SURVEY OF MANGROVES AND THEIR ASSOCIATES IN PICHAVARAM MANGROVE FOREST

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ABSTRACT

Mangroves are the most productive coastal ecosystems in the world. The Pichavaram mangrove forest is rich mangrove diversity in Tamil Nadu. The present survey was conducted in the Pichavaram mangrove forest including Killai, Pichavaram and T.S. Pettai. Totally 25 species were recorded in the study period including 12 mangroves and 13 mangrove associated plants. In Mangroves, Avicennia and Rhizophora species were found to be dominant species in Pichavaram mangrove forest. Six dominant associate species were found such as *Suaeda maritima, Suaeda monoica, Ipomoea pes-caprae* and *Sesuvium portulacastrum*. *Xylocarpus mekongensis* is an endangered species and it was recorded in a very few. The information generated from this study will serve as a baseline to develop adaptive management strategies in anticipation of sea-level rise, setting of conservation priorities, monitor, deforestation and forest degradation, improve terrestrial carbon accounting and quantify the role of mangrove forests in saving lives and property from natural disasters such as tsunamis.

Key words: Mangroves, Associates, Avicennia, Rhizophora, Conservation.

INTRODUCTION

Mangroves are among the most productive coastal ecosystems in the world (Kathiresan *et al.,* 2001). They are confined to the tropics and subtropics, which dominate approximately 75% of the world's coastline between 25° N and 25° S and are estimated to cover an area of 1.7 to 2.0× 105 km² (Borges *et al.,* 2003). Mangroves are trees and shrubs that grow in saline coastal habitats. Mangroves are a taxonomically diverse group of salt-tolerant, mainly arboreal, flowering plants (Ellison and Stoddart, 1991). They fall into two groups according to their habitats in nature: true mangroves and mangrove associates. True mangroves refer to species that specifically grow in intertidal zones, while mangrove associates are capable of occurring in either littoral or terrestrial habitats. Mangrove formations depend on terrestrial and tidal waters for their nourishment and silt deposits from upland erosion as substrate for support (Kathiresan, 2003). Substances in mangroves have long been used in folk medicine to treat diseases (Bandaranayake, 1998). Mangrove habitats of India have been facing tremendous threats due to indiscriminate exploitation of mangrove resources for multiple uses like fodder, fuel wood, timber for building material, alcohol, paper, charcoal and medicine (Upadhyay *et al.,* 2002).

The Pichavaram mangrove forest covers an area of about 1100 ha, of which 50% is covered by forest, 40% by water-ways and the remaining filled by sand-flats and mud-flats (Krishnamurthy and Prince Jayaseelan, 1983). The Pichavaram mangrove is influenced by mixing of three types of waters: 1. Neritic or costal water from the adjacent Bay of Bengal through a mouth called 'Chinnavaikkal', 2. brackish water from the Vellar and Coleroon estuaries and, 3. fresh water from an irrigation channel (Khan Sahib canal'), as well as from the main channel of the Coleroon river. The year for convenience is arranged into four seasons: 1. post-monsoon: January–March; 2. summer: April–June; 3. pre-monsoon: July–September; and, 4. Monsoon (north-east monsoon): October–December. The tides are semi-diurnal and vary in amplitude from about 15 to 100 cm in different regions during different seasons, reaching a maximum during monsoon and post-monsoon and a minimum during summer (Muniyandi, 1986). The rise and fall of the tidal waters is through a direct connection with the sea at the Chinnavaikkal mouth and also through the two adjacent estuaries. The depth of the water – ways ranges from about 0.3 – 3 m (Muniyandi, 1986). The present study aimed to survey the mangroves and their associates present in three different areas of the Pichavaram Mangrove forest.

MATERIALS AND METHODS

Study area:

Pichavaram mangrove forest (Lat. 11.20N; Long. 79,470 E) is located between the Vellar and Coleroon estuaries, near Chidambaram, Tamil Nadu. The forest occurs on 51 islets, ranging in size from 1100 Ha separated by intricate waterways, which connect the Vellar and Coleroon estuaries. The southern part near the Coleroon estuary is predominantly mangrove vegetation, while the northern part near the Vellar estuary is dominated by mud-flats. The Vellar estuary opens into the Bay of Bengal at Parangipettai and links

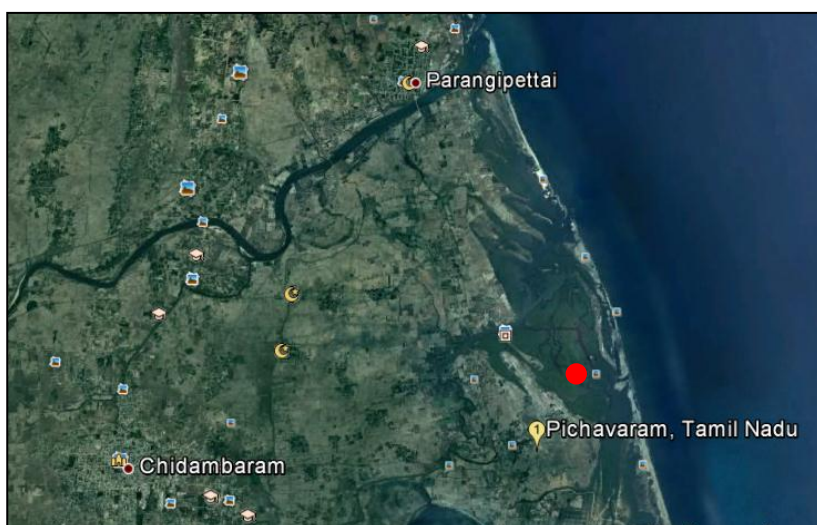with the Coleroon River, which is distributaries to the River Cauvery.

Figure 1: Study area-Pichavaram Mangrove forest

Data collection and duration:

The areas where mangroves and mangrove associated vegetation exists in Killai, T.S.Pettai and Pichavaram were first identified and documented. For the assessment of present biodiversity status, the mangroves, mangrove associated vegetations existing around the study area were considered for identification. Regular surveys were made throughout the forest to explore the successful results of the true mangroves and their associates. The mangroves and mangrove associated vegetation were plucked during their flowering and fruiting seasons for identification and took photographs with the help of camera. The nomenclature of the specimens followed Gamble (1957) and Matthew (1983). Plant specimens were collected whenever identification was not possible in the field. The collected specimens were identified with the help of the publications (Rajendran and Baskar Sanjeevi, 2004; Ramanathan, 1997). Nomenclatures of the identified species were checked with the International Plant Naming Index (IPNI).

RESULTS

Mangrove plants divided into two groups such as true mangroves and mangrove associates. Among them, 25 species were recorded in the study period including 12 mangroves **(Fig. 2)** and 13 mangrove associated plants. Totally 12 species of mangroves belonging to 9 genera and 7 families were recorded **(Table 1)**. *Avicennia marina, Avicennia officinalis* belongs to Avicenniaceae and *Rhizophora apiculata, Rhizophora mucronata* belongs to Rhizophoraceae was most dominant mangrove plant species in Pichavaram mangrove forest. In Pichavaram as well as T.S. Pettai *Avicennia marina, Avicennia officinalis* and *Rhizophora mucronata* was most dominant compared to Killai. In T.S. Pettai *Aegiceras corniculatum, Bruguiera cylindrica* and *Lumnitzera racemosa* was most dominant species compared to Pichavaram and Killai. *Xylocarpus mekongensis* is an endangered species and it was recorded in few numbers in Pichavaram.

Totally 13 species of mangroves associates belonging to 12 genera and 12 families were recorded in Pichavaram Mangrove forest. Six associates *Suaeda maritima, Suaeda monoica, Ipomoea pes-caprae* and *Sesuvium portulacastrum* were observed as dominant species **(Table 2)**.

S. No.	Species	Genus	Family	Order
1.	*Acanthus ilicifolius*	Acanthus	Acanthaceae	Personales
2.	*Aegiceras corniculatum*	Aegiceras	Myrsinaceae	Primulales
3.	*Avicennia marina*	Avicennia	Avicenniaceae	Lamiales
4.	*Avicennia officinalis*	Avicennia	Avicenniaceae	Lamiales
5.	*Bruguiera cylindrica*	Bruguiera	Rhizophoraceae	Myrtales
6.	*Ceriops decandra*	Ceriops	Rhizophoraceae	Myrtales
7.	*Excoecaria agallocha*	Excoecaria	Euphorbiaceae	Euphorbiales
8.	*Lumnitzera racemosa*	Lumnitzera	Combretaceae	Myrtales
9.	*Rhizophora apiculata*	Rhizophora	Rhizophoraceae	Myrtales
10.	*Rhizophora mucronata*	Rhizophora	Rhizophoraceae	Myrtales
11.	*Rhizophora annamalayana*	Rhizophora	Rhizophoraceae	Myrtales
12.	*Xylocarpus mekongensis*	Xylocarpus	Meliaceae	Sapindales
Total		**9**	**7**	**6**

Table 1: Distribution of Mangroves and their families

Figure 2: Distribution of Mangroves in Pichavaram mangrove forest

S. No.	Species	Genus	Family	Order
1.	*Arthrocnemum indicum*	Arthrocnemum	Chenopodiaceae	Ficoidales
2.	*Calotropis gigantea*	Calotropis	Asclepiadaceae	Gentianales
3.	*Citrullus colocynthis*	Citrullus	Cucurbitaceae	Cucurbitales
4.	*Clerodendrum inerme*	Clerodendrum	Verbenaceae	Lamiales
5.	*Derris trifoliata*	Derris	Fabacea	Fabales
6.	*Ipomoea pes-caprae*	Ipomoea	Convolvulaceae	Solanales
7.	*Pongamia pinnata*	Pongamia	Fabaceae	Fabales
8.	*Salicornia brachiata*	Salicornia	Chenopodiaceae	Ficoidales
9.	*Sesuvium portulacastrum*	Sesuvium	Aizoaceae	Ficoidales
10.	*Spinifex littoreus*	Spinifex	Poaceae	Poales
11.	*Suaeda maritima*	Suaeda	Amaranthaceae	Caryophyllales
12.	*Suaeda monoica*	Suaeda	Amaranthaceae	Caryophyllales
13.	*Heliotropium curassavicum*	Heliotropium	Boraginaceae	Boraginales
TOTAL		**12**	**12**	**10**

Table 2: Distribution of Mangrove Associates and their families

DISCUSSION

A total 39 mangroves species were identified from India (Kathiresan, 1999). Tomlinson (1986) reported 60 species mangrove associates belonging to 46 genera and 27 families that exist in the world mangroves. Along the east coast, the least number of mangrove species is present in Tamil Nadu (Deshmukh and Mahalingam, 1991). Our present study indicated that 12 Mangrove species and 13 associated species were present. Analysis of the distribution of true mangrove species in different areas of Pichavaram Mangroves wetlands indicates that *Acanthus ilicifolius, Aegiceras corniculatum, Avicennia marina, Bruguiera cylindrica, Ceriops decandra, Excoecaria agallocha, Lumnitzera racemosa, Rhizophora apicuata, Avicennia marina* are common to all the mangroves of Tamil Nadu. The Pichavaram is also characterized by the presence of a natural hybrid of *Rhizophora* species *Rhizophora annamalayana. Xylocarpus mekongensis* was also reported in Pichavaram by Kathiresan (2003).

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REFERENCES

1. Borges, A. V., Djenidi, S., Lacroix, G., The ´ate, J., Delille, B. and Frankignoulle, M. (2003): Atmospheric CO2 flux from mangrove surrounding waters, Geophys. Res. Lett., 30(11): 1558.

2. Ellison, J.C. and Stoddart, D.R. (1991): Mangrove ecosystem collapse during predicted sea-level rise: Holocene analogues and implications. Journal of Coastal Research., 7: 151-165.

3. Kathiresan, K., Bingham. and Brain, L. (2001). Biology of mangroves and mangrove eco-system.Adv.Mar.Biol.40,81–251.

4. Kathiresan, K. (2003). How do mangrove forests induce sedimentation? Rev. Biol. Trop., 51: 355-360.

5. Bandaranayake, W.M. (1998): Traditional and medicinal uses of mangroves. Mang. & Salt Marsh, .2: 133–48.

6. Upadhyay, V.P., Ranjan, R. and Singh, J.S. (2002): Human mangrove conflicts: The way out. Current Science., 83: 1328-1336.

7. Gamble J.S. (1957). Flora of the Presidency of Madras, Botanical Survey of India, Calcutta.

8. Matthew K.M. (1983): The Flora of the Tamilnadu Carnatic. The Rapinat Herbarium, Tiruchirapalli.

9. Rajendran, N. and Baskara Sanjeevi, S. (2004): Flowering Plants and Ferns in Mangrove Ecosystem of India, An Identification Manual. Environmental Information System (ENVIS), Centre for Advanced study in Marine Biology, Annamalai University, India.

10. Ramanathan, A.L. (1997): Sediment characteristics of the Pichavaram mangrove environment, southeast coast of India. Ind. J. Mar. Sci., 26: 319-322.

11. Kathiresan, K. (1999): Impact of mangrove biodiversity on associated fishery resources and fishers' income. A project final report submitted to WWF, Washington DC.: pp.142.

12. Deshmukh, S.V. (1991): Mangroves of India: Status report. In: Deshmukh S V, Mahalingam R, eds. A Global Network of Mangrove Genetic Resource Centres Project Formulation Workshop. Madras, India, 15–25.

13. Kathiresan, K. (2003): How do mangrove forests induce sedimentation?. *Revista de Biologia Tropical.,* 51(2): 355-360.

14. Krishnamurthy, K. and Prince Jeyaseelan, M. J. (1983). The Pichavaram (India) mangrove ecosystem. *Int. J. Ecol. Envir. Sci.*, 9: 79–85.

15. Muniyandi, K. (1986). Studies on mangroves of Pichavaram (southeast coast of India). Ph.D. Thesis, Annamalai University, Parangipettai, India: pp. 215.