CHAPTER - VI

DISCUSSION

Tuticorin is a very important district in Tamil Nadu based on industrialization and urbanization. In Tuticorin coast environment, the floral diversity is entailing a treasure of valuable plant species. However, most of the plant species are restricted to a very small period of the year at selected sites due to the scarcity of available water, nutrients and a favourable temperature. In the present study, most of the species recorded were frequent during the rainy seasons mainly due to the presence of suitable temperature, adequate moisture and macronutrients. Only trees and few shrubs have little association with post monsoon as these shrubs and trees were found during all seasons. Salt and drought tolerant species were found around Tuticorin, Palayakayal and PunnaiKayal. The spatial variations may be due to the soil type and its composition, moisture contents of soil, nature of disturbance like grazing pressure, human interference (Alhassan et. al., 2006). *Prosopis* is the most abundant species in the Tuticorin that may be due to its adaptations to various types of environments. This species was successful in maintaining the habitat, because of its strong root system, which may facilitate absorption of moisture as well as nutrients from different types of soils.

The rural poor in developing villages often rely on natural resources from coastal areas to support their livelihood. These resources tend to form an important component of the rural economy. The floral diversity of the Tuticorin coast is severely threatened by natural, as well as anthropogenic disturbances, such as, tree cutting, grazing, and lopping of fuel wood, fodder and litter removal.
6.1 TAXONOMIC DIVERSITY

Plant diversity of an area is related to a number of factors such as topography, climate, and soil and natural/human disturbances. In the present study, 393 vascular plants belonging to 83 families were recorded in the study area. Taxonomically, Poaceae and Fabaceae were the most dominant families (with 41, 32 species) followed by Amaranthaceae and Caesalpinaceae (each with 19 species), Euphorbiaceae (17 species), and Cyperaceae (16 species). Similar number of species observations were reported from Kolli hills the Eastern Ghats (Annaselvam and Parthasarathy, 1999, Chittibabu and Parthasarathy, 2000a) and other tropical forests (Richards, 1996; Shruthakeerthiraja and Krishnakumar, 2012 and Rathod Mulchand, 2013). Kadavul and Parthasarathy (1999a) has also reported that family Euphorbiaceae as the most spacious family followed by Rubiaceae in the semi-evergreen forests of Shevarayan hills of Eastern Ghats. More authors have also reported that these families were dominant in the Kalakad Mundanthurai Tiger reserve of Western Ghats (Parthasarathy, 1999), and in the dry evergreen forest of Pudukottai (Mani and Parthasarathy, 2005).

Of the 393 of vascular plants were recorded in the study area, 112 and 74 species were present in the undisturbed area (UDA) and disturbed area (DA) respectively, Similar number of vascular plants were reported by Krishnamurthy et al., (1981); Parthasarathy and Sethi (1997); Parthasarathy and Karthikeyan (1997); Venkateswaran and Parthasarathy (2003); Reddy and Parthasarathy (2003); Mani and Parthasarathy (2005); Reddy and Parthasarathy (2007); Anbarashan and Parthasarathy (2008).
6.2 PHYTO-SOCIOLOGICAL ANALYSIS

The present observation on the disturbed area, shows that the herbaceous species, *Cynodon dactylon* (L.) Piers. has the highest density (11.60), frequency (1.00), abundance (11.60) and Important Value Index (IVI) (19.31). The shrub species like *Arthrocnemum macrostachyum* (Moric.) K. Koch has the highest density (6.20), frequency (0.80), abundance (10.33) and IVI (40.71) The tree species like *Prosopis juliflora* (SW.) DC has the highest density (17.40), frequency (1.00), abundance (17.40) and IVI (82.75). The climber species like *Asparagus racemosus* Willd. and *Pergularia daemia* (Forssk.) Chiov. have the highest density (1.00), abundance (10.00) and while *Pergularia daemia* (Forssk.) Chiov. has the highest frequency (0.35), and IVI (81.28).

In Undisturbed area, the herbaceous species, *Cynodon dactylon* (L.) Piers. has the highest density (12.20), frequency (1.00), and important value index or IVI (14.90). while *Typha domingensis* Pers. has the highest abundance (17.50) The shrub species like *Tephrosia purpurea* (L.) Pers has the highest density (4.40), and IVI (40.83), while *Calotropis gigantea* (L.) Dryand has the highest frequency (0.80), and *Arthrocnemum macrostachyum* (Moric.) K.Koch (12.00) has the highest abundance (10.33). The tree species like *Prosopis juliflora* (Sw.) DC has the highest density (16.05), frequency (1.00), abundance (16.05) and IVI (94.48). Among the climber species *Cissus quadrangularis* L and *Coccinia grandis* (L.) Voigt have the highest density, (1.55), *Coccinia grandis* (L.) Voigt has the highest frequency (0.50), *Hemidesmus indicus* (L.) R. Br. ex Schult. has the highest abundance (6.00) and *Coccinia grandis* (L.) Voigt has the highest IVI (72.10). The present observation shows that the density of the Trees and Herbs were higher in the undisturbed sites compared to disturbed sites. Higher anthropogenic disturbances in the buffer area have also led to
the elimination of seedlings of most of the species. The plant density, as a measure for expressing biological abundance and dominance of vegetation have been used to describe the species composition and spatial patterns of vegetation in different plant communities (Chen et al., 2008). The moisture that prevailed during rainy season might have favoured the occurrence of most of the herbaceous plant species. The variations in the dominance of plant occurrence is associated with micro-climate and edaphic conditions at the study sites (Sharma and Upadhyaya, 2002). Soil, climate, aspect, and geographical location influence the vegetation diversity of coastal environment.

The maximum importance value (IV) at UDA site and dominance during a particular season can be well correlated with the study conducted by Kukshal et al., (2009). The disappearance of some species may be due to the mechanical damage caused by man and animals (El-Khouly, 2004). It is generally argued that each individual species depend on some set of other species for its continued existence and the species have co-evolved in the ecosystem on which they depend (Paine, 1966). Abdullah et al., (2009) have also mentioned climatic factors as a reason that influenced the distribution of species in certain habitats. The low IVI value indicates high degree of biotic disturbance by animals (Raizda et al., 1998). Moreover, the high importance value (IV) by any individual species indicated that most of the available resources are being utilized by that species and left over are being trapped by other species as the competitors and the associates. This could be the reason why IVI was always reported highest for few species during post monsoon than the rest of the season. Other biotic factors that affected the vegetation distribution at site DA such as dispersal limitation, competition, predation (Wright, 2002; Munzbergova and Herben, 2005), and abiotic factors such as nutrient availability (Hall et al., 2004), light availability (Bunker and Carson, 2005), and topographic variation (Itoh et al., 2003; Yasuhiro et al., 2004). It
can be hypothesized that the distribution of niche space or availability of the resource was equally distributed among all species that showed maximum dominance during rainy season at UDA. The Structural analysis of the coastal vegetation at different estuarine formations revealed that there was site specific domination of species which in turn supported to the adaptability of these species to specific site conditions. Ecosystem evaluation with respect to adaptation of a species to the specific site may be attributed by physical, biological and edaphic factors. Tolerance to salinity levels, organic content in the soil, morphological adaptations, ability to resist physical pressure exerted by the turbulent water, duration of fresh water inundation etc. might be influential factors for the species dominance at different sites (Ewel and Bourgeois, 1998).

6.2.1 The Margalef’s index

In the present study it was observed that the species richness (Dmg) was highest for herbs in the undisturbed area (UDA) (8.55) and lowest in disturbed areas (DA) (5.63). For shrub species, the species richness (Dmg) was found to be highest in UDA (2.62) and lowest in DA (1.82). For tree species, the species richness (Dmg) was found to be highest in UDA (2.32) and lowest in DA (1.47). For climber species, the species richness (Dmg) was found to be highest in UDA (1.7) and lowest in DA (0.91).

The Margalef’s index ranged from 8.55 for site UDA to 5.63 for site DA, which is quite low compared to 18.5 and 4.54 reported for the subtropical forest ecosystem (Mishra et.al., 2005). Similar results have been reported by Johnston and Gillman (1995); Cao et.al. (1996) and Kellman and Tackaberry (1998) for other forest ecosystems. The Margalef’s index ranged from 2.32 for tree species for UDA to 1.47 for DA. With respect to density-distribution of trees, the present vegetation is similar to
the tropical dry evergreen forests of South India (Visalakshi 1995; Parthasarathy and Sethi 1997) and the Western Ghats (Ayyappan and Parthasarathy 1999). Other studies elsewhere have reported a similar range of species richness (Brockway, 1998; Tripathi, 2001)

6.2.2 Shannon weiner diversity index

In the present study, the values of species diversity (H’) for herbs was highest in UDA (4.03) and lowest in DA (3.66). The shrub diversity (H’) in the study area was highest in UDA (2.69) and lowest in DA (2.45). The diversity (H’) of tree species was maximum in UDA (2.35) and minimum in DA (2.11). The climber species diversity (H’) in the study area was highest in UDA (2.04) and lowest in DA (1.57) Shannon Weiner index of diversity (H max) in the present study ranges from 1.57 to 4.03 at different sites. Similar index values ranging from 0.950 to 2.922 is in accordance with the values reported for other temperate forests (Monk, 1967; Risser and Rice 1971; Relhan et al., 1982; Pande et al., 2001; Rawat, 2001, Pande et al., 2002, Singh and Kaushal 2006; Sharma et al., 2009), and also similar observation have been reported from the mangroves of Puduvyppu, Kerala by Suresh Kumar (1993). Which was also reported by Steve (1993); Licun Li, et al. (1993); Kurlapkar and Bhosale (1993) and Ganesh datt bhatti (2013). The present study showed that, there was higher diversity index in the UDA compared to DA. Similar observation were reported by Ristan and Horsley (2001) and El-Khouly (2004). Lubchenco (1978) and Huston (1979) considered it as a positive force that might increase species diversity in the community by preventing competitive exclusion by dominant species. Research has shown that the seasons influences both species diversity, spatial heterogeneity and the vegetation structure (Adler et. al., 2001; Metzger et.al., 2005). The effects of monsson season on
plant species richness and diversity have been frequently documented and debated by Milchunas et al. (1998); Wang et al. (2002); Hichman et al. (2004); Sarmiento et al. (2004). The raining season is known to increase species diversity, species richness and total amount of crude protein in plants (McNaughton, 1979; Western and Gichohi, 1995; Vesk and Westoby, 2001). The present study also reports similar observation for herbaceous plant diversity when compared with the shrub and tree diversity. Many researchers have reported the diversity value of Indian coastal vegetation in the range of 0.8 to 4.1 (Parthasarthy et al., 1992; Visalakshi, 1995). The lower diversity values may also be due to anthropogenic disturbances such as burning, grazing and wood collection (Jayasingam and Vivekanantharaja, 1994). This was supported by the present study where greater understorey density and diversity were recorded under undisturbed vegetation.

**6.2.3 Simpson's index**

Simpson's index which varies from 0 to 1, gives the probability that two individuals drawn at random from a population belong to the same species. If the probability is high, consisting of both individuals belonging to the same species, then the diversity of the community sample is low. In the present study of Simpson index of the herb species were found to be highest in UDA (0.97) and lowest in DA (0.02). In shrub species, the value of the Simpson index was highest in UDA (0.92) and lowest in DA (0.91). In tree species, the value of the Simpson index was highest in DA (0.86) and lowest in UDA (0.85). In climber species, the value of the Simpson index was highest in UDA (0.85) and lowest in DA (0.78). The value of Simpson index in the present study is almost similar to various workers were reported by Knight 1975; Visalakshi 1995 and Jose 2003).
The Simpson’s diversity index range in this present study was 0.02 to 0.89 (Table 6A, 6B, 6C, 6D). Similar range observations were reported for the vascular plants. (Whittaker, 1965; Risser and Rice 1971; Ralhan et al., 1982; Singh et al., 1984; Laxmi Pangtey et al., 1987; Sureshkumar 1993; Shibhu Jose et al., 1994; Varghese and Kumar 1997; Pascal 1988; Hegland et al., 2001; Shivaprasad et al., 2002; Kharkwal et al., 2004; Sher et al., 2005; Vasanthraj and Chandrashekar 2006). The lower floristic diversity observed can be attributed to the factors such as adverse environmental condition-flooding and associated soil changes, and the consequent habitat specialization, which permit only a few species to colonize the mangrove vegetation (Leigh et al., 1993).

6.2.4 Sorensen index

The similarity index helps to understand the commonality of species occurrence between different stands. The difference in species similarity among different vegetation stands may be due to the varied microclimate, habitat conditions and soil factors which may support different species composition in studied vegetations. Similarity index (Sorensen) does not underestimate the uniqueness of each vegetation type rather deciphers the inter relatedness and enables to understand the hidden process of succession of different forest types.

The present observation of the value of similarity (S) of the vascular plant species between disturbed (DA) site and undisturbed (UDA) was found to be highest for shrub (0.51) followed by the lowest value for climber (0.42). Similar observatios were reported by Verma et al., (2005) and Shameen et al., (2011). The two selected sites when compared on the basis of species similarity index were observed to show maximum similarity, approximately 50% similarity, The shrubs, and trees were stable
in all seasons but climber and herbs were grazed in dry seasons. During the raining season a higher number of species occurred at both the sites whereas a declining trend was observed when the winter season approached lesser similarity among seasons. Thus two sites depicted considerable dissimilarity in the herbaceous and a climber community structure which is related to differences in conditions and impacts favouring growth of different species at the two sites.

In the present investigation the species richness, abundance and species diversity were highest in UDA habitat due to the absence of anthropogenic disturbance or grazing animals during the two years. In general, diversity (H') showed an increasing trend from spring to summer season and thereafter a decreasing trend till the winter at both sites. This trend is attributed to the fact that during post monsoon season new species go on sprouting depending upon the root / seed stock in the soil and thereby adding to species in total that resulted more diversity. During summer and winter season the rate of sprouting of root / seed stock is diminished and species number declined owing to adverse climatic conditions (Shadangi and Nath, 2005). Many authors reported similar view for Shannon diversity (H’) as reported in the present study (Kiss et.al., 2004; Kharkwal et.al., 2004; Yadav and Gupta, 2007; Lalfakawma et.al., 2009). Higher species diversity may be important in maintaining ecosystem functioning (Yachi and Loreaue, 1999; Chesson et.al., 2002). The low diversity was observed in DA habitats due to the disturbance of human and grazing animals.

The present study suggests that total abundance, species richness and diversity of Tuticorin south were highest in undisturbed habitats. These results suggest that plants and their characteristic habitats influence the local distribution of these herb species. Some species of herbs are capable of occupying many habitats while others
apparently occur in one or more habitats. *Cynodon dactylon* (L.) Pers. *Prosopis juliflora* (Sw.) DC was abundant in all the habitats. The species richness and abundance were highest in UDA habitat in comparison to the UD habitat field with water in most of the time.

6.3 PHYSICO-CHEMICAL ANALYSIS OF SOIL

Physicochemical characteristics of vegetation of the soils vary in space and time due to variations in topography, climate, physical weathering processes, vegetation cover, microbial activities, and several other biotic and abiotic variables (Paudel and Sah, 2003). The nature of plant community a place is determined by the species that grow and develop in such environment (Bliss, 1962). The difference in the species composition from site to site is mostly due to micro environmental changes (Mishra et al., 1997).

6.3.1 Soil Moisture

In the present observation, soil moisture in the disturbed area is 17.36 % at 0-20 cm soil depth and in the undisturbed area, the percentage of soil moisture content is higher 18.73 % in 0-20 cm soil depth. The grazing of rangeland plants by livestock has concurrent adverse consequences in terms of the soil surface becoming compacted, which in turn adversely affects the infiltration of moisture into the soil (Amiri et al., 2008). The effect of trampling of soil on changes of vegetation cover and physical characteristics of the soil and found a decrease in grass-green cover at the end of the grazing period. This was attributed to cessation of growth of certain herbaceous species (Chaichi et al., 2005). However, the most prominent change could be the decrease of soil water availability with an increase of grazing intensity (Dormaar and Willms, 1998; Krzic et al., 2000; Sarmiento et al., 2004). The results show that the livestock
trampling have contributed to compacted soil surface, diversity composition and vegetation impacts to the decreasing soil infiltration rate. The present findings in UDA are also compatible with the findings of Mapfumo et al., (2000). The highly compacted soil in general shows a lower permeability and increased runoff (Saxena and Singh, 1984). Further, due to the inadequate vegetation cover and occurrence of denuded patches created as a result of over-grazing by domestic livestock, the direct sunlight received by soil surface at DA enhances the chances of evaporation. The reduction of soil moisture content due to grazing was also reported by Branson et al., (1981). It was observed that soil moisture in the disturbed area, ranged from 8.35 % to 17.36 % in 0-20 cm soil depth. In the Undisturbed area, the percentage of soil moisture content varied from 9.44 % to 18.73 % at 0-20 cm soil depth. Das et al., (1980) showed that the nature and content of organic debris returned to the forest vegetation varying with vegetation influenced the physiochemical properties of the soil from the direct impact of raindrops, thereby controlling soil erosion and increasing the moisture status in soil. This may be the reason for increased moisture percentage in UDA.

6.3.2 Soil pH

The soil pH of coastal environment is in alkaline range as pH ranged from 7.8 to 8.3. Ghosh and Mandal (1989) reported that soils of littoral forests have acidic reaction and are non-calcareous and alkaline. Thus the above results are similar to that of Ghosh and Mandal (1989). This is due to deposition of salts and low organic matter and microbial activity, will ultimately result in low organic acids (Singh et al., 1995). This is reflected in the present observation of soil pH, the higher value of pH was found in the disturbed area (8.88) and lower in the undisturbed area (8.11) at 0-20 cm soil depth. Muhibullah et al., (2005) reported the average similar pH values were found in
the Sharankhola, Chandpai, Nalianala and Burigoalini respectively for Sundraban mangrove in Bangladesh. Mohamood and Saikat (1995) reported the similar pH values in the soil of Chakaria mangrove area and consequently, this area have a rich reserve of pyrite in its soil. Soil pH influences the availability of plant nutrient and it is a good indicator of forest fertility (Black, 1968). Seasonal variation of pH depicted lowest values during the winter season at both sites (8.53-DA) and (8.11-UDA). Soil pH influences the mineralization of soil organic matter and other nutrient reserves, inhibiting the root growth and consequently, absorption of nutrients (Vermeer and Berendse, 1983). Soils with higher pH generally have a poorer capacity for regeneration (Suoheimo, 1995). The lower pH value at UDA may be due to the continuous decomposition of surface litter over the years and also be attributed to various climatic factors. Similar observations were also reported by Miller (1965); Shrestha (1992) and Kharkwal et al., (2009). Generally, fluctuations in pH values during different seasons of the year is attributed to factors like removal of CO$_2$ by photosynthesis through bicarbonate degradation, dilution of seawater by freshwater influx, low primary productivity, reduction of salinity and temperature and decomposition of organic materials as stated by Karuppasamy and Perumal, (2000) and Rajasegar, (2003).

6.3.3 Soil organic carbon

Soil organic matter is one of the most important soil components, which influences stabilization of soil structure and improving infiltration rate. Nowadays, soil organic matter stabilization is perceived as a mechanism for organic carbon storage in the soil in the context of current climate change (Goh, 2004). Indeed, soil organic carbon is the main terrestrial carbon pool (Batjes, 1996). Organic matter supplies
energy and cell building constituents for most microorganisms and is a critical factor in soil fertility (Allison, 1973). The soil organic carbon content of coastal soils is very low when compared with natural forest and cultivated lands. Among the mangrove vegetation soils, highest organic carbon (1.26%) was recorded on palm swamp vegetation and lowest in the salt water mixed vegetation (Brady, 1984). In the present observation organic carbon content of soil showed minimum variation (1.10%) during raining season to (1.20%) winter at UDA. These observations are within the range reported by Kharkwal et.al., (2009) and Kharkwal and Rawat (2010) in the vegetation in subtropical forest. The amount of soil organic carbon in the soil of the study area was found to be highest in the disturbed area (1.94%) and lowest in the undisturbed area (1.10%) at 0-20 cm soil depth. Earlier studies reveal that if the grazing intensity is increased, soil organic matter is also increased (FAO, 1988, 1998). The variation in undisturbed area may be partly due to poor litter accumulation as it is washed out with frequent flooding and slow decomposition rate as leaves of mangrove species which are thick and waxy in nature.

6.3.4 Total nitrogen

In the present observation total nitrogen in the soil was found to be highest in the undisturbed area (0.80 μg/g) and lowest in the disturbed area (0.39 μg/g) at 0-20 cm soil depth. Comparative values of total nitrogen at both sites revealed the highest value at UDA falls in parallel to the earlier findings (Lyaruu, 2010). In general, soil nutrients are most available in the raining and early summer when temperature and moisture are favourable, and mineralization, is rapid. Cold winter temperature limits microbial activity mitigated mineralization (Brooks et.al., 1996; Grogan and Jonasson, 2003).
6.3.5 Available phosphorus

Available phosphorus is considered as one of the most important parameters in the coastal environment influencing growth, reproduction and metabolic activities of plants. Distribution of nutrients is mainly based on the season, tidal conditions and freshwater flow from land sources. The available phosphorus (P) in the coastal environment is higher than that of non-forest lands. In the present observation the amount of available phosphorus was found to be highest in the undisturbed area (20.20 μg/g) and lowest in the disturbed area (4.32 μg/g) at 0-20 cm soil depth. Similar observation was reported that high concentration of inorganic phosphates observed during monsoon season might possibly be due to the intrusion of upwelling the creek, which increased the level of phosphate (Nair et al., 1984) The variation in available phosphorus content may be due to the various processes like adsorption and desorption of phosphates and buffering action of sediment under varying environmental conditions (Rajasegar 2003). The addition of super phosphates applied in the agricultural fields as fertilizers and alkyl phosphates used in households as detergents can be other sources of inorganic phosphates during season (Tiwari and Nair, 1993). In the present observation also the amount of available phosphorus was found to be highest in the Undisturbed area (20.20 μg/g) and lowest in the disturbed area 4.32 (μg/g) at 0-20 cm soil depth. The maximum available P (22.75 μg/g) and lowest (11.5 μg/g) were recorded in salt water mixed forest and. Thus study revealed that the available P content of mangrove vegetation of coastal environment was much higher than the cultivated lands, this variation may be due to the high P contribution of mangrove leaf litter (Hosur and Dasog, 1995: Wankhede and Prasad, 2008).
6.3.6 Exchangeable potassium

The potassium (K) in the coastal environment is higher than that of open vegetation area. In the present observation, in the disturbed area, the amount of potassium ranged from 290.50 μg/g to 315.20 μg/g at 0-20 cm soil depth. In the undisturbed area, the amount of potassium also fluctuated from 61.50 μg/g to 126.20 μg/g at 0-20 cm soil depth. The exchangeable K of mangrove vegetation soil varied between 256 μg/g and 824 μg/g, whereas in case of adjacent open vegetation area it ranged between 73 μg/g and 452 μg/g. Similar observations were made by Hosur and Dasog, (1995); Wankhede and Prasad, (2008), in coastal soils. Muhibullah et.al., (2005) reported the average potassium values is found 450-750, 250-450, 350-500 and 350-570 μg/g in Sharankhola, Chandpai, Nalianala and Burigoalini, respectively for Sundarban mangrove in Bangladesh. The amount of potassium was high (311 μg/g) in disturbed area and lower in (61.50 μg/g) at 0-20 cm soil depth in undisturbed areas. In general, forest and grasslands had a relatively higher availability of K. The high amount of K was also reported in shrink-swell soils by Pal and Durge, (1987); Patil and Sarar (1993), Srinivas Roa et.al., (1997) and Wankhede and Prasad (2008).

6.4 ANTHROPOGENIC INTERFERENCE

The present study in Tuticorin coastal vegetation is often transformed for various purposes like aquaculture, extension of residential, industrial or related developmental campuses. Among these, conversions to aquaculture or saltpans can be considered as irreversible change. The coastal ecosystems have been exploited by a wide range of man-made activities, livelihoods and local economies are strongly dependent upon access to mangrove resources. Clearing of mangrove trees from swamps render an irreversible change to the landform. Woody mangrove species are
frequently utilized for fuel and low quality timber product in Tuticorin. The salt pans are found in two areas in Tuticorin coast namely Tuticorin and Palayakayal on the mangrove ecosystem. When the mangrove areas is converted into salt pans, the mangrove areas got reduced, resulting in high salt concentration and sediment deposition. The fishermen living in the study areas are involved in destructive fishing practices. The best season for fishing and prawn catch is December to June. According to these fishermen, destruction of mangroves has reduced the availability of fishes considerably. Sand mining causes destruction of the river bed of Tamirabarni. It causes landslides, less influence of fresh water from the adjoining estuary and leaching out of well water from the adjoining land. This in turn results in the destruction of mangroves and other vegetation. The industries in Tuticorin creating solid and liquid waste dump them in the mangrove areas. In fact, pollution due to plastic material is found in the mud flats and mangrove areas. Pollution of the brackish water due to the industrial and sewerage discharge is a serious threat for species survival along the coastal belt of Tuticorin.

The anthropogenic disturbances play an important role in the change or loss of plant diversity in the coastal vegetation. During the present study it was observed that in the anthropogenic disturbances caused visible changes in the coastal environment, which were recorded during the field floristic survey as follows: activity like industry construction, building construction, temple construction, industrial waste deposition, solid waste deposition etc., sightings were done every day or every week, season wise sighting, monsoon wise (i.e) like grazing, medicinal and edible plant collection; occasional disturbances like temple visitors, sand mining, nearest habitation and dependence of people an vegetation etc. Similar observation of anthropogenic disturbances were also done by Venkateswaran and Parthasarathy (2003); Mani and
Parthasarathy (2006); Ahmad, (2008). Mangroves vegetation also is also highly threatened by construction of industries, dumping of solid waste, rural and urban settlements, which affects the rich diversity of flora and fauna in the coastal areas. Similar observation of threats to mangrove vegetation in the intertidal zones of tropical and subtropical coastlines were done by Abeysinghe et.al., (2000); Blasco et.al., (2001); Jennerjahn and Ittekkot (2002); Twilley and Rivera-Monroy (2005); Dahdouh-Guebas et.al., (2005); Duke et.al., (2007) and FAO (2007). Apart from those, conversion of coastal area to aquaculture, construction of port and harbour, extension of human habitation, over-grazing, urbanization, industrialization and chemical pollution are a major concern that dwindle coastal vegetation. Similar observation were reported by Jagtap et al. (1993); Blasco and Aizpuru (1997); Upadhyay et al. (2002); Naskar (2004).

6.5 REMOTE SENSING

In the present study it is observed that the land use area has changed in the coast. In mangrove vegetation a net change of 538 ha is observed due to conversion of Mudflat to other land use categories from 2003 to 2010. Similarly, an area of 432 ha mangrove vegetation has been gained from other land-use categories as a result of increased protection and consequent regeneration. In the sand dune vegetation it is observed that 8371 ha of open land was converted to other land use categories from 2003 to 2010. Similarly, an area of 3087 ha sand dune vegetation has been gained from other land-use categories as a result of increased protection and consequent regeneration. Riparian vegetation is purely localized and found above the tide level mainly in the Tamiraparani delta, and occupies an area of 1801 ha. A net change of 5576 ha is observed due to the conversion of open land to other land use categories.
from 2003 to 2010. Similarly, an area of 3775 ha with riparian vegetation has been
gained from other land-use categories as a result of increased. In scrub jungle
vegetation a net change of 629 ha is observed due to the conversion of open land to
other land use categories from 2003 to 2010. Similarly, an area of 86 ha scrub jungle
has been decreased. In Teri Vegetation a net change of 2513 ha is observed due to
conversion of open land to other land use categories from 2003 to 2010. Similarly, an
area of 464 ha Teri vegetation has been little gained from other land-use categories as a
result of increased. Open vegetation is the agricultural practice with gradual decrease
from 36,321 (2003) to 24,020 ha (2010). A net change of 4626 ha area was observed
due to the conversion of the land to agriculture land, salt pans, land industrial, buildings
and others by the surrounding villagers.

Similarly, many author have reported on the Land use/land cover changes
reflecting the dynamics observed in aquaculture farming, salt pans, land used for the
development of industries, building construction and others. (Jayakumar and
Arockiasamy 2003; Madan et.al., 2006; Navalgund et.al., 2007). The present study has
shown that there is a significant increase of 432 ha of mangrove vegetation, 3775 ha of
riparian vegetation, 3087 ha of sand dune vegetation, 464 ha of Teri vegetation and 86
ha of scrub jungle vegetation and open vegetation were decreased from 2003 to 2010.

6.6 CONSERVATION STRATEGY

Conservation is the planned management of natural resources, to retain the
natural balance, diversity and evolutionary change in the environment. Conservation is
required chiefly to prevent the loss of genetic diversity of a species, to save a species
becoming extinct and to protect an ecosystem from damage so as to promote its
sustainable utilization (IUCN, 1994).Traditional knowledge of medicinal or other uses
is a suitable tool for both botanical and conservation purposes of economic and threatened plant species (Sheldon et al., 1998). The present study is observed Traditional knowledge of medicinal plants used in coastal vegetation. *Tamarix indica* Willd is a new extended distributional record at the Tamiraparani Estuary of Tuticorin, *Tamarix indica* is also medicinally used. It is reassessed as Threatened because of reducing population size, stress posed on the coastal flora, and due to recent climatic variations in the region. The present habitat of *T. indica* provides an opportunity for its conservation but at the same time further studies need to be carried out, keeping in mind the recent environmental changes and habitat replacement. Hence this study will be a milestone for conservation of important rare and endangered species in their natural habitat.

The conservation of coastal vegetation is important considering the restricted geographical distribution and representation of the unique and under-studied coastal vegetation type, the extant level of biodiversity, and bio-resource potential including medicinal plants and the socioeconomic and ecological values of these systems. The following long-term conservation strategies are recommended to preserve these sites: (i) to promote awareness of biodiversity and bio-resource value to people living around the coastal vegetation sites. (ii) to restore moderately disturbed sites with characteristic coastal vegetation species, involving the local communities in restoration programmes and also in nurturing the plant saplings. (iii) to protect and conserve much disturbed sites by providing legal status to the coastal vegetation and development of coastal management systems involving the local communities. (iv) to propagate the endemic, rare, endangered or threatened species and economically important ones. (v) to prepare a locally implementable conservation plan for species and ecosystem conservation. (vi) to prohibit activities like conversion of coastal land for developmental purposes,
dumping of solid wastes, discharge of untreated sewage. (vi) to establish a laboratory facility to monitor physical, chemical and biological characteristics of soil and water.

Scope for further research in this area are (i) Biodiversity inventory – with entire food chain. (ii) Development of comprehensive database on biodiversity. (iii) Socio–economic studies in and around the coastal area.