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STATUS OF *SONNERATIA ALBA* (MANGROVE APPLE) FROM THE ASHTAMUDI LAKE, KERALA, INDIA

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Abstract: The 'Ashtamudi' is one of the largest wetland ecosystems in Kerala and is flourished with immense life varities covering all groups. *Sonneratia alba* (Mangrove apple) was the selected species in the study. Percentage of foliage cover were observed and it was noted that the Ashtamudi Lake was covered by *Sonneratia alba* with it's foliage by about 57%, The second dominant species is *Acanthus ilicifolius* (Shore purslane) which contribute about 24%, An overlap of both the species were also found by about 8% Other species of mangroves and non-mangrove foliage contribute the rest 11%. The water samples collected from the 20 different zones, half of it as representatives of polluted and the another half as of unpolluted zones of lake, analysed by the Winkler's method clearly shows the less amount of dissolved oxygen (0.8ppm) in the polluted water and a better status (3.136ppm) for the unpolluted water.

Key words: Ashtamudi lake, Pollution, Mangrove apple

INTRODUCTION

The mangroves are fragile complex and dynamic ecosystem. The importances of mangroves are innumerable and the habitats formed in those areas are extremely isolated with a unique texture. The faunal aspects in these areas are specific to mangrove ecosystem. Kerala is well known for brackish water systems, once mangroves were really a part of it and now facing the verge of extinction. Not only the mangroves but also thousands of unique and mutually related faunal aspects may also perish in the nearby feature if not conserved properly. (Ananda Rao *et al*., 1998)

The 'Ashtamudi' is one of the largest wetland ecosystems in Kerala. This estuarine system lies in Kollam district and is the second largest wet land of the state. It is a palm shaped extensive water body with eight prominent arms (*Ashta** = Eight; *Mudi*^ = Hair), adjoining the Kollam Town. The arms converge into a single outlet at Neendakara, to enter the Lakshadweep Sea. This estuary is the deepest among all the estuaries of Kerala with a maximum depth of 6.4 m at the confluence zone. The major river discharging into the Ashtamudi is the Kallada river which originates from the Western Ghats and travels around 120 Km. Ashtamudi lake has been designated as RAMSAR SITE in November 2002.

In this study *Sonneratia alba* (Mangrove apple), the most abundant mangrove plant in the lake were taken to study its niche specialties. Plant morphological studies in relation with its ecological significance were taken. This species is common throughout its range, although like many mangrove species is less common at the extremities of its range. In India, this species was found in 40% of 100 sampling sites (Kathiresan *et al*., 2001, 2005). It was estimated that mangrove loss in the last quarter-century report an approximately 20% decline in mangrove areas in countries within this species range since 1980 (FAO 1990, 1997, 2007). Summing up the status of 'Least concerned' in the IUCN-SSC (Species Survival Commission) there were no conservation Actions particular to this species in the world except that this species is planted in mangrove restoration projects in India and Philippines.

* Sanscrit ė=Malayalam

MATERIALS AND METHODS

Study site

Ashtamudi lake located in the Kollam district, is the second largest estuarine system in Kerala with a water spread area of about 32 km^2 the lake is located between latitude 8° 53'-9° 2' N and longitude 76° 31'- 76° 41' E. The main basin is approximately 13 km long and the width varies from a few 100 m to about 3 km. Kallada river majorly contribute an annual discharge of 75 X 10^9 M^3 of water into this lake. It is formed by the confluence of three rivers, Viz., The Kulathoopuzha, The Chendurni and The Kalthurathy. The lake opens to the Arabian Sea at Neendakara, south west coast of India. Several major and minor drainage channels loaded with waste products from municipal and industrial sources join the lake at the southern end. Coconut husk retting for coir fibre manufacture is predominant at several location in the eastern arm of the estuary. This lake is the deepest among all the estuaries of Kerala with a maximum depth of 6.4 m at the confluence zone.

Randomly selected 20 locations of 5M X 5M were selected and Mangrove species variance were observed. Another 20 locations half of it representing polluted zones and the next half representing unpolluted zones were selected.

Selected plant

The Mangrove apple (*Sonneratia alba*) is the most widespread of the Mangrove trees (genus *Sonneratia*, family *Lythraceae*). They are found from East Africa through the Indian subcontinent, Southeast Asia, northern Australia, Borneo and Pacific Islands. Growing up to 15m tall, they have cream, grey to brown bark with slight vertical fissures, with no buttresses or prop roots. Their pneumatophores are cone-shaped. Leaves are rounded, leathery, opposite, with similar upper and undersides of the leaf. Flowers are white and pom-pom-like and open only for one night. Their fruits are large green, leathery berries with a star-shaped base containing 100-150 tiny seeds.

Sonneratia alba can tolerate wide fluctuations in salinity and often grow on exposed, soft but stable mud banks low on the tidal mudflats along banks of tidal rivers, creeks and within sheltered bays of offshore islands and reef cays. It is believed that they store excess salt in old leaves which they later shed. They are able to survive inunduation by salt water twice a day, and in "soil" which is unstable and poor in oxygen (anaerobic). They also have to deal with swollen rivers carrying silt during the wet season, as well as violent storms that hit the coasts ie; they are best species suitable to estuarine habit (Kathiresan *et al*., 1991; Ramesh *et al*., 1999).

They provide a variety of important ecosystem roles: a refuge and food for a variety of flora and fauna, a natural water filter, and an important stabilizer of coastal and river banks. Their roots prevent mud and sand from being washed away with the tide and river currents. Mangrove trees also slowly regenerate the soil by penetrating and aerating it (other creatures such as crabs and mud lobsters also help in). As the mud builds up and soil conditions improve, other plants can take root. Mangrove trees also reduce the damage from violent storms.

Biochemical Analysis

For analysing the dissolved oxygen (DO) content. The chemical determination of oxygen concentrations in water is based on the method first proposed by Winkler (1888) and modified by Strickland and Parsons (1968). Oxygen in the water sample oxidizes iodide ion (I^-) to iodine (I_2) quantitatively. The amount of iodine generated is then determined by titration with a standard thiosulfate ($S_2O_3^{-2}$) solution. The endpoint is determined by using starch as a visual indicator. The amount of oxygen can then be computed from the titer: one mole of O_2 reacts with four moles of thiosulfate. At the time of sampling, dissolved oxygen is fixed by the addition of Mn (II) under basic conditions, resulting in a brown precipitate, manganic hydroxide ($MnO(OH)_2$). Prior to analysis, the sample is acidified to pH 1.0-2.5. This causes the precipitated hydroxides to dissolve, liberating Mn(III) ions. Mn(III) ions oxidize previously added iodide ions to iodine. Iodine forms a complex (I_3^-) with surplus iodide ions. Iodine and the complex exist in equilibrium; thus, I_3^- serves as a reservoir of I_2. The iodine is then

titrated with thiosulfate; iodine is reduced to iodide and the thiosulfate is oxidized to tetrathionate. The stoichiometric equations for the reactions described above are:

$Mn^{+2} + 2OH^- \rightarrow Mn(OH)_2$
$2Mn(OH)_2 + ½\ O_2 + H_2O \rightarrow 2MnO(OH)_2$
Oxidation of Mn (II) to Mn (III)
$2Mn(OH)_3 + 2I^- + 6H^+ \rightarrow 2\ Mn^{+2} + I_2 + 6\ H_2O$
Oxidation of I^- to I_2
$I_2 + I^- \leftrightarrow I_3^-$
$I_3^- + 2S_2O_3^{-2} \rightarrow 3I^- + S_4O_6^{-2}$
Oxidation of $S_2O_3^{-2}$ to $S_4O_6^{-2}$; reduction of I_3^- to I^-

Public survey

A survey regarding 'Awareness for mangrove to public' were carried among **100** randomly selected peoples of the age ranging from 18 to 70.

DISCUSSION

Kollam is the only revenue district in India with the glory of two wetlands declared as RAMSAR sites. The Ashtamudi Lake and the freshwater Sasthamcotta Lake is the second RAMSAR site in the district, both were designated on the same day. The shores of Ashtamudi Estuary are home to thousands of people and become the bio-spots of Kerala by sheltering a large species of flora and fauna. Their future will be significantly affected by decisions made today concerning the estuary's resources and its sustainable management. About 70-80% of the lake shore was bathed in the shades of mangrove foliage.The present study covers the percentage of foliage cover in the selected 20 locations of the Shore of Ashtamudi Lake. $5M^2$ areas from each of these locations were observed and the plant diversity was noted. It was observed that the lake was covered by *Sonneratia alba* (Mangrove apple) with its foliage by about 57%. From the rest it was noted that 24% was covered by *Acanthus ilicifolius* (Shore purslane). *A. ilicifolius* was showing significant niche distinction from *S. alba* by preferring more water shed areas and has a slight shade preference by about 30%, hence due to these facts an overlap of both the species were also found by about 8%. Other species of mangroves and non-mangrove foliage contribute the rest 11% (Fig. 1).

The unscientific disposal of sewage into water bodies' cause grave problems to the aquatic environment since this is a global issue the respective was demanding same significance in the Ashtamudi lake also. Current study also underlines the issue of pollution by means of DO from selected 10 each locations of seemed to be polluted and unpolluted. It was observed that to an average DO value was very less ie; 0.8ppm in polluted water and the same was in a better status on unpolluted zones. (Table 1). Survey in the topic of 'Awareness for mangrove to public' clearly frames the illiteracy of public about the need for conservation of mangroves and its importance (Fig. 2).

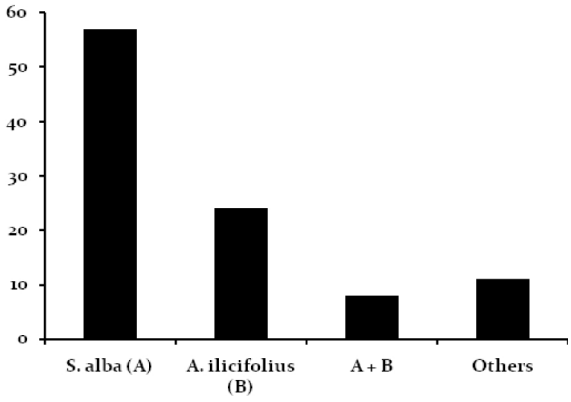

Fig. 1. Bar diagram showing percentage distribution of mangrove species in the area of study, *S. alba* dominates in the bar length significantly.

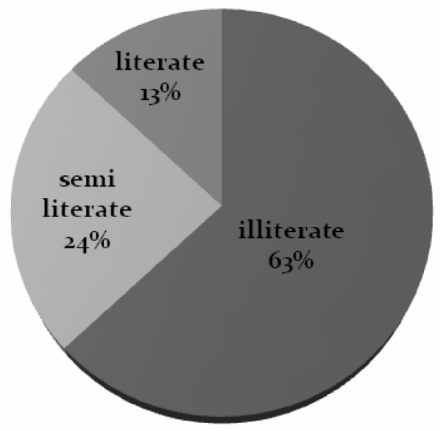

Fig. 2. Pie diagram showing public awareness status in percentage for mangrove conservation and importance

Table 1. Dissolved Oxygen (DO) relative results of 10 samples each from both polluted and un polluted areas of the study area by Winkler's method

Unpolluted		Polluted	
3.13	3.26	0.8	0.91
4.25	3.79	0.76	1.1
3.12	3.24	0.84	0.54
2.75	4.14	0.92	0.32
4.14	3.75	0.61	0.56
$\bar{x}$	**3.55**	$\bar{x}$	**0.73**

The Ashtamudi mangrove ecosystem is a mere representative of fragile complex and dynamic ecosystem of Kerala. The importances of mangroves are innumerable and the habitats formed in those areas are extremely isolated with a unique texture. The faunal aspects in these areas are specific to mangrove ecosystem. Kerala is well known for brackish water systems, once mangroves were really a part of it and now facing the verge of extinction. The study encompasses the fact for the need of conservation the lake demands by holding the IUCN red listed least concerned species *S. alba*, not only the mangroves but also thousands of unique and mutually related faunal aspects may also perish in the nearby feature if not conserved properly.

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