

Surface and Sub-surface Currents in the Moplah Bay during North-East Monsoon Season

By

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ABSTRACT

The results of the surface and subsurface current measurements in the Moplah Bay, Cannanore, during the north east monsoon season have been presented. The flow patterns have been discussed in relation to wind and tide. Outside the breakwater the flow upto 1.5 m. depth follows the wind while inside the breakwater only the surface flow follows the wind and at 1.5m. level the flow shows a northerly trend. The speed of the surface flow varies between 90m/hr to 320m/hr.

I. INTRODUCTION

The crescent shaped Moplah Bay is situated on the southern side of the Cannanore town in Kerala State. The Indo-Norwegian Project is building a fisheries harbour on the north-west side of the bay (Fig. 1). A breakwater was constructed to reduce the wave activity within the planned harbour area. After the breakwater construction severe accretion has been observed in the north-western area of the bay (Srivastava, 1970). To understand the physical processes taking place in the bay area measurements on tide, current, wave and bathymetry were made. In the present paper the results of the current measurements during the north-east monsoon season have been presented.

II. COLLECTION AND ANALYSIS OF THE DATA

Two theodolites were fixed on the breakwater at the positions A and B marked in Fig. 1. Buoyant floats were released at different positions in the bay and their drifts were followed by the theodolites at an interval of 15 minutes. For surface and sub-surface current measurements the floats were adjusted to float just below the surface and at 1.5 m. below the still water level respectively. Continuous observations were made for about five hours a day, occasionally extending to about eight hours a day. Successive positions of the floats were plotted on the base map and the drift charts of the floats at different timings were drawn. A typical chart depicting the drift of the surface float during the months of December and January is presented in Fig. 1.

A cement pipe which has already been sunk at the site (Fig. 1) was graduated in steps of 5 cm. and was used as a tide pole. The zero marking on the tide pole was correlated with the bench mark available near the site (Ref. 1). The tidal data were collected visually every half an hour and the tide graphs prepared. The tide graphs corresponding to the observations presented in Fig. 1 are given in Fig. 2.

The speed and direction of the surface and sub-surface currents during one hour of the rising tide were determined from the drift charts and plotted on the base map vectorially. (Fig. 3)

III. RESULTS AND DISCUSSIONS

From Fig. 3 it appears that outside the breakwater both the surface and sub-surface flows at the rising tides are in the westerly direction, while north of the breakwater the subsurface currents are in general in the northerly direction. The speed of the surface flow during the period under study varies between 90 metres per hour and 320 metres per hour.

The data presented above were collected during the forenoon. The predominant wind during the northeast monsoon season, in the forenoon, in the area under study, is from east. Outside the breakwater the flow of water at the surface and at 1.5 m. below the surface, at rising tide, follows the wind. Although no clear cut conclusions can be drawn from these preliminary observations, it appears that to bring about a rise in the sea level at the rising tide, water will have to flow near the bottom, into the bay.

A comparison of the results of the float tests with the sediment distribution pattern (Nair et. al., 1971) indicates that while there is close agreement between the two results inside the harbour, there is considerable disagreement outside the breakwater.

The northerly change in the direction of sub-surface flow, north of the breakwater, is probably due to the piling up of water on the western side of the bay. The pattern of flow at the falling tide cannot be discussed due to the lack of data.

IV. CONCLUSIONS

Figure 3 depicts the pattern of the flow of water in the bay, at the rising tide, during the north-east monsoon season. Outside the breakwater, both the surface and sub-surface flows follow the predominant wind direction. In the area enclosed by the breakwater the surface flow in general follows the predominant wind direction while the sub-surface flow shows a northerly trend. At the rising tide the bottom flow is towards the bay from the open sea. The speed of the surface flow ranges between 90m/hr. and 320 m/hr.

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VI. REFERENCES

- (1) SRIVASTAVA, P.S., (1970).—"The problem of sedimentation in the Moplah Bay, Cannanore" Presented at the Centenary Conference on Port and Harbour Management, Calcutta.
- (2) NAIR, R.R., VARMA, P.U., PYLEE, A., and V.V.R. VARADACHARI, (1972).—"Studies on the sediment transport in Mopla Bay Harbour, Cannanore, using fluorescent tracers", (elsewhere in this volume).