



ISSN: 2348-1900

Plant Science Today

<http://horizonepublishing.com/journals/index.php/PST>



Research Article

Studies on mangrove diversity of India with special reference to Lothain island wildlife sanctuary

Goutam Brahma¹ and Sobhan Kumar Mukherjee²

¹Bill Joypur High School, Howrah 711205, , West Bengal, India

²University of Kalyani, Kalyani 741235, Nadia, West Bengal, India

Article history

Received: 8 January 2016

Accepted: 12 January 2016

Published online: 18 January 2016

© Brahma and Mukherjee (2016)

Editor

K. K. Sabu

Publisher

Horizon e-Publishing Group

Corresponding Author

Goutam Brahma

✉ goutam.bsi@gmail.com

Abstract

Mangroves are extremely important bio-resources that are crucial to coastal environment. Indian mangrove vegetation covers about 6,756 sq. km. Along the 7516.6 km long coast line, including island territories. Estimates of the number of species considered, mangroves in the world ranges from 50-90, and in India from 50-60. Mangroves are declining rapidly as they are getting degraded for agriculture, aquaculture, tourism, urban development and over exploitation. India lost 40% of its mangrove area during the last century. The present work is focused on assessing the status of mangrove area in India with special reference to the Lothian Island Wildlife Sanctuary in Sundarbans. Total 30 species were collected during the field visits. Among them 16 species are major mangroves and 14 are mangrove associates. Effective governance structures, better planning for rehabilitation of degraded mangroves, education and awareness building in local communities are needed to conserve, protect and restore the valuable mangrove wetland ecosystems.

Keywords

Mangrove; wildlife sanctuary; succession; zonation

Brahma, G. and Mukherjee, S. K. 2016. Studies on mangrove diversity of India with special reference to Lothain island wildlife sanctuary. *Plant Science Today* 3(1): 25-29. <http://dx.doi.org/10.14719/pst.2016.3.1.186>

Introduction

Mangroves represent the most unique forest ecosystem, situated at the interface between land and the sea of tropical and subtropical latitudes. It supports genetically diverse groups of aquatic and terrestrial organisms. As the mangrove environment includes diversified macro habitats such as forests, litter floor, mudflats, water bodies, coral reefs and sea grass ecosystem, there is a remarkable coverage of biodiversity which is still not fully explored and needs full documentation.

World Status of Mangroves

Mangroves are distributed in about 112 countries of the world in the tropical and subtropical zones, covering a total area of about 18 million hectares.

Mangroves are mainly found between 32° N and 38° S latitudes along the tropical coast of Africa, Australia, Asia and Americas (Table 1).

The Old World Tropics (Indo-West Pacific regions) is the most important in respect of abundance of several true mangrove species and richness of mangrove zones (Finlayson and Moser, 1991). Mangroves and their associated flora grow best in the areas where the existing adequate rain fall is ranging from 1000 mm to 3000 mm/ year with high atmospheric humidity (Anon., 1978). Out of the total area of world mangroves, 414.4 % exist in South and South-east Asia, followed by the Americas (27.1%). The Indo-West Pacific mangroves or the Old World mangroves are estimated to be spread over an area of about 1,02,631 sq km and

Table 1. Areal coverage of Mangrove Forests (Spalding, 1997)

Sl. No.	Region	Area in sq. km. (% of Total Area)
1.	South and South-East Asia	75,170 (41.4%)
2.	The Americas	49,096 (27.1%)
3.	West Africa	27,995 (15.4%)
4.	Australia	18,788 (10.4%)
5.	East Africa & Middle East	10,348 (5.7%)

Table 2. Indian Mangrove Areas (Anon., 1987)

Sl. No.	Region	Area in sq. km. *(% of Total Area)
East Coast		
1.	Sundarbans	4200 (62.2 %)
2.	Orissa Coast/ Mahanadi Delta	150 (2.2 %)
3.	Andhra Pradesh Coast	200 (3 %)
4.	Tamil Nadu Coast	150 (2.2 %)
5.	Andaman and Nicobar	1190 (17.7 %)
West Coast		
6.	Kerala Coast	16 (0.2 %)
7.	Karnataka Coast	60 (0.9 %)
8.	Goa Coast	200 (3 %)
9.	Maharashtra Coast	330 (4.9 %)
10.	Gujrat Coast	260 (3.8 %)
11.	Lakshadwip/ Minicoy	0.25

(*Calculated considering the total area of both East and West Coast)

the New World mangroves over an area of about 71,029 sq km (Macintosh, 1984; UNESCO, 1984).

Indonesia and Brazil shows the highest mangrove cover area of about 25,000 sq km. The next dominant mangrove area is in the Australia covering about 11,620 sq km Mangrove areas in Brazil and Australia are more than Sundarbans. However, these mangrove zones are scattered and the mangrove species diversity is less than that of the Sundarbans mangals. The undivided Sundarbans in India and Bangladesh with a total area of about 10,000 sq km is the largest continuous mangrove patch. This is the only 'mangrove habitat tiger land' in the world.

Indian Mangroves

In India, the mangroves are mainly restricted in patches in both the east and west coasts and in Andaman and Nicobar islands. The total mangrove area in India is reported as 6,756 sq km, out of which 5,890 sq km is in the East Coast and 866.25 sq km under West Coast (Anon., 1987) (Table 2).

Mangroves are wide spread on the East Coast of India due to nutrient rich alluvial soil formed by 6 major rivers- *Ganges, Brahmaputra, Mahanadi, Godavari, Krishna* and *Cauvery*. All these rivers have flow of freshwater along their deltaic coasts (Gopal and Krishnamurthy, 1993). Moreover, the smooth gradual sloping in the East Coast provides

a large span of area for successful colonization of mangroves (Untawale, 1986).

Three different types of mangrove habitats, namely deltaic, backwater-estuarine and insular are dominant in India (Kathiresan and Qasim, 2005). Besides the three types of mangrove habitats, the Indian mangroves are again classified based on their spatial and temporal variations of environmental factors (Selvam, 2003). The categories are- (i) tide-dominated as in Sundarbans and Mahanadi mangroves; (ii) river-dominated as in Godavari, Krishna, Pichavaram and Muthupet mangroves and (iii) drowned river valley type for Gujarat mangroves.

Mangroves of Indian Sundarbans

The Sundarbans is the largest contiguous mangrove patch in the world formed at the estuarine mouth of the Ganga-Brahmaputra river system, both in India and Bangladesh. It occupies the lower part of the Bengal Basin. This is the only mangrove-tiger land on the globe, where the world famous 'Royal Bengal Tiger' still lives. Sundarbans mangrove forest area in Bangladesh is estimated to be about 66 %, while Indian Sundarbans covers an area of about 34 % of the total (Naskar and Mandal, 1999).

Three centuries back, the total forests and river area in undivided Sundarbans, of present day's

Table 3. Major mangroves collected during the quadrat study

Sl. No.	Scientific Name	Family	Local Name
1	<i>Acrostichum aureum</i> L.	Adiantaceae	Hudo
2	<i>Aegialitis rotundifolia</i> Roxb.	Plumbaginaceae	Tora
3	<i>Aegiceras corniculatum</i> (L.) Blanco	Myrsinaceae	Khalsi
4	<i>Avicennia alba</i> Blume	Avicenniaceae	Kalo Baine
5	<i>Avicennia marina</i> (Forssk.) Vierh.	Avicenniaceae	Peyara Baine
6	<i>Avicennia officinalis</i> L.	Avicenniaceae	Jat Baine
7	<i>Bruguiera gymnorrhiza</i> (L.) Lam.	Rhizophoraceae	Kankra
8	<i>Bruguiera parviflora</i> (Roxb.) Wight. & Arn. ex Griff.	Rhizophoraceae	Bon Bakul
9	<i>Ceriops decandra</i> (Griff.) Ding. Hou.	Rhizophoraceae	Jat Goran
10	<i>Ceriops tagal</i> (Perr.) C.B. Robins.	Rhizophoraceae	Mat Goran
11	<i>Excoecaria agallocha</i> L.	Euphorbiaceae	Gnewa
12	<i>Nypa fruticans</i> Wurmb.	Arecaceae	Golpata
13	<i>Phoenix paludosa</i> Roxb.	Arecaceae	Hental
14	<i>Rhizophora apiculata</i> Blume	Rhizophoraceae	Garjan
15	<i>Sonneratia apetala</i> Buch.-Ham.	Sonneratiaceae	TakKeora
16	<i>Xylocarpus mekongensis</i> Pierre	Meliaceae	Pussur

India and Bangladesh, was more than 20,000 sq km and restricted within 21° N to 22°31' N latitude and 88°10' E to 92°15' E longitude. During partition of Bengal (1947), more than 66% of the total mangrove forest of Sundarbans had fallen within the jurisdiction of Bangladesh and only 34% remained within India, between 21°31' N to 22°30' N latitude and 88°10' E to 89°51' E longitude. Geographical location of Sundarbans lies south-east of Kolkata and forms the part of Gangetic Delta which borders on the Bay of Bengal (Morgan and McIntire, 1959).

Indian Sundarbans was declared as a biosphere reserve in the year 1989. This Biosphere Reserve supports 4266.66 sq. km (66%) area out of a total 6419 sq km mangrove cover area in India (Naskar, 2004). Considering the importance and uniqueness, the Sundarbans has been accepted in the Global Network of Biosphere Reserves by UNESCO in 2001. The mangrove forest of Sundarbans was also declared as a 'World Heritage Site' and 'Ramsar Wetland Site' for proper preservation of its flora and fauna.

Sunderban Biosphere Reserve in India covers a total area of 9,630 sq km, of which an area of about 1,692 sq km is designated as core zone and an area of 2,233 sq km as buffer zone. The buffer zone includes three (3) Wildlife Sanctuaries namely Sajinakhali (362 sq km), Lothian Island (38 sq km) and Haliday Island (6 sq km).

Area of Study

Lothian Island is the second largest Wildlife Sanctuary located in Indian Sundarbans. This island covering an area 38 sq km was notified as Sanctuary in 1948 and re-notified through notification number 5392- For dated 24th June,

1976. Considering the existence of unique flora and fauna of the Sundarban- the Lothian Island was declared as Wildlife Sanctuary in the year 1976. It is situated at the confluence of river Saptamukhi and the Bay of Bengal. In the northern part of the island, the ground level is high, while in the northern part land is low.

Materials and Methods

The study was conducted only in the mangrove forest area not in the reclaimed lands. Survey was undertaken in the reserved forests areas of Lothian Island Wildlife Sanctuary of Sundarban Biosphere Reserve.

The survey for floristic data collection was conducted with the help of mechanical boats, launches and on foot wherever possible. Since the canopy height is low, the visibility was magnified using binoculars. The small creeks were studied with smaller hand driven country boats.

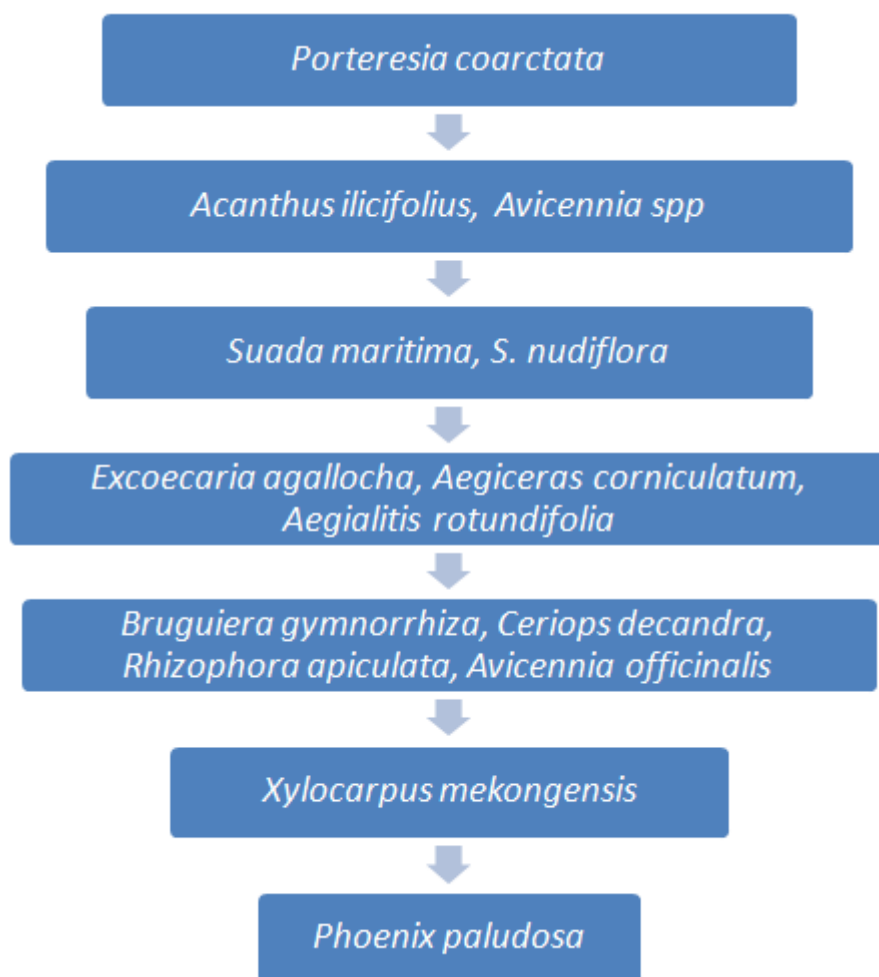
Results and Discussion

Total 30 species were collected during the field visits. Among them 16 species are major mangroves (Table 3) and 14 are mangrove associates (Table 4). They belong to 23 families.

Zonation of plant communities in intertidal habitats is particularly striking and often results in monospecific bands of vegetation occurring parallel to the shoreline. Although zonation patterns are usually depicted in a manner that suggests a rigid sequence proceeding from the shoreline to upland regions, many patterns resemble a mosaic with vegetational patterns occurring repeatedly where the land mass is interrupted by watercourses or other variations in

Table 4. Mangroves associates collected during the quadrat study

Sl. No.	Scientific Name	Family	Local Name
1	<i>Acanthus ilicifolius</i> L.	Acanthaceae	Hargoja
2	<i>Caesalpinia bonduc</i> (L.) Roxb.	Caesalpiaceae	Natakaranja
3	<i>Caesalpinia crista</i> L.	Caesalpiaceae	ShingrLata
4	<i>Clerodendrum inerme</i> (L.) Gaertn.	Lamiaceae	Banjui
5	<i>Derris scandens</i> (Roxb.) Benth.	Fabaceae	Noa lata
6	<i>Derris trifoliata</i> Lour.	Fabaceae	Panlata
7	<i>Dalbergia horrida</i> (Dennst.) Mabb.	Fabaceae	Chulia Kanta
8	<i>Heliotropium curassavicum</i> L.	Boraginaceae	Hatisur
9	<i>Ipomoea pes-caprae</i> (L.) R. Br.	Convolvulaceae	Chhagal Knuri
10	<i>Phragmites vallatoria</i> (Pluk. ex L.) Veldkamp	Poaceae	Nalkhagra
11	<i>Porteresia coarctata</i> (Roxb.) Tateoka	Poaceae	Dhani Ghas
12	<i>Suaeda maritima</i> (L.) Dum	Chenopodiaceae	Giria sak
13	<i>Suaeda nudiflora</i> (Willd.) Moq.	Chenopodiaceae	Giria sak
14	<i>Thespesia populnea</i> (L.) Soland ex Correa	Malvaceae	Parespipal

**Fig. 1. Flow chart showing the succession pattern of Lothian Island**

topography. The large variation in floristic composition of mangrove communities means that patterns of species distribution across the

intertidal zone will vary substantially among geographic regions.

Plant Succession Pattern in Lothian Island:

A well marked succession pattern of mangroves in newly silted char-lands is observed during the field work. Succession is observed with the first appearance of *Porteresia coarctata* in newly formed stable lands, followed by the appearance of *Avicennia marina*, *A. alba* and *Acanthus ilicifolius*. A flow chart is presented to understand the succession pattern (Fig. 1). Zonation patterns in mangrove forests may also vary on a local scale. Occurrence of species may differ across an estuary, apparently in response to differences in freshwater input. For example, species found at the seaward end of the estuary may be absent from the headwaters. Although zonation typically refers to patterns created by segregation of different species, differences in stature and productivity of plants across environmental gradients may also result in readily discernible patterns. Zones may be comprised of different architectural forms that represent variations in height and vigour.

Acknowledgements

The first author is grateful to Dr. H.S. Debnath (former H.O.O. And Scientist 'E', Acharya Jagadish Chandra Bose Indian Botanic Garden, Botanical Survey of India), for his valuable suggestions and supervision. The authors would like to thank West Bengal Forest Department, DFO South 24-Parganas for giving their permission to undertake the study and for providing forest guards.

References

- Anonymous, 1978. Report of the UNESCO. Regional Seminar held in Dacca, Bangladesh.
- Anonymous, 1987. *Mangroves in India- Status Report*. Government of India, Ministry of Environment and Forests, New Delhi.
- Gopal, B. and Krishnamurthy, K. 1993. Wetlands of South Asia. In: Whigham, D.F., Dy Kyjova, D. and Hejny, S. (eds.), "*Wetlands of the World*": Kluwer Academic Publishers, Netherlands. pp. 345-414. doi:10.1007/978-94-015-8212-4_10
- Kathiresan, K. and Qasim, S.Z. 2005. *Biodiversity of Mangrove Ecosystems*. Hindustan Publishing Corporation (India), New Delhi.
- Macintosh, D.J. 1984. Ecology and productivity of Malaysian mangrove crab population. In: Soepadmo, E., Rao, A.N. and Macintosh, D.J. (eds.), *Proceeding Asian Symposium on "Mangrove Environment and Research Management"* University of Malaya, Kuala Lumpur, Malaysia. Pp. 354-377.
- Morgan, J.P. and McIntire, W.G. 1959. Quaternary Geology of the Bengal Basin, East Pakistan and Burma. *Bull Geol. Soc. Am.* **70**: 319-342. doi: 10.1130/0016-7606(1959)70[319:QGOTBB]2.0.CO;2
- Naskar, K.R. 2004. *Manual of Indian Mangroves*. Daya Publishing House, Delhi.
- Naskar, K.R. and Mandal, R.N. 1999. *Ecology and Biodiversity of Indian Mangroves*. 2 vols. Daya Publishing House, Delhi.

- Selvam, V. 2003. Environmental classification of mangrove wetlands of India. *Curr. Sci.* **84** (6): 757-765.
- Spalding, M. 1997. The global distribution and status of mangrove ecosystems. *International News Letter of Coastal Management- Intercoast Network*. Special edition **1**: 20-21.
- UNESCO, 1984. *Handbook of Mangrove Area Management*. Edited by Lawrence, S. Hamilton and Snedaker, S.C.
- Untawale, A.G. 1986. *Hoe to Grow Mangroves? A field guide*. Prepared by NIO, Dona Paula, Goa, WWF for Nature, Bombay, India (2nd Edition). pp. 1-9.

