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MANGROVE ASSOCIATED FLORA AND FAUNA AND CONSERVATION IN THE ANDAMAN AND NICOBAR ISLANDS

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The Andaman and Nicobar Islands are situated in the Bay of Bengal between 6° 45' to 13° 41' north latitudes and 92° 12' to 93° 57° East longitudes. The total area of these islands is 8249 km^2 consisting of 306 islands and 206 rocks and rocky outcrops with a coastal line of about 1962 kilometers. The mangrove occurs at the edges of the tropical and sub-tropical sea in bays, lagoon and estuarine regions. Thus "Mangrove is trees of various species of several families, which grows only where they come into permanent contact with sea water or brackish water". The term mangrove has been derived from two words, *viz*. Portuguese term "Mangue" the community of Mangrove trees and English word 'Grove' means trees or buses Mangroves were referred to the arborescent species that grows in the tidal zones of the tropics. Total area of mangrove forest is 615 square kilometers in the year 2007. Of which 612 km^2 in Andaman group of Islands and only 3 km^2 in Nicobar group of islands. The mangrove forests are the dwelling place of different type of fauna as Polychetes, Moluscs, Crustacean, Eichinoderms, Sipunchuleds, variety of Fishes, Reptiles, Avifauna and Mammals. Mangroves forests are the seaward barrier and check coastal erosion. They minimize the tidal thrust on strong storm hit arising from sea Mangrove surrounding are important spawning ground and nursery beds for several most economic marine or offshore prawn and fish species. Without the mangrove ecosystem several species of shrimps and prawns may not exist. Mangrove protect on minimize the natural cyclone or surges of the bay. To protect the mangrove ecosystem further degradation of the habitat by providing full protection to vegetation, fauna and its associates. Measures should be taken for mass education and emphasized the role of conservation of mangroves ecosystems and the wild animals. To protect the mangrove ecosystem and sustainable utilities of the natural resources the arrangement of the training facilities should require to plan and provide the infrastructure facilities and adequate financial support to rural people to adapt modern techniques of agriculture, aqua-farming, mariculture, opiculture, silvipisculture fruit plant, prawn, crabs and fish processing. For the mangrove conservation, it require to aware the local people by setting up the Mangrove interpretation centres, audio-visual demonstration and highlight the important or impact of the mangroves to the human beings.

Keywords: Conservation, Fauna, Flora, Mangrove

INTRODUCTION

The Andaman and Nicobar Islands are the largest archipelago system in the Bay of Bengal, consisting of 306 Islands and 206 rocks and rocky outcrops. This islands chain is situated between 6° 45' North to 13° 41' North Latitude and between 92° 12' East to 93° 57' East Longitude. The total geographical area is 8249 km^2 with a coastline of 1962 kilometers. The Andaman and Nicobar groups of Islands provide innumerable creeks, bays estuaries and these facilitate the development of rich and extensive mangrove forests. This mangrove forest area constitutes 9.4 per cent of the total land area and about 10.9 of total forest area of the Andaman and Nicobar group of Islands (Dagar *et al*., 1991). These mangrove zones in the Andaman and Nicobar Islands are estimated about 18 per cent of the Indian total mangroves (Naskar and Guha Bakshi, 1987).

The Andaman and Nicobar Islands ecosystems are normally very fragile though 80.76 per cent of land area is still covered by forest mangrove and trees. The ecosystems are under threat due to the developmental activities. The population pressure is continuously increasing in poaching demand on the natural resources. Despite many benefits provided by mangroves, they are under intense pressure

from competing resources uses, in particular fire wood collection, aquaculture, wood chipping operations hut construction, increased commercial activities and urban development demands. The major impact on the mangroves is due to the increase in the population, mainly in the last three decades.

METHODOLOGY

This research paper is based on the information collected by primary and secondary data from different sources, such as Department of Environment and Forests, Department of Census, Andaman and Nicobar Administration, Literatures, local people and NGO.

RESULTS AND DISCUSSION

Definition of Mangroves

- Plant which live in muddy loose, wet soil in tropical tide water - Davies (1910).
- Trees and the bushes growing between the level of high water of spring tide and level close to but above mean sea level - Macnaw (1968).
- Mangroves as coastal tropical formation found along the border of sea and lagoons, reaching upto the edges of the rivers to the point where the water is saline growing in swampy soils and covered by sea water during high tides - Aubreville (1970).
- The mangrove occurs at the edges of the tropical and sub-tropical sea, in bays, lagoon and estuarine regions. Thus Mangroves are trees of various species of several families, which grow only where they come into permanent contact with sea water or brackish water - Geriech (1573).
- The mangrove is a type of coastal wood vegetation that fringes muddy saline shores as estuaries in tropical and sub-tropical regions - Balsco (1975).

The term mangrove has been derived from two words, *viz*. Portuguese term 'Mangue' the community of Mangrove trees and English word 'Grove' means trees on bushes. The words 'Mangrove' and 'Mangrowe" were used in the oxford English Dictionary, since 1613 (17th Century), and the middle of 18th Century, the wide spread meaning of the term 'Mangroves' were referred to the arborescent species that grow in the tidal zones of the tropics.

Mangrove area of the Andaman and Nicobar Islands

North Andaman

South of Landfall island, creeks on the Bheele Bay, the Elizabeth Bay, the Duncan Bay, the Katara Creek, the Reef inlet, the Hudson Bay, the Gudi Nala, the Coffrie Bay, the McPherson Bay, the Mangroves Bay, the Blair Bay, the Gibb Creek, the Bacan Bay, the Shallow Bay, the Godwin Bay, the Luis Inlet and the Robert Bay (Table 1 and 2; Fig. 1).

Middle Andaman

On the Qutram Island, the Henry Lawrence Island, along the Rangat bay, the Austen Strait, the Cook's Passage, the Foul Bay, the Pitt Bay and Horsford Bay (Table 1 and 2; Fig. 1).

South Andaman

The Corieve Bay, the lagoon in Port Meadows on the Wilson Island, along the Blair reef, the Constance Bay, the Shoal Bay creek, the Flat bay, along with creek on the Havelock Island (Table 1 and Fig. 1).

Little Andaman

Along the Bumila Creek, Egubelong Creek, the Jacson Creek, Dugond Creek the Tae-eye-creek (Table 1 and Fig. 1).

Nicobar group of Islands

Near Cape Maud on the Tilanchang develop, along the Satellite bay on the Comorta Island, along with creeks on the Trinkat Island, the Nancowry Island, along the East and West Bay on the Katchal Island, Car Nicobar and Morgan Nala of the Campbell Bay (Great Nicobar) (Table 1 and Fig. 1).

Mangrove area of the Andaman and Nicobar Islands

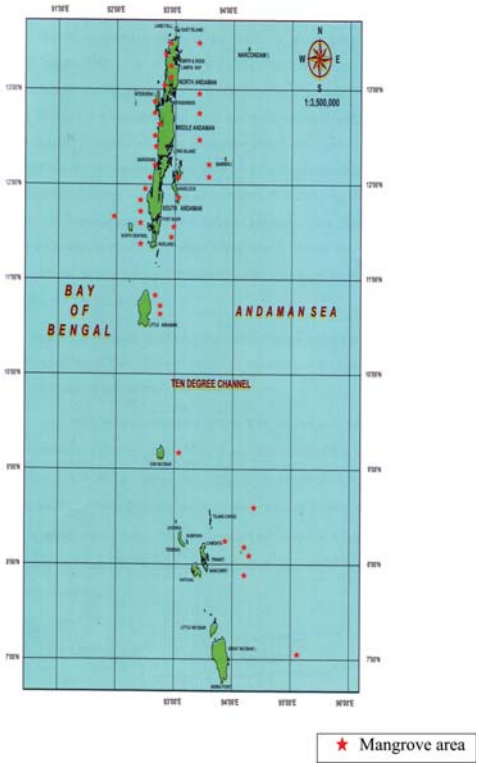

Table 1: Area under Mangrove Coverage in the Andaman and Nicobar Islands

Sl. No.	Location / Region	Area (Ha)
1.	South Andaman	12,750.33
2.	Baratang	8,025.60
3.	Middle Andaman	23,394.55
4.	Mayabunder	7,363.41
5.	Diglipur	19,949.56
6.	Little Andaman	3,414.22
7.	Nicobar	2,871.08
	Total	**77,768.75**

Source – Satellite imagery of March, 1986 & September (1987)- modified after Bandopadhyay, A.K. (1992).

DISCUSSION

The assessment shows a decline in the area of mangroves in Andaman and Nicobar Islands compared to 1993-1999 assessment (Table 2). The main reason for this decline is change in the methodology (digital interpretation) and scale of interpretation (1: 50000) due to which small water bodies (creeks, straits etc.) and non-mangrove areas which earlier could not be delineated had been detected and extracted out from the areas under mangrove covers in visual / manual interpretation on 1:1 million. As mangroves also constitute forest cover like any other tree vegetation in the recent assessment (2001 and 2003) instead of keeping Mangroves as separate class, it is classified into very dense, moderately dense and open forest and include within Forest Cover. **The decrease is mainly because of interpretational corrections as some open forest was in correctly classified as mangrove in the earlier assessment as reported in SFR 2003. The original mangrove cover in 2003 Assessment was 671 square

kilometers. Later on revised and 658 square kilometers. Mangrove cover shown in the SFR-2005. ***compared with 2003 assessment, there has been a marginal decrease of 21 square kilometers in the mangrove cover mainly because of the Tsunami hit in these islands on 26th December 2004 as reported in SFR 2003. Most of these mangrove zones identified on mapped with the help of satellite imagery of space Application Centre (ISRO) Anonymous, 1992) (Table 3).

Table 2: Mangrove occupies area in km^2 year wise

Year of assessment	Area under Mangrove covers in Andaman and Nicobar Islands km^2
1987	686
1989	973
1991	971
1993	966
1995	966
1997	966
1999	966
2001	789*
2003	658 (revised)**
2005	637***
2007	615

Table 3: District wise Mangrove cover as per ISFR 2009

Union Territory	Very dense	Moderately Dense	Open	Area in km^2 Total
Andaman group of Islands	285	260	67	612
Nicobar Group of Islands	-	2	1	3
Total	285	262	68	615

Fauna of mangroves of Andaman and Nicobar Islands

The Andaman & Nicobar Island's mangroves are the dwelling place of different types of fauna as follows, Polychetes (8 species), Molluses (100 species), Gustacean (50 species), Eichinoderms (6 species), Sipunculids (2 species), Fishes (24 species), Arifauna (53 species), and Amphibians (3 species). Among the mammals, wild pigs, bats, squirrels few species, deer, including and reptiles, saltwater crocodile *Crocodiles porous*, Andaman water monitor, lizard and water snakes.

Protective and economic roles played by the mangroves in these Islands

The undisturbed and natural mangroves forest or ecosystem may act as the seaward barrier and check considerably the coastal erosion. They minimize the tidal thrust or strong storm hit arising from the sea. The well developed mangrove habitats may also accelerate the siltation and accretion process by arresting the water transport silt and clay particles, which ultimately built or extend the coastal zone through accretion. Mangrove coverage, may act as a buffer agent and protect on minimize the natural cyclone or surges of the bay. Mangrove surrounding are important spawning ground and nursery beds for several most economic marine or offshore prawn and fish species. Mangrove detritus and the subsequent mineralized nutrients are exported out of the mangrove ecosystem through tidal flashing. Without the mangrove ecosystem several species of shrimps and prawns may not exist. Mac Nae (1968) strongly says that "No mangrove no prawn". Some prawn species may breed and complete

their life cycle in the shallow mangrove dominated water as many of such prawn species may require more saline water and depart offshore to spawn and their larvae or juveniles then migrate back to the mangrove cover waterways. These mangrove areas provide their natural food and these dense mangrove forest zone serve as their grazing ground, till their maturation.

Pressure on mangrove in Andaman & Nicobar Islands

Increasing population is the main cause of pressure on the mangrove in the Andaman & Nicobar Islands. Human activities contributing to the loss and degradation of mangrove habitat include overharvesting for fuel wood and timber production, land clearing for agriculture and coastal development and conversion to shrimp and other aquaculture ponds, creation of ports.

Conservation of mangrove forest for islands welfare

- To protect the mangrove ecosystem beyond the further degradation of the habitat by providing full protection of vegetation, fauna and its associate.
- Eco-restoration of degraded and critical mangrove areas by forestation.
- To identity endangered mangrove species and provide full protection for rehabilitation by declaring the respective areas as National Parks or sanctuary.
- To check reclamation, encroachment and destruction of mangrove by effective measure.
- To create awareness amongst the public on the importance of Mangrove ecosystem and the need for preservation.
- To monitor the changes in mangrove area, its floristic and faunal composition and physiographic changes through proper data base by remote sensing and Geographic Information System.
- Changes in sea level and its effect on mangroves is to be critically documented as islanders will be more affected by the climatic change.
- The hydrological process with respect to the mangrove ecosystem and monitoring the changes in sea level should worked out on a priority bass, as islands are likely to be affected first by rise in a sea level.
- Strict measures have also undertaken for conservation of the Islands mangrove, the mangrove associated flora and mangrove habitats but threatened and endangered fauna by people participation and involving local panchayats.
- Protection measures have been sorted for the natural mangrove habitats and other mangals associated ecosystems, during further developmental activities as these developmental activities must have destroyed the natural systems and may cause hazardous situation.
- The conservation measure must be strengthened by providing facilities to 'Nature Studies' 'Nature Camp and Man-awareness Programmes' and involve these local people of Islands Mangrove fringe areas.
- For these nature conservation it requires to aware the local people by setting up the mangrove interpretation centres, audio-visual demonstration and highlight the importance or impact of the mangrove to the human beings.
- Measures should be taken for mass education and emphasized the role of conservation of mangrove ecosystems and the wild animals; all these measures must minimize the man-animal conflict.

CONCLUSION

Mangroves are the sea-land interphase, intertidal habitat tropical and sub-tropical woody plants. They may also be referred 'coastal ecosystem in a holistic manner including its common habitat or inhabitant fauna. Mangroves are the pride of the Andaman and Nicobar Islands. These are unique resources and have great importance to the majority of people in these islands. The mangrove ecosystems, as such provide natural food to the mangrove dwelling fauna. These mangrove forests may serve as link between the terrestrial and aquatic ecosystem as these grow in the sea-land interphase. The mangrove flora is 34 in the Andaman

& Nicobar group of Islands (Table 4). These mangroves flora and the mangal of ones of the Andaman & Nicobar Islands and least disturbed and best preserved in the perspective to the mangals of other Indian territories. So many species are found in these mangrove forests. For this limited bio-diversity in the Andaman and Nicobar Islands and for preserving several endemic fauna of these Islands the conservation policies should require undertake urgently.

Table 4: Type of Mangroves in the Andaman & Nicobar Islands

Sl. No.	Species Name	Family	Habit
1.	*Acanthus illicifolius*	Ancanthaceae	Shrub
2.	*Acanthus ebracteatus*	Ancanthacease	Shrub
3.	*Ancanthus Volubilis*	Ancanthacease	Climber
4.	*Aegialitis rotundifolia*	Plumbaginaceal	Shrub
5.	*Aegiceras corniculatum*	Mynsinacease	Shrub/tree
6.	*Avicenia Masina*	Avicenniaceae	Tree
7.	*Avicenia offcinalis*	Avicenniaceae	Tree
8.	*Brugriera cylindrical*	Rhizophoraceae	Tree
9.	*Brugriera gummarrihiza*	Rhizophoraceae	Tree
10.	*Brugriera parviflora*	Rhizophoraceae	Tree
11.	*Brugriera sexangula*	Rhizophoraceae	Tree
12.	*Ceriops decandra*	Rhizophoraceae	tree
13.	*Ceriops tagal*	Rhizophoraceae	Tree
14.	*Cynomitra iripa*	Caesalpiniaceae	Tree
15.	*Cynomitra ramiflora*	Caesalpiniaceae	Tree
16.	*Excoecaria agalocha*	Euphorbiaceae	Tree
17.	*Heritiera littoralis*	Sterculiaceae	Tree
18.	*Kondelia Candel*	Rhizophoraceae	Tree
19.	*Lumnitzera littorea*	Combretaceae	Tree
20.	*Lumnitzera racemes*	Combretaceae	Tree
21.	*Nypa fruitcans*	Arecaceae	Palm
22.	*Phoenix paludosa*	Arecaceae	Palm
23.	*Rizophora apiculata*	Rhizophoraceae	Tree
24.	*Rizophora mucronata*	Rhizophonaceae	Tree
25.	*Rizophora stylosa*	Rhizophoraceae	Tree
26.	*Rizophora lamarckie*	Rhizophoraceae	Tree
27.	*Scyphiphora hydrophyllacea*	Rubiaceae	Shrub
28.	*Sonneratia alba*	Sonneratiaceae	Tree
29.	*Sonneratia apaetala*	Sonneratiaceae	Tree
30.	*Sonneratia caseolarus*	Sonneratiaceae	Tree
31.	*Sonneratia griffithei*	Sonneratiaceae	Tree
32.	*Xylocarpus granatus*	Mileacaeae	Tree
33.	*Xylocarpus mekongensis*	Meliacaeae	Tree
34.	*Xylocarpus moluccensis*	Meliacaeae	Tree

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Nypa fruitcans strands – South Andaman

Mangrove of Galathea River – Great Nicobar

Habitat utilization - artisanal fishing in mangrove creeks in the Andamans & Human habitation along mangroves in the Andamans

Mangrove strands dying post tsunami uplifted of Middle Andaman

Mangroves and the Great Andamanese people

Plate 1: Mangrove of Andaman and Nicobar Island