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

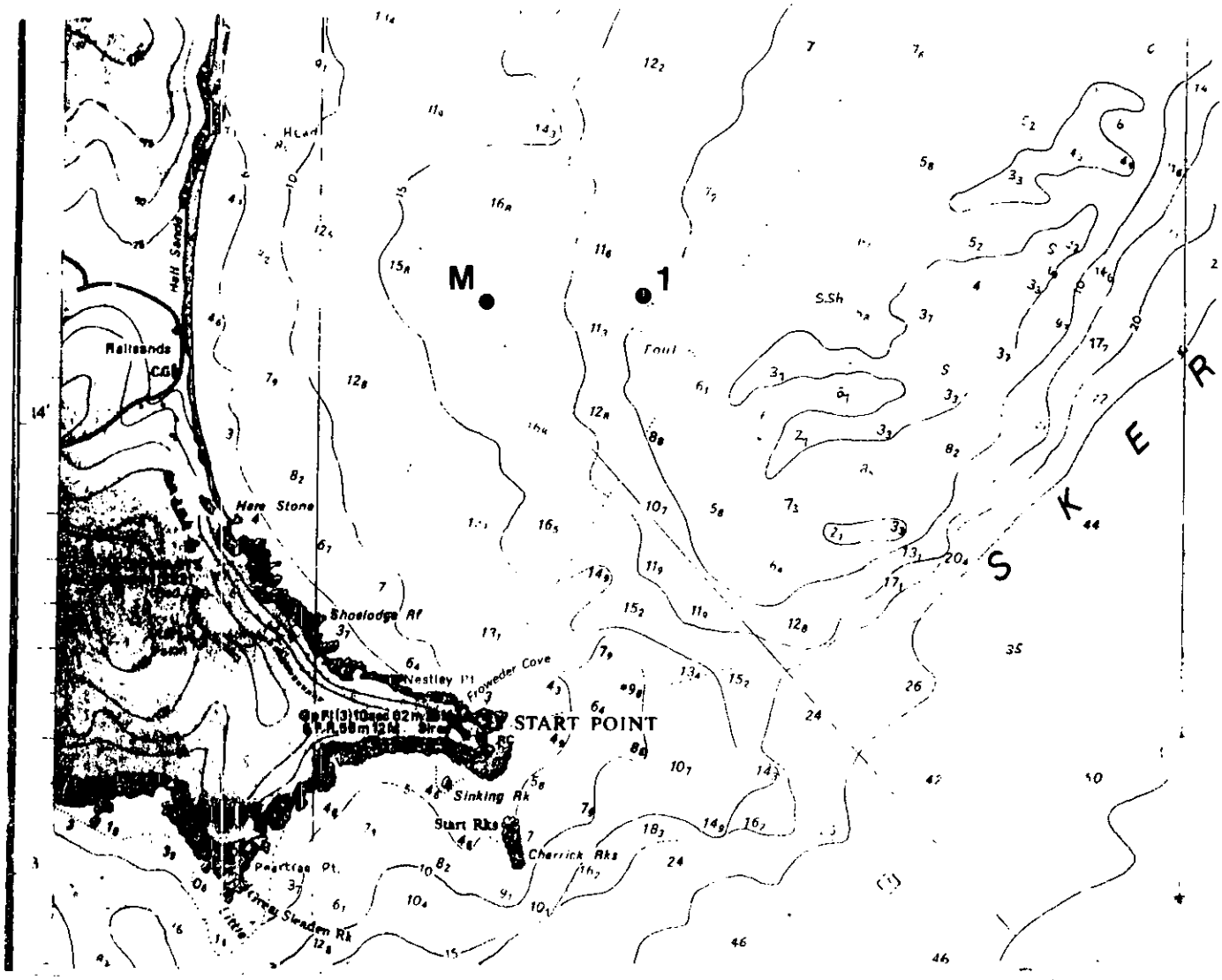

Fig. 1 Location of Stations.

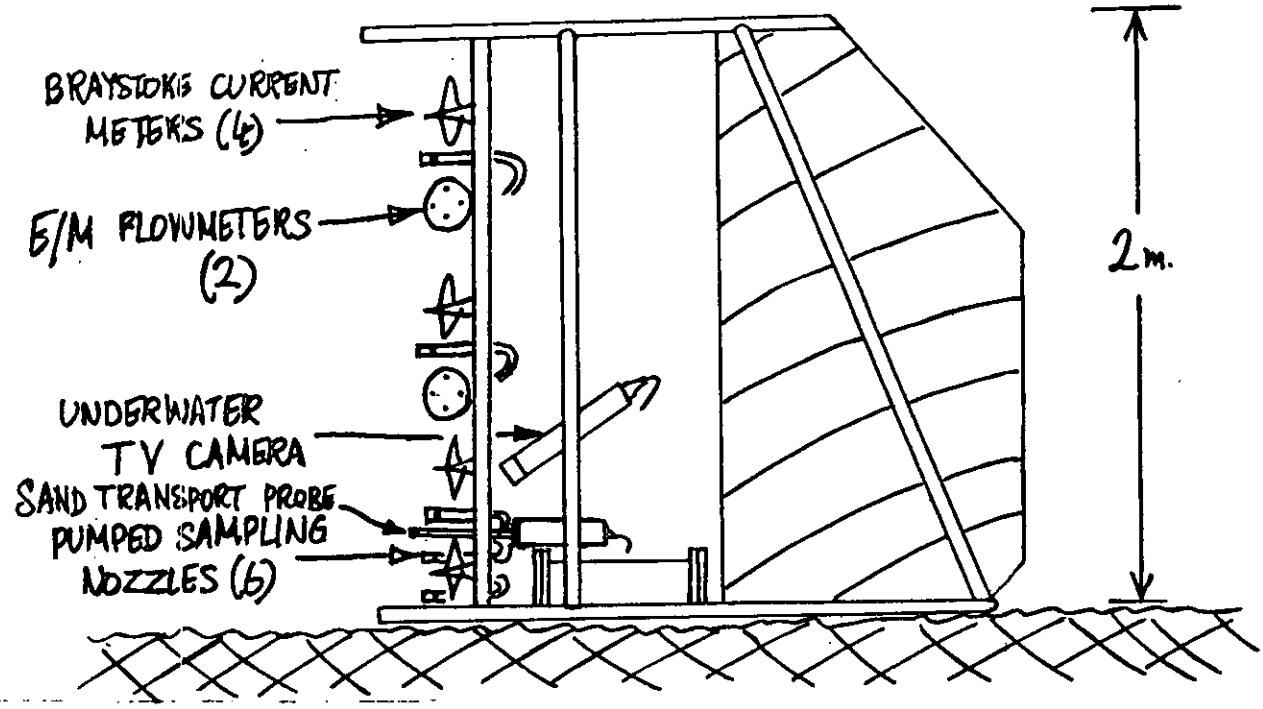

Fig. 2 Turbulence Rig