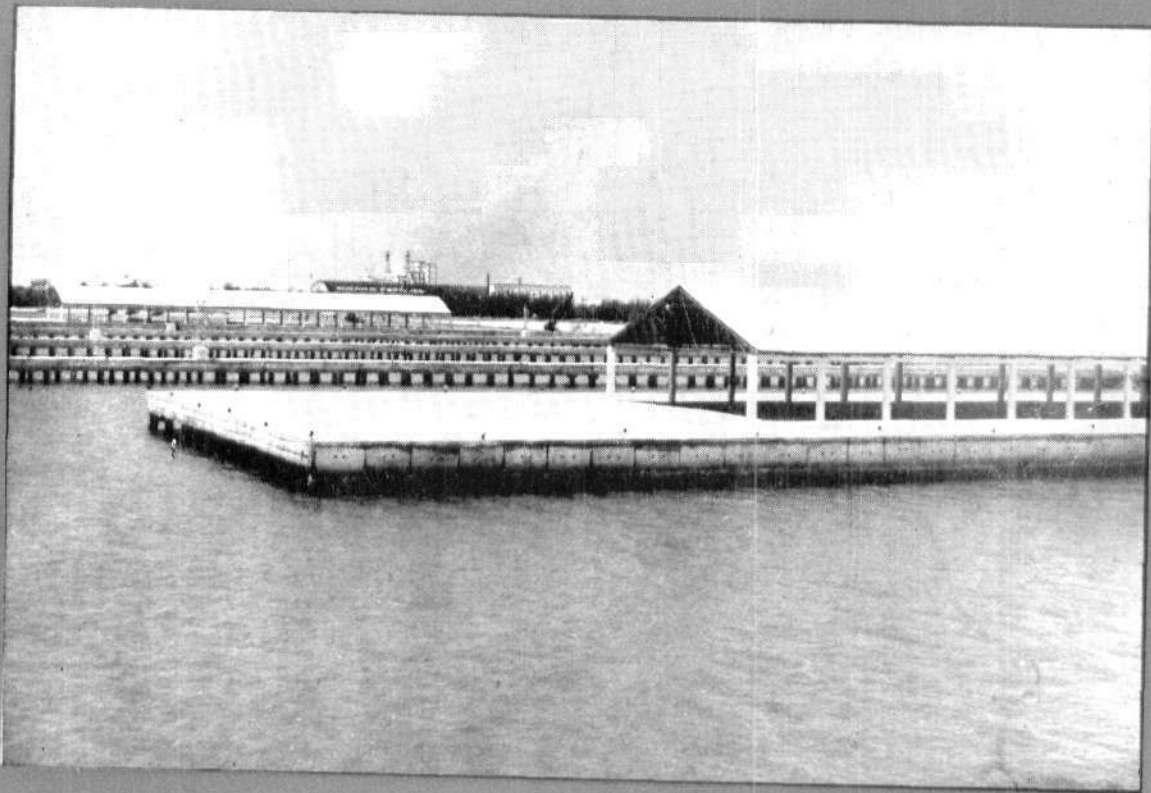




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## SALINITY CHANGES IN THE ESTUARY AND THE COASTAL SEA ADJACENT TO THE PORTMOUTH AT COCHIN\*

### Introduction

The Vembanad Lake south of Cochin to which five major rivers join, and with its permanent connection with the Arabian Sea at Cochin provides excellent opportunities to observe the influence of the coastal sea over the estuary and *vice versa*. As the rivers of the region are rainfed and seasonal the estuary has no other influence to upset its seasonal rhythm. On the other hand, the Cochin mouth being a permanent one, facilitates unhindered flow of seasonal flood water into the sea as well as the saline water into the estuary by tidal effect. The coastal sea plays a predominant role in determining the characteristics of the estuary except during incessant heavy rain during the southwest monsoon season. The flow from and into the sea ensures the exchange of water and effective dispersal of pollutants. The Cochin mouth is situated in a strategic position between the southern and the northern parts of the Vembanad Lake and consequently the flow in and out of the two parts of the lake occurs simultaneously.

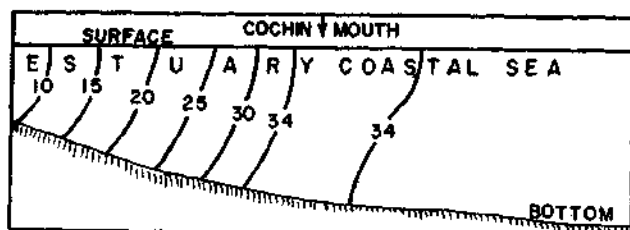


Fig. 1. Salinity (parts per thousand) of the different sections of the estuary and the coastal sea in the pre and postmonsoon season (Not according to scale).

The premonsoon and the postmonsoon conditions of salinity depicted in Fig. 1 show that during the summer months the waters in the Vembanad Lake and the adjacent coastal sea are vertically well mixed with salinity values increasing from the head of the estuary to the Cochin mouth. The salinity of the lower estuary is almost the same as that of the coastal sea during this period.

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The southwest monsoon that normally sets in over Kerala early in June floods the rivers. The flood water, being lighter than the receiving saline water, flows at the surface towards the sea and on its way erodes and replaces a little of the water below (Fig. 2). Consequently, as the season advances the area having the properties of the flood water both at the surface and

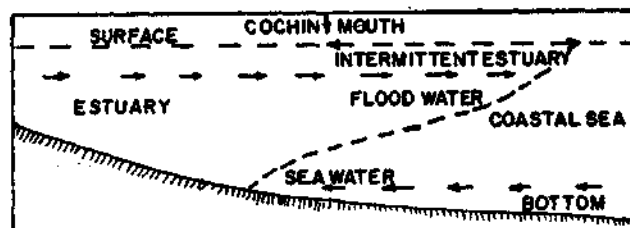


Fig. 2. Vertical distribution of the flood and the sea water in the estuary and the coastal sea during the Southwest monsoon season (Not according to scale).

the bottom extends from the head towards the lower estuary. The water flowing out through the Cochin mouth being still lighter than the coastal sea water entrains a little of the latter from below while it spreads over a wide area as a 'plume' adjacent to the Cochin mouth, turning the coastal region into a functional extension of the estuary. Thus, the Cochin coastal region where the 'plume' layer spreads over the more denser coastal sea water resembling closely a saltwedge estuary in its flow characteristics, becomes an 'intermittent estuary' during the occurrence of the 'plume' though this area lies outside the limits which normally marks the boundaries of an estuary. The boundary between the 'plume' and the sea water is well marked by the change in the colour from a highly turbid surface to clear bright greenish blue.

As the riverine discharge into the Vembanad Lake and the outflow through the Cochin mouth decrease considerably in the post-monsoon season, the sea water invading the region along the bottom rises to the surface and subsequently the transient estuary in the coastal region disappears and the different stretches of the estuary regain their characteristics of the premonsoon season.