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Diversity and distribution of Mangroves in kali estuary of Karnataka, India

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Abstract

The present investigation was carried on the diversity and distribution of mangroves in Kali riverine estuary uttar Kannada districts, to study the present status of mangroves vegetation. The diversity and distribution of mangroves were studied during the year July 2017 to Feb 2018. Line transect quadrate analysis method were adopted in the study sites during the study 4 sites were selected for quantification of Mangrove and their associates. The present investigation *Acanthus ilicifolius* L. and *Rhizophora mucronata* Lamk. Were dominant species recorded in selected sites. Whereas in site III *Acrostichum aureum* L., *Derris trifoliata* Lour. Which shows less occurrence comparatively. Investigated all mangroves and associates species are at serious risk as no systematic attempts has been made to conserve them, recorded species urgent need to conservation. This paper gain the knowledge about Mangroves and their associates, with their Diversity, distribution and abundance approach.

Key words : Diversity, Mangroves, Mangrove associates, quantification.

Mangroves are found over 118 countries and union territories in the tropical and subtropical regions of the world. About 75% of the world's coastline is covered in between 25° N latitude and 25° S longitude by the Mangrove species[8]. Mangroves vegetation is covered 3/4 of the world's tropical coastlines, often in conjunction with the coral reefs. Asia contains most of the world's mangroves with 46 %, followed by America with 35 % and Africa with 17 % [7].

Generally mangrove forests in India are found along the coastline of 9 States and 4 Union Territories. The mangrove habitat of India is commonly classified into three categories namely, as a Deltaic mangroves (Eastern Coast Mangroves), Estuarine and Backwater mangroves (Western Coast Mangroves), and Insular mangroves (A & N) Islands[6].

India has only 2.66% of the world's mangroves, covering an estimated area of 4,827 sq. km. Kerala along the west coast of India has a coastline of 590 km and presently

the mangrove area is estimated to be about 17 sq. km, of which 36% is either completely degraded or is degrading.

The State extends 750 km from North to South and about 400 km from East to West. It covers an area of about 1,91,796 sq. km^2, being the 8th largest state holding 5.83% of the total geographical area of India. Karnataka comprises of varied topographical structures that includes high mountains, plateaus, residual hills and coastal plains. The State is enclosed by chains of mountains to its East, west and south. The general climate of Karnataka can be described as monsoon climate with wet and dry areas. Of these, the coastal zone receives the heaviest rainfall with an average rainfall about 3,638.5 mm per annum, far in excess of the state average of 1,139 mm. Agumle in the Shivamogga district receives the second highest annual rainfall in India (KBB,2010).

Geographically Karnataka is situated on a tableland where the Western and Eastern Ghats ranges into the Nilgiri hill complex. The State of Karnataka is confined roughly within 11.5^0 N and 18.5^0 N latitudes and 74^0 E and 78.5^0 E longitude. The neighboring states bounded with Karnataka includes Maharashtra and Goa in the North and North-West; by the Arabian Sea in the West by Kerala and Tamilnadu in the South and Andhra Pradesh in the East[3]

Physiographically, Karnataka State forms part of two well-defined macro regions of Indian Union; the Deccan Plateau and the Coastal plains and Islands. The State has four physiographic regions namely Northern Karnataka Plateau, Central Karnataka Plateau, Southern Karnataka Plateau and Karnataka Coastal[2]

The state of Karnataka in south India, Latitude 11^0 12' N to 18^0 12' N and longitude 73^0 48' E to 78^0 18' E, covers a geographical area of about 1,90,4983 km^2. It is divided into three zones *viz*. coastal, north interior and south interior. It has a coastline of 320 kms and has fourteen main rivers and few small ones drain their waters into the shore waters of Karnataka[5].

The Uttara Kannada lies between latitude 13^0 92'to 15^0 52'N and 74^0 08'to 75^0 09' E longitude extends over an area of 10,327 Sq. km. The district having five taluka palaces: Karwar, kumtha, Ankola, Honnavar and Bhatkal. About the climate profile of the district there are no cold month, in the major part of the coastal Karnataka, the types of soil are black cotton soil, red loam, black clay and forest soil. The district has three main regions namely Sahyadri ranges, coastlands and Eastern margins and well growth of mangroves are recorded[1]

Quantification of Mangroves and Mangrove associates:

Quantification of the species of study sites was done by line transect quadrat (Random sampling) method. Four sites and four dense habitats were selected for quantification. For quadrat analysis, the trees, shrubs and herbs were determined by standard line transect method by 10 m. random sampling. The frequency, density and abundance (Raunkiaer, 1943) were calculated by using following formulae-[4]

$$\text{Frequency} = \frac{\text{Total number of quadrats in which species occurred x } 100}{\text{Total number of quadrat studied}}$$

$$\text{Density} = \frac{\text{Total number of individuals of species}}{\text{Total number of quadrat studied}}$$

$$\text{Abundance} = \frac{\text{Total number of individuals of a species in all quadrates}}{\text{Total number of quadrates in which the species occurred}}$$

Table-1 Line transect quadrate at Kali estuary Site- I

Sr.No	Name of the Species	1	2	3	4	5	6	7	8	9	10	Total
1	*Acanthus ilicifolius* L.	18	3	-	13	-	12	-	-	2	-	48
2	*Aegiceras corniculatum* (L.) Blanco.	-	3	-	2	2	-	-	-	1	-	8
3	*Avicennia marina* (Forssk.) Vierh.	-	3	1	2	-	-	2	1	-	-	9
4	*Bruguiera gymnorhiza* (L.) Lam.	-	-	-	-	1	-	-	3	-	-	4
5	*Fimbristylis ferruginea* (L.) Vahl.	18	-		-	-	11	-	-	14	-	43
6	*Kandelia candel* (L.) Druce	-	1	-	-	2	-	-	3	-	-	6
7	*Pongamia pinnata* (L.) Pierre.	-	-	-	-	-	-	-	-	2	-	2
8	*Rhizophora mucronata* Lamk.	5	2	-	-	2	5	-	-	6	-	20
9	*Sonneratia alba* Sm.	1	1	1	-	-	-	4	-	-	-	7
10	*Thespesia populnea* (L.) Sol. ex Correa.	-	-	-	-	-	1	-	-	-	-	2

Site I has 07 true mangroves and 03 mangroves associates, *Acanthus ilicifolius* L. and *Fimbristylis ferruginea* (L.) Vahl. has maximum occurrence and number of 48 and 43 individuals respectively. The moderate number occurrence of individuals according to the site are represented by *Rhizophora mucronata* Lamk., with 20 individuals. *Avicennia marina* (Forssk.) Vierh., *Aegiceras corniculatum* (L.) Blanco., *Sonneratia alba* Sm., *Kandelia candel* (L.) Druce. and Bruguiera gymnorhiza (L.) Lam. are represented by 09, 08, 07, 06 and 04 individuals respectively. The least occurrence of individuals of *Thespesia populnea* (L.) Sol. ex Correa. was recorded at only one segment. (Table-1).

Table-2. Line transect quadrate at Kali estuary Site-II

Sr.No	Name of the Species	1	2	3	4	5	6	7	8	9	10	Total
1	*Acanthus ilicifolius* L.	33	-	-	19	-	12	-	-	-	9	73
2	*Aegiceras corniculatum* (L.) Blanco.	-	-	-	1	-	3	2	-	2	-	8
3	*Avicennia alba* Blume.	-	-	-	3	-	-	4	-	-	6	13
4	*Avicennia marina* (Forssk.) Vierh.	3	1	5	-	-	1	2	-	-	-	12
5	*Bruguiera gymnorhiza* (L.) Lam.	3	-	-	1	-	-	-	2	-	1	7
6	*Clerodendrum inerme* (L.) Gaertn.	-	-	3	-	-	1	-	-	1	-	5
7	*Fimbristylis ferruginea* (L.) Vahl.	16	-	13	-	-	-	-	-	24	-	53
8	*Rhizophora mucronata* Lamk.	3	6	-	-	7	-	-	2	-	3	21

At Site II represented by 06 true mangroves and 02 mangroves associates in which the dominant species recorded was *Acanthus ilicifolius* L. and *Fimbristylis ferruginea* (L.) Vahl. represented by 73 and 53 individuals respectively. *Rhizophora mucronata* Lamk. and *Avicennia alba* Blume. represented by 21 and 13 individuals, whereas *Aegiceras corniculatum* (L.) Blanco., *Bruguiera gymnorhiza* (L.) Lam. and *Clerodendrum inerme* (L.) Gaertn. shown 08, 07 and 05 individuals respectively. (Table-2).

Table-3 Line transect quadrate at Kali estuary Site-III

Sr.No	Name of the Species	1	2	3	4	5	6	7	8	9	10	Total
1	*Acrostichum aureum* L.	-	-	-	7	-	-	-	3	1	-	11
2	*Aeluropus lagopoides* Thwaites.	60	-	18	-	-	-	33	-	-	-	131
3	*Avicennia alba* Blume.	3	-	2	-	-	-	3	-	1	-	9
4	*Derris trifoliata* Lour.	4	-	-	1	-	1	-	-	-	-	6
5	*Rhizophora mucronata* Lamk.	4	-	-	3	-	2	-	-	-	3	12

Site III was represented 03 true mangroves and 02 mangroves associates. 131 individuals of *Aeluropus lagopoides* Thwaites. Was recorded, whereas *Rhizophora mucronata* Lamk. *Acrostichum aureum* L. *Avicennia alba* Blume. *Derris trifoliata* Lour. represented by 12, 11, 09 and 06 individuals, which shows less occurrence comparatively. (Table-3).

Table-4. Line transect quadrate at Kali estuary Site-IV

Sr.No	Name of the Species	1	2	3	4	5	6	7	8	9	10	Total
1	*Bruguiera gymnorhiza* (L.) Lam.	-	-	-	-	1	-	-	1	-	-	2
2	*Hibiscus tiliaceous* L.	1	-	-	-	-	-	-	-	-	2	3
3	*Rhizophora mucronata* Lamk.	3	-	-	-	-	-	1	-	6	-	10
4	*Salvadora persica* L.	-	-	-	-	2	-	3	-	4	-	9
5	*Thespesia populnea* (L.) Sol. ex Correa.	1	-	-	-	-	-	1	-	-	-	2

Site IV shown the occurrence of 02 true mangroves and 03 mangroves associates, in which *Rhizophora mucronata* Lamk. and *Salvadora persica* L. recorded as dominant species with the occurrence of 10 and 09 individuals respectively, whereas *Hibiscus tiliaceous* L., Thespesia populnea (L.) Sol. ex Correa. and *Bruguiera gymnorhiza* (L.) Lam. are represented by 03, 02 and 02 individuals respectively. (Table-4).

The present study on the diversity and distribution of mangroves in the Kali estuary reveals significant variation in species composition, abundance, and distribution across the four study sites. A total of true mangrove species and mangrove associates were recorded using the line transect quadrat method, indicating that the Kali estuary supports a moderately rich mangrove ecosystem.

Among all sites, **Site I and Site II** exhibited comparatively higher species diversity and density. Acanthus ilicifolius and Fimbristylis ferruginea were recorded as dominant species in these sites, showing maximum frequency and abundance. Rhizophora mucronata and Avicennia marina also showed considerable representation, indicating their adaptability to varying tidal and soil conditions within the estuarine region.

Site III showed moderate diversity but was characterized by a high dominance of Aeluropus lagopoides, suggesting localized environmental conditions favoring its growth. The comparatively lower representation of other mangrove species indicates possible ecological constraints or habitat specificity.

Site IV exhibited relatively low species richness and abundance compared to the other sites. However, species such as Rhizophora mucronata and Salvadora persica showed dominance, indicating their tolerance to site-specific environmental factors.

Overall, the study highlights that the Kali estuary maintains a diverse mangrove community with uneven distribution patterns influenced by ecological factors such as salinity gradients, tidal inundation, sediment characteristics, and anthropogenic pressures. The dominance of certain species across sites reflects their ecological adaptability, while the limited occurrence of others suggests habitat specialization.

The findings emphasize the ecological importance of the Kali estuary mangroves and the need for conservation and sustainable management strategies to protect this valuable coastal ecosystem from further degradation.

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