



Quantitative Estimation of Mangroves and Their Associates' Marshy Lands at Palghar District in Maharashtra

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Article History	Abstract
Received: 06 June 2023 Revised: 05 Sept 2023 Accepted: 10 Oct 2023	<i>Mangroves are the shrubs or trees growing in coastal saline or brackish water. The ecological study has practical applications in conservation biology, wetland management, natural resource management, city planning community health economic, basic & applied science & human social interaction. Mangrove ecosystems are highly productive but extremely sensitive and fragile. The present study deals with quantitative estimation, density, abundance and diversity index of mangroves located in western coastal region of Maharashtra, the Palghar district which is also a part of Konkan tract or Konkan coast. In the study area of Palghar coastline, out of 16 recorded species, 13 species are true mangrove from 4 genera & 8 families are observed. The flora from family Acanthaceae, Primulaceae, Fabaceae, Convolvulaceae, Combretaceae, Rhizophoraceae, Salvadoraceae, Aizoaceae, Lythraceae, Amaranthaceae are recorded as mangroves and their associates at 5 marshy locations of Palghar coastlines. Due to anthropogenic activity, industrialization & tourisms, sewage water and non-degradable wastes like plastic wrappers, plastic bottles get deposited in the marshy areas which is the reason why the mangrove are degraded. The covered upline areas with plastic suffocate the roots, even the pneumatophores and plants die due to suffocation. Until the adaptation for the plastic-coated marshy lands has not been developed in mangrove plants.</i> Keywords: Mangroves, Quantitative estimation, Abundance, Density, Diversity index
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1. Introduction

The successional development of ecosystem is counted by the abundance, biomass & distribution of organisms in the context of the environment. Patterns of biodiversity & its effect on ecosystem processes are studied by many researchers. The ecological study has practical applications in conservation biology, wetland management, natural resource management, city planning community health economic, basic & applied science & human social interaction. The mangroves are the shrubs or trees growing in coastal saline or brackish water. The term is also used for tropical coastal vegetation consisting of such species. Clough, (2013), claims that mangrove forests consist trees, shrubs and ferns which occupies the inter-tidal areas between land and sea of tropical and subtropical regions. He further adds that in late 19th Century French, German, Dutch and British naturalists described many traditional uses of mangroves. The British, Dutch and French foresters were beginners to practice mangrove silviculture and also supplied timber and other forest products to Bangladesh and Malaysia. The majority of the mangrove forests are found between latitudes of 30°N and 30° S. Mangroves are under threat from pollution, clearance and over-exploitation, and increasing concern has driven demand for an improved understanding of mangrove species (Tomlinson, P.B., 2016). Jennerjahn and Venugopal, 2002 reported that the mangroves are the most productive ecosystems and by their high carbon

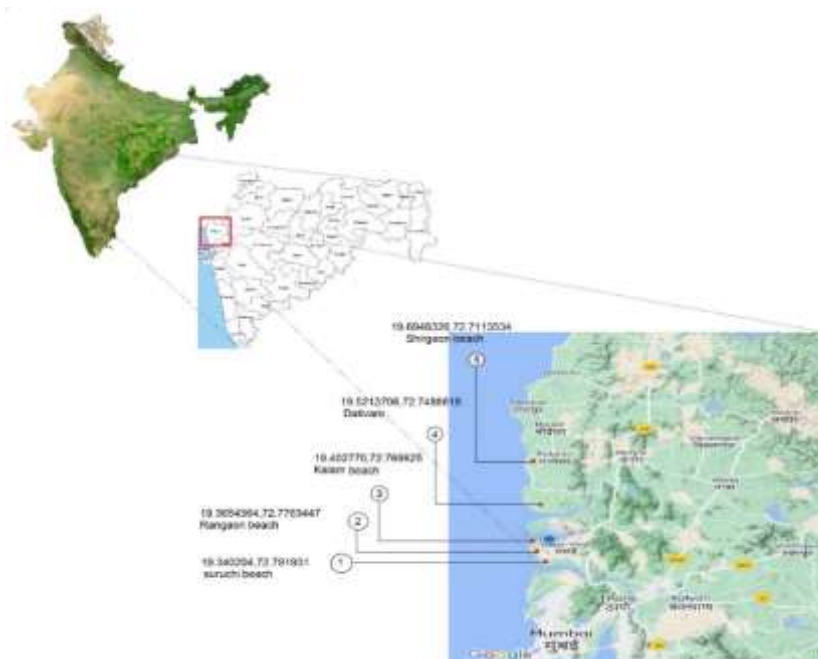
sequestering potential, they play a significant role in mitigation of increasing atmospheric carbon dioxide

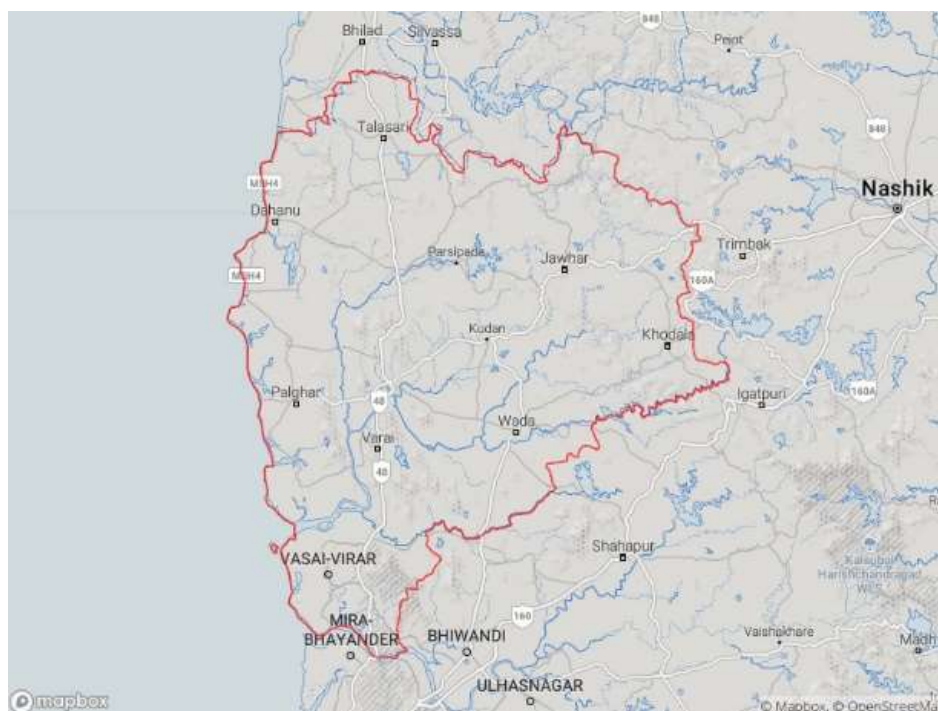
Kantharajan, G., *et al.* 2018 reported that the Mumbai coast has 66 km² of mangrove cover while Maharashtra has notified around 121 hectares of mangrove area in Palghar district as forest land under the Indian Forest Act (IFA). Blatter, 1905 has provided a comprehensive account of mangroves of Mumbai coast and reported 14 species. ‘‘Flora of the Presidency of Bombay’’- vol. I and vol. II, (Cooke, 1903, 1908), has listed 15 true mangrove species. *Avicenna Alba* was reported by (Cooke 1903, 1908) but was not included by (Blatter 1905). Thereafter, Navalkar and Bharucha, 1948, 1950 reported detailed ecology, distribution and succession pattern of mangroves of Mumbai coast. (Jagtap, *et al.* 2001) reported increasing anthropogenic stress on mangroves along the Mumbai coast which affected in decrease in the area of mangroves in Maharashtra. Mangrove ecosystems are found on almost all continents. However, according to (Giri *et al.* 2011), only 79.1% of the global mangrove area are seen in 19 small countries which includes, Indonesia, Australia and Brazil to play a remarkable role as they contain 22.6%, 7.1% and 7.0%, of the world’s mangroves respectively to contribute about 36.7% total mangrove cover. Giri *et al.*, (2011) and Polidoro *et al.*, (2010), claims that unfortunately the ecological degradation of mangrove ecosystem is not different among these countries; many mangrove regions have become completely degraded or are under constant environmental stress, primarily due to the expansion of urban centers and agricultural production. Mangrove ecosystems are highly productive but extremely sensitive and fragile. Mangrove forests are undergoing constant seasonal, short-term, long-term changes due to their dynamic nature and, to a greater extent, through various natural and biotic influences (V. Vijay, 2005).

2. Materials And Methods

Study Area

The present study deals with mangroves located in western coastal region of Maharashtra along Arabian Sea. Palghar district is also known as Konkan tract or Konkan coast. It lies within the geographical location: 19.7867° N, 72.9933° E, with an average elevation of 11 to 16 m. In Palghar there is 14 beaches are situated along the west coast of India. The study has been carried out at 5 mangrove sites viz., Vasai beach, Suruchi beach, Kalamb beach, shirgoan beach, dativare along the western coast of Palghar. Field surveys were conducted from Feb to April 2022. The Quantitative data on mangrove vegetative structure was collected by laying quadrats (10 × 10 sq. Ft.). A total of 5 quadrats were sampled from all the sites.





3. Results and Discussion

Table 1: - Number of species present at each site

Species Name	Family	Suruchi	Vasai	Kalamb	Shirgoan	Dativare
<i>Acanthus ilicifolius</i>	Acanthaceae	4	-	5	27	7
<i>Aegiceras corniculatum</i>	Primulaceae	4	7	-	-	-
<i>Avicennia alba</i>	Avicenniaceae	10	2	5	2	6
<i>Avicennia marina</i>	Avicenniaceae	12	8	3	4	4
<i>Avicennia officinals</i>	Avicenniaceae	13	7	7	3	1
<i>Derris scandens</i>	Fabaceae	7	10	-	-	-
<i>Derris trifoliata</i>	Fabaceae	2	-	-	5	5
<i>Ipomea pescaprae</i>	Convolvulaceae	4	5	3	3	-
<i>Laguncularia racemose</i>	Combretaceae	-	-	-	5	-
<i>Lumnitzera racemose</i>	Combretaceae	6	-	-	9	-
<i>Rhizophorus mucronata</i>	Rhizophoraceae	-	-	-	-	1
<i>Salvadora persica</i>	Salvadoraceae	2	4	-	-	5
<i>Sesuvium portulacastrum</i>	Aizoaceae	7	10	3	3	-
<i>Sonneratia apetale</i>	Lythraceae	2	3	-	-	-
<i>Stictocardia tillifolia</i>	Convolvulaceae	4	3	-	3	8
<i>Suaeda maritima</i>	Amaranthaceae	7	3	5	5	7
Total number of plants observed in certain areas		14	11	7	11	9

Table 2: - Species density and abundance

SPECIES NAME	DENSITY (individuals)	ABUNDANCE
<i>Acanthus ilicifolius</i>	8.6	10.75
<i>Aegiceras corniculatum</i>	2.2	5.5
<i>Avicennia alba</i>	5	5
<i>Avicennia marina</i>	6.2	6.2
<i>Avicennia officinals</i>	6.2	6.2
<i>Derris scandens</i>	3.4	8.5
<i>Derris trifoliata</i>	2.4	4
<i>Ipomea pes-caprae</i>	3	3.75
<i>Laguncularia racemose</i>	1	5
<i>Lumnitzera racemose</i>	3	7.5
<i>Rhizophorus mucronata</i>	0.2	1
<i>Salvadora persica</i>	2.2	3.666666667
<i>Sesuvium portulacastrum</i>	4.6	5.75
<i>Sonneratia apetale</i>	1	2.5
<i>Stictocardia tillifolia</i>	3.6	4.5
<i>Suaeda maritima</i>	5.4	5.4

Table 3:- Diversity indexes of selected mangrove sites

Diversity index	Suruchi	Vasai	Kalamb	Shirgaon	Dativare
Simpson index of Diversity	10	9.8	6.2	16.6	6.9

In the study area of Palghar coastline, out of 16 recorded species, 13 species are true mangrove from 4 genera & 8 families are observed. The flora from family Acanthaceae, Primulaceae, Fabaceae, Convolvulaceae, Combretaceae, Rhizophoraceae, Salvadoraceae, Aizoaceae, Lythraceae, Amaranthaceae are recorded as mangroves and their associates at 5 coastlines of Palghar marshy locations. Members of Acanthaceae family are observed more dominant on all over spotted locations of mangrove. Shirgaon beach of Palghar shows *Acanthus ilicifolius* is more (27 trees) abundant than the other species of family Acanthaceae. While the abundance of family Acanthaceae is observed at Suruchi beach, viz, *Acanthus ilicifolius* (4), While plants from Avicenniaceae family also shows wide spread such as *Avicennia alba* (10), *Avicennia marina* (12), *Avicennia officinals* (13) than on Shirgaon beach *Acanthus ilicifolius* (27), *Avicennia alba* (2), *Avicennia marina* (8), *Avicennia officinals* (7) (Table no.1). According to the abundance of Family Acanthaceae, the seacoast can be ordered as Suruchi (39)-Shirgaon (39) – Kalamb (20)-Dativare (18)-Vasai (17). Vasai beach shows abundance of Family Acanthaceae, *Acanthus ilicifolius* (00), *Avicennia alba* (2), *Avicennia marina* (12), *Avicennia officinals* (13) followed by Family Aizoaceae, *Sesuvium portulacastrum*, (10) and *Derris scandens* (10) from Family Fabaceae. Family Convolvulaceae has equal spread (8) on Suruchi, Vasai and Dativare beach. At Dativare only *Stictocardia tillifolia* are observed, whereas Suruchi beach has equal number of *Stictocardia tillifolia* (4) and *Ipomea pes-caprae* (4) while Vasai beach shows *Ipomea pes-caprae* (5) and *Stictocardia tillifolia* (3). Only Suruchi and Shirgaon beach shows plants from family Combretaceae where Shirgaon beach shows *Laguncularia racemose* (5) + *Lumnitzera racemose* (9), in all 14 plants of family Combretaceae while Suruchi beach shows only *Lumnitzera racemose* (6). Trees from Family Primulaceae are observed only at Vasai and Suruchi marshy lands where comparatively more (7) number of *Aegiceras corniculatum* are observed at Vasai than at Suruchi (4). Plants from Family Amaranthaceae (*Suaeda maritima*) and Family Acanthaceae (*Acanthus ilicifolius*, *Avicennia alba*, *Avicennia marina*, *Avicennia officinals*) are observed in all selected locations where at Vasai *Acanthus ilicifolius* of Family Acanthaceae are totally could not get located but otherwise the other species in study are from both the families are present in all five locations. *Sonneratia apetale* is a only plants from Family Lythraceae observed at Suruchi (2) and Vasai (3) whereas only Dativare beach shows single plant of *Rhizophorus mucronata* (Family Rhizophoraceae). Among the thirteen true mangrove species reported along the Mumbai coast, the distribution of *Avicennia marina* and were

more common than other mangrove species. *Derris scandens* are critically endangered. all the reported species were in the Least Concern (LC) status, according to The IUCN Red List of Threatened Species.

Maharashtra has notified around 121 hectares of mangrove area in Palghar as forest land under the Indian Forest Act (IFA). Due to anthropogenic activity, industrialization & tourism, sewage water and non degradable wastes like plastic wrappers, plastic bottles get deposited in the marshy areas which is the reason why the mangrove are degraded. The covered upland areas with plastic suffocate the roots, even the pneumatophores and plants die due to suffocation. Until the adaptation for the plastic-coated marshy lands has not been developed in mangrove plants. According to Kantharajan (2018), there are only 9 species of true Mangroves and 11 species of Mangrove associates in gulf of Kuchha while at Palghar district, 12 species of true mangrove are observed. High diversity of mangrove and their associates are recorded at Suruchi and Shirgaon as the tourism rate is low and are still virgin areas. Kalamb (site 3) is having low density because there are so many resorts and hotels which generate highly solid waste, sewage water and waste water which is allowed to flow in the creek areas to cause difficulty in survival of mangroves.

Total tree density and abundance for the individual species in palghar were 60 (density) individuals and 88.55 abundance respectively. Individually *Acanthus ilicifolius* having high density is 8.6 and abundance is 10.75 but in Gujrat *Avicennia marina* having high density is 87.5 abundance is 87.5. In Mumbai *Avicennia marina* 493.05 having high density, comparing to palghar Gujrat and Mumbai have high density of *Avicennia marina*, I found 6.2 density of *Avicennia marina*. In Palghar dist. *Rhizophorus mucronata* has low density which is 0.2 and 1 abundance, in Gujrat *Sonneratia apetala* 0.7 low density and abundance is 1.75.

Second largest area of mangroves in India is Gujrat which is 1058 km². Simpson index of Diversity in Gujrat at Navsari is 0.66 is high and at shirgaon Simpson index of diversity is 16.67 which is high. Low diversity at Bhavnagar 0.03 comparing to kalamb Simpson index is 6.2. Kalamb Simpson index is higher than Bhavnagar.

Distribution of mangrove species depends on various environmental parameters like temperature, salinity, tidal pattern and freshwater inflow, which are specific to each habitat (Duke et al., 1998). Due to release of sewage water, the concentration of nutrients, heavy metals and Polycyclic Aromatic Hydrocarbons (PAHs) is persistently increasing in most creeks along the Mumbai coast (Datta, 2012; Kulkarni et al., 2010; Navalkar, 1951; Sahu and Bhosale, 1991; Singh et al., 2007; Sukhdhane et al., 2015). Kantharajan et al. (2017).

4. Conclusion

Diversity index of Shirgaon is comparatively more than the other places in study. The diversity of mangroves playing an ecologically important role to maintain balance of ecosystem. Mangrove areas along the Palghar dist. have been threatened by various anthropogenic activities like and disposal of sewage as well as overexploitation for salt, dumping garbage, fishing, navigation, and recreational activities. Low species diversity recorded in the study it indicates the degraded nature of the mangroves along the coast due to these reasons.

The density and abundance of the various species were calculated. The highest frequency found in true mangroves *Avicennia marina* and *Acanthus ilicifolius* and lowest frequency and *Rhizophora mucronata*. The highest abundance found in *Acanthus ilicifolius* and lowest *Rhizophora mucronata*.

Mangroves protect both the saltwater and the freshwater ecosystems they straddle. Mangroves provide valuable protection for communities at risk from sea-level rises and severe weather events caused by climate change. Coastal forests help the fight against global warming by removing carbon dioxide from the atmosphere (mangrove is carbon sequestration), most of which is stored within the plant. Mangrove are also having medicinal properties. So, we have to protect the mangrove and also coastal forest.

Acanthus ilicifolius



Aegiceras corniculatum



Avicennia alba



Avicennia marina



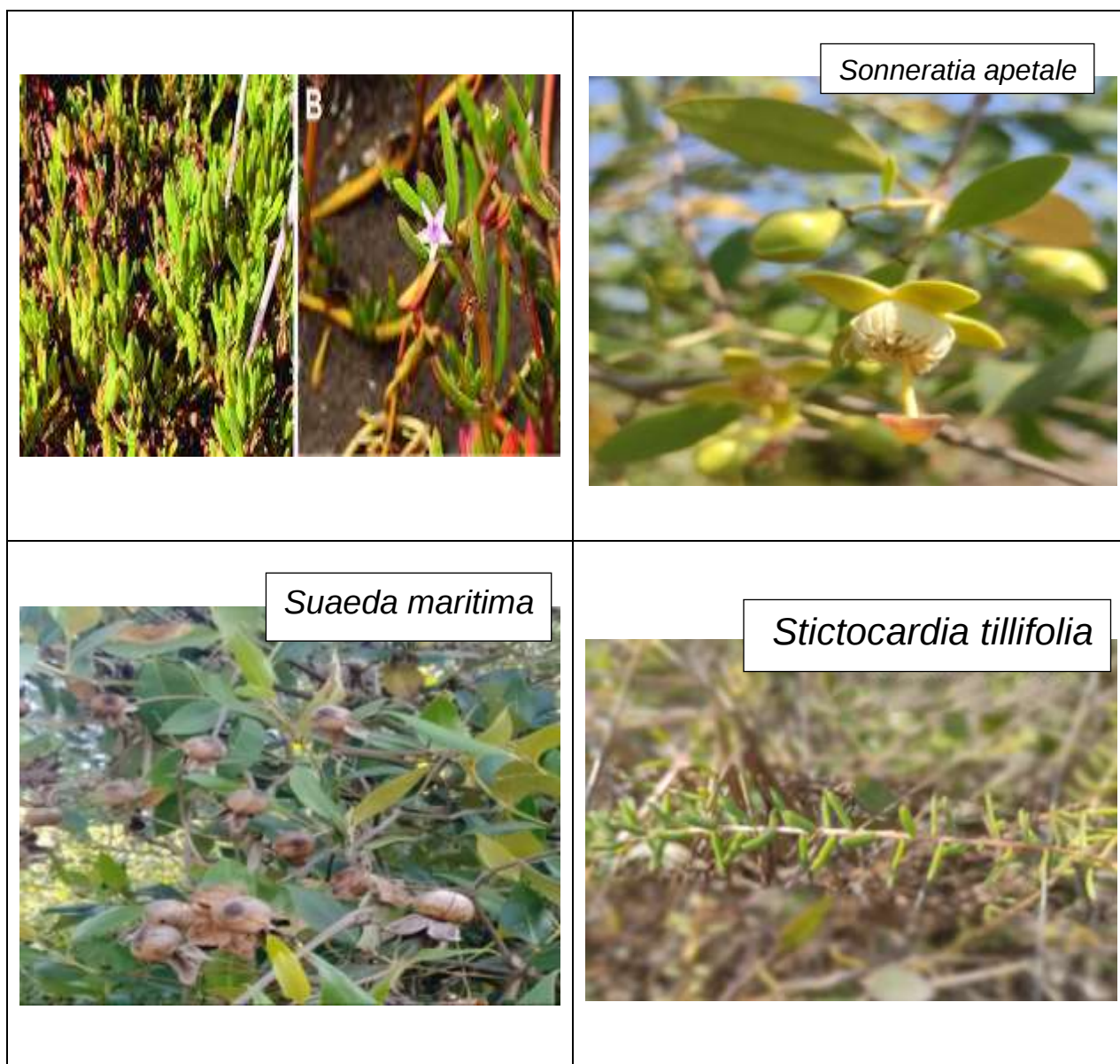
Avicennia officinalis



Derris scandens



<i>Derris trifoliata</i> 	<i>Ipomea pes caprae</i> 
<i>Laguncularia racemose</i> 	<i>Lumnitzera racemose</i> 
<i>Rhizophorus mucronata</i> 	<i>Salvadora persica</i> 



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