Structures of Water Column and Sediment Sub-bottom in the Tangalle Bay, Sri Lanka

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Abstract

Water quality parameters and local morphology are important for monitoring aquatic life, and for planning any coastal development project. So far, few studies have been carried out in Sri Lanka for identifying water column structure and sub-bottom lithology in coastal zones. Tangalle Bay is situated in lowlands in the intermediate zone of southern Sri Lanka. Tangalle Bay replenish freshwater by minor tributaries (e.g., Kirama Oya) and Rekawa Lagoon. Field excursion in Tangalle Bay was carried out during the northeastern monsoon which is relatively less influenced by high wave-energy compared to the southwest monsoon. In this study, water quality parameters were measured using Valeport Midas CTD instrument. In addition, sub-bottom morphology was identified using Bathy 2010PC™ CHIRP sub-bottom profiler. Pre-decided systematic sampling locations were identified for covering three cross-shore and six long-shore survey lines.

Water quality parameters of cross-shore and long-shore survey lines are represented separately. In cross-shore survey lines, temperature variations show warm pool in shallow water (depth < 3 m), up to a distance of 4 km from the shore. In addition, temperature variations in deep and distance (> 4 km) water can probably indicate well-mixed nature, perhaps due to upwelling. Less dense water can be observed in shallow water (depth < 3 m). Density variations also indicate upwelling of dense water at a distance of 4 km. The lowest salinity was detected close to the nearshore area due to freshwater supply by tributaries. Salinity variations also indicate possible vertical zonation of upwelling beyond 4 km distance from the shore. Dissolved oxygen values are high up to a 3 km distance in surface and bottom water, due to well mixing in the nearshore area. However, dissolved oxygen values are decreased in bottom water at distance of 3-4 km from the shore. In long-shore survey lines, temperature and density variations show strong stratifications same as that of cross-shore survey lines. High salinity on the bottom and low salinity on the surface water in the nearshore area can probably indicate freshwater supply from terrestrial margins.

Sub-bottom profile data indicate the attached coral reef on the bed rock. This attached coral reef creates two depositional features such as layered sedimentary features on the landward side and homogeneous sediments on the seaward side of the bay.

Keywords: Sri Lanka, Sub-bottom morphology, Tangalle Bay, Water quality