Chapter-I

Introduction
INTRODUCTION

Mangroves can be defined as woody plants that grow in tropical and sub-tropical latitudes along the land-sea interface, bays, estuaries, lagoons, backwaters, and in the rivers, reaching upstream up to the point where the water still remains saline (Qasim, 1998). The forest is typically distributed from mean sea level to highest spring tide level (Alongi, 2009). They are also called as “coastal woodlands” “tidal forests” and “mangrove forests”. They interact and support diverse marine, fresh water and terrestrial flora and fauna (Tomlinson, 1986; Macintosh and Ashton, 2002). Living along the interface between land and sea, the mangrove are genetically diverse groups of plants (Hogarth, 1999). Duke, (2006) used more clear criteria to distinguish true mangroves and mangrove associates which were largely accepted. The principal genera are *Avicennia* (Avicenniaceae), *Lumnitzera* (Combretaceae), *Nypa* (Palmae), *Bruguiera, Ceriops, Kandelia* and *Rhizophora* (Rhizophoraceae), and *Sonneratia* (Sonneratiaceae) (Tomlinson, 1986).

The most recent estimates suggest that mangroves presently occupy about 14,653,000 ha of tropical and subtropical coastline in 112 countries (Wilkie and Fortuna, 2003; FAO, 2004; Spalding et al., 1997; Kathiresan & Bingham, 2001). Forty percent of mangroves occur in South and Southeast Asia regions (Spalding, 1997). Mangroves are largely restricted to latitudes between 30°N and 30°S. Northern extensions of this limit occur in Japan (31°22' N) and Bermuda (32°20' N); southern extensions are in New Zealand (38°03' S), Australia (38° 45' S) and on the east coast of South Africa (32° 59' S) (Spalding, 1997; Hogarth, 1999; Kathiresan and Bingham, 2001; McLeod & Salm, 2006). There are two main areas of mangroves: The Eastern hemisphere and the Western hemisphere. The Eastern hemisphere is Indo-West Pacific region that includes East Africa, Indo-Malaysia and Australasia.
The Western hemisphere is Atlantic East Pacific region that includes West America, East America and West Africa. The Eastern hemisphere is considered as a place of origin for mangroves, and hence the region is called as the old world mangroves and the Western hemisphere as the new world mangroves. The Eastern hemisphere has more species than the Western hemisphere (Untawale, 1984). The mangrove species evolved and diversified due to the break-up of Gondwanaland. The origin of mangroves is still under debate (Kathiressan & Bingham, 2001). Mangroves are quite old, possibly arising just after the first angiosperms (Duke, 1992). Mangroves evolved from terrestrial or fresh water plant species rather than marine plants. In the distant past, these land plants adapted to brackish water and became the “core” mangrove flora. It is not clear why only a few members of many plant groups adapted to saline water. However, mangrove plants do not exhibit very primitive plant characteristics. It is believed that the first appearance of mangroves as early as 80 million years ago. *Avicennia* and *Rhizophora* were probably the first genera to evolve, appearing near the end of the Cretaceous period. Chapman, (1976) recognized 65 mangrove species globally belonging to 22 genera and 16 families.

India has a vast coastline of 8,118 km distributed in nine coastal states and four union territories with many ecosystems such as estuarine, riverine, backwater, creeks, deltaic, lagoons and islands. Indian mangrove flora comprised of more than 60 species belonging to 41 genera, 29 families and 26 species, in the East coast. Eight species, that are present in the West coast, are absent in the East coast (Untawale, 1984). According to the report of Forest Survey of India, (1999) mangrove vegetation in India consist of with 41 species belong to 30 genera and 21 families, of which eight species of mangrove are reported only from West coast and 25 mangroves species have restricted distribution along the East coast (Kathiressan and Bingham, 2001). Due to general intertidal slope and heavy siltation, the delta environment of east coast supports extensive mangroves. Sundarbans is the world’s largest continuous single block of mangrove forest with mangrove area of 10,110 km2 of which about 6,000 km2 is in Bangladesh.
and the remaining 4,110 km² is in Indian water (Das and Siddiqi, 1985; Ali, 1988; Bandaranayake, 1998; Iftekhar, 1999). According to the report of Forest Survey of India 1999, in India the total mangrove area is estimated to be 4,87,100 ha of which, 96,000 ha present along the Andaman and Nicobar islands and the remaining 2,75,800 ha and 1,14,700 ha found along east coast and west coast, but as far as density and growth are concerned, mangroves of these islands are the best in the country (Jagtap, 1985). In Tamil Nadu, mangroves are well-developed in Pichavaram and Muthupet. The Pichavaram mangrove is a typical swamp, extending between Vellar and Coleroon estuaries. In Pichavaram mangroves sixteen Angiosperm species were recorded, fourteen of them are exclusively mangrove species (Krishnamurthy and Sunderraj, 1973). Small patches of mangroves are found in Gujarat, Maharashtra and some other coastal states (MOEF, 1987). Ecological studies in relation to the mangrove environment along the Goa coast was studied (Jagtap T.G, 1986).

The past and present distribution of mangroves has been reviewed by several authors on a global level (e.g. Tomlinson, 1986; Ricklefs & Latham, 1993). In this work, detail documentation has been done on the diversity of mangroves along the Goa coast in view of taxonomy and allied fields.
Objectives of the present work

Mangroves ecosystems along the Goa coast have been studied in the past focusing mainly the 7 major rivers and a connecting canal. In the present work all 10 rivers along with the connecting canal is studied. Cutting of mangrove species for fire wood, aquaculture, central and state government projects etc. largely account for the destruction of mangroves in the region. The present study was done by keeping the following objectives in mind.

1) To describe the distribution of mangrove along the Goa coast.
2) To define seasonal variations of hydrological parameters of study area.
3) To evaluate the sediments of mangrove area.
4) To explain responses of selected mangrove species to two contrasting salinities in their early growth stage (seedlings).
5) To study bird congregated mangrove areas and non congregated mangrove areas with reference to nutritive value of soil and fishery.
6) To identify the endangered mangrove species.
7) Assessment of suitable site for Mangrove Park.
8) Raising awareness among public on the importance of mangroves and need for their conservation.