



Study of Mangrove flora along the Zuari River (Case study on Curtorim Village – Goa- India)

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Abstract

The present study documents the diversity of true mangroves and their associates, from four sampling stations along the Zuari River of Curtorim village, South Goa district, Goa. These four sampling points selected along the Zuari River and latlong was recorded with the help of DGPS which reflects the differences in the habitat of mangrove flora at different locations in same climatic conditions. Five true mangrove floral species belonging to four families and one associate floral species were identified along the river and adjacent regions at the study site. This paper highlights the need of present study to further gain knowledge about the mangrove flora in order to help the conservation of mangrove ecosystem.

Keywords: Mangroves, curtorim, south Goa, zuari river, flora, diversity

Introduction

Mangrove communities comprise a group of biotic components, including plants, animals and microbial organisms that are highly adapted to intertidal environmental conditions. However, none of these can be identified as a community in a mangrove ecosystem without the actual mangrove plants (trees and shrubs), implying that the true mangrove vegetation is the major constituent of the ecosystem. Mangrove vegetation defines the landscape and participates directly or indirectly in the ecological processes that take place in this ecosystem¹. Therefore, knowledge of the exact species plant composition of mangroves in any country is a basic and important prerequisite to understanding all the aspects of structure and function of mangroves, as well as their biogeographical affinities and their conservation and management. The past and present distribution of mangroves has been reviewed by several authors on a global level¹⁻³. The species richness of mangroves in many geographical areas is decreasing with time as a result of the destruction of mangrove forests and exposure to various anthropogenic stresses.

Mangroves are trees and shrubs that grow in saline coastal habitats in the tropics and subtropics. 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. Mangrove is one of the most productive ecosystems and a natural renewable resource⁴. Mangroves are a taxonomically diverse group of salt-tolerant, mainly arboreal,

flowering plants that grow primarily in tropical and subtropical regions³.

A “mangrove” has been defined as a “tree, shrub and palm or ground fern, generally exceeding more than half a meter in height and which normally grows above mean sea level in the intertidal zones of marine coastal environments or estuarine margins”⁵. The term “mangrove” can refer to either the ecosystem or individual plants². Mangrove ecosystems have been called “mangals”⁶ to distinguish them from the individual plant species. However, across the globe, the world’s mangroves are threatened. Mangrove habitats are being destroyed as rivers are dammed, their waters diverted and the intertidal zone extensively developed for agriculture or aquaculture. Mangroves are distributed globally, occurring in over 112 countries. India with a long coastline of about 7516.6 km, including the island territories, has a mangrove cover of about 6,749 km², the fourth largest mangrove area in the world⁷. These mangrove habitats (69°E- 89.5°E longitude and 7°N-23°N latitude) comprise three distinct zones: East coast habitats having a coast line of about 2700 km, facing Bay of Bengal, West coast habitats with a coast line of about 3000 km, facing Arabian sea, and Island territories with about 1816.6 km coastline⁸. In South India, Pichavaram and Muthupet are two places, which have dense mangrove vegetation in the state of Tamilnadu⁴⁻⁸. Mangroves have tremendous social and ecological value. The mangrove ecosystem provides income from the collection of the mollusks, crustaceans and fish that live there.

Mangroves are harvested for fuel wood, charcoal, timber, and wood chips. Services include the role of mangroves as nurseries for economically important fisheries, especially for shrimp.

Mangroves also provide habitats for a large number of mollusks, crustaceans, birds, insects, monkeys and reptiles. Other mangrove services include the filtering and trapping of pollutants and the stabilization of coastal land by trapping sediment and protection against storm damage⁹. They also support the growth of microbial flora. Some antibiotic producing actinomycetes are present in this environment, which is essential for inhibition of pathogenic microorganisms. Some novel chemical molecules and metabolites have been identified from mangroves and their associates⁵. Mangrove habitats of India have been facing tremendous threats due to indiscriminate exploitation of mangrove resources for multiple uses like fodder, fuel wood, and timber for building material, alcohol, paper, charcoal and medicine. Apart from those, conversion of forest area to aquaculture and agriculture, construction of port and harbour, extension of human inhabitation, over-grazing, urbanization, industrialization and chemical pollution are major common occurrences that dwindle mangrove area¹⁰. Owing to these threats > 33% of the Indian mangrove areas has been lost within the last 15 years. Of this, East coast area has lost about 28%; West coast area about 44%; and Andaman and Nicobar Islands about 32%⁷⁻¹⁴.

The main objective of the present study is to understand the diversity of mangrove flora and their associates, which is helpful in deriving taxonomical information based on species diversity, along Zuari Rivers in Curtorim village, Goa.

Material and Methods

Study area: The state of Goa is located between 15° 44' 30" and 14° 53' 30" N, and 73° 45' and 74° 26' E, along the Central West Coast of India. Its extreme length from north to south is 105 km,

its greatest breadth from east to west is 65 km, and its entire area is 3,702 km². It is bounded by the Terekhol or Araundem River to the north, which separates it from the Maharashtra state, on the east by the Western Ghats, on the west by the Arabian Sea, and on the east and south by the Karnataka State. The region is divided into three main regions^{11,15-20}: i. The Eastern Sahayadris - The Goa sub region of the Western Ghats, and covers ~ 43% of the state total area. ii. The Central uplands - It is the tract between the coast and the Ghats. It consists of a chain of rolling hills with gentle to moderate slopes and long, narrow intermediate valleys, and covers ~ 35% of the state area. iii. The Western coastal plains - The coastal belt accounts for ~ 22% of the total area of Goa.

Goa is organized for administrative purposes into 11 talukas or counties, viz. Ilhas (Tiswadi), Bardez, Salcete, Mormugao, Ponda, Bicholim, Pernem, Quepem, Sanguem, Canacona and Satari.

The state is intersected by numerous rivers, which can be navigated for different purposes. Most of the major rivers, which cut across hinterland formations, originate in the Western Ghats across the border. The two main rivers are Mandovi (61.6 km in length), and Zuari (92.4 km), with their interconnecting Cumbarjua Canal (15 km) form a major estuarine complex. The other rivers are run for short distance as Terekhol (22.4 km), Chapora (28.8 km), Baga (5.4 km), Sal (16.1 km), Talpona (11.2 km), and Galgibag (3.8 km) in length (Esteves, 1966; Fonseca, 2001).

Curtorim is located at 15.28°N 74.03°E. It has an average elevation of 38 metres (125 feet).



Figure-1
Distribution of Mangrove flora along Zuari River- Curtorim Village, Goa-India

Data collection: The area where mangroves vegetation is exist along the Zuari River near Curtorim village is first identified and documented. For the assessment of present biodiversity status, the mangroves, mangrove associate vegetation existing along the study area was consider for identification. Survey made along the river to explore the successful results of the mangrove and mangrove associated vegetation were plucked during their flowering seasons for identification and took photographs with the help of camera. The nomenclature of the specimens

followed²¹⁻²³. The latlong of every sampling station recorded with the help of DGPS.

Table-1

Study sites	Latitude	Longitude
Site-1	15°18'27.91658"	74°00'51.58836"
Site-2	15°18'16.90022"	74°00'58.72388"
Site-3	15°18'13.92315"	74°01'05.96435"
Site-4	15°18'37.77878"	74°00'37.68192"

Table-2

Sr. No.	Botanical Name	Family Name	Life Form	Site-1	Site-2	Site-3	Site-4
1.	<i>Acanthus ilicifolius</i>	Acanthaceae	S	+	+	+	+
2.	<i>Avicennia officinalis</i>	Avicenniaceae	T	+	+	+	--
3.	<i>Sonneratia caseolaris</i>	Sonneratiaceae	T	--	+	+	+
4.	<i>Kandelia candel</i>	Rhizophoraceae	T	+	+	+	+
5.	<i>Rhizophora mucronata</i>	Rhizophoraceae	T	--	+	--	--
6.	<i>Acrostichum aureum</i>	Pteridaceae	S	--	--	+	--



Acanthus ilicifolius



Acrostichum aureum



Avicennia officinalis



Sonneratia caseolaris



Kandelia candel



Rhizophora mucronata

Figure-2
Mangrove Flora

Result and Discussion

Site-1: The study site is an island along the Zuari river- Curtorim village. The area is dominated by *Kandelia candel* and in the borders *Acanthus ilicifolius* is occupying the area along the river. *Avicennia officinalis* also recorded during survey.

Site-2: Five mangrove species were recorded in this site namely *Acanthus ilicifolius*, *Avicennia officinalis*, *Sonneratia caseolaris*, *Kandelia candel*, and *Rhizophora mucronata*. Here the first three species are dominant one others are rare.

Site-3: After the 1km of distance from site-2 four true mangroves species called *Acanthus ilicifolius*, *Avicennia officinalis*, *Sonneratia caseolaris* and *Kandelia candel* were recorded along with one species of mangrove associate i.e. *Acrostichum aureum*.

Site-4: This site is selected for study on other site of river bank and species like *Acanthus ilicifolius*, *Sonneratia caseolaris* and *Kandelia candel*. On this site all three species of true mangroves are dominant.

True Mangroves: The results after the survey, made from selected sites, showed following five mangrove floral species belonging to four families. A classified list of mangrove vegetation identified is presented in table-2. The species *Acanthus ilicifolius* and *Kandelia candel* are the dominant mangroves found in almost all the sites. The next dominating species are *Avicennia officinalis* and *Sonneratia caseolaris*.

Mangrove associates: Only one species *Acrostichum aureum* belongs to Pteridaceae family found at site-3.

Conclusion

Curtorim village represents south region of Goa. It is a site that has multiple habitats of sandy beach and mangrove forests. As we know that mangroves grow in the saline habitat along the estuary, river and ocean but this study area is highly productive and less saline means as like fresh water. The species called *Sonneratia caseolaris* indicates fresh water characteristics.

The people use forest resources for fire wood and small timber. The site has no protection. There is need to restrict the development of aquaculture farms in the area. This paper highlights the diversity of mangroves habitats along the Zuari river- Curtorim village. The present information will be useful for the further studies and help to monitor the mangrove ecosystem. It is help formulate the strategic plans and forestation of mangroves.

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