PREFACE

Estuaries constitute a small part of the area and even smaller part of the volume of the total marine hydrosphere. Estuaries are unique water systems; they are the interface between fresh river water and saline coastal water. Situated between the land and sea, they play a dynamic role in mixing, circulation, sediment and water dynamics in the transitional zone. Estuaries have high biological productivity. Pollution problems in estuaries have been aggravated by the concentration of human population along the shores of the estuaries. To preserve the water resources in these systems, where complex interactions of physical, chemical and biological factors occur, studies have to be made in the midst of many conflicting interest.

A gradient of salinity from the freshwaters of the river to the coastal waters at the mouth is the characteristic of estuaries. In well mixed estuaries, the vertical distribution of salinity is uniform but in stratified estuaries the surface waters may be considerably fresher than the waters at the bottom. At any given place within the estuary the salinity can vary widely on several time scales. As the river flow varies seasonally the freshwater moves seaward during high freshwater discharge while the sea water moves landward during periods of low river flow. During dry period the estuary will become saltier while during wet period it becomes fresher. The geographical extent and the magnitude of these changes are largely determined by the
unique geomorphology of each estuary. Also all estuaries are characterised by an extremely variable set of environmental conditions which impose unusual stresses on the population that inhibit them.

Chaliyar river is one of the major estuarine system in the middle of the Kerala coast in India. Detailed studies on the distribution of suspended sediment and salinity in the entire estuarine region for the computation of fluxes in the estuary has not been reported so far. The variation of hydrographical features, the stability of the estuary, sediment and water dynamics, flushing characteristics, mixing and circulation, longitudinal coefficient of eddy diffusivity are topics of interest involved in this study. The saline intrusion into tidal streams causes problems to irrigation, industrial and domestic water supply schemes. A thorough knowledge of the suspended sediment distribution is needed for understanding the sedimentation process.

This thesis is presented in seven chapters. The first chapter describes the general introduction and gives a clear picture about the classification based on geomorphology, freshwater flow, evaporation, stratification and circulation. The literature review covering the relevant fields of physical aspects, description of the study area and the scope of the work are also included in this chapter.

The method of data collection, processing and analysis are given in chapter-II.
Monthly variation of the distribution of temperature, salinity and currents are described in chapter-III. Apart from these the longitudinal and vertical variation of time averaged values of salinity, the variability of residual currents and residual salinity with non-dimensional depths are presented here. The influence of Chaliyar river discharge, rainfall and wind speed are also detailed in this chapter.

Residual flow of water and salt are presented in chapter-IV. The influence of different forces causing transportation of water and salt are discussed and the classification of the estuary is also done.

In chapter-V computed values of the Richardson's number are used for comparing the stabilising effect of stratification. The flushing time for different months were computed. Based on longitudinal eddy diffusivity mixing processes were discussed.

Discussions about the distribution and transportation of suspended sediments during different months of the period of study are given in chapter-VI. The variation of suspended sediment with tidal amplitude and current speed are also discussed here. The annual sediment input and entrapment in the estuarine system is quantified.

All the discussions in the previous chapters are summarised in chapter-VII.