9/26/69

"VICKERS VENTURER"

Report on Cruise 2: 16 June - 3 July, 1969.

Dye Diffusion Experiments in the Irish Sea

Liverpool University, Oceanography Department

Scientific Personnel

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1 . . . 16 - 24 June
2 . . . 24 June - 3 July

Aims.

1. To investigate the processes of diffusion, using a continuous source of rhodamine B dye as a tracer, in two representative areas of the Irish Sea.

2. To make observations of the physical environment, including the conditions of temperature, salinity and current, in which the diffusion takes place.

Narrative.

(a) 16 - 24th June.

The University personnel and equipment were embarked in "Vickers Venturer" at Liverpool during the morning of 16 June. Mr.Fitton, N.I.O., was present to demonstrate the operation of the line hauler. The ship sailed in the afternoon and at 2100 hours arrived at Station A, off Red Wharf Bay, Anglesey. The Bergen current meter was laid, suspended about 10 m. above the bottom from a submerged float.

All day on 17 June was spent in making preparations for the dye release experiments. The dye release buoy was assembled and the filling system for it set up on the stern of the ship. The buoy and its moorings were then laid and the dye container filled. The two dye-sampling hose pipes, with a temperature-salinity probe attached, were rigged for use from a boom over the port side on the forecastle deck, using the capstan for lowering. The fluorometers and recorder were set up in the laboratory. For the water bottle casts a 4mm. wire was run from the line hauler to a meter wheel on a boom on the port side aft .

The first dye release experiment was carried out on the morning of 18 June. The general procedure in all releases was to allow the dye solution to flow out continuously from the container through a hose pipe and jet at the desired depth for a period of about 3 hours. Sampling traverses were made in a zig-zag pattern across the plume, working away from the release point, with two inlets separated vertically by 1 or 2 m. The sampled water was pumped continuously through two separate fluorometers and the intensity of fluorescence was recorded on a two-pen recorder.

In the afternoon of 18 June current measurements were made by releasing three drogues, set at 3, 6 and 9m., and tracking them by Decca fixes made at half-hourly intervals. Two more dye releases were made on 19 June but it was then found that the dye buoy had broken away from its mooring and was drifting. The buoy was recovered but the sinkers and anchor were lost. No replacements were available on board and it was decided to take the ship to Holyhead. Most of 20 June was spent in obtaining an anchor and length of chain and returning to Station A, where the dye buoy was relaid. The fourth dye release was carried out successfully on 21 June.

The Bergen current meter was recovered in the evening of 21 June after

dra ing for it, since the dahn buoy marking the position of the mooring had broken awa The current meter was still working satisfactorily but the dahn buoy was lost.

Four further dye releases were made, or attempted, on 22 and 23 June. Water sampling was carried out at 5 stations in the vicinity of Station A before lifting the dye buoy and returning to Liverpool late on 23 June.

A number of difficulties were encountered in the experiments at Station A and, of the 8 releases made, only 4 allowed satisfactory sampling traverses to be obtained. The most serious problem was in getting a free flow of dye solution through the jet. There appeared to be a quantity of suspended impurities in the batch of rhodamine B used in these experiments. A different batch was obtained from I.C.I. for the second series of releases and no further blocking of the jets occurred.

(b) 24 June - 3 July.

At Liverpool there were some changes in personnel and repairs were made to the ship's Decca plotter, radar and echosounder by engineers from the respective companies. The ship left Liverpool at 0220, 25 June and sailed for position B about midway between the Cumberland coast and the Isle of Man. During the passage the dye and dye buoy were prepared so that on arrival the equipment was ready and at 1400 the dye buoy was laid. Immediately afterwards a water bottle cast was carried out and when completed the dye release was started with the outlet jet at a depth of 4m. The pump inlet was also set at 4m and the dye plume was traversed at regular intervals with the ship moving slowly downstream. Unfortunately both the radar and the Decca plotter were still faulty and the echosounder only gave intermittent readings. The courses were plotted by taking Decca readings from the decometers at one minute intervals throughout the experiment. This last procedure had to be continued for the remainder of the cruise whenever a dye experiment was in progress. At 1800 hr the traverses were restarted near the buoy with the fluorometer inlet pipe at 6m and observations were continued until the tide turned. Only one pumping depth was used because the operation of the second fluorometer was unsatisfactory. The trouble was found to be due to a faulty valve and in all subsequent releases sampling was carried out at two levels. Towards dusk the Bergen meter was set in position, suspended 10fm above the bottom by a submerged float in a total depth of 22fm. The operation was successfully completed at 2300 when the associated dahn buoy was released.

In the morning an attempt was made to fill up the dye buoy but due to the rough sea (wind:S force 6) some damage was done to the buoy. The wind remained strong all day and at 1900 when there was no longer any hope of carrying out the experiment in daylight the ship sailed to Ramsey Bay and anchored for the night.

On 27th June a second attempt was made to charge the dye buoy and despite some difficulties due to the sea state (wind : W force 5) it was filled eventually and the discharge was started at about 1100 hr. The dye was released at 4m depth below the surface and with the pumping inlets at 2m and 4m good peaks were traced on both recorders during the crossings of the plume. At 1400 the sampling depths were changed to 4m and 8m and the traverses were continued until the end of the tide. A water bottle cast was then completed at Station B prior to making another dye release. After recharging and casting off the dye buoy it was obvious that the dye was not flowing out properly and after trying to clear the jet the release was postponed until the following morning. During the night current measurements were made near Station B with a D.R.C.M. at half hourly intervals at 5 depths between the surface and the bottom. The measurements covered a tidal cycle.

Six more successful dye releases were completed between 28th June and 2nd July with mainly good peaks on both fluorometers. The results appeared to be more consistent for flood tides when there was considerably less variability in current speed and direction than on the ebb. At the end of each release a water bottle cast was carried out at Station B and the study of the water structure was further supplemented on 30th June by a more detailed survey of 4 stations in the same vicinity.

Additional current measurements were made with current drogues between 1450 and 1911 on 1st July. The current was measured at 3m and 7m by fixing the drogue positions every half hour. A 10m drogue fouled the ship at launching and was lost. At the conclusion of these observations the Bergen current meter and its moorings were successfully recovered.

The last dye release was started at 0945 on 2nd July with the outlet pipe at a depth of 8m. Difficulty was experienced detecting the plume and matters were

not helped by the presence of about 40 small trawlers in the area which hindered navigation. At 1230 the dye buoy and its moorings were recovered and at 1315 the ship sailed for Liverpool.

Comments on the ship and its equipment.

In conclusion some remarks about the performance of the vessel and its equipment are appropriate as VICKERS VENTURER was on charter to N.E.R.C. Naturally enough the ship was not fitted with as much equipment for the convenient handling of our oceanographic equipment as the other N.E.R.C. vessels we have used. The manually operated crane was difficult to handle and its slowness was a constant source of anxiety during operations in choppy seas. The new line hauler designed at N.I.O. proved to be reliable and fairly easy to operate. However due to its position on the well deck relative to the davit used for hydrographic work our shallow water bottle casts were slow indeed. These problems would have been completely resolved if the stem A frame had been moveable as in JOHN MURRAY. The ship was undermanned on deck and it was necessary to employ keen but inexperienced students on tasks that really required experienced seamen; as a result the handling of the heavier gear on the stern working platform became rather hazardous at times. The difficulties in this respect were increased because ofthe inadequate communication system between the wheelhouse and the stern, especially when the line hauler diesel was in operation.

On the credit side the accomodation and messing facilities were excellent and the considerable amount of useful work accomplished during this cruise was due in no small measure to the efforts of Captain Samuel and his officers, to whom we are most grateful.

SUMMARY OF WORK DONE

Date	Time BST	Lat. N	Long. W	Work done
16/VI	2100-2330	53°24'	4°08'	Bergen current meter and moorings laid
18/VI	0900-1400	53°24'	4°08'	WB, DR 1 (satisfactory)
	1618-1900	(and vicinity)		Current drogues tracked.
19/VI	0715-0925	"	"	WB at 3 positions
	1000-1130	"	"	DR 2 (tap fractured)
	1400-1830	"	"	DR 3 (buoy drifted)
21/VI	0945-1330	"	"	DR 4 (satisfactory)
	1830-2230	"	"	Recovered Bergen C.M.by dragging
22/VI	1230-1500	"	"	DR 5 (satisfactory at third attempt)
	1738-1800	"	"	DR 6 (dye ran out too quickly)
	1932-2300	"	"	DR 7 (satisfactory)
23/VI	0700-1130	"	"	DR 8 (Jet blocked)
	1325-1512	"	"	WB at 5 stations
25/VI	1400-1837	54°21'	3°55'	WB, DR9 (satisfactory)
	2250-2309	(and vicinity)		Bergen current meter and moorings laid.
26/VI	(Weather too rough for dye release)			
27/VI	1036-1607	"	"	DR 10 (satisfactory)
	1730-1800	"	"	WB
	1925-1945	"	"	DR attempted - faulty discharge
27/VI - 28/VI	2327-1015	"	"	Current measurements by DRCM.
28/VI	1125-1440	"	"	DR 11 (two sampling depths only)
	1500-1515	"	"	WB

Date	Time BST	Lat. N	Long. W	Work done.
28/V1	1846-2155	54°21'	3°55'	DR 12 (satisfactory)
29/V1	1325-1841	(and vicinity)		DR 13 (Incomplete - tide turned)
	2050-2110	"	"	WB
30/V1	0840-1235	"	"	DR 14 (Satisfactory)
	1305-1635	"	"	WB at 5 stations
"	1900-2230	"	"	Current drogues tracked
1/V11	0920-1320	"	"	DR 15 (Satisfactory)
	1355-1408	"	"	WB
	1450-1911	"	"	Current drogues tracked
	2000-2112	"	"	Recovered Bergen CM
2/V11	0945-1230	"	"	DR 16 (Abandoned)

Abbreviations.

DR1 etc.	Dye Release No. 1, etc.
WB	Water bottle cast.