

Volume

Conservation and management strategies for mangrove forests of Bhitarkanika National Park, Orissa, India

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Mangroves are world's most productive ecosystems and support genetically diverse community of terrestrial and aquatic and flora and fauna. They provide innumerable direct and indirect benefits to human beings. Mangroves and their resources are often over exploited and need conservation and application of judicious management practices for their sustainable use. Bhitarkanika mangrove forests located in the confluence of rivers Brahmani and Baitarni in Orissa is the second largest mangrove formation in Indian sub-continent. These mangroves have high biological species diversity which is rated among one of the best in the world.

Realising the importance of these mangroves the State Government of Orissa declared it as a Sanctuary in 1975 under Wildlife (Protection) Act. 1972. Subsequently, the core area of the Sanctuary over an area of 145 Sq. Kms having all the mangrove forests have been declared as a national Park in 1998. In fact, this is the only National Park of the State as on date. It has been declared as a Ramsar site since 2002. Gahirmatha coast (breeding grounds of over 6 lakh sea turtles annually), of Bhitarkanika has been declared as a Marine Sanctuary in 1998.

At present the area is protected with declaration of two sanctuaries and a national park. There are many areas of conflict between the local residents and the protected area authorities. The Mangrove Forest Division has initiated eco-development programme in order to reduce the dependency on the mangrove forests. If properly implemented eco-development can be used as an effective tool in Protected Area management. Conservation and management strategies for mangrove forests of Bhitarkanika National Park, Orissa, India

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SUMMARY Mangroves are worlds most productive ecosystems and support genetically diverse community of terrestrial and aquatic and flora and fauna. They provide innumerable direct and indirect benefits to human beings. Mangroves and their resources are often over exploited and need conservation and application of judicious management practices for their sustainable use. Bhitarkanika mangrove forests located in the confluence of rivers Brahmani and Baitarni in Orissa is the second largest mangrove formation in Indian sub-continent. These mangroves have high biological species diversity which is rated among one of the best in the world.

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At present the area is protected with declaration of two sanctuaries and a national park. There are many areas of conflict between the local residents and the protected area authorities. The Mangrove Forest Division has initiated eco-development programme in order to reduce the dependency on the mangrove forests. If properly implemented eco-development can be used as an effective tool in Protected Area management. Introduction

Mangroves are typically tropical and subtropical coastal vegetation found in inter-tidal zones of river deltas and backwater areas. It is a dynamic ecosystem and flourishes only in the region where there is influx of both fresh and tidal water. Mangrove forests dominate one-quarter of the worlds tropical coastline. The total area of Indian mangroves is estimated to be 4827 sq km distributed along the coastal States/Union Territories, which account for about 5% percent of the worlds mangrove vegetation and 0.4 percent of the geographical area. (Anonymous, 2003).

Mangroves forests are widely distributed throughout the tropics where they grow abundantly along the coasts (Choong et al.1990). Mangroves are fast disappearing at a time when there are clear indications of potential changes in climate, sea level and the levels of UV-B radiation. Indiscriminate exploitation of mangrove resources without any land use plan has degraded

mangrove ecosystems in India. India has lost 40 percent of its mangrove area cover during the last 100 years (Anon, 1987). In India mangrove conservation and management policies were initiated between 1985 and 1995, thanks to the various efforts taken by Ministry of Environment and Forests, Government of India. This paper describes the mangroves of Bhitarkanika and efforts made by Forest Department of Orissa for management and conservation of mangrove forests.

Mangroves of Orissa

The coastline of Orissa extends over 480 Kms along the Bay of Bengal, sustain countrys rich mangrove forests. These mangroves occur in a continuous belt for a distance of 160 Km from Dhamara river mouth in the north to Devi river mouth in the south through deltaic formations of major rivers like Brahmani, Baitarani, Mahanadi and their tributaries. They are considered as one the Indias richest mangrove forests in terms of species diversity. The mangroves of Orissa cover an area of 215 sq. Km. (Forest Survey of India, 1999) and constitute about 4.37 percent of the countrys mangrove forest (4827 sq. km.) (Table 1). Mangrove forest is distributed in seven coastal districts of the state, four districts in the northern part, and three in the southern part. The distribution of mangroves in major four districts of the state are given in table 2. Mangroves occurring in the tracts of Balasore, Puri and Ganjam are now in highly degraded form and often ignored. Mangroves occurring in the regions like Paradeep, Hukitola, Kujanga, Jambu in Mahanadi delta are in highly denuded form or totally destroyed at places. Mangroves of estuaries of Devi, Subarnarekha and Budhabalanga are in highly degraded status with sporadic occurrence of species like *Acanthus ilicifolius*, *Rhizophora mucronata*, *Phoenix paludosa*, *Excoecaria agallocha*. The mangrove taxa at the fringes of Chlika lake and Barakuda island as enumerated by Narayanswami and Carter (1922) as well as Haines (1921-23) are not traceable at present.

Biodiversity of Bhitarkanika mangroves

Bhitarkanika mangrove forests occur in the northern part, over about 130 sq. km., bear considerable importance and ecological significance. The mangroves of Bhitarkanika forests contain high concentration of typical mangrove species and wide spectrum of genetic diversity (Das et al. 1991). About 63 species of mangroves and their associated vegetation are known to occur in this area. Occurrence of 3 species each of *Avicennia*, *Heritiera*, *Sonneratia*, *Rhizophora* and *Xylocarpus* and 4 species of *Bruguiera* is significant for this forest. It also shows maximum number of species diversity in comparison to those of Sunderbans, Godavari, Cauvery and Andaman-Nicobar islands (Choudhury et al., 1995).

Besides, the diversity in plant species, the faunal diversity in Bhitarkanika is also very high (Table 3). It supports 285 species of birds including migratory ducks and geese. There are 26 species of mammals, 5 species of amphibians, 44 species of reptiles and several species of fishes, and numerous species of invertebrates in these mangroves (Pandav, 1996; Daniels & Acharjyo, 1997). The important carnivores include the endangered fishing cat (*Felis viverrina*) and leopard cat (*Felis bengalensis*). Further, these mangroves constitute the preferred habitat for endangered reptiles such as the saltwater crocodile (*Crocodylus porosus*), Indian Python (*Python molurus*). King cobra (*Ophiophagus hannah*), water monitor (*Varanus salvator*) and the Olive ridley sea turtle (*Lepidochelys olivacea*). The creeks and mudflats abound small crustaceans and invertebrates. The horseshoe crab is an important species found in the area. Its blood is known to have potential medicinal properties. Coastal waters also contain dolphins and little Indian porpoise.

Recently it has been declared as Ramsar site. In fact, the coasts of Orissa (Gahirmatha and river mouths of Devi and Rusikulya) are the breeding grounds of over 6 lakh turtles annually, which has been designated as the largest sea turtle mass nesting rookery in the world. Gahirmatha coast of Bhitarkanika has been declared as marine sanctuary in 1998. Threat to mangroves

Mangrove community

Mangroves are endowed with rich and diverse living resources. In view of high degree of productivity of these forests and wetlands, the density of resident human population both inside the sanctuary and in the periphery is very high. This region is very fertile and suitable for paddy cultivation. The area has also valuable fishery resource, which substantially contributes to the livelihood security of the poor. About 2 lakh people live in over 410 villages situated in the and around the mangroves areas. The villages are inhabited by a number of castes where social, economic and gender inequalities are predominant presenting complex socio-economic characteristics. There is continuous migration of Bengali speaking population to these areas through sea and river route. Paddy cultivation and subsistence fishery are the means of livelihood for the people.

Exploitation of mangrove resources

Human communities living in and around the mangrove forests are dependent on it to meet their

various needs. Mangroves are exploited for fuel, house building and basket making materials, wood for agricultural implements and fishing tools, honey collection and medicine etc. People living in and around the mangrove forests indulge in poaching, illegal fishing, collection of crabs, thus threatening the unique environment. Besides, much of the mangrove forests in Orissa have been encroached and reclaimed for agriculture and aquaculture and human settlement (both for local and migrants). Construction of commercial ports coupled with extensive shrimp farming has been the cause of mangrove degradation in Orissa. Due to increase in population in this region, the mangrove vegetation is being continuously destroyed. As a result of over-exploitation and destruction of mangrove vegetation, some taxa have been identified under threatened categories (Biswal and Choudhury, 1993). Some of the taxa of these categories are as follows (Table 4).

Grazing One of the principal hazards facing this ecosystem is the magnitude of animal grazing particularly by goats, cattle and buffaloes. At the mangrove area has large population of buffaloes both for purpose of milk and for draught power in agriculture. Specific groups in the community known as Gopals (milkman) keep buffaloes for commercial purpose. Most of the mangrove species are found to be grazed by buffaloes. Further, emerging seedlings are damaged due to trampling by these animals. The herdsman are not able to maintain their buffaloes due to want of grazing land and are allowing their herd to graze in nearby mangrove forest blocks resulting in low seed establishment rate, soil compaction, heavy browsing of apical shoots in case of seedlings and trampling of samplings and uprooting of many species of vegetation particularly affected were *Avicennia*, *Rhizophora*, *Cerriops*, *Aegiceras*, *Phoenix*, *Porteresia* and *Myriostachya* etc. (Table 5) which result in stunted growth. The intensely grazed plants flower early and do not grow normally. The problems of buffalo grazing in this area have a direct adverse impact on the fragile and unique ecosystem. Apart from buffaloes cattle are also left in the forest to forage which not only graze on the young leaves but also damage the seedlings.

Prawn Farms

Extensive prawn farming is taking place in mangrove areas of Orissa. Immediate high profit margin lures many outside entrepreneurs and local people to take up shrimp farming unmindful of the damage to the environment. Shrimp farming results in rendering the area permanently unsuitable for mangrove ecosystem. It causes pollution through addition of chemicals and pesticides and usually makes the land unfit for agriculture or forestry. Owners of rice fields adjacent to prawn ponds are forced to give the land to shrimp farm owner, either because of low productivity of their rice fields or pressure from the wealthy farm owners (Kumar, 1997). People see only the short-term gain and are not aware of long-term livelihood security. The social consequences of this entrepreneurship are not clearly understood. The desirability of prawn cultivation and shift in the land use pattern in sensitive habitats need to be critically examined. Shrimp farming is a very profitable business in short term basis compared to agriculture and animal husbandry (Kumar, 1997). Majority of shrimp farms in India are 100 percent export oriented. Out of a total 1.456 million hectare of brackish water area available in India. 0.902 million ha is being utilized principally for shrimp farms. It earns foreign exchange and generates employment for large unemployed coastal population (Mishra. 1998). In Bhitarkanika area, there are four main fish landing centers viz., Dhamara-Chandbali, Talachua, and Tantiapal. Dhamara is a port and is one of the oldest fish landing centers and Talachua is fairly recent. Since the Gahirmatha coast has been declared as a Sanctuary in 1998, fishing is prohibited in the off shore regions of the Bhitarkanika area.

Natural calamities in coastal Orissa

In the year 1971 the coastal belt of Orissa experienced a serious cyclonic storm, which almost wiped out two coastal villages of Bhitarkanika facing Bay of Bengal i.e. Kanpur and Satbhaya, claiming lot of human life and livestock. However, the villages protected by mangrove forests were saved. Super cyclone that hit Orissa coast in Oct 28, 1999 has caused havoc with loss of human and cattle population apart from loss of vegetation and properties worth millions of rupees in Paradip and Erasama area in Jagatsinghpur. But no significant damage was done to Bhitarkanika area there by highlighting the role played by mangroves in protecting the hinterland. The winds speed and tidal wave invasion has been minimum to areas close to mangrove forests. There has been no damage to mangrove forests, which is clearly visible from remote survey maps. This unique and sensitive plant community is fragile in nature and therefore, any fluctuation in the ecological equilibrium, will lead to biodiversity loss in an accelerated manner.. Many mangrove species have potential medicinal value. Now it has been realized that mangrove ecosystem should not only be protected but also be increased through adequate management interventions and sustainable method of uses.

Conservation and Management Strategies

Bhitarkanika was part of Kanika Zamindari till 1952. When the Zamindari system was abolished and the area were vested with the State Government of Orissa, mangroves were considered as unwanted weed and were cleared for growing agricultural crop and settlement of colonies till 1970s. Thus, pristine mangrove areas were clear felled to rehabilitate settlers both local and Bengalis from neighboring states and even from Bangladesh during early 1950s. Realising the importance of mangroves and concerns expressed by intellectuals over depletion of mangrove forest in Bhitarkanika, the State Government of Orissa declared it as Sanctuary in 1975 under Wildlife (Protection) Act, 1972. Subsequently, considering the zoological, geographical, geomorphological and ecological importance of Bhitarkanika, the core area of the Sanctuary over an area of 145 Sq Km having the mangrove forests have been declared as a national Park in 1998. This is the only National Park of the State as on date.

Objectives of management

1. Conservation of the mangrove eco-system along with its unique flora and fauna on long term basis.
2. Preserve the mangrove forests as a protective cover against cyclones and Tsunamis.
3. Maintain the ecological diversity for present and future scientific research.
4. Help people to understand nature .at its very best.
5. Generation of employment for local people through ecotourism.
6. Reduction of man-animal conflict

The management faces difficulties to completely prevent biotic interference in the national park .Six grampanchayats namely Dangmal, Talchua, Rangani, Gupti, Ishwarpur and Satbhaya directly draw their bio-resources from Bhitarkanika. The number of staff of forest department is quite inadequate to guard this pristine mangrove ecosystem from the onslaught of villagers surrounding the park. However, presence of estuarine crocodile in the creeks and creeklets creates some fear in the minds of local people. However, the man-animal conflict arising out of crocodile attack makes villagers raise their ire against both management and crocodiles. This again is an impediment to the conservation efforts in Bhitarkanika. The location of the villages is such that these are not easily approachable to nearby towns and cities. Thus the villagers are deprived of basic amenities like schools, dispensaries etc. Often roads get cut off during monsoon and boats are the only mode of communication. It is not possible on the part of handful of staff to cover all the areas that too in such inhospitable and difficult terrain for protecting the sensitive ecosystem. They are also deprived of looking after their families as the terrain is not suitable to keep their families with them. Lack of proper infrastructure and communication facilities makes the task even harder.

Ecodevelopment committees

Ecodevelopment committees (E.D.C.) have been constituted in peripheral villages along the concept of joint Forest management. However, usufruct-sharing mechanism has not been promised to the villagers in view of the fragility of mangrove ecosystem at Bhitarkanika and it being a declared national park. On the contrary the E.D.C. have been made to understand that by such arrangement the ecological benefits that would accrue will far outweigh the short-term economic benefits, they were deriving at present. The constitutions of these committees were earnestly taken up from February 2001. Till now there are 31 such committees dotting the periphery of the National park.

After constitution. Eco-development committees were involved various activities have undertaken through eco-development committees like cattle vaccination, health camp, vocational training for woman folk on papad making, incense stick making, basket making, bee-keeping, inland fishing, grass plantation, decentralized nurseries etc. facilities like drinking water, biogas plant establishment and opening of fire wood depot etc were taken up. Participation of eco-development committees in various activities yielded the following results.

1. The awareness level about national park has gone up amongst the local villagers.
2. The villagers are increasingly realizing the benefits accruing from the mangrove ecosystem
3. In a number of villages, they have shifted from firewood to dry coconut twigs, branches, cow dung cakes etc. as fuel on their own initiatives.
4. They are increasingly helping the National Park officials in apprehending poachers and woodcutters

Peoples participation

Sincere efforts have been made to enlist support of the local people in the management of Bhitarkanika national park. Earlier the villagers living in the peripheries always thought the existence of Bhitarkanika authority as a threat to their livelihood. The authorities had been trying hard to implement the provisions of Wildlife (Protection) Act, 1972, which does not allow any right to exist within the National park. That, the existence of mangrove ecosystem here is essential for their very livelihood was perhaps not so well accepted earlier. But gradually things are changing.. Particularly the devastating Super cyclone in October 1999 along the coast of Orissa has demonstrated that the

mangroves and the people living close to it are inseparable.

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Table 1. Mangrove distribution in India

Sl. No State Area (Sq. km) 1 Andhra Pradesh 329.0 2 Goa 10.0 3 Gujarat 960.0 4 Karnataka 3.0 5 Kerala 8.0 6 Maharastra 116.0 7 Orissa 207.0 8 Tamil Nadu 35.0 9 West Bengal 2120.0 10 Andaman & Nicobar Islands 671.0 11 Daman & Diu 1 12 Pondichery 1
Total 4461.0

Table 2. Mangrove distribution in Orissa

Sl No District Area (Sq. km) 1 Balasore 4.0 2 Bhadrak 20.0 3 Jagatsinghpur 3.0 4 Kendrapara 180.0
Total 207.0

Table 3. Biodiversity of Bhitarkanika mangroves

Sl. No Name of the species Number 1 Mangroves 29 2 Mangrove associates 41 3 Mammals 24 4 Birds 199 5 Amphibians 5 6 Reptiles 7 7 Crocodile 1 8 Lizards 9 9 Snakes 16 10 Sea turtle 4 11 Water turtle 3 12 Crab 4 13 Fish (Commercial) 15 14 Fish within the estuary 12 15 Macrofauna 61 Sources: Plants: Chada and Kar, 1999 Fishes: Daniels, 1997 Amphibians and Reptiles: Dutta and. Acharjyo, 1977 Birds: Kar and Pandav and Daniels Mammals: Forest Dept, Govt. of Orissa, Acharjyo and James et. al., 1989 Macrofauna: Kanvinde, 2003

Table 4: Mangrove species under stress in Bhitarkanika Species Status Cerbera manghas Vulnerable Sacrolobus carinatus Vulnerable Sonneratia caseolaris Vulnerable Heritiera kanikensis Rare Amoora cuculata Rare Acanthus volubilis Rare Merope angulata Endangered

Table 5: Mangrove and their associates eaten by buffaloes. Sl. No Mangrove Species Associated Species. 1 Avicennia sp. Phoenix paludosa 2 Rhizophora apiculata Suaeda maritima 3 Brownlowia tersa Dalbergia spinosa 4 Ceriops decandra Porteresia coarctata 5 Acanthus ilicifolius (only flowerin shoot is eaten) Cynodon sp 6 Aegicera corniculatum Myriostachya wightiana 7 Heritiera fomes