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A STUDY ON THE MANGROVES OF KALI AND AGHANASHINI RIVER ESTUARIES OF UTTARA KANNADA DISTRICT, KARNATAKA[1].

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ABSTRACT

A study was carried out on the mangroves of Kali and Aghanashini river estuaries of Uttara Kannada district, Karnataka to determine the floristic composition, organic and inorganic constituents of litter of principal mangrove species and fisheries potentiality. Present status of mangroves and possible steps for their conservation and regeneration have been discussed. Implication of the mangroves in protecting the bunds constructed to prevent the ingress of saline water into the Kharlands (productive paddy growing, low lying areas along the coast) is also discussed.

INTRODUCTION

Mangroves, an unique plant community of the tropical sea coast are found all along the estuaries, tidal creeks and also on the banks of inland rivers meeting the sea. They cover about one quarter of the world tropical coastline ranging in 20° North and South latitudes (Johannes 1972, Mc Gill 1958). In India mangroves cover about 3,50,500 hectares (Blasco 1975). However, according to a recent estimates by Untawale (1979) total mangrove area is about 7,00,000 hectares. Rich growth of mangroves is found along the east coast in Sunderbans, Andaman & Nicobar, Krishna, Godavari, Cauvery & Mahanadi delta and Muttupet and Chatram. Of the total mangrove area in India Sunderbans and Andaman & Nicobar cover about 75 per cent. Along the west coast relatively good growth of mangroves is observed in Gujarat, Maharashtra and Karnataka.

Uttara Kannada coast (144 Kms) in Karnataka has 4 important rivers: Kali, Aghanashini, Gangavali and Sharavati, all flowing towards west into the Arabian sea and meeting at Karwar, Kumta, Ankola and Honnavar respectively. These rivers harbour mangrove community all along the estuaries and tidal creeks, which support very rich fauna and have great influence over fishing. The present study was carried out at Kali and Aghanashini river estuaries to determine the floristic composition, fisheries potentiality and chemical constituents of litter of important mangrove species. Possible steps for conservation and regeneration of mangroves of these areas have been discussed.

Implication of mangroves on certain problems of consolidation of constructed

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mud bunds along the kharlands (productive paddy growing areas of the coast) is also discussed.

MATERIALS AND METHODS

Plant specimens from different mangrove regions of Kali and Aghanashini river estuaries were collected and herbaria prepared. Voucher specimens are deposited in Department of Botany, Karnataka University, Dharwad. The vegetation was studied for its density using quadrats of 10×10m and3×3 m for tree and shrubby species respectively. Litter samples (freshly fallen leaves) of 11 mangrove species were collected from both the estuaries for their chemical estimation. These samples were hand picked every month for a period of one year. Samples were thoroughly washed in tap water to remove adhering particles. Samples were sun dried for 10 days, thoroughly ground to a fine powder and sieved using 70 mm sieve. Sieved samples were analysed for organic carbon (Piper, 1947), available Phosphorus (Bray & Kurtz, 1945), available sodium and potassium (APHA, 1980) and calcium and magnesium (Black, 1955). The monthly values were averaged and expressed as g/100g dry tissue. Data were also collected for important fish catches along the mangrove swamp.

OBSERVATIONS

Mangroves of Kali river estuary: Kali river estuary extends from Sadashivghad/ Kodibag upto Mallapur about 29.9 Kms away from the river mouth. Three major mangrove localities were recognised on the basis of their location to the river mouth, tidal effects and the type of forest (Table I).

Sunkeri mangroves have a long feeder canal which connects it to the main stream of the estuary, therefore it has very less tidal effect. Sunkeri is represented by the fringe type of forest, dominated by *Sonneratia alba*, *Avicennia marina* and *A. alba*. Pure strip of *Sonneratia* extends nearly 8-10 hectares, wherein *S. alba* shows maximum growth (Max. girth: 1m, height: 5-6m). *R. apiculata* and *R. mucronata* appear in few patches. Shrubs like *Aegiceras corniculatum*, *Lumnitzera recemosa*, *Excoecaria agallocha* and *Acanthus ilicifolius* are also present in the community. Quadrat studies indicate relatively dense vegetation, with 4-5 plants per quadrat of 3 square meters. Chitakula mangroves are characterised by the dense growth of *A. marina*,

TABLE I

KALI RIVER ESTUARY MANGROVE LOCALITIES, VEGETATION PATTERN AND DOMINANT SPECIES

Locality	Location in relation to the river mouth	Vegetation pattern	Dominant species
1. Sunkeri	South eastern part	Sparse to dense	*Sonneratia alba*
2. Chitakula	North eastern part	Sparse to dense	*Rhizophora mucronata*
3. Kanasgeri	3 Kms east from Chitakula	Sparse to dense	*Rhizophora mucronata*

A. alba, *Rhizophora apiculata* and *R. mucronata*. Natural regeneration of *R. mucronata* is high here as hundreds of seedlings were seen growing below the big trees. Kanasageri mangroves are well established, probably due to less human interference. Hence *A. marina* and *A. alba* attained maximum growth here (girth upto 2m, height: 7-9m). A list species recorded from Kanasageri mangroves is given in Table II.

Aghanashini river estuary: Aghanashini

TABLE II

IMPORTANT SPECIES OF KALI AND AGHANASHINI RIVER ESTUARIES

Species	Kali river estuary	Aghanashini river estuary	Biological form
Acanthaceae			
Acanthus ilicifolius L.	+	+	Shrub
Avicenniaceae			
Avicennia alba Blume	+	+	Tree
Avicennia marina Vierh	+	+	Tree
Combretaceae			
Lumnitzera recemosa (L.) Gaertn.	+	—	Shrub
Cyperaceae			
Scirpus litoralis Scharad	+	+	Herb
Euphorbiaceae			
Excoecaria agallocha L.	+	+	Shrub
Graminae			
Aleuropus lagopoides	+	+	Herb
Myrsinaceae			
Aegiceras corniculatum (L.) Bl.	+	+	Shrub
Papilionaceae			
Derris trifoliata Lour.	+	+	Climber
Abrus precatorius Linn.	+	—	Shrub
Rhizophoraceae			
Rhizophora apiculata Bl.	+	+	Tree
Rhizophora mucronata Lamk.	+	+	Tree
Bruguiera gymnorihiza (L.) Lamk.	+	—	Tree
Kandelia candel (I.) Druce	+	+	Tree
Sonneratiacea			
Sonneratia alba Sm.	+	+	Tree
Verbenaceae			
Clerodendron inerme Gaertn.	+	+	Shrub

river, which flows into the Arabian sea at Kumta, shows salt intusion in it upto 20-25 Kms. Mangrove swamps observed in thick patches near Kagal and Masur villages While *Rhizophora mucronata* is the dominant, *R. mucronata* and and *R. apiculata* form a distinct shoreline vegetation. *Kandelia candel*, *Sonneratia alba* and *Avicennia* were present towards the leeward side of the vegetation. *Rhizophora* sp. and *Kandelia candel* have a density of 5-6 plants and 1-2 plants per 3 square meters respectively. Species recorded from this estuary is given in Table II.

Organic and inorganic constituents of litter samples : Chemical constituents estimated showed variation from species to species and also between the same species growing at the two estuaries (Table III).

Fisheries potentiality : Sunkeri, Kanasageri and Chitakala in Karwar have rich harvest of prawns (*Panaeus monodon*, *P. indicus*, *Metapenaeus dobsoni* and *M. monoceros*), edible oyster (*Crassostrea gryphoides*),

TABLE III

ORGANIC AND INORAGANIC CONSTITUENTS OF LITTER SAMPLES OF PRINCIPAL MANGROVE SPECIES OF KALI AND AGHANASHINI RIVER ESTUARIES

Plant species		Org. carbon	Na	K	Ca	Mg	P	Na/K
Acanthus	K	19.2	3.70	2.38	0.35	0.79	0.195	1.55
ilicifolius	A	21.0	3.24	1.86	0.34	0.76	0.21	1.74
Avicennia alba	K	36.0	3.50	1.25	0.24	1.265	0.13	2.7
	A	36.8	3.70	1.30	0.240	1.216	0.125	3.24
Avicennia marina	K	34.2	3.50	1.70	0.268	1.3	0.145	2.8
	A	34.8	3.30	1.14	0.35	1.40	0.127	3.9
Lumnitzera racemosa	K	33.6	3.50	0.69	1.88	1.60	0.04	5.1
Excoecaria	K	26.4	2.80	0.72	0.26	0.76	0.15	3.88
agallocha	A	25.2	2.75	0.69	0.30	0.68	0.21	2.75
Aegiceras	K	29.4	2.00	0.64	0.80	0.11	0.16	3.12
corniculatum	A	27.6	2.56	0.77	0.92	0.02	2.11	3.32
Rhizophora	K	34.8	2.75	1.30	0.24	1.48	0.19	3.12
apiculata	A	37.8	2.80	0.52	0.41	1.70	0.21	5.38
Rhizophora	K	35.4	3.00	0.96	0.16	0.89	0.21	3.12
mucronata	A	36.0	2.80	0.36	0.20	1.80	0.24	7.70
Bruguiera gymnorhiza	K	43.2	4.0	0.36	0.26	1.26	0.25	10.98
Kandelia	K	40.2	2.0	1.14	2.0	0.92	0.14	1.75
candei	A	37.8	1.80	1.26	0.24	0.90	0.12	1.42
Sonneratia	K	34.2	3.24	1.18	0.24	0.48	0.13	2.74
alba	A	32.4	4.0	1.60	0.69	0.43	0.13	2.5

K—Kali river estuary. A—Aghanashini river estuary.
Values are expressed in g/100g of dry tissue.

mussel (*Perna viridis*) and clam (*Meretrix meretrix*). Low lying mud flats and paddy growing plains (gajani lands) are used for aquaculture by bunding methods. Other important resources along the swamps are *Mugil cephalus*, *Scathophagus argus*, *Etroplus suratensis*, *Ambassis* sp., *Telescopium telescopium*, *Littorina scabra*, *Cerethedia fluviatilis* etc., In Aghanashini estuary, gajani lands adjacent to mangrove swamps are mainly used for prawn culture during October to May. Besides, shell collection from the shallow soil sediments of mangroves is a flourishing business in both the estuaries.

Trees are considered as obstacles for aquaculature and axed for the fuel wood. This is very much evident in Sunkeri where approximately 2-3 hectares of well grown trees are completely cleared for the aquaculture. Clearings of the trees prevented the natural regeneration of vegetation. Removal of species with proproots and pneumatophores which have the greater capacity to hold the silt and organic rich soil resulted in their subsequent loss and thereby increased depth of water also. Artificial construction of mud bunds (to prevent ingress of saline water into the paddy fields) along the kharlands has also cleared major mangrove areas in Aghanashini river estuary.

DISCUSSION AND CONCLUSION

Species diversity was very little in both the estuaries. *Lumnitzera recemosa* and *Bruguiera gymnorhiza* were restricted to Kali river estuary *Kandelia candel* (recorded earlier only from Kumta, Cook, 1905) is also noticed in Kali river estuary *Sonneratia alba* dominated Kali river estuary followed in descending order by *Rhizophora mucronata*, *R. apiculata* and *Avicinnia* species. *Rhizophora mucronata* was very prevaient in Aghanashini river estuary followed by *R. apiculata* and *Avicennia* species. Association of *Aegiceras corniculatum* with *R. apiculata* is very characteristic in both the estuaries.

Nutritional values of leaves of mangrove plants is important from the stand point of fish feeding. Golley (1969) is of the opinion that nutritional value of mangrove foliages are relatively higher than other tropical trees. Fallen leaves forms an important source of nutrition to the marine animals. Chemical composition of leaves of different mangrove species was studied earlier by various workers (Sokoloff, Redd and Dutcher 1950, Morton 1965, Lakshmanan 1983, Leela Bhosale *et al.* 1983). Untawale (1978) studied the seasonal variation in major metabolites of 7 species of mangrove foliage from Goa. Analysis of the chemical constituents of the litter helps in understanding their per cent nutrient contribution available to the marine fauna. Thereby such species with higher per cent of nutrient values may be used in fish farms. The difference in the chemical constituents in species of Kali and Aghanashini river estuaries (present study) may be due to different environmental factors (like salinity, edaphic factors etc.). *Sonneratia alba*, *R. mucronata* *R. apiculata*, *A. marina* and *A. alba* with high density of vegetation and greater energy content could of much value in fish forms. *B. gymnorhiza*, *Kandelia candel*, *Lumnitzera recemosa* and *Aegiceras corniculatum* are some other species could be used at areas of their abundance.

Fish and shell fish seed resources studied in Kali estuary (Nagaraj & Neelakantan, 1982) indicate the abundance of edible oysters, clams, bivalves and prawns mainly in the vicinity of mangroves. pneumatophores and proproots of mangroves provide shelter to the associated fauna and also act as breeding grounds for commercially important fishes. Soil sediments in the vicinity of mangroves

are the rich source of shells and providing lot of labour opportunities (shell collection from the shallow bottom) to the local inhabitants. Thus destruction of the vegetation result ultimately in poor fishing and erosion problems.

Conservation of mangroves will be fruitful only if the local inhabitants are made to realise their importance. This could be done by educating the school children and involving them in mass planting of mangrove seedlings every year. Regeneration of vegetation require establishing a nursery of mangrove plants and planting them in disturbed sites. Social forestry programmes in these areas may also provide alternate source of fuel wood and fodder to local inhabitants and their cattles.

Mangroves in the Kharland management : Kharlands form the vast stretches of low lying lands along the coast subjected to regular inundation by tides from the sea. These areas form the productive paddy growing plains of the coast. Ingress of sea water is a regular feature and because of salanization the lands become unproductive. The State Government is monitoring the kharland management by constructing artificial mud bunds with sluice gates to prevent entry of saline water into the fields. Consolidation of the bunds is a major problem as erosion is very severe particularly in the monsoons. The erosion can be prevented and bunds could be made stable by mass planting of stilt rooted *Rhizophora apiculata*, *R. mucronata* and *Kandelia candel*.

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