Mangroves ecosystems are recognized as biogeochemically active regions, where organic carbon inputs from a variety of sources undergo intense biogeochemical processing. In addition to their carbon sequestration, these ecosystems are also hotspots in terms of mineralization. Due to their dynamic ecotonal location, these environments display strong spatial and temporal variability of major biogeochemical characteristics. Many aspects of carbon dynamics in mangrove ecosystems still remain unravelled.

Knowledge of the sources and reactivities of organic matter, as well as the factors controlling its distribution, are important to understand the role of mangrove ecosystems in global biogeochemical cycles. In general, bulk parameters are relatively reliable proxies of organic matter origin. Elemental and isotopic compositions of sedimentary organic matter are commonly used to distinguish its sources. Measurement of the biochemical composition of organic matter - proteins, carbohydrates, and lipids- can also help to determine both sources and the quality of organic matter. However, these tools are effective only to differentiate the relative contributions of autochthonous and allochthonous organic matter sources.

Due to the complex nature of organic matter in mangrove sediments, these bulk parameters are not completely successful in revealing the sources. An effective tool for the source characterization of organic matter in mangrove systems is the biomarker approach. Molecular organic
biomarkers can serve as proxies to provide insight into how aquatic systems process, metabolise and sequester carbon in both the water column and the sediments that is spread over decadal to geological time scales. They are extremely useful in resolving the complexity of systems with multiple organic carbon sources. Fatty acids are abundant in living organisms and their source specificity with respect to individual compounds and their relative stability when compared to aminoacids and carbohydrates make them ideal as biomarkers.

The studies pertaining to the biogeochemistry of organic matter with special emphasis on source characterisation of Cochin estuary and mangrove areas still remains poorly documented. The main objective of the study was to investigate the sources of organic matter in three mangrove systems of Cochin estuary and to identify the major biogeochemical pathways. Fatty acid biomarkers, δ¹³C of total organic matter and the elemental composition were used to characterize the sources of organic matter in these mangrove systems. Assessment of biochemical composition (total lipids, proteins and total carbohydrates) were employed to study the quality and quantity of organic matter. The geochemical characteristics of the systems were also assessed using mineralogy, trace metal analysis and phosphorus fractionation.

The thesis is divided into five chapters. Chapter I is Introduction and it deals with the aim and scope of the present study. Chapter II, Materials and Methods describes the general geographical features of the study area and the details of the sampling and analytical methodology. Results of the general hydrographical condition of the study region are also included here.
Chapter III is *Geochemistry* and it deals with the seasonal and spatial variations of the geochemical parameters of the surface sediments. It includes the general sedimentary characteristics, mineralogy, elemental composition, heavy metal and phosphorus geochemistry. Chapter IV is *Biochemical composition*. It discusses the biochemical composition of organic matter in the surface sediments to examine the quality and quantity of organic matter. Attempt has also been made to characterise the sources of organic matter with the help of bulk parameters. Chapter V, *Fatty Acid Biomarkers*, deals with the source characterisation of organic matter in these complex ecosystems with the help of fatty acid biomarkers. All the biogeochemical characteristics of the three mangrove systems under study are summarised at the end of the thesis.