Ecological studies have attained great importance in recent times due to the increased degradation of aquatic environments. The reports of the Royal Commission on environmental pollution (1972, 1982, 1984) reviewed the status of different estuaries and coastal waters of Britain. Hydrographic surveys by Seki (1982) in Karumigarakura lake, Japan; Clark (1986) in Thames estuary; Jeren Gavis and Virginia Grant (1986) and Reay et al. (1992) in Chesapeake Bay; Sund and Hustman (1987) in North Carolina estuary; De Angelis and Lilley (1987) in Oregon estuary; Dillon et al. (1990) in central Ontario lake; Sinke et al. (1991) in Loosdrecht lake and Merchant (1993) in Loire estuary were noteworthy contributions. Reduced dissolved oxygen, or hypoxic events were documented for several estuaries. Important reports are that of Cooper and Brush (1991) in Chesapeake Bay; Parker and Rielley (1991) and Howell and Simpson (1994) in Long Island estuary. Presence of hydrogen sulphide have been reported from several marine and estuarine areas of the world (Dauer and Ranasingh, 1992; Stanley and Nixton, 1992).

The Indian subcontinent is flanked on the west by the Lakshadweep sea and on the east by the Bay of Bengal. The east coast of India have been extensively studied. The water quality of the Hoogly estuary was investigated by Ghosh et al. (1973), Ghosh and Choudhary (1989) and Bose and Dutta (1985); that of Edaiyar-Saras estuarine system by Nair and Ganapathy (1983); that of Vasishta - Godavari estuary by Ramana et al. (1988); that of Adyara estuary by Ethiyrajan (1987); that of Coastal waters of Tuticorin by Natarajan et al. (1981); that of Vellar estuary by Santhanam (1976), Subramanian and Venugopalan (1980) and Shanmukhappa et al. (1987a, 1987b); that of Port Novo waters by Sundaraj and Krishnamoorthy (1975); that of Cooum estuary by Azariah and Hilda Azariah (1987) and Azariah and Damodaran (1986) and the Coleroon estuary by Prabha Devi (1986).

The waters of the West Coast of India were studied in detail by various workers. Zingde et al. (1980b, 1981, 1985) have made detailed studies on the water quality and
The water quality of estuarine rivers and lakes in Kerala have drastically changed due to pollution from industrial wastes; effluents from large number of factories and sewage etc. This has resulted in a marked depletion of dissolved oxygen, rise in temperature, biochemical oxygen demand and chemical oxygen demand; eutrophication leading to increased amounts of organic and inorganic nutrients in water and the high concentration of trace metals leading to toxic effects on the organisms in these water bodies. Sarala Devi (1987), Sarala Devi et al. (1979), Vijayan et al. (1976) and Unnithan et al. (1975) discussed the effects of organic pollution on some water quality features of Cochin backwater in relation to industrial pollution. Other important studies in the Cochin estuarine system include that of Balachand et al. (1991) and Mohanachandran and Kumar (1996), Venugopal et al. (1980, 1982), Ouseph (1987). The Cochin backwater system and lower reaches of the river Periyar were studied in detail to assess the longitudinal extent of salt water intrusion into the system and its effect on the flushing of pollutants introduced by the industries (Sankaranarayanan et al. 1986). Nair et al. (1976 a, b) have given an account of the water quality changes due to pesticide pollution in Kuttanad area. Water quality studies of other estuarine systems in Kerala has been elucidated by Urs et al. (1987) in the Kuttiyadi estuary; Varma et al. (1987) in the Periyar estuary; Premchand et al. (1987) and Nirmala (1990) in the Beyapore estuary; James (1987) in the estuaries of Beyapore, Kuttiyadi, Ponnani and Valapatnam; Jacob et al. (1987) in the Pamba estuary; Ramamirtham et al. (1986) and Ramamirtham and Muthuswamy (1986) in Vembanad estuary; Abe and Jaya Kumar (1996) in
Muvattupuzha estuary; Nair and Abdul Azis (1988) in the Ashtamudi estuary; Nair et al. (1983) in Akathumuri - Anchuthengu - Kadinamkulam backwater systems and Nair et al. (1984) in the Kadinamkulam backwater. Thus, it can be seen that there is enough scientific information with regard to the impact of pollution from industries, sewage and agricultural run off in the Indian waters.

In the retting zones, the organic wasting leached in to the water get disbursed and mix with the water. It results in the formation of large qualities of suspended matter reduces the depth of euphotic zone and affects the productivity of the water bodies. The estuaries of Kerala afflicted by retting remain a unique ecosystem. Pioneering work on the water quality of the retting zones of Kerala was carried out by Abdul Azis and Nair (1978) in the Edava - Nadayara backwater. This study has revealed for the first time the startling water quality changes that retting has brought out on the estuarine tracts of Kerala. Studies conducted by Abdul Azis (1978), Abdul Azis and Nair (1986, 1987) in the retting zones of Edava-Nadayara, Paravur Ashtamudi backwaters; Remani (1979) and Remani et al. (1989) in the retting zones of Cochin backwater and Beypore, Irrigalore, Palazhi, Odavanna, Kallai, Eranjikal and Korapuzha estuaries and Bijoy and Azis (1994, 1995) in the Kadinamkulam backwaters have revealed that there is a sharp depletion of dissolved oxygen concentration with simultaneous increase in the hydrogen sulphide concentration and drastic temperature and BOD changes. The pH of the water fell to acidic values and nutrients like nitrite, phosphate and silicate increased, thereby resulting in a marked deterioration in the water quality of these highly productive water bodies.

Several studies have been carried out on the primary productivity of the waters of different ecosystems of the world. Production and utilization of organic matter in the Baltic waters have been carried out by Kuparinen et al. (1984); Lassig et al. (1980) and Larsson and Hagstrom (1982). Hatcher and Mann (1975) compared the production in various salt marches along the Atlantic and Gulf coasts of the United States. Hobbie (1976) compared the estimates of primary production in Georgia and North Carolina. Pool et al. (1975) have estimated the primary production in the mangrove swamps of Puerto Rico and Florida. The primary production in Langebaan Lagoon and coastal lakes and estuaries of South Africa has been studied by Christie (1981). Head (1976) reported
the primary production from several Fjords and coastal plain estuaries and suggested a net production of 100 - 500 g cm\(^{-2}\) y\(^{-1}\).

Inspite of its growing importance, primary production studies in estuarine waters of India are meagre. On the West Coast of India primary productivity data is available from the Kali estuary (Neelakantan et al. 1987). Raghuprasad (1967) has given a short description of organic production in waters of the South East and West Coast of Peninsular India. Dehadrai (1970), Dehadrai and Bhargava (1972a), Bhargava (1973), Bhargava et al. (1977) and Bhattathiri et al. (1976) have reported results of investigations carried out in the Mandovi-Zuari estuaries in Goa. Purushothaman and Bhatnagar (1976) have brought out the distribution of primary production and nutrients in relation to the hydrographic features in the Vellar estuary.

Important works on the primary productivity of the estuaries of Kerala are those from the Kadinamkulam estuary (Nair et al. 1983, Bijoy Nandan et al. 1989); Ashtamudi estuary (Nair et al. 1984, Nair and Abdul Azis, 1987) and Cochin backwaters (Qasim and Reddy 1967; Qasim et al. 1968, 1970, 1972, Nair et al. 1975; Pillai et al. 1975; Gopinathan et al. 1982). Qasim (1979) and Nair (1970) attempted to review the productivity studies in the Indian sea and estuaries.

Remote sensing with its synoptic, repetitive multispectral coverage and its vast array of application potential has emerged as a unique tool for the management of natural resources. The conventional technique employed for ecological studies is generally a point measurement, non synoptic and time consuming. With the advent of multispectral sensing and fast digital processing through computers coupled with the developments in Space Science the last decade has witnessed a phenomenal advancement in the application of remotely sensed data for various activities. The technique offers a wide range of possibilities in the study of various water quality parameters such as suspended sediment, secchi disc transparency, turbidity, temperature, phytoplankton concentration, surface oil slicks, etc. Since the 1960's, there has been constant advancement in remote sensing technology that now permits routine observation of terrestrial, atmospheric and oceanic variables. The basic principles of remote sensing
have been outlined by Curran (1969), Gorden and Morel (1983), Kirk (1983), Robinson (1985) and Lo (1986). The inherent optical properties of sea water and of the optically active substances which are generally present in sea water were discussed by Sathyendranath (1984). The special features of water such as color, suspended sediment load, light penetration etc have been widely integrated with satellite imageries during the last decades. Johnson and Harris (1980), Johnson et al. (1983), Allan (1992), Muller-Karger (1992) and Clark (1993) provide extensive reviews in the application of remote sensing for aquatic pollution studies.

Psurty and Allen (1975) studied the digitized aerial photographic data for mapping the areal patterns of two oceanic outfall plumes of USA. Munday and Alfodi (1979) carried out water quality studies using remote sensing data and proposed the suitability of linear fit for the turbidity variations. Morel (1980), Voillier et al. (1980), Singh et al. (1983) and Robinson (1983) have made water quality investigation in the diverse European coastal waters (Baltic to Mediterranean) and generated a wide variety of approaches to fashion the algorithms most suited to local environmental conditions. Lindel (1981) carried out water quality mapping in lake Malarem and outlined the potential of remote sensing methods. Khorram and Cheshire (1980) and Ritchie et al. (1986, 87), studied Landsat and CZCS data for mapping sediment distribution patterns in reservoirs, estuaries and other waterbodies. Aurup et al. (1987) analyzed the CZCS scenes from the North sea to study the frontal areas and transport pattern in relation to water quality.

Kandaal'ev et al. (1988) studied the satellite inferred and contact measurement data and revealed the high correlation between spectral signatures and water quality parameters. Ortiz-Casas (1988) and Casas and Martinez (1989) carried out water quality studies using remote sensing. Amann et al. (1989) collected shipborn and airborne radiometric data to map suspended matter, yellow substance and SST in Madura bay. Trong et al. (1989) investigated the water quality of Mekong river estuary using satellite data. Feasibility of remote sensing in monitoring turbidity, SST, transparency and suspended solids have been reported by Tassan (1987); Dierberg (1991); Schiebe et al. (1992); Kuttinen (1991) and Gitelson (1991). Nichol (1993) demonstrated the
application of Landsat TM data to the survey and monitoring of water quality in the Singapore-Johor-Riau growth triangles.


Muller-Karger (1991) investigated the surface plankton concentration and SST for the Gulf of Mexico. Badev et al. (1991), Kamov (1992), Hardin et al. (1993), Prasad and Haedrich (1993) and Zhang et al. (1992) carried out chlorophyll pigment studies using remote sensing. The applicability and consistency of models which relates digital spectral data and in site pigment concentrations were investigated by many researchers (Sherman, 1986; Baltch et al. 1989a,b; Khorram 1986, 1991). Sathyendranath (1989, 1992) and Berthan (1992) have proposed several algorithms. Ekstrand (1992) suggested a ratio of TM1/log TM3+1 for the quantification of chlorophyll-a.

The modelling of water quality variables using satellite data is based on statistical methods. Several studies have been reported (Lin et al., 1984; Lathrop and Lillesand, 1986; Khorram 1981; Khorram et al. 1987). The theoretical algorithms have
been developed and tested for different water quality parameters (Khorram and Cheshire, 1985; Tassan and Storm, 1986; Tassan, 1987).

The advent of remote sensing technology has made a drastic change in India in recent years in coastal and aquatic environmental studies. The National Natural Resources Management System (NNRMS), the Space Application Centre (SAC) and the National Remote Sensing Agency (NRSA) have carried out various research projects in the areas of remote sensing, specially in coastal ecosystem studies. Deekshatulu (1981) conducted pioneering efforts in water quality monitoring studies using remote sensing data in the Hussain sagar lake. Muralikrishna (1984) made a comparison of different chlorophyll retrieval algorithms and their applicability. Nayak (1983) used MSS data for studying suspended sediment distribution in the Gulf of Khambat and Ukai Reservoirs and found that the ratio of MSS 6/MSS 4, MSS 7/MSS 4 and MSS 5/MSS 4 are ideally suited for estimation of suspended sediment. Manavalan et al. (1984) carried out capacity evaluation studies of Ghatprabha reservoir using digital analysis of IRS-LISS-II data. Ramakar et al. (1994) used IRS data for studying reservoir sedimentation.