-violet light. Dune movement, on the flanks of the sandwave, was measured using sidescan sonar. Echo-sounding and sidescan sonar surveys were conducted to study the stability of the larger sandwave area.
b) Observations were made with reference to the AUWE contract.
c) A system of self recording (EPROM) stakes was set up parallel to the sea bed reference stakes. These were observed on a routine basis by divers and records made upon their levels of exposure.
d) The Cardiff University underwater towed vehicle was tested by the IOS diving team. The vehicle manned by two divers was towed at slow speed and tests were carried out upon its manoeuverability.

EQUIPMENT PERFORMANCE

a) Initial difficulties occurred with the provision of the necessary power supplies for the equipment viz: Trisponder, 24 V D/C (from ship's batteries). Sonar, 24 V D/C (via power pack from generator). Mutual interference occurred between the Trisponder and the Sonar if run from the same power supply when the sonar transducer was used in a hull mounted mode. Echo-sounder, 12 V D/C (from Battery).

Underwater T.V., 240 V A/C (from Generator).
b) Considerable interference occurred on the Trisponder. However, it was known that another vessel was using a Trisponder system to the S of Start Point.

RESULTS

The cross sectional profile of the crest was obtained over a period of 15 days which covered a Neap/Spring/Neap tidal period. During this time tidal flow data was obtained from two self recording current meters. Twice daily diver inspection ensured that weed fouling was kept to a minimum. In addition divers were able to measure the height of the flow sensor above the sea bed. This height was initially set to be 1 m, but changed during the observational period. Fluorescent dyed sand was used to measure the dispersion of sand from the sandwave crest for the period of a single ebb tide.
Only poor quality data was obtained from echo-sounding and sidescan sonar surveys because of low geared steering on Devonian (hence difficulties in maintaining a steady track) and interference on the Decca Trisponder position fixing system.
Continuous wave data was obtained throughout the cruise period.
The EPROM stakes failed to operate because of ingress of water through the resin potting.

PREPARED BY : (D N LANGHORNE)

APPROVED BY : (K R DYER)

DATE : 10 March 1980 — 10 March 1980

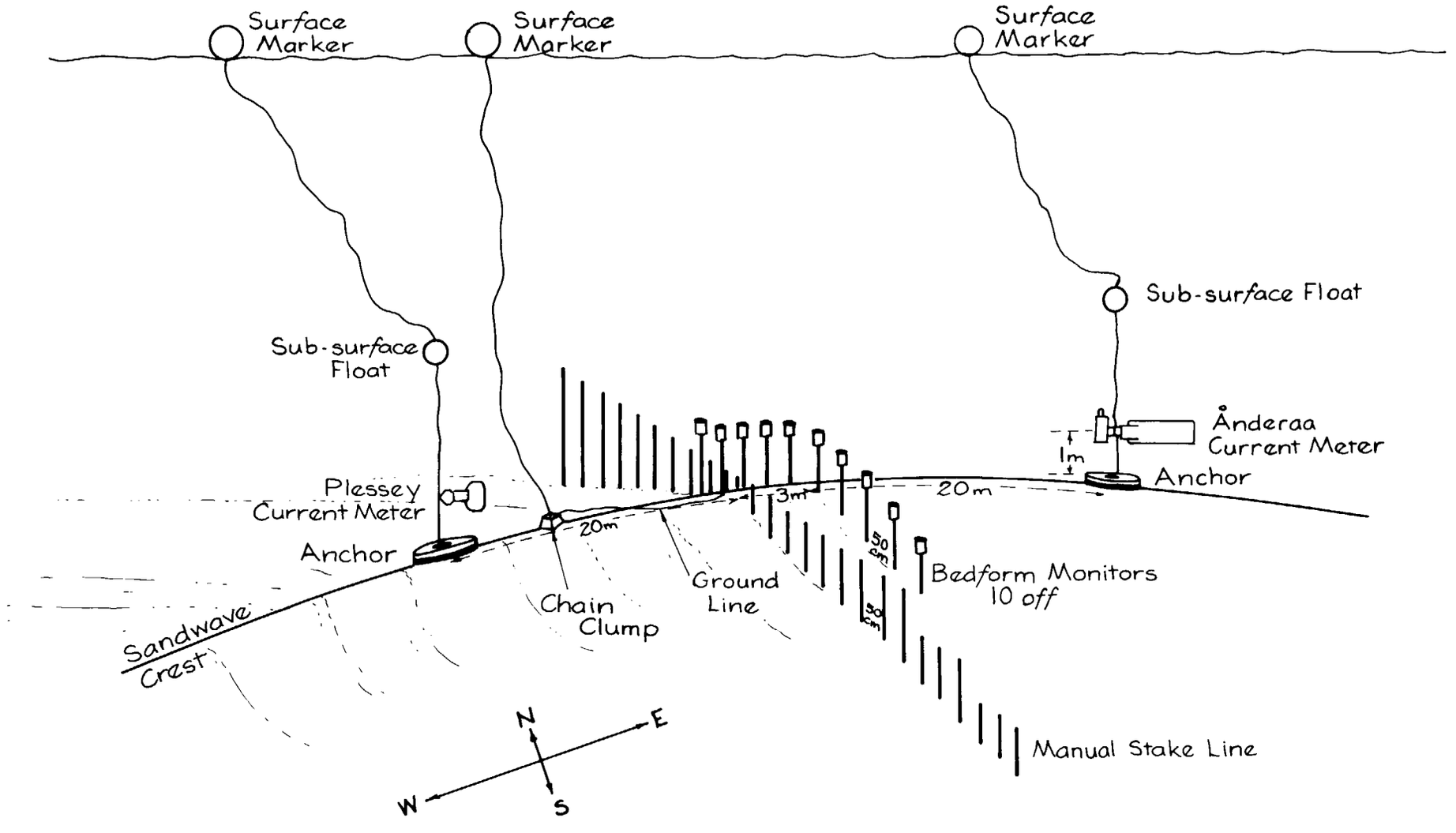


Diagram of Main Work Area. Devonian Cruise. September 1979.

VESSEL R.V. SARSIA

CRUISE PERIOD 1 October - 12 October 1979

PERSONNEL

R.L. Soulsby	SSO Senior Scientist	1 - 12 October
K.R. Dyer	SPSO	2 - 11 October
A.P. Salkield	SSO	1 - 7 October
G.P. Le Good	SO	1 - 12 October
G. McNelly	PTO IV	1 - 7 October
B. Norman	ASO	7 - 12 October
R. Bryant	CO	7 - 12 October

ITINERARY

Monday 1 Oct. RLS, APS, GPLeG, GM travelled to Plymouth and unloaded and set up equipment.

Tuesday 2 Oct. D.N. Langhorne joined ship. 0900 Proceeded to Start Bay Stn M (Fig 1). E.J. Moore and KRD arrived at 1300 in launch Sandpebbler. Laid Marconi current meter system with assistance from Sandpebbler . 1345 EJM and DNL departed in Sandpebbler. Three-point anchored at Stn. 1. Lowered rig and checked out instruments.

Wednesday 3 Oct. Commenced experiment (a)

Thursday 4 Oct. Continued experiment (a)

Friday 5 Oct. Continued experiment (a) until 1600. Wind and swell rising. Put into Kingswear.

Saturday 6 Oct. Sheltering in Kingswear.

Sunday 7 Oct. BN and RB joined, and APS and GM left ship. Sheltered through morning. 1600 Proceeded to Start Point and three-point anchored at Stn. 1. Continued experiment (a).

Monday 8 Oct. Continued experiment (a) until 1300. Wind and swell increasing again. Put into Kingswear. EJM and divers J.D. Humphery and A.J. Marks arrived. Set up equipment for experiment B.

Tuesday 9 Oct. Sheltered through morning. 1245 Proceeded to Start Bay and anchored in lee of Start Point. Tested ripple measuring techniques. 1900 Three point anchored at Stn. 1.

Wednesday 10 Oct. 0000 commenced experiment (b) using shadow technique. 0930 EJM and divers arrived in Sandpebbler. Divers took measurements with ripple profiler at slack water. Continued experiment (b) using ripple rake. Divers left and returned at 1700 with third diver (Peter Bird) for night work. The divers repeated ripple profile measurements at slack water, and left for Dartmouth. Continued experiment (b) using shadow techniques.

Thursday 11 Oct. Stripped instruments off rig. Bottom sample taken. 1130 Echosounder survey over entire site of Stns. 1 and M. 1230 EJM arrived in Sandpebbler and assisted in recovering Marconi current meter system. EJM and KRD left. 1350 Proceeded to Plymouth. 1700 Berthed in outer basin. 2000 moved to inner basin.

Friday 12 Oct. Unloaded equipment and returned to Taunton.

OBJECTIVES

This cruise was made as part of a study funded by the D of E of the processes of sand movement by tidal currents. The detailed aims were:

Experiment (a)

To make measurements of the turbulent components of sand concentration together with simultaneous turbulent velocity fluctuations, to yield the vertical sediment flux.

Experiment (b)

To make measurements of the tidal variation in ripple shape to correlate with changes in the roughness length obtained from simultaneous velocity profile measurements.

PROCEDURE AND METHODS

a. Measurements of the horizontal and vertical turbulent components of velocity were made at two heights using electromagnetic (E/M) current meters with 10 cm diameter sensors mounted as shown in Fig 2. They were recorded on an analogue tape recorder and a chart recorder. Shrouds were mounted over the sensors at slack water to establish zeroes. The mean velocities at four heights were measured with Braystoke rotors and recorded every minute in printed form and on punched paper tape controlled by a PDP-8 computer.

The fluctuating suspended sediment concentration was measured with a new design of sand transport probe intended to improve its frequency response. The impact rate was recorded on the tape recorder and displayed on the chart recorder. The heights of the signal pulses were discriminated at three levels correponding to different grain size ranges, counted over 1 minute intervals and recorded on paper tape using the PDP-8 system.

Pumped suspended sediment samples were taken repeatedly, either at the height of the STP, to calibrate the probe, or alternately above and below it to yield the concentration gradient. Video tapes of the sea bed immediately ahead of the rig were taken. The current 5 m below the water surface was measured every 30 minutes. Occasional profiles of temperature and salinity were taken. Echosounder runs in the ship's boat were made to establish the position of the rig relative to the local topography.

A string of six current meters spaced throughout the water column was laid 600 m W of the main site, recording throughout the cruise on the Marconi logging system.

b. The changing ripple shape was measured using three techniques:

i) A 'rake' of fine rods bearing graduation bands was mounted on the rig and penetrated the sea bed. The level of the sand against the rods was viewed by the TV camera and recorded on video tape every 10 minutes.

ii) The shadow of a rod mounted on the rig 10 cm above the bed and aligned along the current direction was thrown obliquely onto the sea bed. The resulting distorted image was viewed with the TV camera and recorded on video tape every 10 minutes. The shape of the shadow is

geometrically related to the ripple profile.

iii) A linear array of knitting needles clamped at right angles to a supporting bar was carried to the sea bed by divers. The bar was placed on a previously levelled frame just above the sea bed and the needles released to take up the profile of the bed. The needles were re-clamped and brought to the surface for the profile to be recorded. Profiles were taken at intervals across the 1.2 x 1.2 m frame area to give a three-dimensional plot of the sea bed. Near-bottom velocity profiles were measured as in (a) above, but with 6 Braystoke rotors being used. The pumped sampling, surface current measurements and echosounder runs continued.

EQUIPMENT PERFORMANCE

A serious problem of interference between the E/M current meters and the STP was encountered. Spikes appeared on the STP output at the chopping frequency of the E/M coil drive whose size was comparable with the signal level due to grain impacts. This was completely unexpected, as these instruments had been used together on a previous cruise without any problems being apparent. During the course of the cruise a number of modifications were made to the sensor, but none eliminated the problem. This meant that the threshold settings needed to be kept very high so that only the largest grains registered and the frequency response was correspondingly poor. On 8th October the electronics housing leaked following one of the modifications, preventing further measurements. The E/M current meters were occasionally noisy, though this could sometimes be cured by re-positioning the rig. A worn pump presented difficulties with the suspended sediment sampling on the first half of the cruise. It was replaced for the second half. Some of the video recording gave poor reproduction, subsequently found to be caused by a faulty batch of tape. One out of the six Marconi current meters failed to operate. The remaining five meters recorded successfully throughout the cruise, and did not appear to have been fouled by weed.

All three ripple measuring techniques worked satisfactorily. The ripple rake however suffered from some scour around the prongs and the level of the sand was not easy to see. The shadow technique was very successful in this respect, though the recovery of the profiles requires more assumptions. The diver-operated profiler worked well, six profiles being obtained over the period of slack water.

The other equipment worked satisfactorily.

RESULTS

a) Some useful turbulence data, velocity profiles and pumped samples were obtained. However, the STP data was marred by the interference problem and is consequently likely to be of less value than hoped. The velocity profiles from the Marconi current meter system provide a comprehensive data set for defining the tidal dynamics of the site.

b) Several tides' worth of good data were obtained using the rake and shadow techniques, and the diver-operated profiler fills in the details of the three-dimensional ripple structure. These can be correlated with the velocity profiles obtained. The ripples appeared to be about 50 cm wavelength and 6 cm high. They travelled through one wavelength in about 3 hr.

STATION LIST

Station 1	50° 14.3' N	3° 37.9' W
Station M	50° 14.3' N	3° 38.3' W

PREPARED BY : R.L. Soulsby (R L SOULSBY)

APPROVED BY : K.R. Dyer (K R DYER)

DATE : 22nd Feb 1980 22 February 1980

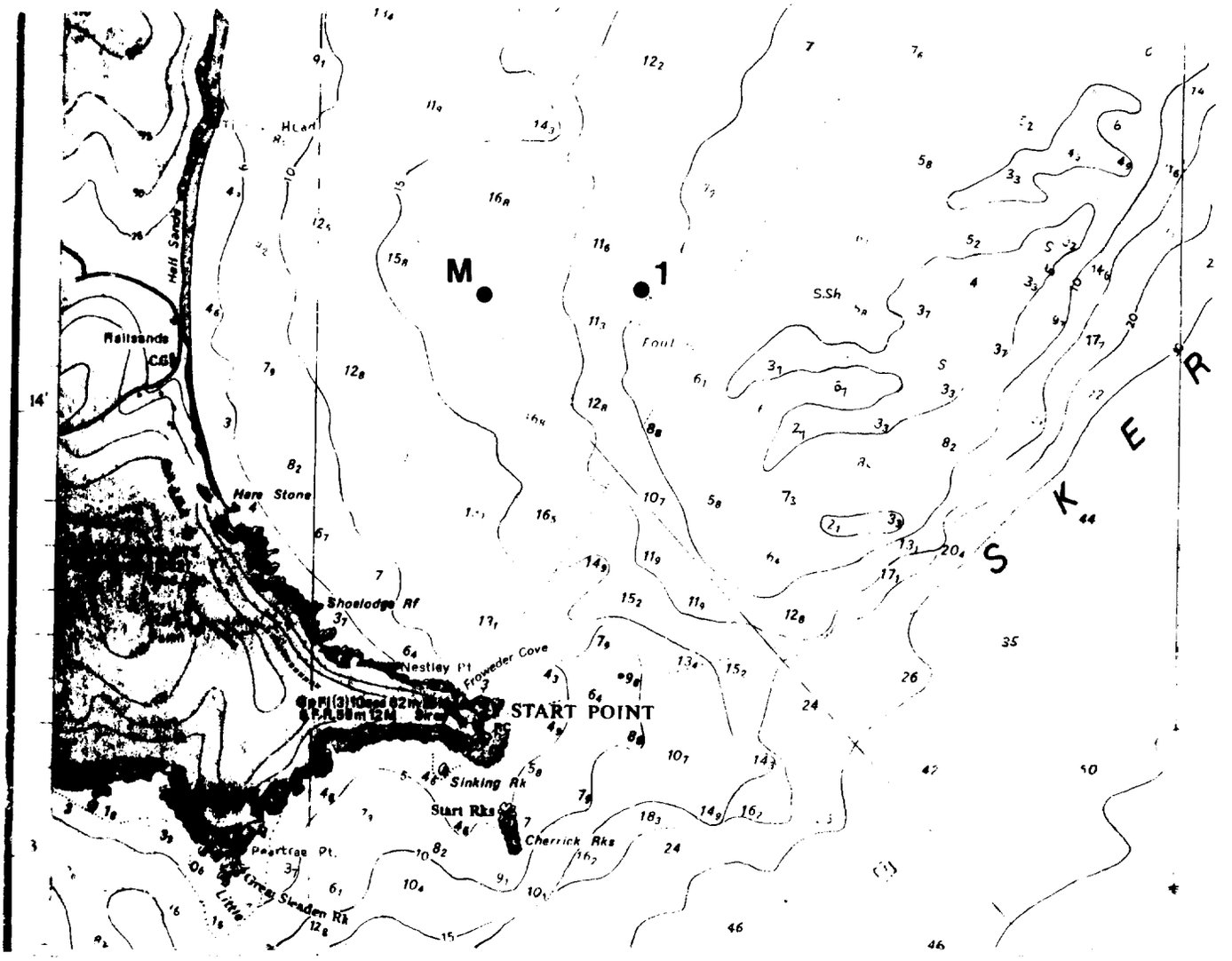


Fig. 1 Location of Stations.

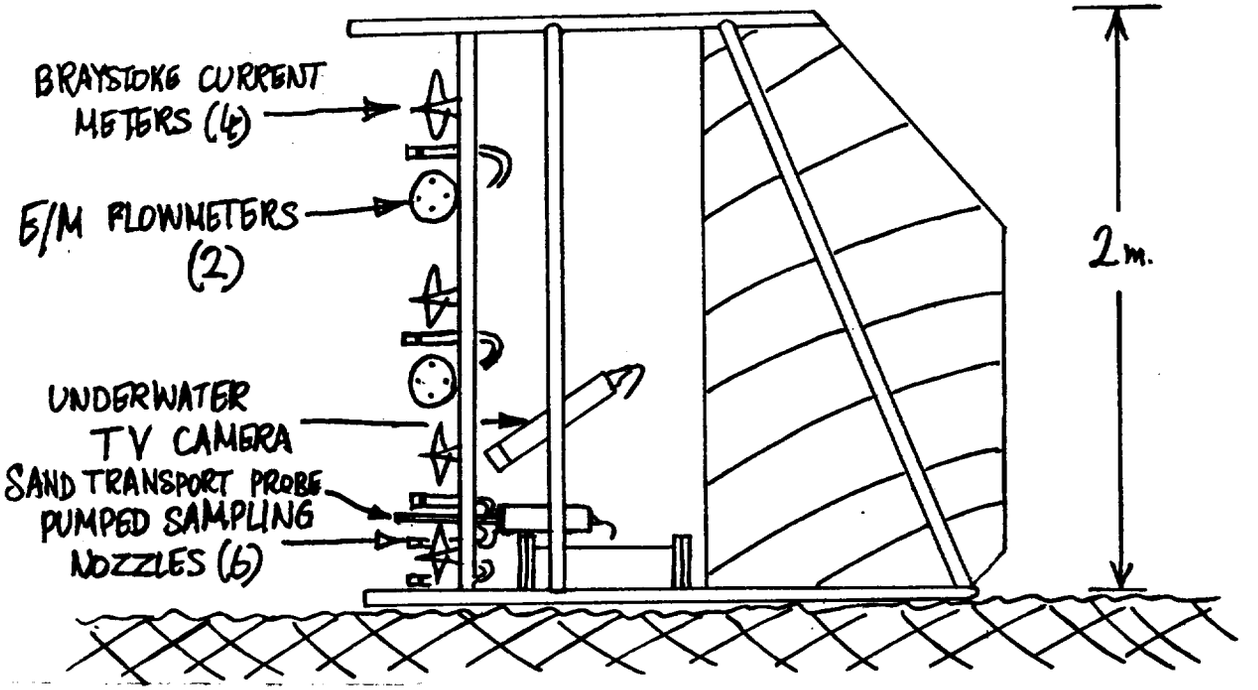


Fig. 2 Turbulence Rig