
STATE OF
SUNDARBANS
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Foreword

It has been aptly named - the Sundarbans - which in English translates 'the beautiful forest'. This vast expanse of tidal mangrove forest in Bangladesh's southwestern coastal region, which was once a serene and pristine natural forest, has for ages been an object of great pride for the country. A collection of innumerable islands, islets and shoals through which flow down to the Bay of Bengal countless rivers, rivulets and creeks, the Sundarbans has been a veritable ecological wonder that has always attracted and baffled all - from common people and nature lovers to the scientists, botanists, zoologists, geologists; from adventurers, livelihood-seekers to environmentalists and conservationists.

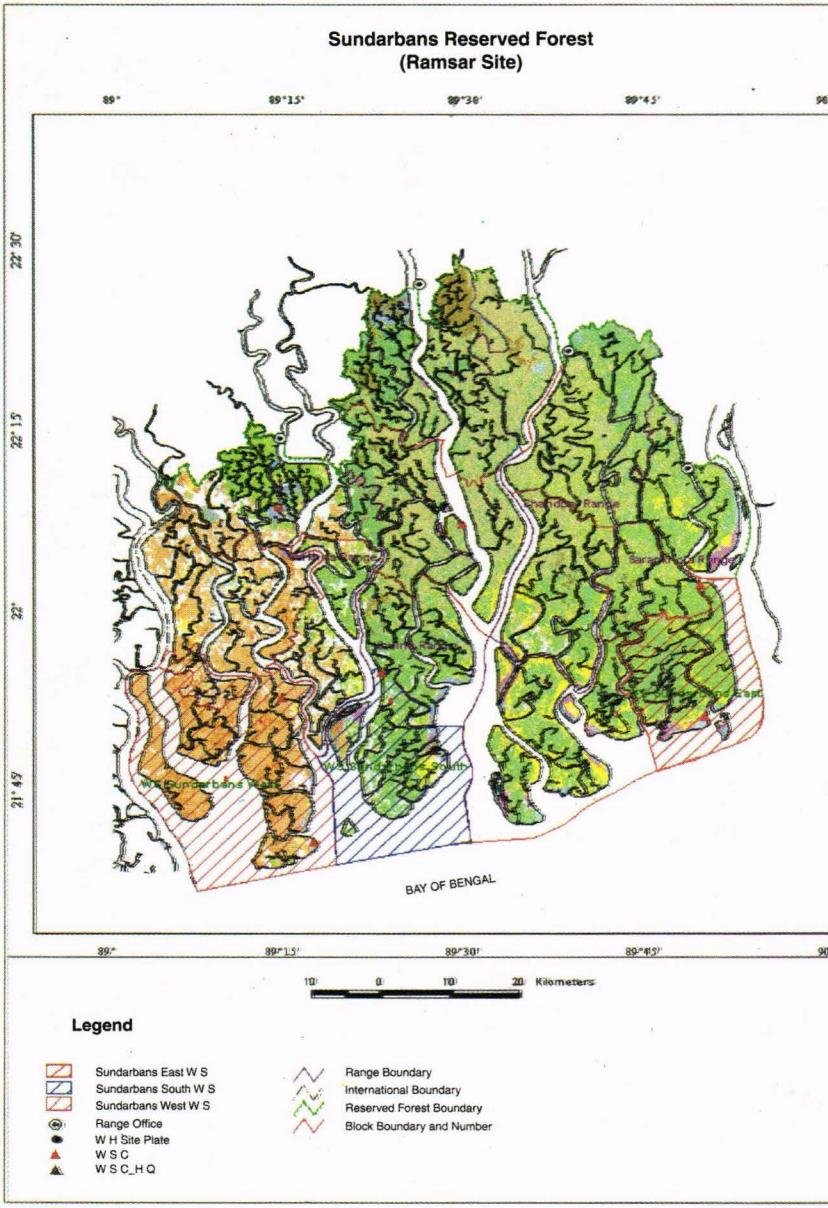
Dubbed the world's largest remaining mangrove forest, straddling the frontiers between Bangladesh and India, it has been of late declared a World Heritage Site by UNESCO. But unfortunately though, the Sundarbans of the myths and legends, the great habitat of bio-diversity, the abode of endless flora and fauna and the home of the world famous Royal Bengal Tiger, is fast approaching towards becoming a wasteland.

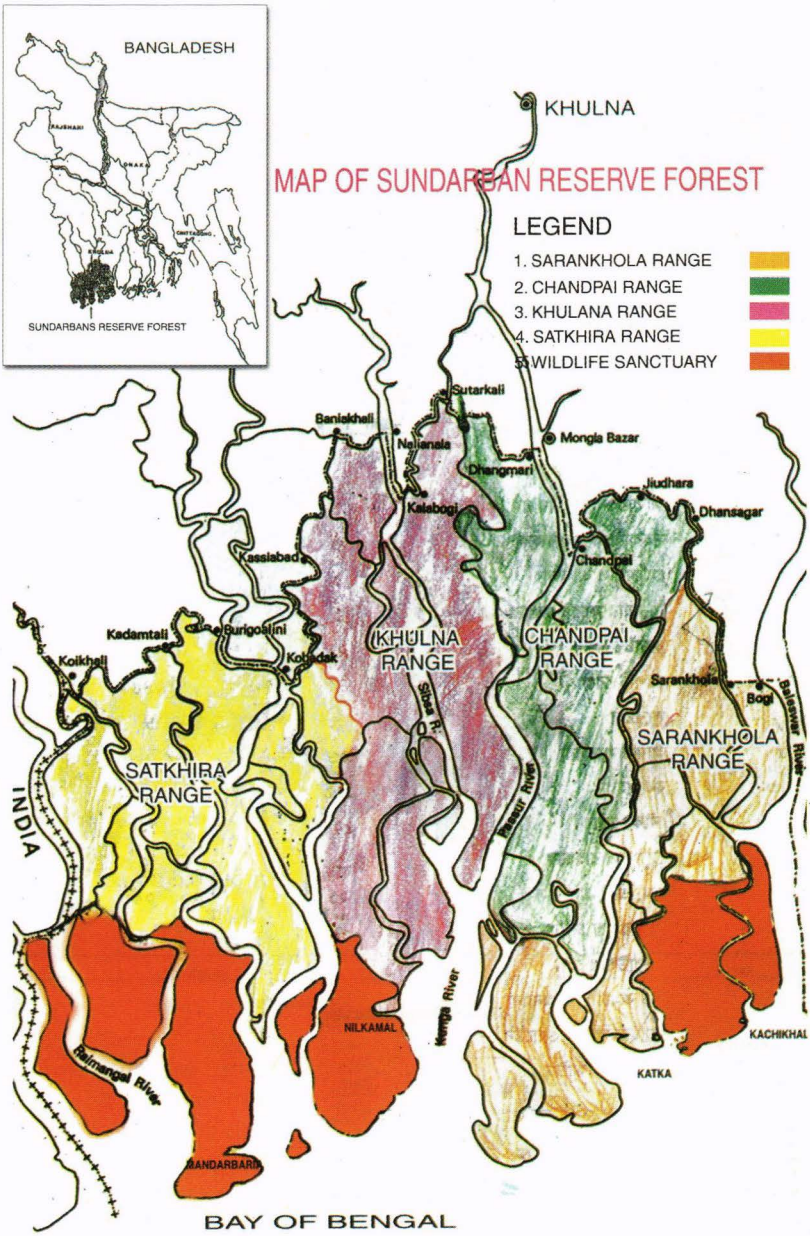
This book is part of an effort by FEJB to focus on the environmental perils to which this unique mangrove forest today is exposed and subjected. Let us frankly admit that the book is not based on intensive researches. Rather it is an anthology of reports, stories and articles contributed mostly by the FEJB members. Some of those reports are outcome of a number of field trips to the Sundarbans organised by FEJB. We have also included some informative articles and papers by academics.

The objective of this publication is to open yet another window to this rich and enigmatic wilderness waiting to be slowly depleted not only through encroachments and poaching, but also because of public neglect and inadequate government attention required for conservation. Our approach has been to create a greater awareness among people as a whole, and the policy-makers in particular, about

the need for saving this great natural heritage. If this publication can serve that purpose to some measure, our humble effort will not go in vain. With these few words we are presenting this pictorial book to the readers with the hope that they will like it and appreciate our efforts.

Quamrul Islam Chowdhury
Chairman, FEJB
September, 2001

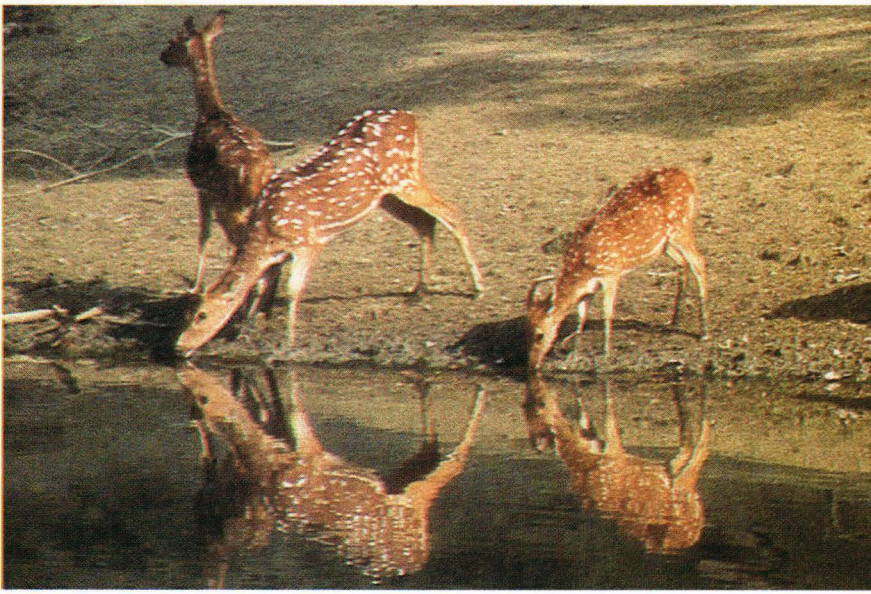




Chapter

1

Overview of an amazing ecosystem



Rows of boats laden with golpata anchored in one of the rivulets i
the Sundarbans. Photo: FEJB

The Sundarbans

Overview of an amazing ecosystem

By Quamrul Islam Chowdhury with Dr Mahfuzul Haque and Shahidul Islam Chowdhury

The Sundarbans is the world's single largest mangrove forest that extends across Bangladesh and the Indian state of West Bengal. Centuries ago, people used to refer to the Sundarbans and its adjacent region as 'Bhati' - meaning low-lying areas -- which suggest that the most important physiographical feature around was its wetlands and waterbodies. A unique reservoir of bio-diversity, the forest is more than five thousand years old. There is no archeological evidence that could provide a reliable chronological history of the Sundarbans.

Bangladesh owns about two thirds of the forest that makes about 45 percent of the country's total productive forest area. Located on the southern most extremity of Bangladesh, the Sundarbans comprise an extensive flat, coastal and deltaic land formed by the confluence of the three mighty rivers of the Ganges, Brahmaputra and Meghna. It is criss-crossed by large tidal rivers as well as channels and creeks, all discharging into the Bay of Bengal.

The forest encompasses a land area of 6017 sq km, of which 1874 sq km constitute the river water area. The forest is bordered to the south by the Bay of Bengal while polders and agricultural land border the forest to the north. The western border follows the Raimangal-Harinbhanga rivers, which also forms the international boundary with India. To the east lies the Baleshwar river and Meghna estuary.

There are rivers and canals spread across this forest like a net with their innumerable branches. Nearly 450 large and small rivers occupy about 1 lakh 75 thousands 685 hectares or about 30 per cent of the Sundarbans. The biggest river is the Pusur. Other rivers worth-mention are Baleswar, Sibsa, Arpangasia, Bhola, Horinbhanga, Kalindi, Andharmanik, Raimangal, Kapotaksha, Koira, Shela Bhadra etc. As one proceeds to the south, the rivers widen. Some rivers are so wide that one cannot see one bank form the other. Baleswar and Pusur rivers and their tributaries and distributaries are connected with the Ganges. As a result these rivers and their branches have flow of sweet water. The Sibsa and other rivers in the western part have their source

of sweet water only in the Ganges and the northern portion of the Sundarbans depend upon the rain water. As a result, the sweet water flow in these rivers decreases during the dry season when there is a massive intrusion of saline water. Moreover, the condition of the rivers and canals in the Sundarbans is deteriorating. Shoals are forming and navigability is declining. Rover erosion is taking place at some places.

The forest is within the three administrative districts of Khulna, Satkhira and Bagerhat. Administered by the Forest Department (FD), the area is divided into four forest ranges, namely; Sarankhola, Chandpai, Khulna and Burigoalini. Three patches of the forest in the south have been declared as "Wildlife Sanctuaries". They are Kachikhali-Katka sactuary in the Sarankhola range, Neelkamol at Hiron point in Khulna range and Mandarbari in the Burigoalini range. They have been declared by UNESCO in 1997 as the "World Heritage Sites".

The forest is flat and the maximum ground elevation is 3 meter above the mean sea level. The land developed through the process of sedimentation, subsidence and down-wrapping of sediments. The soil is deep alluvium of silty clay loam. It has a tropical humid climate with temperature ranging between 20.4 degree and 31.5 degree Centigrade. The annual rainfall is between 1640 and 2000 mm. The rainfall is strongly seasonal and 85 percent falls during the monsoon, July-October. Semi-diurnal type tidal inundation regulates the hydrology of the forest. The four main seasons are pre-monsoon (March-May), monsoon (June-September), post-monsoon (October-November) and dry winter (December-February). The pre-monsoon period is characterized by the southerly winds, high temperature and high rate of evapo-transpiration with occasional heavy thunderstorms and norwesters. The forest areas are inundated by tidal water increase which also raises the salinity of river water.

The monsoon ushers in high rainfall, humidity and cloud cover. Sediment load and water levels of the rivers also increase. The salinity level is lowered due to the influence of onrushing fresh water from the upstream region. Occasional thunderstorms, cyclones, storm surges and rising salinity levels of river water occur during post-monsoon season. Generally, violent cyclonic storms brew in the Bay from mid-May to mid-June due to north coastal winds, Cyclones also occur in October and early November. The dry winter season is characterized by cool, dry and sunny weather with low precipitation.

There is a popular belief that the "Sundarbans" derived its name from the Sundari (Heritiera fomes) trees, a major component of the forest.

Legends also have it that the forest received its name from foreign explorers, who termed it as "the jungle of sundry trees" or diverse kind of trees, which finally came to be called the "Sundrybans". There is another popular folk tale that the very name originated from local word "Samundar" meaning the seas, which later was changed to "Samundarbans".

Floral diversity

The forest supports a diversified flora and fauna. The floristic composition of the Sundarbans encompasses a variety of plants including trees, shrubs, grasses, epiphytes and lianas. Being mostly evergreen, they possess very similar physiological and structural adaptations. As the tidal estuaries deposit vast amount of nutrientrich silt in the deltaic region, they provide an ideal condition in the Sundarbans for the propagation of thick vegetation. Seemingly natural and simple, the succession of mangroves is in reality quite complicated. Each and every species in the Sundarbans has to struggle to grow and survive. Salinity, soil conditions, nutrients, weather hazard, sunshine, temperature, cyclones, tides etc. render the existence of every species difficult in various stages of life cycle.

The uniqueness of the Sundarbans reserve forest lies in its diversity of species. It is interesting to note that tree height is relatively shorter in the west-southern parts and longer in east-northern parts of the forest. Another fascinating feature of the forest is that water of the former region is more saline than that of the latter region. Flora includes 66 species of plants of which 31 are trees. The others are shrubs and climbers. The distribution of the species is not uniform and primarily controlled by the level of salinity and not by the tidal inundation which is fairly uniform. On the basis of salinity level, three zones are recognized : fresh water zone, moderately saline zone and highly saline zone. Salinity increases from east to west and north to south.

Altogether 13 forest and four non-forest types of vegetation have been identified of which the Sundari (Heritiera fomes), Gewa (Excoecaria agallocha) and Garan (Ceriops decandra) are dominant in the fresh water, moderately saline and highly saline zones respectively. The Sundari prefers fresh water flushing, drainage predominance and firm higher ground. It is vulnerable to fungal infection and top-dying of the trees makes their survival difficult. Commercially, it is the most sought after tree, comprising about 21% of the forest cover of Bangladesh part of the Sundarbans. Gewa can tolerate high salinity and grows in groves in association with the Sundari, Bain, Hental and Goran bushes. Commercially very important, the Gewa timber is used for paper pulp and in match factories. Garan species of the mangroves

grow in the southern Sundarbans, where the tidal influence is high. Being the fuelwood most in demand in the Sundarbans, Garan is also used as a building material.

The other major trees are Keora (Sonneratia apetala), Ora (S caseolaris), Passur (Xylocarpus mekongensis), Dhundul (X granatum), Bain (Avicennia alba), Kankra (Bruguiera gymmorrhiza). Keora and Ora look similar in appearance but Keora being bigger, spreads its branches much more extensively. The Keora is the most graceful and tallest tree in the Sundarbans. Ecologically, Keora is the most important tree in the mangrove food chain. Birds, bats, rats, monkeys, deer, fishes, insects get their food from its bark, leaves and fruits. Passur is the most praised timber in the Sundarbans as it is used both as building material and furniture timber.

Hental (Phoenix paludosa) is another member of the palm family commonly found throughout the Sundarbans. It is usually a slender, straight, small tree which can attain a height of 6 meter. The stems of the hental are harvested throughout the year and is sold for making rafters, fence and house-posts. The Golpatta (Nypa fruiticans) grows abundantly along the banks of the Sundarbans rivers and creeks. It is a stemless palm whose leaves look like coconut fronds and are mainly used for thatching roofs. Bala (Hibiscus tiliaceous) is a scrambling woody shrub found along the river banks and is extensively harvested for fuelwood. Garjan and Jhanna possess stilt roots, their leaves are thick and wide. They usually grow along the soggy banks of the creeks. Hogla or Elephant Grass (Typha elphantina) is a pioneer species generally found on riverbanks, estuarine chars (shoals) and along the edge of streams. It is used for making mats and as thatching material for temporary sheds.

Faunal variety

Animals have to struggle for life in the Sundarbans due to the forests' adverse and hostile environment. Almost all the species can tolerate brackish water and subsist on their water intake from food. All the resident species of aquatic mammals, reptiles and amphibians are powerful swimmers and habituated to meeting food requirements partially from aquatic sources. All the terrestrial animals such as birds, reptiles, fishes, plankton etc. are well adapted to the daily, periodical and seasonal tidal rhythms. All animals including birds restrict their movement during the high tide. But fishes find the high tide ideal for feeding.

Sundarbans faunas include 32 species of mammals, 226 species of birds, 35 species reptiles and 8 species of amphibians. Sundarbans is

one of the last remaining natural habitat of the Royal Bengal Tiger (Panthera tigris tigris). Population density of tigers in the southern Sundarbans grasslands is amazingly high due to the abundance of deer and boar population there. The Sundarbans tigers are more prone to north-south movement and rather adverse to east-west mobility. The Sundarbans offer no ideal ground as a tiger habitat. A soft-padded creature like tiger favours walking on dry ground. The Sundarbans tigers have to cross the rivers, creeks and rivulets everyday for survival. They are forced to tread on soggy, muddy terrain and negotiate the piercing roots of various mangrove species. A study suggests that the tiger population of the Sundarbans could be between 800 and 1000.

The other important wild animals in the Sundarbans are the Chital and barking deer, wild boars, rhesus macaque, otters, cats, tree shrews, rats, civets, mongooses, porcupines etc. The Chital or spotted deer (Cervus axis) are reputed to be the most beautiful deer in the world and they have favoured the swamp forests of the Sundarbans as their habitat. Compared with other deer species, the Chital is of medium stature. Another deer species found in the north-eastern Sundarbans of Chandpai and Sarankhola ranges is the barking deer (Muntiacus muntjak), characterised by its doglike barking calls. The Chitals are well distributed throughout the southern sea-board meadows of the Sundarbans where they can graze. Their main fodder in the forest are the leaves and fruits of Keora, new leaves of passur and gewa and various grasses. Large herds of deer may be found in the sea-facing meadows of the Sundarbans in Kochikhali-Katka, Chanmiakhali, Titar Char, Jhanpa, Tinkona island, Hiron point and Mandarbaria areas. The barking deer are found only in the northern areas of Chandpai and Nalian forest ranges in the Sundarbans. The wild boar (Sus scrofa), another dominant mammal species of the Sundarbans, is a large and heavily built animal. Being omnivorous, the boar eats a variety of food- roots, tubes, insects, mollusks, carrion, small mammals and even the remains of a tiger kill. Notorious crop-raiders, they are used to attacking and ransacking standing crops on the forest edge.

The Rhesus Macaque (Macaca mulatta) lives in the Sundarbans in highly organised troops; up to thirty animals co-exist in a band under the leadership of a dominant male. They are equally at home on trees, on the spike roots infested ground as well as the mudbanks. They feed on keora leaves and fruits of telakucha, insects, small lizards, bird eggs, crabs etc. The Rhesus Macaques have developed a mutually effective relationship with the deer in the Sundarbans. A herd of deer can often be seen feeding under a tree inhabited by these monkeys. Both species react to each other's alarm calls, warning about the

presence of a predator -- a tiger perhaps.
Otter is mainly an amphibian mammal and can be found all over the Sundarbans, but lesser number in the southern areas. The commonest otters of the Sundarbans are the claw-less otters (Aonyx cinerea). The species used widely for fishing in the Sundarbans by the Tarjali fishermen are the smooth Indian otters (Lutra perspicillata). They are bigger, stockier and lighter in colour. It has a streamlined body with short legs, a thick neck and a long and powerful tail. Like the mongoose, otters sometime stand on their hind legs to see around. Forest otters are active both during day and night and they start hunting as the tide goes down. Three species of lesser cats may be seen in the Sundarbans. Being highly secretive and exclusively nocturnal creatures, it is difficult to find them. Their coats are well adapted to concealing. All three species are concentrated in the northern forests. The jungle cat (Felis chaus) prefers peripheral forest areas. The leopard cat (Prionailurus bengalensis) is the most widely distributed animal, compared with the other two. And the fishing cat (Prionailurus viverrinus) prefers swampy areas of the forest.

The common tree shrews (Tupala glis) are among the neglected animals of the Sundarbans as they have seldom been recorded. The family Muridae is well represented in the wilderness of the Sundarbans. Among other members of the family, musk shrews, bandicoot rats, Indian field mouse, house mouse and the common house rats are frequently seen in the area. Civets, mongooses and porcupines are all nocturnal animals and very difficult to find. The presence of Indian porcupine (Hystrix indica) may be felt in Chandpai range areas. The mongooses (Herpestes auropunctatus and Hedwardsi) are found along the forest fringes. The common palm civets (Viverricula indica) can be seen in the eastern forests and the presence of the large Indian civet (Viverra zibetha) is hardly discernible inside the forest.

The brackish water of the Sundarbans estuary supports a number of dolphin species. The presence of the Ganges river dolphin (Platanista gangetica) is most common in the rivers of the Sundarbans. The Irrawaddy dolphin (Orcaella brevirostris), melon-headed dolphin (Peponocephala electra) and the little porpoise (Neophocaena phocaenoides) may also be seen without much difficulty. The globular and blunt-headed Irrawaddy dolphin prefers less saline waters and can be seen in the northern Sundarbans rivers. The massive melon-headed dolphins are well adapted to saline water like the porpoises. Dolphins are seen mostly in the confluence of the major rivers and the creeks. The short-finned pilot whales (Globicephala macrorhynchus) are sometimes found within the Sundarbans.

In the Sundarbans, salt water or estuarine crocodiles (Crocodylus porosus) can be seen very often. Once they were abundant in number in almost every estuary of forest ranges. Sundarbans rivers, especially the chars of the Passur river near Khulna were infested with these reptiles. They were quite fierce. Of late, their population is on the decline, as their egg-laying habitats are being disturbed by collectors of shrimp fries. It is believed that the total number of crocodiles today may be around 250. In the Sundarbans, one can find some monitor lizards. Three of their species can be found in the forest: they are the Bengal (Varanus bengalensis), the yellow monitor (Varanus flavescens) and the ring lizard (Varanus salvator). The ring lizard, the second largest terrestrial lizard after the Komodo dragon, finds the Sundarbans river estuaries a congenial place for breeding. It is a voracious eater of birds, bird chicks, snakes, rodents, fishes, etc.

Among the venomous snakes in the Sundarbans, the King Cobra (Ophiophagus hannah) is considered to be the largest. These are diurnal creatures as their prey species like rattle snakes, young monitor lizards, etc. The King Cobra also preys on small mammals, lizards, bird chicks and other poisonous and non-poisonous snakes. They can move amazingly fast despite their huge size. The forest dwellers dread the King Cobra because of their size and open-mouth charge with hissings. Other cobra species are: Bengal Cobra (Naja kauthia), Binocellete Cobra (Naja naja). Bengal cobra is a scary creature and can attack without much provocation. They prefer water habitat and consume mammals, eggs of birds, lizards, amphibians, etc. The Binocellete Cobras are comparatively rare species in the Sundarbans and can be seen in the dry areas of the forest. They carry very potent venom and prey mostly on rodents and amphibians.

The sluggish vipers are of two species: the chandra bora or the Russel's viper and the tika bora. Thick bodied, the Chandra bora looks more like a young python. The tika bora or spotted tailed green vipers are almost undetectable as they easily camouflage their presence in the green foliage of their habitat. They prey on lizards, insects and bird chicks and eggs. The sea snakes are highly venomous, but due to their small mouth and position of the venom injecting fangs, they seldom bite. Hook-nosed sea snake is the most common sea snake, which is highly venomous. There are a number of non-poisonous snakes including the rock pythons in the Sundarbans.

Among the other reptiles and amphibians, the river terrapin (Batagur baska) is one of the most commercially exploited estuarine turtles and is listed as an endangered species. The Indian roofed turtle (Kachuga

tecta) and the peacock soft-shell turtle (Trionyx hurum), also listed as endangered, are exploited by the turtle traders. The olive ridley and hawksbill turtles can be seen wading across the shoals of the forest. The exclusive green frogs (Euphlyctis hexadactylus) could be seen in Chandpai area. Other forest amphibians include the skipper frog, bull frog, cricket frog, common toads and tree frogs seen in the forest and its adjoining areas.

The Sundarbans also provides habitat to a variety of birds. Around 226 species of birds can be found there. Most are resident birds, but some migratory ones can also be seen in the winter season. For more than 100 species of waterfowls, of which some 50 are known to be migratory ones, the Sundarbans provides an important habitat for seasonal migration. The periodically inundated muddy banks of the creeks and the rivers are the nesting and feeding grounds of these migratory waterfowls. Notable among these are the masked fin foot, white-bellied sea eagle, Pallas's fish eagle, 8 species of kingfishers, waders, gulls and terns. The loss of nesting sites and availability of food are major factors adversely affecting the distribution, composition and population trends of some of these species.

Though an exact account of fisheries resources of the Sundarbans is non-existent, it is reported that about 120 species of fish are commercially harvested from the area. Dublarchar - an estuarine island in the southern tip of the Sundarbans -- has a sprawling fish industry where seasonal fishermen have developed a fishing village of make-shift houses.

People of the Sundarbans

The Sundarbans with its vast wealth of natural resources always attracted people from different parts of country as well as from abroad for multifarious economic interests. On the one hand, there are pirates, poachers and plunderers looting the scarce resources of the forests. On the other, slowly groups of people like Bawalis (wood cutters), Mouals (honey harvesters), grass cutters, fishermen and mollusk shell collectors converged in the area for exploiting the forest resources on which their livelihood depends. These latter section of people are the forest dwellers -- courageous, bold and adventurers. They are aware of the hazards of the forest life. Living in the forests for many generations, they have by now developed a coping strategy for survival in a hostile and inhospitable environment.

Traditionally, these forest dwellers possess the indigenous instinct and knowledge of their forefathers. They face various natural calamities like tidal surges, cyclones, rains, scorching heat, and humidity. They

have to tread between the trails of poisonous snakes, wild boars, crocodiles, man-eating tigers and the pirates. They leave behind their families for months, and lead a life of great insecurity and loneliness. It can be said that lives of these forest dwellers are regulated by tidal rhythm and the movement of the moon. The Bawalis, Mouals, grass cutters, fishermen have to know about the tidal movement. Even the predators and the preys in the jungle are aware of tidal timings. The moon plays an important role in the forests. Specially, for the fishermen, Vara Katal or Vara Gone, meaning moonlit nights bring hope and fortune, as they expect a good catch this time of the month. On the other hand, Mora Katal is a period of dark nights that bring grief and miseries for them.

Bawalis, the wood cutters, receive seasonal permits from the local forest offices, which allow them to harvest mainly the Gewa trees for paper and pulp industry. Although they move in a group, they take high risk as they enter the forests and live in make-shift houses for months in isolation. Mouals are seasonal professionals who work for three to four months inside the forest during the flowering season. Honey collection season starts on the first day of April with an assembly prayers at Burigoalini range office. Permits are issued by the forest officials for the particular season. Most of the honey producing plants grow abundantly in the Burigoalini range areas. Under the leadership of a Shaindar or Bahardar , a group of Mouals, usually in odd numbers goes to Mahal, the site for honey collection for a period of three months. The Mouals perform the most dangerous profession. Virtually, they have to traverse every inch of the forest land through the apparently impenetrable mud and slush. They walk bare-footed over the shula-ridden jungle floors and swim across the creeks and canals in high risk. In a team, there is a Gunin or a spiritual guide to provide divine blessing. Every year a few of these Mouals are killed by tigers.

The Jailas or the fishermen come to the Sundarbans from the neighbouring districts. Offshore fishermen are almost strangers having little interaction with the forest people, while the onshore fishermen are part of the forest dwellers. One-third area of the Sundarbans is water. Hundreds of water channels criss-cross the landmass and constitute an ideal habitat for brackish water fishes. The fishermen constitute the largest forest dwelling community, about 48 percent of the total forest dwellers. Of late, due to introduction of shrimp farming, shrimp fry collection in the rivers and creeks of the Sundarbans is on the rise causing destruction of fish diversity, as they only collect the shrimp fries and throw away all other species.

The forest dwellers pay homage to certain gods and deities whom they

thought to be their saviors and protectors. The popularly worshipped are the Banbibi, Gazi Shaheb, Dakshin Ray, Pir Badar, etc. These days, almost all the forest dwellers, irrespective of their religious or communal beliefs, seem to rely much more on a piece of cloth, a triangular red cloth blessed by the "Pir Shaheb" of Noapara, which they hoist atop the mast of their boat with great respect.

Depletion of bio-diversity

The bio-diversity of the Sundarbans has been under threat for various reasons. There has been increasing conversion of the forest land for agriculture, mainly for paddy and shrimp farming and for human habitation. The forest's bio-diversity is also threatened by unabated poaching, hunting, illegal felling of trees, diseases, unplanned and over extraction of resources, insufficient conservation effort, deterioration of law and order situation, corrupt practices of the forest officials and unscrupulous traders etc. Poverty, population pressure and encroachment by the forest/local people are blamed for the depletion of bio-diversity in the Sundarbans. Contrary, to this customary belief, plundering and exploitation of forest resources by the poachers and dacoits in connivance with the corrupt forest officials are said to be the main causes of forest loss in the Sundarbans. Recurrent natural calamities like storms, cyclones and tornadoes pose a big threat to tall slender trees, which act as a barrier against the cyclones and tidal surges originating in the sea. More than a dozen of cyclones have hit the Sundarbans during the last decade. A disastrous cyclone at Dublar Char in 1988 devastated the forests and the fishermen's villages.

Besides these anthropogenic activities and natural calamities, some ecological changes like increase in salinity, outbreak of diseases like "top dying" of the Sundari trees pose a serious threat to rich biodiversity of the Sundarbans. Such diseases are taking a heavy toll of the wood lots in the Sundarbans. Actual cause of the disease is not yet known. Diversion of the natural courses of rivers, construction of embankments, dams and bridges in the upstream as well as decreased flow of fresh water in the rivers resulted in the increase in salinity level and over-silting in many places and caused subsequent changes in the mangrove ecosystem. Increased salinity and siltation within the forest area may hinder the biological functions of the breathing roots and are supposed to the major causes of top dying of the trees. Possibility of fungus pathogens can not be overlooked. In the Sundarbans, for bringing non-commercial cover areas under tree cover in different areas of Chandpai, Sarankhola and Khulna forest ranges, plantation of exotic species, like Acacia nilotica, Alibizia procera have taken place. Though at a limited scale, many other exotic species have been

introduced in the Sundarbans mangrove ecosystems, particularly in areas around the forest offices. It is apprehended that these exotic species may pose a threat to the native variety of mangrove species.

Sea-level rise

Another looming threat to the Sundarbans -- the world's largest remaining mangrove forest -- is the much talked about sea-level rise that scientists have already predicted. According to a conservative estimate, the sea-level rise that is expected to inundate many a island nations as well as low-lying coastal regions across the world -- thanks to the global warming and green house effects. It is now widely believed by experts that sea-level rise by one metre, expected to take place by the current century, will devour the whole of the Sundarbans. That is another major concern for our great natural heritage called the Sundarbans.

Following reasons have been identified as major threats to the bio-diversity of the Sundarbans:

- Population pressure, expansion of agricultural land, construction of houses, roads, embankments, bridges, etc;
- Faulty shrimp fry collection and conversion of forest lands into shrimp farming;
- Unscrupulous harvesting of forest resources and insufficient measures to regenerate the resources;
- Indiscriminate use of chemical fertilizers and insecticides in croplands and adoption of unplanned agricultural practices resulting in low productivity of the forest;
- Introduction of exotic species of trees that threaten the native mangrove species;
- Lack of appropriate policies for proper management and training of forest officials working in the wildlife sanctuary/protected areas;
- Activities of the pirates, poachers, plunderers of resources in the Sundarbans;
- Uncontrolled diseases causing a havoc, mainly on the Sundari trees;
- Unregulated testing and exploration activities by the International Oil Companies in the Sundarbans; and
- Apprehended sealevel rise due to global warming, which would permanently inundate coastal low-lying areas with saline water.

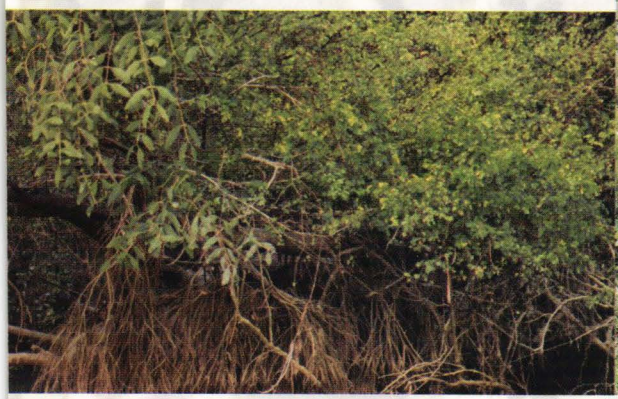
Conclusions

The World Heritage Site of Bangladesh, the Sundarbans, is indeed a treasure-trove of bio-diversity because of its wide spectrum of flora and fauna. Its range of ecosystem, species and other forest resources have

supported and contributed to the existence, adaptation and well-being of the forest dwellers in particular and people in the periphery in general. Indigenous knowledge and practices of the local people -- the forest dwellers, acquired through many generations, in fact helped in the conservation and management of the forests. They are no "encroachers". The pirates, poachers, corrupt officials and unscrupulous forest traders are in fact the plunderers of the forests. They are the infiltrators to be dealt with strictly. Rule of law has to be established in the forests with proper forest conservation policies and plans. Forest officials have to be properly trained in modern conservation practices. Forest resources are to be considered from conservation point of view and taken as commercial products. The sanctuaries have to be strictly managed by enforcing laws and regulations. Forest users including the tourists must be made aware of the sensitivities of the nature and wildlife within the forests. Let us not forget the fact that the mangrove forests of the Sundarbans are a delicate ecosystem that must be dealt with proper attention and care.

Chapter
2

The saga of the largest mangrove forest of the world



Clockwise from above: *Shulas*--- the breathing roots of the mangr
plants; a lonely tree on a patch of grass; another solitary plant wai
grow up; and a hedge of mixed plants in the Sundarbans. Photo:

The saga of the largest mangrove forest of the world

By Anisur Rahman

"If there is no mangrove forests, then the sea will have no meaning. It is like having a tree without roots, for the mangroves are the roots of the sea." - a fisherman on the coast of the Andaman Sea.

The Sundarbans is the largest contiguous block of mangrove forest remaining in the world. Along the mouth of the Bay of Bengal, it extends over 10,000 square kilometres in Bangladesh and India. Some 60 percent of the forest lies in Bangladesh and the rest in the Indian state of West Bengal. Said to be named after its maiden Sundari tree species, the Sundarbans is a globally significant ecosystem rich in bio-diversity providing habitat for around 334 plant and 453 animal species, including the world famous Royal Bengal Tiger. Several critically endangered species like rare sharks also find refuge in this forest containing Sundari, Gewa, Goran, Keora, Passur, Baen and many other trees and plants.

Besides its ecological value, more than four million people who live around the Sundarbans derive part of their subsistence extracting resources including fisheries, fuelwood, and non-wood forest products like honey. Livelihood of million others also indirectly depends upon this rich forest.

Every year a good number of tidal surges hit Bangladesh's south and southwestern coastline and the Sundarbans bears the brunt acting as a vital barrier against all such calamitous lashings of the nature to protect the country's southwestern coastlines including the regional towns and cities like Mongla and Khulna.

What is mangrove forest

"One perceives a forest of jagged, gnarled trees protruding from the surface of the sea, roots anchored in deep, black, foul-smelling mud, verdant crowns arching toward a blazing sun...Here is where the land and sea intertwine, where the line dividing the ocean and continent blurs, in this setting the marine biologist and the forest ecologist both

must work at the extreme reaches of their disciplines." That was how the Scientific American, a US specialised journal, described the mangrove forest in its March 1996 issue.

Growing in the inter-tidal areas and estuary mouths between land and sea, mangroves, able to tolerate saline water, provide critical habitat for a diverse marine and terrestrial flora and fauna. Healthy mangrove forests are key to a healthy marine ecology.

Mangroves are the consequential product of the inter-relationships of flora, fauna, aquatic and water resources in certain natural conditions. The combinations of the resources and conditions, occupying the special ecological niche where seawater meets freshwater and fertilised periodically by sediments from the land and sea, are the foundation of its high biological productivity, uniqueness and diversity.

Mangrove forests are vital for healthy coastal ecosystems. The forest detritus, consisting mainly of fallen leaves and branches from the mangroves, provides nutrients for the marine environment and supports immense varieties of sea life in intricate food webs associated directly through detritus or indirectly through the planktonic and epiphytic algal food chains. Planktons and benthic algae are primary sources of carbon in the mangrove ecosystem, in addition to detritus. The shallow inter-tidal reaches that characterise the mangrove wetlands offer refuge and nursery grounds for juvenile fish, crabs, shrimps, and mollusks. Mangroves are also prime nesting and migratory sites for hundreds of bird species.

Mangrove forests are comprised of taxonomically diverse, salt-tolerant tree and other plant species, which thrive in inter-tidal zones of sheltered tropical shores, "over-wash" islands, and estuaries. Mangrove trees have specially adapted aerial and salt-filtering roots and salt-excreting leaves that enable them to occupy the saline wetlands where other plant life cannot survive.

Often described as "rainforests by the sea," the mangroves are estimated to cover an area of 22 million hectares, dominating the majority of the subtropical and tropical coastlines around the world. However, over the past several decades, the global area in mangroves has greatly diminished as a result of a variety of human activities, such as over harvesting, freshwater diversion and conversion to other uses.

Mangrove forests literally live in two worlds at once, acting as the

interface between land and sea. Mangroves help protect coastlines from erosion, storm damage, and wave action. Thus the stability mangroves provide is of immense importance. They prevent shoreline erosion by acting as buffers and catch alluvial materials, thus stabilizing land elevation by sediment accretion that balances sediment loss. This way they also protect vital coral reefs and sea grass beds from damaging siltations.

World's largest mangrove forest

The main feature of the Sundarbans, which is likely to mesmerize a lone tourist, is its unique silence. Without doubt, one's first impression of the dense forest will be its great silence. Forest creatures are very shy, but as the visitor picks his way along the trail or the water bodies around, which occupy one third of the Sundarbans Reserve Forest (SRF), he will realise how alive it is. Numerous living organisms are discreetly watching and waiting whilst one passes through their protective home. From time to time, the complete tranquillity will be shattered by a darting forest bird or a group of noisy monkeys jumping through the trees, disturbing the secretive residents and setting up a chain reaction when the ever-wary forest comes to a colourful and boisterous life for a moment, until silence reigns again.

Mangroves across the world are not particularly diverse in terms of their floristic composition, especially compared with rainforest ecosystems. While up to 75 species are recognised as genuine mangrove plants, the floristic composition of the Sundarbans is made up of 60 plus species. According to International Union for Conservation of Nature (IUCN) no other mangrove ecological niche in the world offers such a variety of associate mangrove vegetation as the Sundarbans does.

Historical records reveal that during the medieval period, the northern boundary of the Sundarbans extended from Hatiagargh, south of Diamond Harbour on the Hoogly river to Bagerhat, south of Jessore and Haringhata along the southern part of Fakirhat, Satgaon and Khalifabad. During the later part of the 18th and early 19th centuries, the boundaries of the Sundarbans tract extended for about 273.53 kilometres along the shoreline of the Bay of Bengal from the estuary of the Hoogly river to that of the Meghna and inland up to a distance of 96.54 to 128.72 kilometres. According to a 1998 study carried out by UNDP/FAO sponsored Forest Resources Management Project (FRMP), the total area of the SRF, representing three wildlife sanctuaries, is 6017 square kilometers stretching over the districts of Khulna, Patuakhali, Bagerhat and southern part of Satkhira. Of the total SRF, 3997 square kilometers is forest area, sandbars or grass covers 115

square kilometers and the rest 1905 is occupied by a number of rivers or channels.

With expansion of human settlements and reclamation of land for agricultural use, a large part of the forest was cleared in between 1830 and 1875, when parts of the mangroves were declared as reserved forest i.e. the SRF. Since then the territorial integrity still remained almost intact, in sharp contrast with many other mainland "protected" areas in the country. Despite large scale indiscriminate felling of trees due to management problems, the natural regeneration process has kept the SRF alive and growing all the time. While all other forests in the world are being more and more technically managed and their soil productivity, regeneration of plants, reproduction of wildlife are controlled and monitored regularly as they are tending to lose their erstwhile individual characteristics, the SRF is continuing to evolve new and newer biogeochemical cycles. However, it is also clear that the well-defined boundaries of rivers and canals, and perhaps the presence of widely feared what the local traditionally refer to as "maternal uncle" (the Royal Bengal Tiger) have added significantly to protecting the forest.

The ecology of the Sundarbans

The Sundarbans soil is characterized as moderately to slightly saline zone in the east and highly saline zone in the west. Its ecosystem is characterised by a very dynamic environment due to the effect of tide, flooding, salinity and even the cyclones. The fragile and intricate mangrove ecosystem depends on many variable components like tides, salt contents in water and soil, duration of sunlight, contents of sediment and organic matter in water, temperature and density of seawater and fresh water. The composition of terrestrial and marine flora and fauna also plays an important role in the mangrove ecosystem. If sun is regarded as the source of all energy flow, water must be considered as the nursing mother of an ecosystem.

In the Sundarbans, the flow of fresh water received from the tributaries of the Ganges (Padma) is lighter in turbidity than that of the Bay of Bengal waters. The temperature of the two waters also varies seasonally. The fresh water carries loads of mineral and microbe-rich silts, which do not flow easily into the tidal backwaters from the sea as the influence of the tides make the water flow back and forth. The mixture of the flows of fresh water and brackish water and the mineral-microbe silts from upstream and the forest wastes like over mature leaves creates an ideal environment for different mangrove organisms.

As the forest litters and other organic materials are transported in the channels the microorganisms like bacteria and fungi starts to decompose them converting them into minerals and nutrients. These are then used by phytoplankton and insects like acron worms, nematodes and amphipods. In turn the micro organisms themselves become a source of food for small aquatic animals, which too are preyed upon by shrimps, crabs etc. The zooplanktons are again the food source for different aquatic animals like fishes, catfish, eels, groupers and giant sea perches. The planktons also provide food to sharks, crocodiles, and dolphins. In this process some die, decay and become nutrients accumulated in the mangrove soil. The amphibians and the reptiles act as connecting agents between water-based energy flow and terrestrial energy flow. In the Sundarbans, the higher order animals like the tiger, wild boar and monkey supplement their diet by eating aquatic animals and fishes.

"Zonation" often characterizes mangrove forests. Certain tree species occupy particular areas, or niches, within the ecosystem. Some mangrove species occur close to shore, fringing islands and sheltered bays; others are found further inland, in estuaries influenced by tidal action.

The largest mangrove forest of the world is under threat

Mangrove forests are one of the most productive and bio-diverse wetlands on earth. Yet, these unique coastal tropical forests are among the most threatened habitats in the world as experts fear they may disappear more quickly than inland tropical rainforests because of lack of public notice. The Sundarbans too is no exception.

Most experts agree that due to direct and indirect impact of human interventions, far-reaching changes are taking place slowly but steadily -- affecting the delicate Sundarbans ecosystem. Much of such changes are not clearly visible. Direct human impacts are further worsened by the less-readily detected but perhaps more menacing impacts which threaten the mangrove ecosystem. Massive changes in both the adjacent agricultural lands and upstream areas with construction of polders, embankments or barrages are feared to have been generating fundamental changes in the hydrological regime of the Sundarbans.

The changes in freshwater flushing are visibly caused by gradual eastward shift of the flow of the Ganges river. The change is acknowledged as being historical in nature although the more recent impact of the Farakka Barrage in India and subsequent siltation in the Gorai is accelerating the process. It is believed that the changes affecting the salinity, flood intensity and periodicity, erosion, siltation

and sedimentations may all be factors for perplexing and worrisome loss to the world's largest mangrove system.

A number of species like Javan rhinoceros (Rhinoceros sondaicus), water buffalo (Bubalus bubalis), swamp deer (Cervus duvauceli), gaur (Bos gaurus), hog deer (Axis porcinus) and marsh crocodile (Crocodilus palustris) became extinct during the last 100 years from the Sundarbans.

The Royal Bengal Tiger is an inseparable part of the legend attached to the Sundarbans. The tidal mangrove forest is a rare habitat for this tiger species. But today they have been pushed due to habitat shrinkage. The SRF tiger population estimate in the past 20 years remained in the range of 350 to 400, the largest discrete population of the species in a single tract of natural habitat in the world.

But the preservation of the Royal Bengal Tigers is, by far, the most important challenge for those concerned for the protection of Sundarbans bio-diversity. This challenge has become even more compelling of late with recent media reporting of the outcome of a tiger population in the Indian part of Sundarban where the number of tigers was once estimated at something similar to that in the Bangladesh part - i.e. 300+. The figure is now down to some 50 only.

Incidental mortality due to diseases, illegal hunting and subtle changes in the Sundarbans ecosystem poses a serious risk for the survival of the Royal Bengal Tiger. Apart from that, the interaction with humans in the area, particularly the killing of humans by tiger, complicates the management of the area. IUCN has listed it as an endangered species in its Red Book.

The marsh crocodiles, once abundant, are already extirpated. The salt-water crocodile (Crocodylus porosus) still survives in low densities and like the marsh crocodiles its population is being reduced through indiscriminate hunting and trapping for skins, quite apart from the immediate conflict with men. Despite an apparent reduction in illegal trade in its skin, the population shows little sign of recovery.

Some 30 species of snakes have been recorded in the SRF and there appears to have been a general decline in densities or at least in their sighting particularly in the past two decades. The Rock Python (Python molurus) is one of the valuable SRF snake species, which is said to have declined over recent years. IUCN has listed it as a "vulnerable species."

The results of four independent inventories undertaken over the past seventy years indicate that the overall volume of wood per hectare has decreased. Moreover, closer analysis of three inventories undertaken in 1959, 1983 and 1996 indicate a marked reduction in total standing volume for the two principal species of economic importance, Sundari and Gewa.

According to studies carried out at different times by the forest department, British ODA and UNDP/FAO sponsored Forest Rresource Management Plan, the mean volume per hectare of the Sundari tree was 34.5 in 1959. The volume was reduced to 19.9 in 1983 and 17.8 in 1996. In case of Gewa, the mean volume per hectare was 8.7 in 1959, which was reduced to 4.6 in 1983, and 2.1 in 1996. The dramatic decrease is blamed on their over exploitation, legally and illegally, because of their commercial value and subtle changes in the ecosystem. A number of issues related to the Sundari, Gewa and Goran trees have emerged for immediate concerns of the foresters.

According to experts, the reasons for the decline in Sundari (Heriteria fomes) are twofold. First, as a valuable timber species with real commercial value, it has been subject to heavy exploitation. Second, increasing salinity as a subsequent impact of the subtle ecological changes, noticeable increase in salinity and siltation have resulted in hostile anaerobic conditions in which the Sundari finds it difficult for healthy respiration. This has resulted in die-back whereby the tree is progressively defoliated from the top downwards. The phenomenon, in fact an infectious disease, is called "top dying." The infectious top-dying disease of Sundari causes another management problem as experts said poor execution of infected trees invalidate the basic rationale for the "sanitation/salvage" method to save the uninfected trees. Long delays between marking and cutting causes more trees in an area affected by top dying eventually exposing them to "axes instead of saws."

With regard to Gewa, forest officials say high pressure from deer population in some areas of forest patches have sparsed or caused nil regeneration of the species, leaving the areas under-stocked. The decline in Gewa (Excoecaria agallocha) is largely attributable to harvesting of around 50,000 m3 per annum as feedstock to Khulna Newsprint Mill for the production of newsprint over the years.

Experts say there is apparently little respect for the basic rule of leaving one stout stem to aid re-growth while cutting Goran trees, the second largest tree species of the SRF as all available merchantable stems are being cut from one area. Some officials admit there is also Goran

cutting going on outside the coupe areas, including the wildlife sanctuaries. However, acknowledging the importance of forest resources exploitation on a sustainable basis, the Forest Department imposed a logging moratorium in 1989 on all timber species except Gewa in the SRF.

Many factors contribute to mangrove forest loss, including the charcoal and timber industries, legal and illegal logging, oil spill, tourism industries, unplanned development projects, urban growth pressures, and mounting pollution problems. However, one of the most recent and significant causes of mangrove forest loss in the past decade has been the consumer demand for luxury shrimp, or "prawns", and the corresponding expansion of destructive production methods of export-oriented industrial shrimp aquaculture along the forests.

No discussion of the ecology of the SRF would be complete without noting the problem of water pollution. Pollution from various sources is a major determinant of water quality -- both in riverine and coastal areas of the Sundarbans. As approximately one third of the nearly 600,000 hectares of the Sundarbans area consists of tidal channels, and most of the reminder is subject to periodic inundation, impacts of water pollution are potentially very widespread. Pollutants are carried into the Sundarbans and ultimately into the Bay of Bengal from various upstream sources including the industrial units, municipal wastes, agrochemicals and port sewages in the Mongla and Khulna region.

The main threat today may come from outside the area in the form of pollution. On the northern edge of the area, Mongla, Bangladesh' second seaport, is situated. This port and its associated marine traffic is a frequent source of oil spills and there is a permanent risk of accidents with chemicals. Moreover, toxic products (pesticides, etc.) enter the system due to upstream pollution in the huge Ganges catchment. Pollution may not be a direct source of mortality, but it may also reduce the health of the forests, increasing the mortality rate of the flora and fauna on the long term. Many products such as pesticides have also been proved to reduce the reproductively (birth rate) in animal populations.

Almost all Khulna-based industries like the match factories, fish processing plants, jute mills, steel mills, the Khulna Shipyard and newspaper mills discharge liquid or solid wastes directly into the Bhairab-Rupsha river system. According to a DOE paper, the Khulna Newspaper Mills alone is estimated to use and discharge 30,000 m3 of

processed water laden with chlorides and dissolved and suspended solids everyday along with the municipal wastes of the regional cities.

Oil spills during transfer of refined petroleum from tankers to receiving stations in Mongla and Khulna, fuel oil spillage and discharge of oily ballast and sewages from some 600 ships anchored in Mongla Port and residual heavy oil sludge, lubricants and engine oils discharged during ship breaking operations in Khulna are major sources of water pollution affecting the Sundarbans.

A future threat is the exploitation of mineral gas, which is abundant in the underground of the Sundarbans. The recent government decision to allow exploration by international oil giants in the area has caused added concerns, as mangrove environments are known to be the most vulnerable coastal habitats to such activities.

A very densely populated area surrounds the SRF. Around 1.2 million local users reside seasonally in the area for fishing and other resource use activities. Commercial hunting was a problem mainly before the 1970s and this resulted particularly in a serious depletion of the crocodile populations and to a lesser extent to the deer population. Although wildlife protection has improved significantly in the last decades, illegal hunting is still occurring on an incidental basis and fishery is having an adverse impact on the remaining turtle and crocodile populations as these animals are frequently caught up in fishing nets.

Due to natural processes the role of the Sundarbans to discharge the water of the Ganges and Brahmaputra catchment is decreasing as main waterways are shifting eastwards. As a result, the salinity of the Sundarbans is increasing -- particularly in the western region. Further, the total annual discharge is decreasing due to intensifying land use (dams, irrigation) upstream. The role of this change is not yet clear, but is evident that it will influence wildlife populations and vegetation in the long term.

The expanding shrimp farming in the greater Khulna region has caused wide concerns for the rich bio-diversity of the Sundarbans. Experts say indiscriminate shrimp and salt cultivation already destroyed the valuable mangrove forest in Chokoria Sundarbans and fear that the ecosystem of the SRF too would be in jeopardy for the same reason in the near future. The fisheries department reckons that some 200 billion different fish fries are destroyed every year in course of gathering two billion shrimp fries from the water bodies along the Sundarbans due to the crude methods adopted for the purpose.

Several international reports suggests that vast tracts of mangrove forests particularly in Latin America, Africa and the Pacific Islands have been cleared to make way for the establishment of coastal shrimp farm facilities. The failure of national governments to adequately regulate the shrimp industry, and the headlong rush of multilateral lending agencies to fund aquaculture development without meeting their own stated ecological and social criteria, are other important pieces to this unfortunate puzzle.

The great earnings from the shrimp sector are short-lived, while the real costs of shrimp culture in terms of consequent environmental ruin and social disruption are long-term and astronomical. While the immediate profits from shrimp farming may satisfy a few, vast numbers of coastal residents, once dependent on healthy coastal ecosystems for fishing and farming, are being displaced and impoverished. Observers believe that the environmental and social losses would eventually eclipse profits from the shrimp sector.

Forest department officials admit that though slowly far-reaching changes are taking place pervasively in the Sundarbans. These arise from direct and indirect impacts of human influence in the area causing widespread quantitative and qualitative degradation of the resource base throughout the Sundarbans eco-system. According to forest inventory, it is clear that the level of illicit takeoff, some purely illegal and some quasi-sanctioned, may be quite larger than what could be scientifically justified for sustainable management of the SRF.

The expanding tourism trade is appearing to be another major concern for the protection of the Sundarbans. Except the conscious tourists or tour operators, others tend to knowingly or unknowingly disturb the delicate ecosystem of the Sundarbans staging bonfires, playing loudspeakers or disposing of non-degradable wastes like polythene inside the forest, sea shores or water bodies. That should be stopped.

Consequence of mangrove deforestation

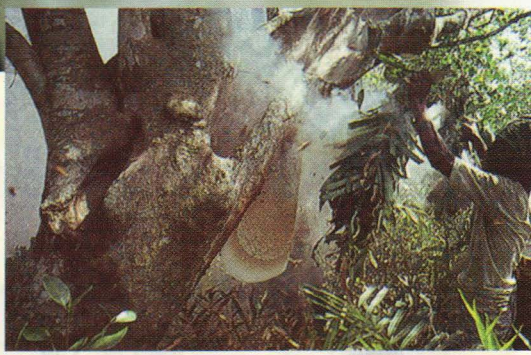
In many areas of the world, mangrove deforestation is contributing to fisheries declines, degradation of clean water supplies, salinization of coastal soils, erosion, and land subsidence, as well as the release of carbon dioxide into the atmosphere. In fact, mangrove forests fix more carbon dioxide per unit area than phytoplankton in tropical oceans. With regard to the Sundarbans, experts have sounded caution that destruction of the forest will not only affect the ecology but cause far reaching impacts on national economy and causing immense damage to the marine resources of the Bay of Bengal, still economically

unexplored and unexploited by Bangladesh. The loss of the Sundarbans would also expose the entire southwestern region of the country to frequent cyclones and tidal surges.

Mangrove forests once covered three-fourths of the coastlines of tropical and sub-tropical countries. Today, less than 50 percent of that is surviving. And then again, of this remaining mangrove forests, over 50 percent has been degraded and not in good form. Greater protection measures should be taken for maintaining high quality mangrove forests like the Sundarbans -- a World Heritage Site. All said and done, future sustainability of the Sundarbans depends upon the political will of the policy makers, environmental awareness of the people and the improved management and conservation by the forest department and other concerned agencies.

Chapter
3

Scientific study of the Sundarbans needed



Clockwise from above:
A snail on a branch; a *moul* harvesting honey from a honeycomb --one of the prized products of the Sundarbans; root-ridden muddy habitat of the Sundarbans mangrove.
Photo: FEJB

Scientific study of the Sundarbans needed

By Hasanuzzaman Khan

Whether one has ever seen it or not, the Sundarbans pervades our national consciousness as a legend, a treasure and a heritage. It may not be anything as big as the Amazonas, which controls the climate of continents, the Sundarbans' influences over the whole of Bangladesh are immense.

It provides the people, not only of neighbourhood but also in distant places, with fuel wood, despite curbs on cutting trees. And this is much in an energy hungry land, especially the rural areas. It is also the source of raw materials for the only newsprint mill of the country. The Sundarbans also provides golpata used for thatching huts in the rural areas. It is famous for honey throughout the country. And the whole Sundarbans is a great hunting ground for fish. It provides shelter and habitat for hundreds of species of animals and birds, including the Royal Bengal Tiger. It is the home of several species of trees and shrubs useful to the economic life of the people and sources of medicines.

A large number of fishes inhabit the innumerable rivers, canals and creeks that criss-cross the entire Sundarbans. Braving danger to life many people go into the Sundarbans to gather wood, golpata and honey. Thousands of, and some time over a hundred thousand, people enter the forest area to fish. But many like us, the city dwellers, go there to have fun or if possible to see the Royal Bengal Tiger.

Very few people go there for a scientific study of the forest and its environment. But two such scientific expeditions to the Sundarbans, led by late Prof. M. I. Chowdhury, had been undertaken -- one in late 1965 and the other in 1967. The first team went there during the dry season. It consisted of over 30 experts from different disciplines, including geography, forestry, microbiology, etc. They stayed there for nearly a month. The papers they produced were mostly published in a supplement on the Sundarbans brought out by the Morning News in early 1966. The other expedition was conducted during the monsoon. But the team this time could not stay there beyond a fortnight because

of inclement weather against which there was not enough protection. The expedition also suffered due to paucity of funds.

Here I should beg apology for writing on the Sundarbans because I had only a fleeting glimpse of the great forest during a trip to Khulna by steamer as late as the late 1980s. One of my friends, Fakir Ashraf, who was a senior official of the Customs Department at Khulna, had arranged the trip for me to the Sundarbans. But we could not go very far down the Rupsa as the river as well as the sea had been rough and our vessel was not properly equipped for such a trip. We travelled for about 45 minutes and then returned to Mongla Port for our lunch. But the only thing I learnt from a distance was that the golpata was not round after all as it suggests in Bangla language. And I did not have the chance to see the breathing roots of the mangrove forests of which I have read so much.

My contention, therefore, is that very little on-the-spot study has been done on the Sundarbans in which we take great pride as it is said to be the largest mangrove forest in the world. We really don't know much about this great forest and the multitudinous life forms that it harbours. We don't even have a history of the Sundarbans, its origin, progress and the threats of depletion being faced by the forest from various quarters. It is a good thing that the UNESCO has declared the Sundarbans as a World Heritage Site. But this is only the beginning. We should follow it up with groundwork of scientific studies to really know what heritage we inherit.

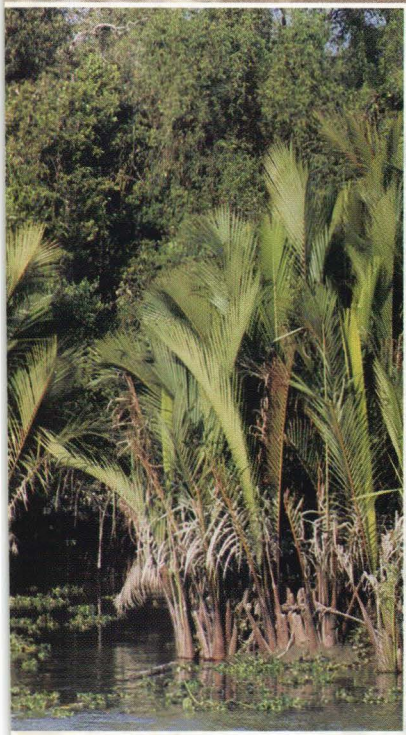
The Sundarbans is left entirely in the care of the Forest Department. But they do not have adequate manpower and equipment to monitor and carry on surveillance over the vast tracts of the forest. Moreover, the forest officials are not properly trained but are mostly ordinary government employees.

Now that the UNESCO has declared the Sundarbans as a World Heritage Site, the government should come forward to chalk out an elaborate plan in cooperation with the UN and international agencies. Such move should help in protecting the flora and fauna of this great mangrove forest. The authorities should also set up scientific research stations in the Sundarbans to study different physical, biological and environmental aspects. This will certainly help us in our main pursuit of protecting the Sundarbans mangrove forest, its trees and animals for our posterity.

Chapter

4

Tiger conservation in the Sundarbans



The world famous Royal Bengal Tiger, the pride and glory of the Sundarbans and their pug-marks on muddy shores. Photo: FEJB

Tiger conservation in the Sundarbans

By Hasna J. Moudud

Any conservation action or initiative affects people and, therefore, conservation of biological diversity and protection of natural environments should be ecologically and socially sustainable: this concept is now well realized among conservationists. From a narrowed concept of conservation of a given species we should try to preserve the complexity and integrity of the entire ecosystem in relation to human context. Such initiatives can serve local population which depend on the exploitation of natural resources to look at an ecosystem as a sustainable resource base for future. It also serves the interest of the local stakeholders who depend on sustainable use of their resource base and, therefore, they should be a part of what we are trying to save.

The key to survival of tiger in the wild in the long run is the maintenance of their habitats. Tiger habitats must be sufficiently large to support the number of animals that provide for an adequate genetic variety (Tamang, 1993). The effect of human population growth accompanied by reduction and degradation of habitat has resulted in fast decrease in tiger population and extinction in Asia. Surviving populations are isolated, scattered and mostly confined to protected areas.

As many as eight sub-species of tiger once lived in many parts in Asia, from snow-capped north to topical jungles in the South. Now only five sub-species barely survive in the wilderness. These are Siberians, Indo-Chinese, Sumatran, South China and Royal Bengal Tiger. All of them, including the Royal Bengal Tiger, are in danger of extinction.

The tiger population all over the world is declining at an alarming rate. The tiger has become a victim of its own myth. Illegal poachers trap or shoot for them for their hide, bones and organs as some ancient eastern myths about their medicinal power for healing are strongly attached to them. IUCN, the World Conservation Union, has put all five sub-species of tiger on the endangered list. In a bid to protect the tigers, we need to study and monitor the existing ones in the sanctuaries and put pressure on the authorities concerned to

ensure all the facilities required for the survival of the Royal Bengal Tiger in Bangladesh.

In effort to conserve the tiger in the wild and protect its habitat we need to understand our relationship with tiger and its habitat, the mangrove forest. It is only the Sundarbans forest of Bangladesh, home of the Royal Bengal Tiger, which happens to be the most ideal tiger habitat and possibly the best of the tiger strongholds of the world.

The Sundarbans is known to be better than many other tiger habitats; but that, too, is changing. Its population maintains itself under extremely vulnerable and rapidly changing situation and, therefore, deserves full attention of conservationists and policy markers. There should be an immediate census of tiger population and constant monitoring of their habitat. The authorities must take appropriate measures to save the Royal Bengal Tiger and its habitat ie, the Sundarbans.

The future of the Royal Bengal Tiger is uncertain due to unsustainable and heavy exploitation of the Sundarbans. Conservation of tiger should include a study of tiger population, taxonomy, its habitat and also to what extent growing number of people depend on the same forest for their survival or make unwise and unsustainable use. It is also important to know to what extent shrimp farming and fishing inside the reserved forest and on the offshore islands are causing harm to the mangrove ecosystem and tiger habitat.

There should be a study on tiger conservation in the Sundarbans of Bangladesh based on secondary data and information as available. Conservation of tiger is now a global concern. Without documented knowledge, planning and management, conservation of tiger is not possible. At present, there is no tiger conservation project being implemented in Bangladesh. Although the scope of this project is very limited, it is intended to provide some necessary information for tiger conservation and to create an urgency for taking immediate action to save the Royal Bengal Tiger as well as the Sundarbans.

Tiger as the greatest indicator of health of the Sundarbans and as part of a complex food web, the protection of the species is equivalent to protection of the entire ecosystem of the mangrove forest. Survival of species in nature depends on the maintenance of ecological integrity of the ecosystem, of which tiger is a part. If the ecological processes that govern the integrity of the Sundarbans ecosystem are not managed properly, it will be difficult to save the tigers.

The Sundarbans protect Bangladesh from cyclonic storms, sea level rise, pollution and provides fish and numerous flora and fauna resources. The forest plays an important role in the national economy as well as the economy the southwestern region of Bangladesh. Its provides the single largest source of forest products in the country. According to one official estimate more than one million people enter the forest in a year. It is not only human encroachment but also the water regime that decides the state of the Sundarbans and tiger population. Lack of fresh water during dry season due to dams in the catchment areas has impaired both the Sundarbans and the tiger population. Hence, saving the tiger and its habitat has national, regional and global significance.

Inaccessibility of the mangrove wetlands has attracted the Royal Bengal Tiger which is dependent on this forest for their shelter. On the other hand, the Sundarbans is protected by the tigers preventing human beings from destroying their own habitat. Therefore by protecting the Sundarbans we are also protecting the tigers.

Physical setting of the Sundarbans

The Sundarbans is the largest compact mangrove forest of the world, located in the estuary of the Ganges covering an area of about 1 million hectares in south-west Bangladesh and the South-eastern Indian state of West Bengal. About 62% of the forest lies in the districts of Bagerhat, Khulna and Satkhira in Bangladesh. The forest covers an area of 595,000 hectares, of which about 401,600 hectares are land and the remaining area are under water as rivers, canals and creeks of varying widths. Of the 401,600 hectares of land, only 6,100 hectares are covered by bare ground, grassland or clearings.

Land Sea Interactions

The Sundarbans as a mangrove forest is a coupled system linked by water to sea and land. The system is not independent of neighbouring areas and the ecological processes of coastal area. It is not possible to see the Sundarbans thriving independent of sea or land. The Sundarbans at the interface of land and sea is strongly influenced by external factors such as flow of freshwater and sediment from upstream, tidal charges from the sea, land and sea based pollution and sea level rise.

Three great rivers-the Ganges, Brahmaputra, Meghna and their distributors carrying fresh water and enormous sediment from upstream have contributed to the formation of the delta on which the Sundarbans has developed. The entire coastal area was once covered by forest. It is believed that the delta is subsiding at a rate of 5 mm per

year. This process of subsidence has resulted in upliftment of the ground. An expert visit further confirms it.

The importance of interaction between freshwater, salinity, sediment load and tide on the distribution of plants and physiognomic appearance of the forest has been documented for the Sundarbans (Karim, 1993) but there has not been any systematic study on their effect on animals. The species diversity decreases and forest stratum's diversity and heights become greatly reduced with the increase in salinity. Tigers, like other mammals in the area, have adapted to drinking extremely saline water, as high as 3% that might affect their liver and kidney. It has been observed that tiger likes and prefers fresh water to saline water. The dense forest cover and larger diversity of the forest provide varied ecological niches and support stable ecosystem. Any imbalance is likely to affect the whole ecosystem including flora and fauna.

Tiger Habitat in Bangladesh

Once upon a time, tigers used to be found all over forests in Bangladesh. But it is now confined only to the Sundarbans. The last tiger outside the Sundarbans where tiger population is now almost non- existent was shot in the Bhawal-Modhupur sal (Shorea) forest tracts in the 1940s. In the hill forests of northeastern parts and in the Chittagong Hill Tracts of south eastern parts of Bangladesh, tiger was last recorded to be shot in the '80s. However tiger had disappeared from the southeastern hill forests much earlier. There is still a small tiger population in the Kassalong Reserve Forest of Chittagong Hill Tracts, according to Forest department sources.

In the East and south east of Bangladesh bordering with eastern Indian forest states, the Bengal Tiger meets with the Indo-Chinese Tiger known as Panthera tigris corbetti. Tigers are found throughout the Sundarbans but in recent years tiger population are more constrained in the sanctuaries. It has also been found that tigers have moved further south. Some have moved near human habitation in the north. In this case, availability of food may be an important factor. It has been reported that tigers are migrating into the Indian Sundarbans where one tiger is poached a day. Total tiger population in the Indian Sundarbans is on the rise, it was reported. But tiger migration within the country and across the border has not been monitored or studied.

Three wildlife sanctuaries now totalling 139, 699, 656 hectares were established in 1977 under the Bangladesh Wildlife (Preservation) Order, 1973. These are : Sundarbans West (71,502.13 ha), Sundarbans

South (36,970.454 ha), and Sundarbans East (31226.938ha). Not all critical sites for wildlife are included in the sanctuary network. Although legislation rules against damage to vegetation in the wildlife sanctuaries, the Forest Department permits a variety of activities inside -- such as fishing and wood cutting. Local people are allowed to harvest grasses in the open areas within the sanctuaries and permits are issued for the cutting of Nypa along the edges of the rivers and channels.

Biomass Availability and Food Consumption

The crude animal biomass available to tigers amount to 7,221,800 kg (1826 kg/km2 X 3955km2) for the whole of the Sundarbans. The total requirement for tigers of 919,800 kg/yr therefore account only for 13 percent of the standing crop of ungulate biomass in the Sundarbans. Considering total tiger predation of 13 percent of the standing crop, it seems that the tiger perdation does not limit the prey population in the Sundarbans.

Grassland and keora forest are the most productive habitat with 4200 kg/km2 biomass versus sundri, gewa, goran with 1725 kg/ km2; and goran and gewa forest the least productive with 1200 kg/km2 ungulate biomass (Tamang, 1993). The overall crude ungulate biomass estimate for the entire Sundarbans is 1826 kg/km2. Unfortunately no detailed survey on tiger habitat nor quantitative survey on long term adverse effect on ecosystem of the mangrove forest have been done. It is necessary to study the effects of massive uncontrolled exploitation of wildlife and increasing human activity and ecological linkages.

Tigers' main activities revolve around their food supply. Tigers in the Sundarbans hunt both at day and night. The spotted deer and wild boars are the main prey of tigers. Other prey animals include barking deer, rhesus macaques, otters, smaller carnivores, monitor, lizards and other reptiles, fish, frogs, and crabs. In the Sundarbans a tiger also eats human being and is known as a man-eater. But it is said that all tigers are not man-eaters.

On an average, a tiger needs about 6-10 kg of meat daily. Past studies based on baits and wild prey indicate a tiger needs 2555 kg (7kgX 365 days) of meat per year ie, roughly about 73 spotted deer or wild boar. With a tiger population of 362 -- including adults and juveniles -- in an area of 3955 km2 the combined annual food requirement for the tiger population would be a total of 919,88 kg of large prey biomass (Tamang, 1993).

Habitat Quality and Integrity

The problem of habitat fragmentation since there are no east-west corridors linking the sanctuaries and dispersion of food supply has added to the problem of tiger habitat. High metabolic demand requires the tiger to have large areas of living space. More and more people have encroached on tiger land for settlement, agriculture and fisheries -- thus shrinking the tiger habitat in size and quality. Even the solitary tiger requires a 'critical mass' for a population to survive (Seidensticker et al., 1973). Habitat fragmentation can have long term genetic impacts on tiger population. Restricted gene flow in small population can affect fitness and survival quality.

Tiger cannot be protected by legal measures only. It requires habitat continuity and habitat quality. Three factors that affect tiger habitat quality are changes in vegetation, diversion of productivity away from the tiger's food chain and degradation of the ecosystems to a state that cannot support a population of big predators.

At present infrastructural activities such as clearing forest and building bungalows for conservators and officers inside the wildlife sanctuaries are taking place. Bungalows should be built near the riverside or existing forest stations or navy bases outside the sanctuaries. The use of generators, for electricity inside the sanctuaries, day and night will have adverse effect on tiger population.

The tiger is a carnivorous animal under the order: Carnivora and family, Felidae. There were 8 sub-species at one time of which 3 have become extinct. The Bengal Tiger, Panthera tigris, tigris, is found in the Indian sub-continent, and is known as Royal Bengal Tiger in Bangladesh. This variety of tiger has not been studied in full detail.

The tigers belong to the largest cat family. The tiger is admired, feared and attributed many supernatural qualities. Claws adapted to strike and hold prey, canines designed for biting and killing, short strong jaws controlled by powerful muscles, soft pads for stealth approach make tiger capable of sudden speed and burst of power. It is combined with highly developed sense of hearing and vision. However its power of smell has been found to be not as powerful as the hearing ability. Its head and body length vary between 140 cm and 280kg. Male weighs 180 to 280 kg and female weighs among 115 to 180 kg. It's unique striped colour of deep yellow, orange and black are variable.

Population Status

The first guess-estimate of tiger population in the Sundarbans was based on a field study by Guy Mount Fort, leader of WWF expedition to

Bangladesh in 1967. According to him the tiger population was said to be between 50 and 100. The informal census was limited to space and time. In 1975, Hubert Hendrichs, estimated tiger population at 350 in the Sundarbans based on three months of detailed study in three areas: compartments 29, 30 and 31 in the north; compartments 46, 47, 48, 49 and 50 B in the northwest and compartments 3,4,5 and 6 in the southeast. He visited almost all the compartments (55 in total) in the Sundarbans.

The second methodical study of tiger population was conducted in 1982. The investigation was carried out in 110 km2 area in the south wildlife sanctuary where 15 tigers were counted based on pug-marks. The age, sex, and class composition was: adult male 2, adult female 3, cub 6 and juvenile 4. On the basis of the result of this study total tiger population was projected to be 450 for the whole of Bangladesh Sundarbans.

The third methodical investigation on tiger population made in 1993 estimated tiger population to be 362. The estimation was made by studying pug-marks in 350 km2 in the northeast part of the Sundarbans. The density was determined at 1 tiger per 10.9 km2. Male-female ratio was one male to 2-3 females, and juveniles and cubs were found to be 40%.

The Forest Department in Khulna made two guess-estimates of tiger population in 1971 and 1992. Tiger population was at 320 in 1971 and 359 in 1992. The guess-estimates were made based on the reports of the people working in the Sundarbans.

The unbalanced sex ratio of 2.3 females to one male is considered normal. Tiger population is considered stable but for how long no one knows. Tiger population count is based on estimates that lacks accuracy. Trained people need to constantly monitor and censuses need to be conducted as scientifically based as possible.

Male tiger has much larger home range and they wonder more widely. The females on the other hand have much smaller ranges and are restricted to smaller territories and to raising and protecting cubs. In 1975 Hendrichs observed a pair of stray tigers living within a territory of 15 km2 area in the Sundarbans.

Reproductive Biology

Reproductive biology of tiger has not been studied but some observance have been made while assessing the population of tiger in the Sundarbans by studying the pug marks, identification of adult and

infant/cub population and female and cubs. Two cubs and a female were seen in the east Wildlife Sanctuary in March 1993 by a study team working on an informal census. Two cubs and a female were spotted outside the sanctuary at the Sapla Khal in January 1993. In April 1998 two cubs and a female were seen at tiger point (Kachikhali).

A tiger may be sexually mature within 2 and half years. Gestation period of a female is 100-108 days. A tiger is fertile up to 15 years. A female tiger can produce 6 litters and can give birth up to 15 cubs in her life time (2.5 cubs in a litter). It will of course depend on the condition of the habitat.

Tiger is polygamous. Tiger mating season has been reported to be during rainy season when the forest is likely to be less disturbed. Female and cubs are mostly seen during March, April and May in the Sundarbans. Reproduction rate of Bengal tiger is said to be good in the wildlife sanctuaries especially in the East Wildlife Sanctuary.

Tiger-Human Interactions

The tiger evokes a reverence and mystery in the Sundarbans. The local people, the Bawalis specially, are said to worship tigers. Hindu and Muslim gather at a mazar in Khulna for protection from tiger. Often one sees inside the Sundarbans red cloth form a mazar on display. Such are the beliefs that Bawalis are said to also to pray to bon bibi or spirit of the forest which guards all living beings in Sundarbans. It is here in the Sundarbans that the tiger is known as man-eater. It is here, that tiger is feared but not hated by local people (Montgomery, 1995). Tigers' dislike of the human face is well-known and is the reason why it is believed that a face mask worn at the back of the head protects people form being attacked by the tiger. The British hunter, Kenneth Anderson observed, "Man-eaters always leave untouched those parts of the victim we associate with personhood: the hands, legs and head" (Montgomery, 1995).

Tiger is a carnivorous animal and is on top of the foodchain. It attacks human when encountered inside the forest. This kind of chance killing has made tiger man-eater. In the Sundarbans man-killing behavior of tiger was well established since 1665. During the period from 1912 to 1921, 427 people were killed by tigers in the Sundarbans. From 1948-49 to 1970-71, on an average 25 people were killed by tiger annually. Some 301 persons were killed form 1984 to 1993, an annual average of 30 victims.

The following reasons for which tiger turn into man eaters are offered

by tiger experts (Tamang 1993):

1. When surprised at a kill;
2. Unable to capture a prey due to old age or injury;
3. When protecting cubs;
4. After killing a man a tiger learns that man can be eaten as any other natural prey and is easier to catch;
5. After a tiger gets a taste of human flesh he prefers it and
6. Increased salinity in tiger habitat as well as lack of fresh water for drinking. Human casualties due to tiger show a definite pattern. It has been observed that human casualties is more during 7 to 9 in the morning and 3 to 5 in the afternoon.

Threats to Tiger

Trade in Tiger Products

There is no record of commercial trade of tiger body except tiger hide which is either smuggled or sold. There is no record of recent tiger poaching in the Forest office. Newspapers sometimes report on tiger hide being smuggled across the border.

Poaching / killing etc.

Before the enactment of Bangladesh Wildlife (Preservation) Order, 1973, tiger could be shot or killed. Annual average killing from 1959/60 to 1967/68 was about 4.5; from 1975/76 to 1985/86. 12; and due to cyclone in 1988, 9 tigers were killed. A total of 452 tigers were killed from 1912 ie. 4 tigers were killed in a month between 1912 and 1921.

Human interference is one of the threats to tiger population.

Lack of Information

Lack of information and monitoring are the most immediate obstacles in taking up a sensible tiger management plan. The Ministry of Environment and Forestry does not have a wildlife cell. The Forest Department in Khulna does not have specific responsibility towards information collection relating to wildlife conservation. Lack of direction, lack of trained and experienced staff coupled with lack of logistics and equipment is considered main impediments too information collection.

Legal measures

The Bangladesh Wildlife (Preservation) Order, 1973 is still in effect and provides for establishment and management of wildlife sanctuaries and other protected areas. The Act needs to be revised in

view of Bio Diversity Convention and UNESCO World Heritage Site Declaration in 1997. Law and order situation inside the Sundarbans need to be curbed by proper legal and management measures.

Global Tiger Conservation Initiatives and Conventions

CITES is a United Nations administered international treaty that provides protection for wild animal and plant species form over-utilization in international trade through a worldwide system of controls. More than 117 nations that are parties to the treaty who meet every two-year to update species' categories of protection. Bangladesh became party to CITES in 1982. Of all the tiger conservation initiatives, **Global Tiger Forum** is the most well-known. Bangladesh is also a member of the forum.

Recommendations

The Sundarbans has never been properly studied for wildlife or tiger conservation purposes in the past. Without a thorough study it is not possible to take up a tiger management plan. In view of the fast disappearance of tiger form rest of Asia and in Bangladesh it is important to take up a census and first hand primary investigation of Royal Bengal Tiger and its habitat on an urgent basis both by the Government and international tiger conservation agencies. Besides, following measures may be taken up immediately to save the tigers :

1. A Tiger and Sundarbans Conservation and Management Plan should be taken up;
2. Tiger census should be taken up immediately along with provisions for continuous monitoring;
3. The Ministry of Environment and Forestry should have a separate Wildlife Cell or Department;
4. There should be a National Committee for Tiger Conservation including experts from multisectoral disciplines to give advice and monitor conservation activities;.
5. The Sundarbans Forest Division should have a Tiger Conservation Cell in Khulna to collect / receive and preserve all information relating to tiger. There should be a Field Tiger Conservation Team within the Sundarbans. This team will be responsible for conservation activities including monitoring and transmitting information to Khulna Cell every month;.
6. A continuous monitoring system of tiger population (status, trend, breeding, feeding and human casualties, etc.) should be developed. National Committee for Conservation of Tiger, Departments of Zoology and Environment in local universities, NGOs and public may participate in the monitoring system.
7. An integrated study of tiger and its habitat should be taken up.

Information should be available for planners and public for informed planning and public support.

8. Information should be collected on tiger and its prey species compartment wise, vegetation wise and salinity wise on a regular basis;
9. Concept of Floating Conservation Zone may be taken up to ensure smooth and undisturbed movement of animals in marine and coastal environmental during development activities such as mineral exploration and transportation on shore or off shore;
10. The entire Sundarbans should be declared as Tiger Reserve with controlled and wellcoordinated human activities allowed. The present sanctuaries should be expanded and corridors allowed. The present sanctuaries should be expanded and corridors allowed;
11. Wildlife Sanctuaries should be off limit to human activities or commercial exploitation. Floating off limit zone concept may be applied to the present sanctuaries on a selective basis to allow regeneration of forest and undisturbed tiger breeding by seasonal or annual closing down of sanctuaries by rotation;
12. Shrimp cultivation should be brought under control. Hatcheries should be promoted and properly guided so that fish resources can regenerate. The incidents of fishing inside the Sundarbans with cyanide or other poisonous chemicals should be investigated and stopped;
13. Legal reforms and measures should be taken up to stop killing of tiger as man eater and deer shooting and to improve the law and order situation inside the forest and offshore;
14. Controlled eco-tourism only should be allowed;
15. Monitor sea level rise, salinity and other hydrodynamic and topographic changes including adverse effects of Ganges withdrawal on the Sundarbans during dry season.
16. Enforcement of EIA on mineral exploration activities on or off shore;
17. Control oil spill, oil pollution and other land and sea bases pollution;
18. Exploitation of the Sundarbans as source of revenue collection should be compared to bio diversity loss and cost of Sundarbans afforestation;
19. People who depend on the Sundarbans for their survival should be rehabilitated; educated and provided with credit. The extent of their exploitation and exploitation of forest products by private businesses should be studied and controlled;
20. NCS, NEMAP and Five Year Plan should be revised to include Tiger Conservation and Sundarbans management plan;

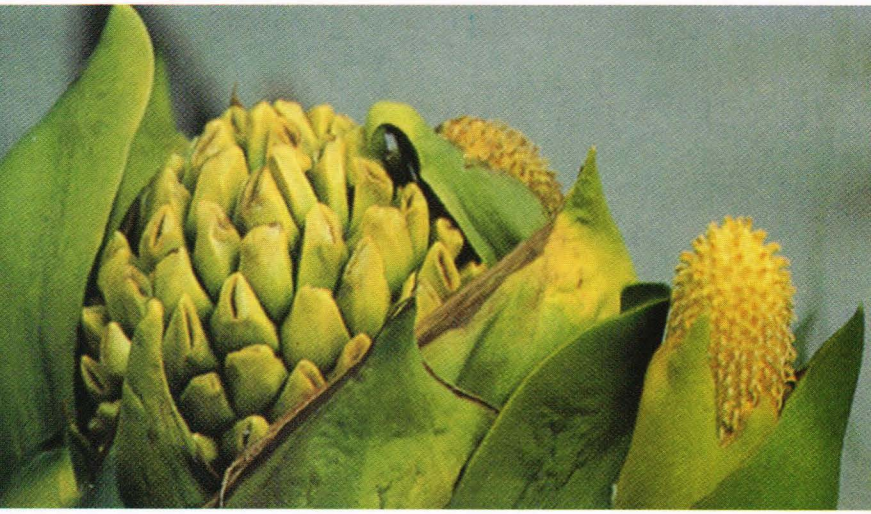
From a narrowed concept of conservation we have to move to

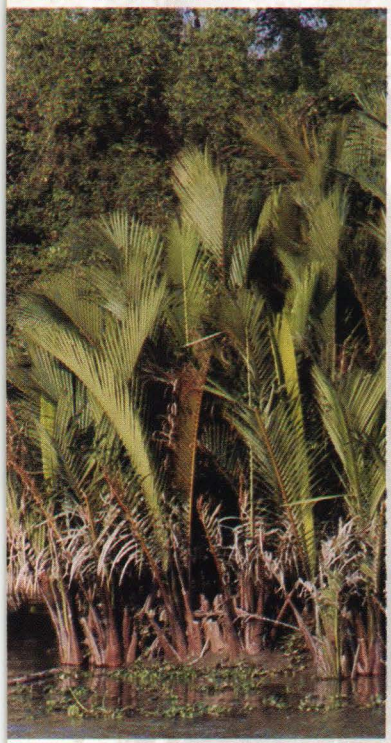
environment and to sustainable development in order to be successful in the conservation of tiger in the wild. In the context of future food reserve and food security, the Sundarbans will remain an important resource potential. Tiger is an integral part of the complex food web in the Sundarbans. If we cannot protect the tiger we cannot protect the Sundarbans and its flora and fauna including one of the most productive fish breeding grounds in the region. When the population of Bangladesh doubles within the next century, food and protein shortage will be acute. Therefore we need to look at our forests and wetlands as future food reserves. It is well worth investing on new areas such as environment -- the Sundarbans, the marine eco systems, and the wetlands to save something for the future generation.

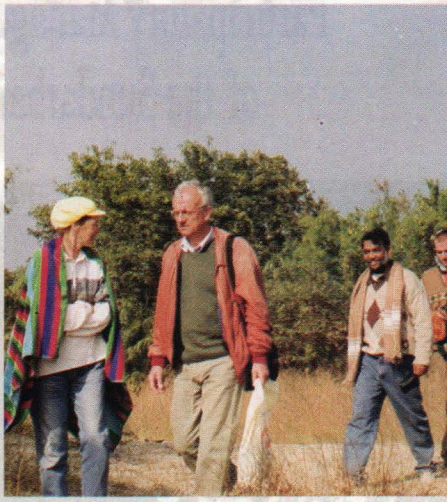
Chapter

5

Participatory Management of the Sundarbans







Above: trees battered by cyclonic storm. Middle right: during field trip
Below: hedges of golpata. Photo: FEJB

Participatory Management of the Sundarbans: The Experience of West Bengal, India

By Dr. Mizan R. Khan

Sundarbans is one of the last tropical deltaic mangrove forests in Asia, the rest having converted to rice agriculture. A rare and endangered ecological system, the deltaic mangrove wetland forest of the Sundarbans bridges Bangladesh and India in the southwest, bordering the Bay of Bengal. Once a vast expanse of luxuriant mangrove forest, it has been reduced over the years to a large extent due to land reclamation for agriculture, settlements and ever growing biotic pressure on forest products.

Till recent times, the landscape of the Sundarbans was a product of two countervailing forces: conversion of wetland forests to cropland versus sequestration of forests in reserves to be managed by the Forest Department (FD) for long-term sustained yield of wood products. During the colonial period, state reclamation efforts were encouraged through landlords by increasingly favorable state policies (land grants, tax incentives, cadastral surveys, and eventually colonisation projects and subsidised irrigation). These policies were designed by revenue officials to maximise the rate of transformation of wetland forest to taxable agricultural land. In the late 19th century, as the rate of agricultural conversion increased, the colonial FD sought to preserve the remaining Sundarbans forest by giving them legal status as Reserve Forest. They were managed to provide a sustainable supply of timber and fuel-wood for the growing population of southern Bengal. Today, the supply of some economically valuable tree species have been depleted and some mammals are locally extinct.

Obviously, the question of management comes in a big way. Conventional state management is questioned in many countries, because of declining productivity of state forests, growing imbalance between supply and demand of forest products, declining tree cover in state forests, and rising conflicts between FD staff and local communities. Some experts argue that the main cause of deforestation is the inability of forest owners/managers to exclude various user groups from the resources which in theory are under a well-defined property regime. Therefore, the problem is not with the property

regime as such, but with its enforcement. This is relevant particularly in countries of the sub-continent, where forest-fringe people continue to believe that the forests belonging to them had unjustly been taken over by the former colonial government.

Another group of experts argue that the effects of centralised control over forest resources in the Indian sub-continent were: (i) diminished access to forest lands and products for resident communities, with serious consequences for their lifestyles, livelihood and security; (ii) enhancement of illegal use of forests because of restrictions; and iii) virtual extinction of the traditional practices and indigenous institutional mechanisms of forest use. Among the policy makers, therefore, it is increasingly realised that without the willing participation of communities living in and around the forests, no programme of sustainable management can succeed. Such views are reflected in the multilateral agreements and declarations of recent years, such as, Agenda 21 (chapters 11 and 26) and Authoritative Statement of Forest Principals (para 5, 9a). However, participatory models are required more for Asian forests, most of which are located close to population centers and local encroachments for collection of fuel-wood, fodder or small timber are too rampant to be controlled.

The Forestry Sector Master Plan of Bangladesh (1993-2012) states: "In such situations, conventional forest management will not succeed ... participatory forestry involving the villagers is the only recourse." The Plan regards the following definition of participation as acceptable: "In participatory forestry, the participating farmers will be involved in planning, decision-making and implementation of all its activities. Accordingly, many countries have initiated a variety of participatory models in forest management. Today, no policy-maker talks of any development/resource management project without the 'participation' of local communities. The questions are : What kind of participation? How does participation take place? What is the policy-legal framework of participatory forest management?

With such a perspective, the present paper attempts to analyse the management of the Sundarbans in West Bengal, India. The case of West Bengal as a learning experience is relevant and important for Bangladesh for several reasons: a) both areas share many similarities in historical experience and socio-economic conditions; b) West Bengal portion of the Sundarbans is a truncated part of one ecosystem, now severely degraded; c) FDs in both countries still bear the colonial legacy of management; d) the Bengal area is the most densely populated place in the world (except city states); and e) a model named joint forest management (JFM), initiated back in 1972 on a

pilot basis is reportedly proving successful in regeneration of degraded state forests all over India including in the Sundarbans. Thus, the first part of this paper lays down a Conceptual Framework of participation, while the second part analyses the experience of participatory management of the Sundarbans in West Bengal, India.

Part I: Conceptual Framework of Participatory Resource Management

Erosion of customary rights over land and trees due to state-sponsored privatisation or nationalisation of natural resources is regarded as the real problem. In South Asia since the 1950s, local common property resources/regimes (CPR) have broken down not so much by population pressure as by inequitable privatisation schemes. When Indian government authorities began to privatise well-functioning CPR systems in the name of clarifying ownership and helping the poor, the traditional village commons collapsed and the poorest households received only one-half to one-third the amount of land given to more prosperous households. Another Indian analyst argues that privatisation of CPR has led to overuse of forests because of unavailability of common pasture, and the local rich have doubly benefited from such privatisation - as owners of nearby lands, they gradually encroached into the adjacent public forest lands.

Such actions fit the CPR Tragedy Model (Fig.1), articulated by Garrett Hardin. It argues that individual rationality manifest in the form of maximising benefits leads to collective tragedy. It calls for a superior force in the form of private or state ownership and management. Accordingly, some argue for private property rights to well-defined parcels of forest lands either through sale in the financial market or by lottery. But the experience of some countries like Indonesia, Malaysia and the Philippines indicate that large private firms, guided by a profit-making motive, could not manage forests with an objective of long term sustainability.

Experiences also show that the so-called 'effective hegemony' imposed by government resource managers worsens the problem by undermining local users' responsibility to protect resources. This is vindicated by the realities in the state forests of many countries including Bangladesh. In recent years, because of environmental degradation, state agencies in the developing world are tightening zoning and other centralised restrictions on land and resource use. If past experiences are any guide, such a renewed centralised control of resources under heavy biotic pressure is utterly misplaced.

But the other, Viability Model of CPR (Fig. 1) is supported by the empirical research of Bromley, Cernea, Ostrom and others. Their

studies show that many communities dependent on common resources, both in developed and developing countries, have devised and sustained informal/customary ways to control access to the resource and institute rules among the users. The CPR tragedy model simply conflates "common property" with "open access" resources. To viability advocates, CPR management is a question of identifying the appropriate social and institutional arrangements at the community level. Michael Cernea (1989), senior adviser to the World Bank, pointed out:

> "Resource degradation in the developing countries, while incorrectly attributed to `common property systems' intrinsically, actually originates in the dissolution of local level institutional arrangements whose very purpose was to give rise to resource use patterns that were sustainable."

Communities with power to control some resources are seldom prone to destructive practices. Dangers arise when the rural elite or elite-backed governments take away local control. Incentives to conserve then disappear. Non-accountable government agencies, such as forest departments, irrigation bureaucracies and marketing boards often constitute the greatest single threat to secure local control by ordinary farmers and the landless. Agarwal thus argues:

> "Whenever national bureaucracies have taken over management role, discharged by local communities, systems of traditional governance over natural resources have broken down, and local communities were alienated and environmental resources suffered."

Thus, Agenda 21 includes a Chapter on promoting `sustainable livelihoods' for the poor, and this builds on the positive experiences of many community-based initiatives in resource management. After spending about US $1.5 billion on forestry projects in Asia between 1979 and 1990, the World Bank admits that its actions "have had a negligible impact on borrower's forestry sectors as a whole." The Brundtland Report entitled Our Common Future argues, "Programs to preserve forest resources must start with the local people who are both victims and agents of destruction...They should be at the centre of integrated forest management, which is the basis of sustainable agriculture." The Report also acknowledges that achieving sustainable development (SD) requires a fundamental change in the way natural resources are owned, controlled and used.

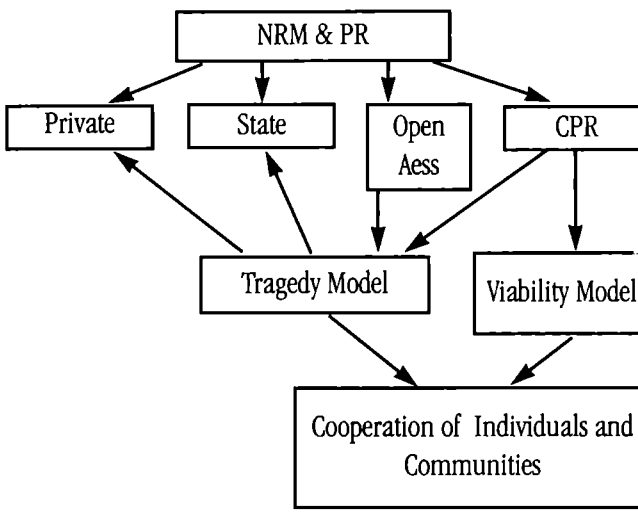
This brings in the question of linkage between management regime and property rights on natural resources. Property can be regarded as a secure claim to a resource or its services. Property rights/regimes in

natural resources exist in usually four forms (Fig.1):

a) Private property;
b) Open access resource, where legal rights are not clearly defined;
c) State property, where the legal claim rests with the government, such as in land and forests; and
d) Common or communal property resources (CPR), where individuals have claims as members of recognized groups.

During the times of antiquity, all natural resources belonged to the Crown or the Sovereign. The citizens, often in groups, were given the *usufructs*, a use right without legal ownership. During the industrial period, increased technological power and mobility created an open system in which resource substitution and importation

Fig. 1



minimised the fears of scarcity. Resources were therefore perceived as being both absolutely and relatively abundant. During this period, according to O'Riordan (1985), social controls over resource appraisal and allocation gave way to laissez-faire and the freedom of rights of the individual. Competition set the rules and economic principles dominated the allocation process in the then-industrialising world. In the colonised world, the Western concept of rights of the individuals over that of the community was strengthened, as individuals began to buy/own formerly communal properties.

Currently, there is no problem with private property rights in general. However, there are serious problems with the last two categories, i.e., state property and CPR. Alienation of poor communities compounded the problem of government management, which fails to control encroachments from local and distant sources. Therefore, sustainable resource management is argued to be a function of cooperation at all levels. It is argued that this cooperation will sustain through 'effective' participation of local communities, who are the best guards against distant, and more powerful encroachers.

People's Participation: Varied Interpretations

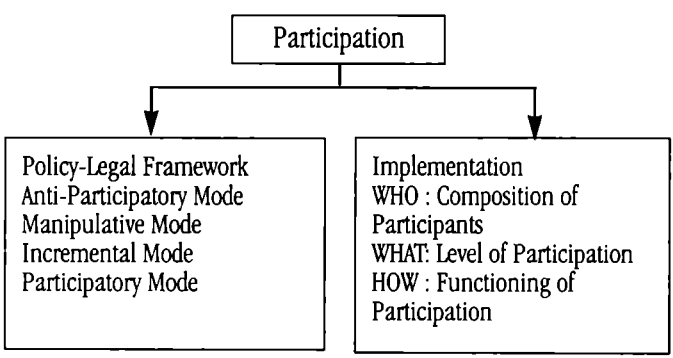
Participation, like SD, has become an umbrella term for a new approach to development intervention. A review of relevant literature in such disciplines as economics, political science and sociology presents a complex and confusing picture of the concept.

Disagreements occur as to what participation really means or how it should be realised. The fundamental split is between those who see participation as a means to an end, and those who advocate it as an end in itself. As a goal in itself, community participation is viewed by some as a necessity for individual and social well-being; others see it as a 'basic need by itself of men and women.' Such views are related with the perceived inadequacies of the new democratic nation-states, where the newly-forming political institutions usually bypass the poor and marginalised populations. The democratisation process in the South is dominated by the urban middle class, in cooperation with the rural elite. The latter have at times used democratic procedures to consolidate and extend local power. UNDP's 1993 Human Development Report estimated that more than 90% of the global population are unable to exert a meaningful impact on economic, political and social functioning of societies they live in.

Therefore, participation is to be concerned with power, particularly to control resources and decision-making. Brazilian sociologist and dependency theorist FH Cardoso (who was elected President of Brazil) argued that participation ought to be linked to political activity in broader arenas, and not confined to small-scale, problem solving efforts. Attaining sustained participation thus requires major political change and decentralisation, not of administrative bureaucracy (as often is done), but of management of resources. Thus, what is needed first is economic democracy, without which political democracy has no meaning for the poor and disenfranchised. The focus should be on socio-economic empowerment through implementing land reforms, providing security of tenure, employment and support programmes, expansion of educational opportunities in rural areas etc. Once the

poor as a group are sensitised enough about their condition, they can exert their voice in local and ultimately national-level decision-making.

Empirical studies by scholars of participatory development, such as Uphoff (1979), Oakley and Marsden (1984), Blair (1985), Ghai (1994) and Midgley (1986) show that state-initiated community participation was often meant for cooptation, political mobilisation or clientelism. In most of the cases a top-down approach to development has remained essentially unchanged. So state-directed participation is regarded as a paradox. While the state now controls resources and the lives of its citizens to an extent previously unknown, it is naive to assume that the ruling elite readily agree to devolution of authority to the masses. Midgley (1986) presents four types of state responses to participation, based on such criteria as state definition of what participation entails, or the degree to which it is willing to devolve power to local institutions: a) the anti-participatory mode (participatory initiatives are viewed by regimes as threats and are suppressed); b) the manipulative mode (participatory rhetoric is used by regimes for some ulterior motive); c) the incremental mode (regimes officially support participation, but policies are vaguely formulated and incrementally implemented); and d) the participatory mode (regimes create machinery for effective participation through devolution). These forms are not definitive, and a state may fall between one or more categories at various points of time. A typology of participation can be seen in Table 1.



However, there is no agreed set of indicators for comparison of the participation processes. Political regimes greatly differ in the degree of participation they allow in the development process. Experiences in many developing countries indicate a trend of distorted implementation of policies because of a lack of accountability on the

part of ruling elite. Therefore, to examine the process at the micro-level, participation has to be looked at through the questions that Norman Uphoff, a leading theoretician of participatory development, suggests: namely, WHO participate, WHAT kind of participation takes place, and HOW it takes place. Then state responses to participation can be checked against the framework of the four participatory modes, mentioned before. Such an approach helps locate and explain the degree of fit between the policy framework and its implementation.

Table 2: Typology of Participation in Development Projects

Typology	**Characteristics of Each Type**
1. Manipulative Participation	Participation is simply a pretence, with "people's" representatives on official committees, but who are unelected and have no power.
2. Passive/Pseudo-Participation	People participate by being told what has been decided or has already happened. It involves unilateral announcements by an administration or project management without any listening to people's responses. The information being shared belongs only to external managers/ professionals.
3. Participation by Consultation	People participate by being consulted or by answering questions. External agents define problems & information gathering processes, and so control analysis. Such a consultative process does not concede any share in decision-making, and professionals are under no obligation to take on board people's views.
4. Participation for Material Incentives	People participate by contributing resources, for example, labour, in return for food, cash or other material incentives. Farmers may

	provide land and labour, but are involved in neither experimentation nor the process of learning. It is very common to see this called participation, yet people have no stake in prolonging technologies or practices when the incentives end.
5. Functional Participation	Participation seen by external agencies as a means to achieve project goals, especially reduced costs. People may participate by forming groups to meet predetermined objectives related to the project. Such involvement may be interactive and involve shared decision-making, but tends to arise only after external agents have already made major decisions. At worst, local people may still only be coopted to serve external goals.
6.Authentic/Interactive Participation	People participate in joint analysis, development of action plans and formation or strengthening of local institutions. Participation is seen as a right, not just the means to achieve project goals. The process involves interdisciplinary methodologies that seek multiple perspectives and make use of systematic and structured learning processes. As groups take control over local decisions and determine how available resources are used, they have a stake in sustaining the structures/practices.
7. Spontaneous Participation/ Self-mobilization	People participate by taking initiatives independently of external institutions to change the system. They develop contacts with

external institutions for resources and technical advice they need, but retain control over how resources are used. Self-mobilization can spread if governments and NGOs provide an enabling framework of support. Such self-initiated mobilization may or may not challenge the existing distribution of wealth and power.

Source: adapted from Pretty, J.N., "Participatory Learning for Sustainable Agriculture, World Development, 23 (8), 1995.

Part II: Participatory Forest Management in West Bengal, India

Based on a policy of inclusion, many countries of Asia, Africa and Latin America have developed a variety of participatory models in forest management. These models can be grouped into the following broad typology:

1) Farm and homestead forestry
2) Group farm forestry, as in West Bengal
3) Cooperative/Community woodlot, as in China and Korea
4) Joint forest management, as in India, Nepal and Indonesia
5) Management by indigenous communities/NGOs in Thailand, the Philippines and in some Latin American countries
6) Communal/private lease contracts, as in China or the Philippines
7) Collaborative forest management, as in Thailand or Indonesia (in this model, a triangular collaboration takes place among social scientists, FDs and local communities/NGOs)

As there is no universally accepted framework of the participation process, these models differ widely in their working dynamics. However, the model of joint forest management (JFM) in West Bengal deserves particular mention. Informally initiated as a pilot project in the Sal forest of Arabari, southwest West Bengal in 1972 by some forest officials, led by Dr. Ajit K. Banerjee (then DFO of Silviculture, South), the model of JFM proved successful in regenerating the degraded Sal forests. The model was based on care (protection by villagers through social fencing) and share (usufructs including 25% of timber value). The state and federal governments formally approved the model in 1989 and 1990 respectively for nation-wide replication. Currently, FDs of almost all Indian state governments have introduced JFM and

thousand of forest protection committees (FPCs) have been formed all over India. But West Bengal leads the programme to date, with the extent of people's involvement regarded as the highest, compared to the rest of India. This leading status of West Bengal in JFM can be discerned from the following criteria: a) Regeneration of forests; b) Restitution of biodiversity; c) Income generation; d) Cost-effectiveness; and e) Acceptance of JFM at the micro, national and international levels. Currently, the FPCs in West Bengal protect an area over half the state forest land. The fact that forests are protected and regenerated better through peoples' participation, compared to traditional custodial management, has been widely recognised. Together with its rapid spread across India, other countries are applying JFM in their own ways. In 1992 the FPCs of West Bengal collectively received the Paul Getty international award for their contribution to forest regeneration. In the mid-90s, the World Bank had extended a project loan of US $34 million to finance the promotion of JFM in West Bengal, a state ruled by a left-front government (LFG) since 1977.

Status of the West Bengal Part of the Sundarbans

In the late 19th century, the total area of the Sundarbans comprised about 19,500 sq kms of which the Indian/West Bengal part was 9,630 sq kms. Currently, the area under Reserve Forest is 4,264 sq kms and the rest of the area is reclaimed and inhabited. Over 2,585 sq kms of forest area, the Sundarban Tiger Reserve Forest had been created in 1973 and the rest was demarcated for forestry activities. There are three wildlife sanctuaries, namely Sajnekhali, Haliday island and Lothian island and one National park within the Sundarbans Biosphere Reserve area. Administrative boundary of the Sundarbans passes through two districts i.e. north 24-Parganas and south 24-Parganas covering 19 Blocks - 6 under the former and 13 under the latter.

Socio-Economic Status of People in the Sundarbans

Over four-fifths of the people living in the Sundarbans are dependent on agriculture on reclaimed land which bear mostly single crop of paddy. Besides agriculture, other occupations are fishing and pisciculture, honey collection and wood-cutting. Some 50% of agricultural labourers are landless. And 44% of total population belongs to Schedule Caste and Schedule Tribes. As a result, the level of literacy and per capita income are much lower in the Sundarbans than in other parts of West Bengal. The communication is also very poor and most of the areas are inaccessible. Though some of the points are linked with Calcutta by few metal roads, communication in this area dissected by the network of numerous streams and canals is dependent mainly on boats and motor launches.

Protection/Conservation: Administrative Measures and Infrastructural Facilities:

1. One Director in the rank of CCF is in overall charge of Sundarban Biosphere Reserve (SBR) under which comes the Sundarban Tiger Reserve.
2. There is a `State-level Steering Committee for the Sundarban Mangroves and Biosphere Reserve Management' constituted to guide and oversee the Biosphere Reserve Program and its activities. Chief Secretary, Govt of West Bengal, is the Chairman of this Committee and the Representative of the Government of India, Principal Chief Conservator of Forests, Director of SBR, a number of specialists, representatives of NGOs and Shabhadhipatis of both north and south 24 Parganas Zilla Parishads are members of this Committee.
3. There is a Monitoring Sub-Committee to monitor the physical and financial performances of all projects under the Mangrove Biosphere Reserve Program and to assess the impact of various components of the projects including generation of employment, economic upliftment of the people alongwith their attitudes and acceptance of the schemes.
4. There is also a Research Sub-Committee under the state-level Steering Committee to identify the research areas concerning social adversities, study on impact of pollution, effect of traditional system and development of more productive system.

Major Central and State Projects

Important on-going schemes are:

A. Centrally sponsored Schemes are:
   i) Establishment of SBR
   ii) Conservation and Management of Sundarban mangroves
   iii) Integrated Afforestation and Eco-Development Project.

B. West Bengal Forestry Project (World Bank-funded).
C. Area-Oriented Fuelwood and Fodder Program (50% Centrally sponsored Scheme).

JFM and Eco-Development of People in and around the Sundarbans

Traditional forest management and mere policing were found to be insufficient to conserve mangrove forests and their bio-diversity. SBR was, therefore, created with the main thrust on socio-economic development activities with conservation and ensuring people's participation in the process through mass awareness building and motivation. Following the success of JFM through Forest Protection

Committees (FPCs) in the fringe villages in other parts of West Bengal, the same system has also been introduced in SBR area. While forming the FPCs, stress has been given to include all the families in the villages taking one member from each family with the privision of joint membership for each household (husband being a member, wife becomes automatically a member).

As provided in the Government Order of 1989, the members of FPCs will be entitled to 25% of net sale proceeds of final harvesting of plantations/forests and 25% of the intermediate yields from coppicing, multiple shoot-cutting and thinning and collection of fallen twigs, grass fruits, flowers, seeds etc. For socio-economic development of the people, a package of eco-development programme which includes mariculture, acquaculture, bee-keeping, farm forestry, horticulture, distribution of smokeless chullah, use of solar energy for generating electricity, vocational training, health services, veterinary services, etc. are being implemented. With the economic upliftment of the people in and around the Sundarbans, the buffer population will help protect the mangrove forests and their eco-system from the biotic interference. This will also minimise the age-old man-animal conflict. Many FPCs comprising of villagers have already been formed and recognised within the areas of 24-parganas.

Pisciculture: Under SBR programme, ponds close to the bank of rivers have been excavated at government cost and each such pond is being handed over to a group of ten beneficiaries in the villages as per recommendations of local Panchayets. Importance has also been attached to popularise culture of edible oisters and crabs.

Honey Collection & Apiculture: On an average 60,000 kgs of honey are extracted from the Sundarbans every year through the honey-collectors and FD takes the honey as well as wax from them at fixed tariff and arrange for sale of filtered honey after processing in the Departmental Filtering Unit at Sealdah. About a thousand of families earn their livelihood through collection of honey from the Sundarbans forests.

Apiculture (bee-keeping) is now gradually becoming popular and necessary training is imparted under the SBR programme. Apiary-boxes have been distributed among the villagers as per recommendation of local Pancahyats and these are supplementing the income of the beneficiaries.

Timber & Other Forest Products - Their Uses: At present, matured natural forests are extracted for timber and fuel-wood on a rotation

basis for catering to the needs of the local people.

Smokeless Chullah & Use of Solar Energy: Such chullahs are very useful to combat the twin problems - scarcity of fuel-wood as well as pressure on conventional energy sources. More than 14,000 chullahs have been distributed to the villagers within SBR by the mid-90s. Trial on use of solar energy for generation of electricity particularly for illumination purpose proved to be useful in some areas within SBR. Important locations within the STR area are also illuminated at night by use of solar energy. So far, several hundred points within the SBR have been brought under solar energy technology.

Vocational Training: To generate scope for self-employment and help earn supplementary income, the SBR wing organises vocational training for the villagers in the Sundarbans area on Pisciculture, Poultry, Apiculture and Horticulture.

Educational Trips: Villagers from fringe areas are taken to the forests of Sundarbans and other parts of West Bengal to make them acquainted with various aspects of JFM and status of forest protection there. Trips are also arranged for students from different schools/colleges for their exposure to nature and diverse flora and fauna of the Sundarbans.

Awareness: With a view to expose the villagers and students of schools and colleges to various aspects of JFM and conservation of forests and wildlife, video-shows in different areas on forestry and wildlife are arranged by different units of SBR. Two centers - one at Sajnekhali and another at Bhagabatpur have also been established keeping these objectives in view.

Role of Women: Women folk in the Sundarbans play a significant role along with men in earning their livelihood. In JFM, wives have the joint membership in FPCs along with their husbands. Women groups are also taken to villages for their motivation and awareness through dialogues, meetings and conventions. Training programmes suitable for women are also organised.

Health & Veterinary Services: FD in collaboration with the Department of Health & Family Planning has started coordinated health-service programme to fill up the gap and periodic health-service camps are organised in remote villages taking advantage of available infrastructural facilities of SBR and knowledge of foresters about the people and the locality. Health service camps are also organised in the villages with NGOs. Besides the necessary assistance from the

Directorate of Veterinary for extending such services in the villages, the STR project has also veterinary experts to serve the local needs.

Coordination with Other GOs: It is an uphill task for the SBR wing of FD with limited resources to fulfill the total objectives of Biosphere Programme to coordinate the three elements of Eco-restoration, Eco-conservation and Eco-development. Therefore, coordination is maintained among the departments of Agriculture, Irrigation, Health & Family Planning, Animal Resource Development, Education, Fisheries, Science & Technology and Department of Sundarbans Affairs. Sundarbans Development Board has been taking part in the execution of substantial work of afforestation, soil conservation and socio-economic development under the SBR. Calcutta Port Trust is also associated with afforestation and research programme of the SBR in the vicinity of their working zone.

Role of NGOs in SBR: Many NGOs are involved in the SBR programme, but they work in partnership with the FD. The NGOs do not control much resources independent of the government, either in the West Bengal or elsewhere in India.

A Synthesis: It was proposed in the framework that the experience of West Bengal would be checked against the four modes of state responses to participation. Looking through these lenses, it may be deduced that West Bengal falls in between the incremental and participatory modes. State policy has legitimised community participation in forest management. Community needs have been given preference to industrial needs in forest products by the Forest Policy of 1988 (a reversal of prior policies). The policy laid out some modalities of implementation. The democratically-elected left-front government initiated important structural changes, such as a) land reforms and share-croppers' rights, b) effective Panchayati Raj, and c) integrated implementation of rural development programmes, led by the increasingly representative local leaderships. The LFG power base commands the required autonomy independent of the vested, propertied classes to pursue reforms and policies within a social-democratic framework that favors the poor. However, it must be mentioned that the LFG did choose to ride the winning horse of JFM, led by the FD. But the LFG policies helped sustain the programme of JFM.

The FD bureaucracy as a whole appears committed to the programme, as evident from their activities, departmental restructuring and initiatives for attitudinal changes through training of officers, with NGO assistance. The FD's attempt to maximise employment benefits

to the FPC members through tuning their operations during the lean season, and coordinating other programmes in the fringe areas are further evidence to their commitment. From discussions with the FD officials of West Bengal, it was clear that in a traditionally hierarchical, structured bureaucracy, such as the FD, initiatives for effective participatory management have to come from within the bureaucracy itself. Because as an organisation it develops a vested interest to maintain its own value systems and becomes resistant to outside forces/influences coming in. Such a thesis is borne out by other country experiences, such as the US Forest Service.

The above factors can be viewed as elements of a participatory mode. But it contains contradictions: rather than empowering the FPCs, it strengthens the state, as well as the party in power. The problem is: the core feature of participatory mode - the devolution of power and decision-making down to the local community organisation, the FPC - is still missing. The amendment to the state government order of 1990 has expanded the FPC role from mere 'protection' to various activities, but the latter formulation is vague, and findings from the field indicate that all those activities pertain to 'responsibilities' only on FD terms. The federal circular also stipulates community participation in the planning process. As seen, the FD staff carry out all such activities. With the provision of registration of FPCs only with the FD, the former even does not have any legal status. The FPCs are yet to play the role of an actor.

Although the LFG drive for political mobilisation of the rural masses through national and local party institutions has achieved sustained electoral victories since 1977, the accumulated political sensitisation and empowerment are not yet reflected in the FD-FPC equation. The power of the local government representatives regarding the FPC activities is still recommendatory in nature. This shows either the regime is not yet sure of the efficacy and viability of local level devolution in JFM programme, or that participation is not taken by the political regime as a goal in itself, or that the still developing participatory political-administrative processes are yet to wrest control in directing the programme implementation.

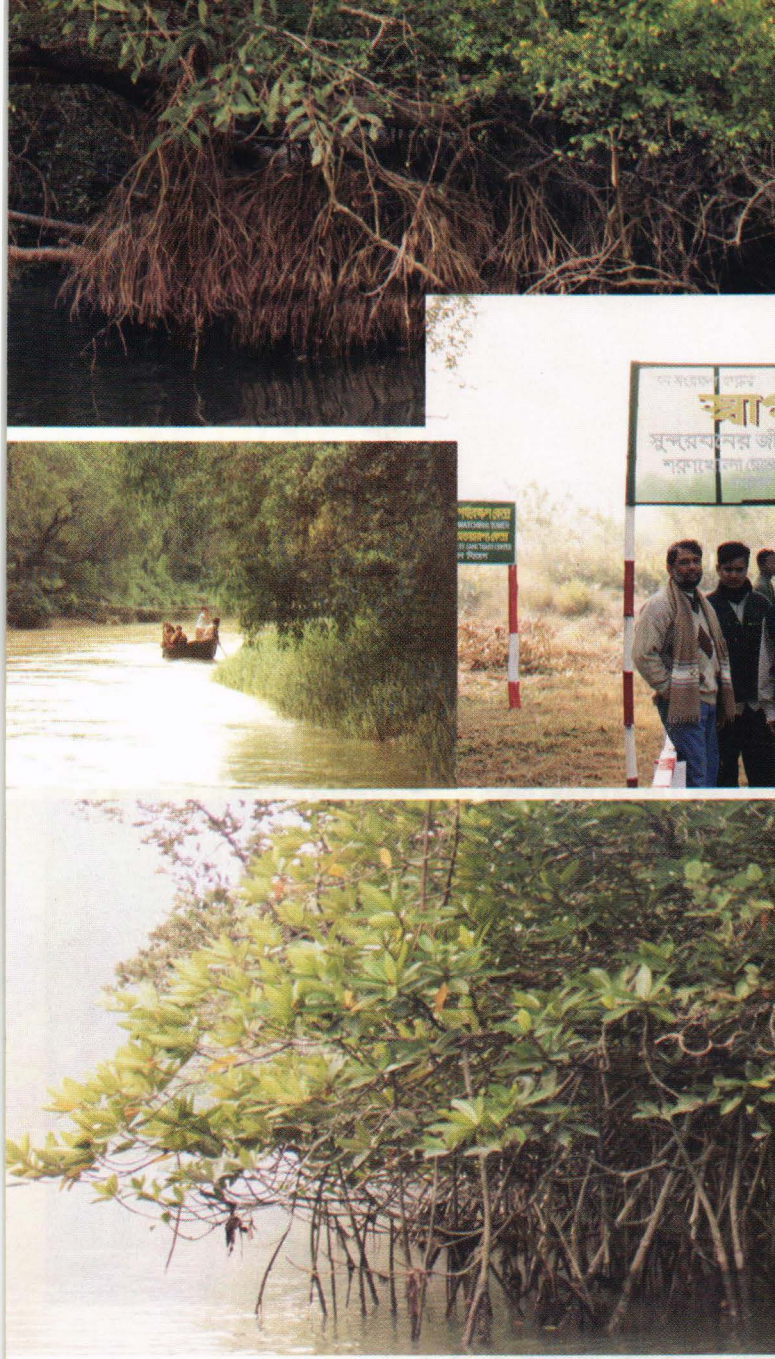
As a result, the government muddles through in its implementation of the programme, changing its orders in an incremental fashion, despite the fact that spontaneous participation of villagers in the FPC programme anti-dated the government approval. With the current level of participation and its functioning, JFM might be sustained the way it is so long as the LFG remains in power, since under it, the local power structure includes the poor low-caste and tribal population. But

a change of government in West Bengal, headed by Congress or Bharatya Janata Party in future may change the balance again in favor of the propertied class. In that case, the future of JFM with its current dependence on extra-community forces and levers of power for functioning does not augur well. Even after years of functioning, the programme fails to develop a community leadership, able to take charge, independent of the regime in power, or the local foresters' patronising role. As a further setback, the Indian Forest Act appears to be a new brake on JFMs march forward: its restrictive provisions may further disempower the communities, and strengthen bureaucracy and the state. In any case, with all its drawbacks, JFM can still be regarded as the initial step towards the larger frame of community control and management of a vital natural resource like forests.

Chapter

6

Three days in the Sundarbans



Clockwise from above: A typical mangrove bush with sprouting roots; FEJ
eam on a field trip to the Sundarbans; shrubs of golpata along a
Sundarbans river; submerged *garjan* plants. Photo: FEJB

'A separate high-powered regulatory authority should be set up'

Three days in the Sundarbans

By Abdul Hye Siddique

The Sundarbans is a priceless resource. It has a marvellous history and various stories are told about it. There are different opinions about its nomenclature. There is no end to the problems besetting this world-famous mangrove forest. Though troubled by thousands of problems the Sundarbans is still a beautiful forest. After being designated a 'World Heritage Site' the Sundarbans now has the prestige of a world resource. It is the duty of everyone to protect the Sundarbans.

Short history and geographical position

The land on the shore of the Bay of Bengal in the southwest of Bangladesh is known as the Sundarbans. If also extends to the southern area of the Twenty-four Pargana district of West Bengal in India. The land lying between the Ganges and the Meghna is named the Sundarbans. It is learnt that this area was under the sea about 2,500 years ago. After the Bhairab and the Padma branched out of the Ganges, the delta began to be created in the present-day Sunadarbans area that gradually became the Sundarbans, the world's largest mangrove forest. Some others, however, say that this area arose as alluvium island in the sea between the fifth to the thirteenth century.

To the north of the Sundarbans are Shyamnagar in Satkhira district, Koira and Dahape in Khulna district and Mongla, Morelganj and Sarankhola in Bagerhat district. To the east is Mathbaria in Pirojpur district and Patharghata in Barguna district. To the south is the Bay of Bengal. To the West is the Indian Sundarbans. The total area of the Sundarbans in Bangladesh and India is 10 thousand square kilometres of which the Bangladesh portion is 5 thousand 772.85 square kilometres. Seventy per cent of the Sundarbans is forested. The rest 30 per cent consists of rivers, canals and creeks. This forest is 44 per cent of the total forest land of Bangladesh.

Origin of the name

There are differing opinions on the origin of the name of the Sundarbans. The Sundari trees are the most visible in this forest, so

most people think that Sundari trees gave the name to the Sundarbans. Those who oppose this opinion argue that the forest has gewa, keora, ora, passur, goran, bain and other trees besides the Sundaris and these trees are not much less number than the Sundaris, therefore they do not agree that the Sundarbans derived its name from the Sundari trees. According to them, this forest is situated on the seashore and the tide of the sea moistens its soil, so it was called *Samudraban*. Many of the illiterate people pronounce *samudra* (sea) as *sumuddur* or *sumundur*, therefore Sundarbans is a distorted appellation of *Samudraban*. Another group of people believe that the Sundarbans got its name form the Sundha river in Barisal district. The forest on the bank of the Sundha once used to be called Sundharban that, at a later time, came to be known as the Sundarbans. Some others hold the opinion that this vast forest came to be known as the Sundarbans because of its pleasing and beautiful scenery. These are several other opinions on the origin of its name. But the majority of the people think that this name Sundarban has been derived from the Sundari trees.

The rivers

Thirty per cent of the Sundarbans are rivers. Four hundred and fifty big and small rivers are spread like a net in the area. To the east of the Sundarbans are the Haringhata and the Baleswar rivers. In the middle of the eastern portion is the Pusur river, forming the boundary between Khulna and Bagerhat districts. To the south of Khulna is the terribly destructive Sibsa. To the south-east on the eastern border of Satkhira district are the Kapotaksha and Arpangasia rivers. The biggest rivers on the western border of the Sundarbans are the Raimangal and the Harinbhanga. Almost all the rivers flowing through this forest have originated from the Ganges or the Padma. Among the other rivers in the Sundarbans are the Hansaraj, Sumati, Bhola, Chhaprakhali, Singa, Jamuna, Kalindi, Golkhali, Kukumar, Chalki, Chunar, Koira, Malancha, Sutarkhali, Firingi, Bhomrakhali, Lataberi, Atharabeki, Bhetuipara, Baluijhaki, Dudhmukhu, Andermanik, Sapkhali, Mathura, Khasitana, Matha bhanga, Bara sheola, Chhoto sheola, Neelkamal, Dobeki, Bhadra, Chunkuri, Jhapa, Katka, Rangabali, Dhanpati, Rajakhali, Jatghata, Kanchikata, Burigalli, Taltali, Kadamtali, Dangmari, etc.

Sanctuaries

There are three sanctuaries in the Sundarbans. These are 'Sundarban East', 'Sundarban South' and 'Sundarban West'. The Katka-Kachikhali sanctuary is known as the Sundarban East sanctuary, spread over an area of 192 square kilometres. The Neelkamal sanctuary is in the Sundarban South, situated at Hironpoint. Its area is

224 square kilometres. The Sundarban West sanctuary, with an area of 442 square kilometres, goes up to south Talpatti island. The UNESCO declared the Sundarbans a 'World Heritage Site' on 6 December, 1997 at the 21st session of its World Heritage Committee.

Vegetation

There are innumerable trees of various species in this coastal mangrove forest. Survival is possible only for the young plants that can tolerate the hazards of the muddy land and the saline water. The plants and trees that have withstood the storms and surges and escaped the depredations of the loggers and the timber smugglers have kept the Sundarbans alive. A full-scale survey of forest wealth was done in 1903. The survey found 334 species of trees. No full-scale survey has been conducted in recent times. However, surveys conducted by various voluntary organisations found no more than 100 species of trees. According to the survey by the Sundarban Study Group there are 68 species of trees in the Sundarbans at present. The Sundari trees were the most numerous among the vegetation of the Sundarbans. They are seen everywhere in this forest. Other trees, especially mentionable, are Keora, Passur, Gewa, Bain, Goran, Garjan, Golpata, Banchandan, Hijal, Bhatkathi, Amur, Hado, Shingra, Bhadal, Khalsha, Hingey, etc.

Fauna

The first name that will come up in the fauna of the Sundarbans is the Royal Bengal Tiger. The Sundarbans and the Royal Bengal Tiger are almost synonymous. But as more and more time is passing the number of tigers in the Sundarbans is diminishing at an alarming rate. The number will be more or less 300. According to different sources, there are 375 species of wild animals in the Sundarbans. Of them, 10 are amphibians, 63 are reptiles, 261 are birds and 41 are mammals. Different governmental and non-governmental organisations, including the forest department, are claiming that there are 200 crocodiles, 80 thousand deer, 20 thousand boars, 40 thousand monkeys, 20 thousand otters, 50 thousand--, a very large number of birds and innumerable snakes including pythons. Pending a full-scale survey by any responsible organisation, we have to accept these figures for the present. It is learnt that at one time there were elephants, rhinoceros and wild buffaloes in the Sundarbans but no one has sighted an elephant or a rhino there. However, many have sighted buffaloes there at the beginning of the twentieth century. At one time crocodiles were plentiful in the rivers of the Sundarbans, though it is claimed that now there are only 200 there. In reality the number may be less. A crocodile lives for 200 years on an average. A female crocodile lays 50 eggs. These eggs are often eaten by other animals if they get the chance. On the other hand both male and female

crocodiles eat their offspring. So only the young ones that could escape could grow up. Poachers secretly kill many crocodiles as their skins, teeth and bones fetch fortunes.

Royal Bengal Tigers

Many people think that there are about 300 Royal Bengal Tigers in the Bangladesh portion of the forest. A survey conducted in 1993 shows there are 362 tigers in the Sundarbans. In 1997 the then environment and forest minister, Syeda Sajeda Chowdhury, informed the Jatiya Sangsad (Parliament) that there are 360 tigers. But the wild animal expert, Tisa McGregor, a British national, said in 1999 that there are no more than 200 tigers. It is very difficult to get correct statistics on these fierce animals. However, all over the world, including the Sundarbans, the number of tigers is decreasing alarmingly. At present there are about 7,000 tigers of this species throughout the world. But only a century ago there were one hundred thousand Royal Bengal Tigers in Asia alone, of which the Indian subcontinent had about 40 thousand.

Man always treats the tiger as an enemy. That is why tigers are not safe from men. Killing of tigers is banned all over the world including Bangladesh. But when the hides, eyes, claws, blood and bones of a single tiger can fetch more than 10 lakh takas, poachers are always tempted to kill the Royal Bengal Tigers. Besides, when a tiger becomes a man-eater, it is hunted down on the instructions of the authorities. Most of the tigers do not become man-eaters. Usually an injured or very old tiger, which has no longer the strength to hunt the deer or the boars, turns into a man-eater. Once it has tasted human flesh it becomes a confirmed man-eater and does not try to catch other animals, according to experts. On several occasions the tigers have been seen haunting the human habitations near the Sundarbans, no doubt to prey on human beings. There is no year when men have not been the victims of the man-eaters. In the year 2000 alone 24, men have been eaten by the Royal Bengal Tigers in the Sundarbans and the nearby localities. Various newspapers have reported that the highest number of persons eaten by tigers was 56 in 1979. In 1988 tigers ate 52 persons.

Men have killed at least 4 tigers in the Sundarbans in the year 2000. Poachers kill, on an average, 10 tigers in a year, according to sources, but the real number must be much higher. UNDP and FAO statistics show that the tiger population in the Sundarbans is decreasing by 20 every year. The tigers themselves are partly responsible for not increasing their number. A tigress at a time gives birth to a litter of 4 to 5 cubs, but often the male tiger eats its own cubs. The tigress hides

the cubs to save them from the tiger. On the other hand, when the tigress does not get a chance to hunt other animals, it eats the cubs. However, such incidents are rare.

Two projects-'Tiger project' and 'Tiger project of the Sundarbans'-were taken up to protect the tigers. If these two projects had been implemented then the killing of tigers could have been stopped and at the same time the breeding of the tigers could also have been increased. But there is no sign at all that the two projects are being implemented.

People roam unhindered in deep forests of the Sundarbans. There is no opportunity for men to have a permanent habitation in the Sundarbans, and there are no dwellings in the forest except the various offices of the forest department. But numerous people use the forest to earn their living. A publication of the Sundarban Study Group shows that 50,000 people visit the Sundarbans everyday. In the winter this number is believed to double. A certain source claims that two to two and a half lakh people enter the Sundarbans to fish. At some seasons the presence of people increases enormously. The season to cut golpata is from January to March. The season to collect honey is from April to June. The best time to gather snails and oysters is considered to be November-December. A set of statistics shows that the number of bawalis engaged in cutting golpata and timber is no less than one and a half lakh. Bawalis gathering honey and bees' wax number about 8 thousand. About 3 thousand people are engaged in gathering snails and oysters. Sixteen thousand workers are engaged in cutting trees and sawing timber. People connected with the timber business number one lakh 15 thousand. Besides, people of other trades depending on the Sundarbans number at least 10 thousand

Three days in the Sundarbans

A 9-member delegation of the Forum of Environmental Journalists of Bangladesh (FEJB) toured the Sundarbans from January 5 to 7 on the launch, MV Abasar, of the Guide Tours. Besides the journalists there were 44 more local and foreign tourists aboard the vessel. Under the able management of the Director of the Guide Tours, Afroza Monsur, and the excellent guidence of the junior officer, Mohammed Abdullah Abu Dayan Rimon, the tour was very enjoyable though few animals were sighted. The FEJB delegation consisted of Dr. Mahfuzul Huq, Mahmud Hasan, Shafiuddin Bitu, Anisur Rahman, Ruhul Amin Rushd, Shahidul Islam Chowdhury, Abu Darda Zubair bin Habib, Michael Galvin and Abdul Hye Siddique. Besides, the family members of Dhaka's notable businessman, Mahfuzul Alam Chakladar, were active participants of this lively tour. Over 50 men consisting of the

FEJB delegation and the local and foreign tourists set out from Narayanganj on January 4 aboard the Abasar for the Sundarbans. Sailing down the Sitalakhya, Dhaleswari and Meghna, the launch reached Barisal by nightfall. After spending the night at Chowdhury haat in Barisal, the Abasar steamed towards the Sundarbans on the morning of the 5th of January. By noon the long-sought-after Sundarbans could be sighted. Everything was verdant as far as the eye could reach. Sundari, gewa, goran, golpata and innumerable other trees were ubiquitous. But no Royal Bengal Tiger, which is synonymous with the Sundarbans, could be seen. Even its roar could not be heard. No crocodile was seen on the first day. We could not see even one deer after we entered the famed forest through the Baleswar. The smart Rimon, who is a student of Environmental Science at the North-South University, advised everybody not to be disheartened. In the afternoon the Abasar halted at the Supati forest station to complete some official formalities and then started for the Katka sanctuary. Before we could reach Katka, we found the luxurious government vessel, the Banarani, swiftly moving ahead. Four naval vessels were escorting the Banarani. We came to know that the then Environment and Forest Minister, Syeda Sajeda Chowdhury, was aboard that vessel.

The minister had come with her family to see the Sundarbans. The Banarani anchored in mid-stream at the Katka ghat of the Katka-Kachikhali sanctuary, and the minister with her entourage spent the night there. Abasar cast anchor half a mile from the Banarani. As soon as the sun rose the next morning we could see herds of deer in Katka. A fascinating sight in the Sundarbans is several deer ambling together. After watching birds at dawn about 50 tourists including the journalists' team went into the Katka sanctuary. Two forest guards, Monir and Farid from the Supati forest station, accompanied the tourists with rifles. Though Mr. Chakladar and his wife had not come to see the wild animals of the sanctuary, their grand daughter Mashiat came riding on the shoulders of Bayezidur Rahman, the youngest son-in-law. She was only two years old. Apart from a Swedish couple all the local and foreign tourists were eager to see the Royal Bengal Tiger with their own eyes. Many persons went up the Zamtala observation tower, known as Tiger Point, and looked for tigers with binoculars. It is from this tower that Ranger Ghulam Mustafa saw a tiger on a July noon for the first time in his life. Though he had been working in the Sundarbans for four years, before coming to Katka he had not seen a tiger with his own eyes. Although everybody was inquiring 'where is the tiger', many persons at heart were scared. The forest department people assured everyone that on seeing so many persons together even a man-eating tiger gets frightened and seeks refuge elsewhere. The other tigers flee if they see even a much smaller number of people. It is

known that there are 6 Royal Bengal Tigers in the Katka area. Ranger Ghulam Mostafa informed the team that after the declaration of Katka as a sanctuary, the tiger population is gradually increasing. On the night of January 2, a tiger ate a deer just beside his office.

We saw a group of bawalis busy cutting chhan (a river-side reed) near the observation point. Journalists talked to bawalis Abdul Ghani, Malek Howlader and Zakir Howlader. These bawalis had come from Sharankhola as contract workers. In reply to queries from the newsmen they said they had not seen any tiger with their own eyes. However, they had occasionally seen wild boars, monkeys, deer and other animals. They had seen the pug marks of a tiger at Katka, though they did not hear it roar. Replying to newsmen the Ranger said nobody is allowed to kill or capture any animals in the sanctuary, and nobody is allowed even to cut the trees or plants there. After the forest suffered an irreparable loss when the chhan caught fire from a cigarette butt left by a tourist about two years back, it was forbidden to cut the chhan to allow it to grow back. Permits are now being issued to cut chhan from the sanctuary.

On the way to the Katka sea beach we saw many branches of trees had been cut and many that were lying on the ground. This had been done on the occasion of the minister's visit. The clever staff of the forest department had done this so that deer from the depths of the forest came here to have on easy meal and could thus be seen by the minister. After a while we came across a pond. Deer come to this pond to drink sweet water. Sometimes tigers also come for a drink.

On the bank of the pond we found a tiger's pug mark. Many tourists jumped with delight. Those who had cameras with them snapped up pictures of the pug mark. It was like consoling oneself with a base substitute. Bayezid Shaheb shouted 'tiger, tiger'. And just then the young man from Australia, Michael Galvin, found a tooth of some wild animal. His hunch was that it was a tiger's tooth, and naturally he was delighted. Many people were thrilled at seeing the pug marks but the faces of some female visitors became pale, especially those who had small children with them. Some people really became nervous on confronting the reality that 'there is a tiger nearby'. The smart young guy, Riman, assured everyone and said, "There is no cause for alarm. If the tiger sees so many people together it will flee. Besides, there are two armed guards with us". However, all reached the seashore safely. Barring two or three, all of the team bathed in the salt water of the sea. Dr. Mahfuzul Huq and some journalists found some uprooted trees lying about on the shore. It was learnt that storms and cyclones, storm surges and continuous pounding by waves had caused this sorry

state. Some people in Badamtala were cutting the branches and trunks of these felled trees. Jehangir, Mostafa and Jalil, who hail from Padmashuri village of Patharghata in Barguna district, said that not only they but many other people cut the timber of uprooted trees.

From the seashore we went back to MV Abasar on local dinghies. On the way we saw a monkey on the canal bank. On seeing the boat it swiftly fled into the dense forest.

After a while we found a deer crossing the canal. When the boat progressed further we found that a fawn was waiting helplessly to cross the canal with one of its feet in water. The mother deer had crossed the canal moments ago but the young one hesitated on seeing the boat. As its mother has already gone to the other bank, the fawn could neither go back nor dare go forward because of the approach of men. It is not known what happened to the fawn. Later we could see herds of deer roaming on both sides of the river. Some deer were munching young leaves or eating fish or crabs stranded by the ebb tide.

In the meantime two large launches had entered Katka. Officers and workers of a Khulna jute mill had come for a picnic with their families. Microphones were blaring from the launches and polythene bags were being thrown into the river. The young members of the picnic party were seen chasing herds of deer in the forest adjacent to the Katka range office. In the evening they gathered dry wood and lit a fire and exploded crackers. They were mindlessly flouting the law. All these were being done in front of the forest officials, though such behaviour is strictly prohibited in the Sundarbans, especially in the sanctuaries.

On the morning of January 7 Abasar left Katka for Khulna. It again stopped at the Supati forest station at 9 a.m. There we talked to Deputy Ranger K.M Shahidullah and forester Firoze Kabir Khan. They informed the journalists of their numerous problems. The menace of dacoits in the Sundarbans is great. Manpower to face the dacoits is inadequate and the forest department personnel have only a few out-dated weapons. Previously a forest station had the sanction of 12 hundred litres of fuel a month for the patrol boats. After the declaration of the sanctuary it was reduced to 100 litres, where the need was a minimum of 2 thousand litres!

After we left Supati, we saw a large crocodile basking in the mid-day sun on the river midway between Mrigamari and Andharmanik. When the sareng (helmsman) of the Abasar saw the crocodile he slowed down the craft. Curious tourists all went up to the roof to have a better

view of the reptile. Those who had binoculars could see the crocodile clearly. The reptile had its eyes closed as it was enjoying the warm sunshine in the winter.

In a moment the crocodile was captured on camera. When the Abasar was nearing the creature the exclamations of the tourists became louder. Sensing the presence of human beings the giant reptile slid into the river.

During the three days of travel and observation in the Sundarbans we talked to all sorts of people and were apprised of the many problems besetting the area. Besides the reduction in the flow of sweet water, increase of salinity day by day, frequent natural disasters, poaching of wild animals, various diseases of the trees, gradual increase in the sea level and depredations by forest and riverine dacoits, the unplanned use of forest resources has gradually made the problems of the Sundarbans more and more complex. In the light of opinions expressed by many local and foreign tourists and by experts, the junior officer of the Guide Tours, Riman, said that these should be a separate high-powered authority for the management of the Sundarbans. Even if a separate authority is created, he said, the forest department would have to monitor the activities of the authority. He also proposed the development of eco-tourism. But he cautioned nothing could be managed properly without a correct guideline.

Chapter

7

Tiger, tiger not burning bright

Clockwise: a shrub of golpata, one of Sundarbans resources; boats stacking golpata; and a hedge of garjan trees. Photo: FEJB

Tiger, tiger not burning bright

All 5 species headed for extinction

By Ahmed Nure Alam

The number of Royal Bengal Tigers in its own homeland-Bangladesh-is only 362, while neighbouring country India has 3,750 Royal Bengal Tigers. Bangladesh has not yet provided the tigers with a safe habitat. The habitat of Bengal tigers in Bangladesh has shrunk to parts of the Sundarbans. The tiger, the biggest member of the cat family, is a greatly endangered animal all over the world.

At the beginning of the last century there were about 100 thousand tigers throughout the world. But by the end of the century the number dwindled to a maximum of 7,500. In one hundred years three species of tigers have become extinct. Only five species of tigers still survive. If the tiger becomes extinct then the world will miss this beautiful animal. One cannot think of a future Bangladesh without the Royal Bengal Tiger. The tiger, with its power and grace and its royal demeanour, is the symbol of Bangladesh.

On 18 January, 2000, 40 representatives from 14 countries met at the first general session of the Global Tiger Forum (GTF) to devise ways and means to save the unfortunate tigers from extinction. The Bangladesh environment and forest ministry was the co-sponsor of the GTF meeting. Though the focus of the GTF includes tigers in all the countries, the Bengal Tigers received most attention in the discussions.

The present members of the GTF, which was constituted in 1994, are India, Bangladesh, Bhutan, Myanmar and Vietnam. The Bengal Tiger resides in all the above-mentioned countries except Vietnam. Of all the tigers that are still surviving 4,715 live in the above four countries and Nepal. The non-member countries like Nepal, Laos, Cambodia, Indonesia, Malaysia and Thailand also took part in the general session. This is the biggest international initiative to save this animal. The GTF has tried to include nearly all the countries where tigers live.

Indian forest and environment state minister Babulal Marandi presided over the inaugural session at Dhaka Sheraton Hotel. The then Bangladesh environment and forest minister, Syeda Sajeda

Chowdhury, was the chief guest and the then state minister, H.N. Ashiqur Rahman, was the special guest. Syeda Sajeda Chowdhury said that Bangladesh has taken several steps to protect wild animals, including tigers, since liberation. In 1977 three sanctuaries with an area of 125 square miles was set apart in the Sundarbans to protect the wild animals. The area of these sanctuaries was increased to 1,400 square kilometres in 1996. The UNESCO has declared these three sanctuaries World Heritage Sites. The minister informed the participants that the government had taken up a Tk. 380 crore project from 1998-99, named Preservation of Bio-diversity in the Sundarbans, to protect and maintain bio-diversity. The Sundarbans has been divided into four parts under this project to ensure proper management.

Indian forest and environment minister Babulal Marandi said that if proper measures are not taken in the border areas of the countries where tigers live, the effort to save the tiger will not be successful. India has signed bilateral agreements with Nepal and China to preserve the tiger. In a few days, he said, India will sign a bilateral protocol with Bangladesh. The Indian minister proposed that the countries that have tigers should totally ban all markets where tigers and tiger's limbs are bought and sold.

GTF secretary general A.C. Dey said that tigers cannot be saved by the individual efforts of any state. He said that the existence of the tiger had been threatened as the population of the world reached 600 crores. It is unthinkable what will happen in 2050 when world population will be 1200 crores if proper steps are not taken to protect the tiger.

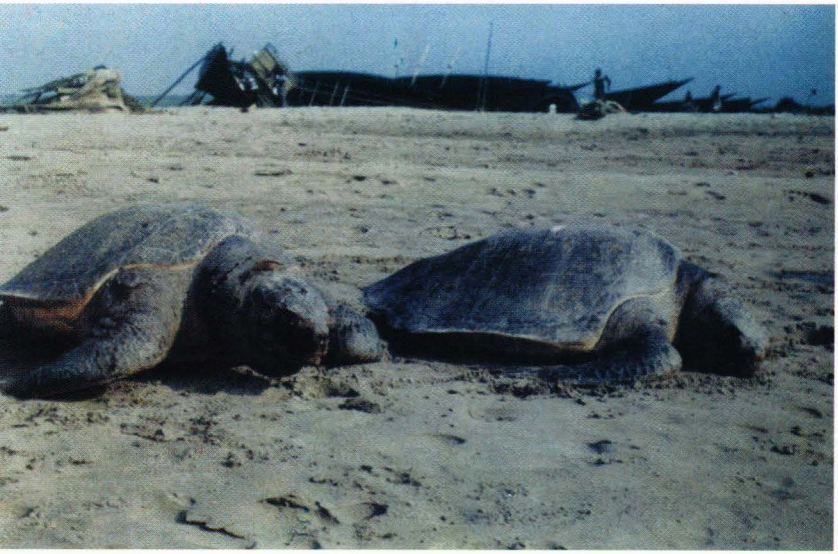
The then environment and forest secretary, Syed Marghub Murshed, foreign secretary C.M. Shafi Sami and chief conservator of forests Mohamad Rabbi also spoke at the inaugural session. The participants were informed of some sad facts by the speakers at the general session. We learnt that three species of tigers had become totally extinct of before end of the last century. These are the Caspian , Javan and Bali tigers. The first to disappear was the Bali tiger in the 1940s. Then followed the Caspian tiger. This species of tiger was last sighted in the 1970s. Afghanistan, Iran and Turkey were also the habitats of this tiger. The Javan tiger, which disappeared in the 1980s, used to live in south China. The surviving five species of tiger are also facing extinction. These belong to Bangladesh, Amur, China, Sumatra, India, China and the Indo-China region. The China tigers number only 30. There are only 406 Amur or Siberian tigers. These tigers inhabit Russia, China and North Korea. Only 371 tigers live in the vast

country of Russia. Indo-China tigers (PT corbetti) number only 1,785. They live in China, Cambodia, Laos, Malaysia, Myanmar, Thailand and Vietnam. India has the highest number of tigers-3,750 Bengal Tigers. In Bhutan there are 240, in Myanmar 231 and in Nepal 220. These tigers are found in China also, where their number is 35. But the number of Royal Bengal Tigers in their homeland Bangladesh is only 362. The Royal Bengal Tiger of the Sundarbans is threatened not only by cruel hunters but by the rapid shrinkage of its habitat. This magnificent animal will disappear unless sincere efforts are made by the government. That will be an irraparable loss.

Chapter

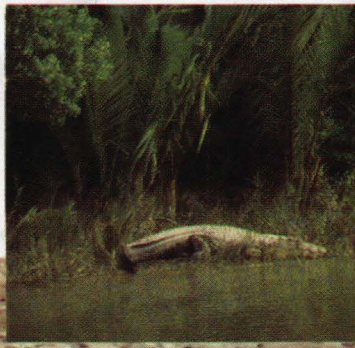
8

Cnservation of bio-diversity in the Sundarbans








Clockwise: monkeys, crocodiles, otters, golpata and boatmen in the Sundarbans. Photo: FEJB

Tk. 382 crore project for conservation of bio-diversity in the Sundarbans

By Anwar Hossain Manju

The Sundarbans extends over an area of 6 thousand square kilometres, i.e. more than half of the reserved forest area of Bangladesh. Stretching along both sides of the border the Sundarbans in the Indian State of West Bengal and in south-western Bangladesh is the largest mangrove forest in the world. These are about 425 species of wild animals including the famous Royal Bengal Tiger and about 334 species of trees and plants in the Bangladesh portion of the forest. Situated on the shore of the Bay of Bengal the Sundarbans, criss-crossed by innumerable rivers and canals, has developed a unique and sensitive ecology under the influence of the daily ebb and flow of tides.

The Sundarbans supplies 45 per cent of the country's demand for timber and fuel wood. It is the direct source of livelihood of about 50 lakh people residing in the neighbourhood. During the last one hundred years the Sundarbans has suffered the ravages of men's cruel intervention and greed. Widespread damage has been done to the flora and fauna. The formerly rich forest now faces annihilation due to indiscriminate hunting and unplanned cutting of trees. The bio-diversity of the area has been drastically reduced. But an initiative has been taken to restore the Sundarbans to its former glory through preservation of bio-diversity and proper supervision. As part of this initiative the Tk. 382 crore 30 lakh Sundarbans Bio-diversity Preservation Project has been approved. The forest department and the local government engineering department have been given the joint responsibility of implementing the project financed by the United Nations Development Programme (UNDP), the Food and Agricultural Organisation (FAO) and the Asian Development Bank (ADB). The work on the project taken up in 1998 is scheduled to end by 2005.

The Sundarbans, with its extensive natural resources and still rich bio-diversity, has transcended the environmental and socio-economic system of Bangladesh to earn international importance. The UNESCO has declared the three sanctuaries in the Sundarbans to be 'World Heritage Sites' in 1997. The Sundarbans Bio-diversity Preservation Project is an initiative to preserve and enrich the World Heritage Sites.

The need to formulate an integrated plan to ensure proper management of the Sundarbans despite ever-increasing population pressure in the neighbouring localities has been considered urgent. At present the forest department is solely responsible for the management of the Sundarbans, but it does not have adequate manpower, transport, infrastructure and equipment to take care of such a vast and dense forest. The Asian Development Bank has completed a detailed survey of what needs to be done. The project has been drawn up on the basis of this survey.

The main aim of the Sundarbans Bio-diversity Preservation Project is the rational use of resources by ensuring participation of people directly dependent on the resources of the Sundarbans in the development of a durable management system of the forest within the project period. That is why priority has been given to the increasing the institutional capacity of the Sundarban management authority.

Batiahata, Dakope, Boira and Paikgachha in Khulna district, Ashashuni, Kaliganj and Shyamnagar in Satkhira district, Morelganj, Rampal, Shyamkola and Mongla in Bagerhat district, Bhandaria, Mathbaria and Nasirabad in Pirojpur district and Bamna, Patharghata and Borguna Sadar in Barguna district stand adjacent to the Sundarbans. About 50 lakh people of these areas are totally dependent on the Sundarbans for their livelihood. An initiative has been taken by the project to create scope for the well-being of these people through the development of social infrastructure, increase in the institutional empowerment of users of the resources of the Sundarbans and their participation in the management of resources.

Besides, the project includes development of eco-tourism and adoption of programmes to create environmental consciousness, building up the basic public infrastructure and provision for necessary training. In order to reduce population pressure in areas adjacent to the Sundarbans, arrangement of sweet drinking water in the LGED (Local Government Engineering Department) areas, building of roads and bridges, drainage schemes and educational institutions have been initiated. The local survey department, forest department and some non-governmental organisations will help the LGED in the task. The Water Development Board will also cooperate with the LGED in implementing a part of the project.

At the implementation phase of the project it was hoped that any attempt to damage the bio-diversity of the Sundarbans would be stopped by the year 2001. The initial work to compensate for the loss of the bio-diversity of the Sundarbans may be completed by the year

2003. The development of the infrastructure of the reserved Sundarbans forest may be completed by the year 2002. Continuous efforts will be made to create awareness of the rich heritage of the Sundarbans at the national and international levels from the beginning of the project to its completion. The authorities hope to get a positive response in this regard. The project also includes taking necessary measures for natural regeneration of the Sundarbans and for removal of impediments to dense planting so that the Sundarbans can play a vital role in retaining excess carbon dioxide, which is responsible for the slow climate change now taking place and for the ominous rise in the sea level.

In order to reduce the pressure of population depending on the Sundarbans, social forestry, sustainable resource collection, human resource development and a social infrastructure will be developed. It is hoped that collectively the family income will increase due to the economic opportunities created by these measures.

Researchers and environmentalists, however, apprehend that infrastructural development under the Sundarbans Bio-diversity Preservation Project will rather accelerate the destruction of the Sundarbans because the looters of forest resources will, as a result, get easy and unhindered entry to the now inaccessible areas. It will then be impossible to protect the Sundarbans. Extensive facilities for tourism in the Sundarbans envisaged by the project may cause tremendous damage to, and further reduce the bio-diversity of, this beautiful but beleaguered forest.

Chapter

9

The Sundarbans

State of the Sundarbans

Deers: the most beautiful and graceful of the animals in the Sundarbans. S
and nimble, deers have keen senses of smelling, hearing and seeing. Larg
of deers are found in the swamp forests and the sea-facing meadows of th
Sundarbans. Photo: FEJB

The Sundarbans

By Badiul Alam

People's cry to protect the Sundarbans from the onslaughts of the International Oil Companies (IOC) has gone unheeded. Ignoring their protest, both at home and abroad, the government has decided to go ahead with the PSC (production sharing contract) deal on block 5, covering the Sundarbans and its adjacent areas, which had been initialed some one and a half years ago.

Recently, the cabinet committee on the finance and financial affairs has given its nod to PSCs initialed earlier on the blocks 5 and 10. Anglo-Dutch oil company Shell and its British partner Cairn Energy Plc won exploration contracts for the two blocks under the country's second round bidding.

Earlier, the government had signed another PSC on block 7, adjacent to the Sundarbans, with Unocol, the US oil company, for exploration of oil or gas, ignoring the consequences on the ecosystem of the Sundarbans forest area.

According to the Ecofile, a periodical on life and nature, the Sundarbans spans over an area of about 5,77,000 hectares of which 70 per cent is on land and 30 per cent in water bodies. Some 62 per cent of the total Sundarbans area lies in Bangladesh, constituting about 51 per cent of Bangladesh's reserved forest.

The Bangladesh area of the Sundarbans offers habitation to 425 species of wildlife, which include 49 species of mammals, 315 of birds, 53 of reptiles and eight kind of amphibians. More than 120 species of fish are also available in the different rivers in and around the Sundarbans area.

The Sundarbans deserves conservation attention from the economic point of view. Besides contributing four per cent forest revenue, it is the source of livelihood for about 0.5 to 0.6 million people. These people enter the Sundarbans almost every day from its surrounding villages under five Upazillas to catch fish fry, collect honey, wood resources and

for other economic purposes.

The Sundarbans is not only the world's largest mangrove forest, some parts of it have been declared as 'World Heritage Site'. Some 139,700 hectares area of the Sundarbans east, south and west have been identified as the World Heritage Site by the UNESCO.

Considering the great importance of environment and other related issues, people in general and, environmentalists and civil societies in particular have raised their voice against the opening of the Sundarbans and its adjacent areas for hydrocarbon exploration activities.

A national conference to protect the Sundarbans held in Khulna on February 14-16, 2001 expressed concern that exploration of oil and gas in blocks 5 and 7 may endanger the world's largest mangrove forest and the World Heritage Site.

Not only the environmentalists and civil societies, the Ministry of Environment and Forests (MOEF) has also expressed concern at the possible negative impact on the Sundarbans, if it is opened for hydrocarbon exploration. The MOEF's position is that the entire Sundarbans and its adjacent areas up to 20 kilometers should be kept out of any exploration activities.

If the position of the MOEF is taken into consideration then there should not be any PSC deal on block 5 and the deal on block 7 should not be allowed to proceed in its present form.

But the Cabinet committee on finance and financial affairs did not take into consideration the concerns expressed by the MOEF, environmentalists and the civil societies and approved the PSC deal on block 5, allowing the IOCs to conduct the exploration activities in the northern part of block 5.

The IOC side pleaded that there would not be any negative impact on the Sundarbans' ecosystem if the exploration is conducted outside the reserved forest areas. The environmentalists and the civil societies have contested this argument. They said that for exploration purposes, different chemicals are likely to be used which would endanger the bio-diversity of the Sundarbans forest.

It seems that the government has accepted the position of the IOCs and ignored the counter-argument though it has signed the World Bio-diversity Convention. The Prime Minister and the Environment

Minister, in their messages on the world environment day early this year, made firm commitments to protect the country's environment. The Environment Minister told a discussion meeting on the environment day that exploration activities would not be allowed within 20 kilometers of the Sundarbans.

But the actions of the Cabinet committee on finance and financial affairs with regard to the approval of the PSC deal on block 5 did not reflect the commitment made by the Environment Minister. Under the circumstances, the question has been raised whether the government leaders are providing only lip service to the environmental issues.

The Prime Minister is the Chairman of the National Environment Council. But she did not consider the environment and bio-diversity aspects while approving the second round bidding proposal for exploration of oil and gas in different blocks.

Thus the government appeared to have ignored both national and international concerns about the Sundarbans forest. The Friends of Earth, UK and its Netherlands chapter in recent past staged demonstration in front of the Shell's office in London demanding stoppage of exploration activities in the Sundarbans and its adjacent areas. A two-member delegation of the Friends of Earth also visited Dhaka and expressed their concern to the government and the non-government officials.

Chapter
10

Economy of the Sundarbans

The Sundarbans provides habitat for a large variety of birds-- at least 226 species of them. Photo: FEJB

Economy of the Sundarbans

By Anisur Rahman

While in terms of ecology the resources of the Sundarbans mangrove forest are invaluable, the direct economic uses of the Sundarbans Reserve Forest (SRF) are numerous. More than 30 "products" are harvested from the SRF, which can be categorised as wood products, non-wood products, fisheries and other services like tourism. More than four million people who live around the Sundarbans derive part of their subsistence extracting resources of this forest. And millions of others are indirectly dependent on the mangroves in the country's southwestern coastline. According to forest officials, everyday some 50,000 people from around the neighbouring localities and districts enter into the forest for their livelihood.

Extraction of different forest resources varies from season to season. From November to March, woodcutters -- locally known as Bawalis -- go there mainly to collect Golpata leaves used for thatching huts. And from January to March they extract Garan. From April to June the honey collectors, called "Mouals", make their forays into the thickets of the Sundarbans. November and December are the months suitable for collecting "jhinuk" (shells). The fishermen, constituting the largest forest dwelling community, derive their livelihood catching fishes round the year.

Over the centuries, the Sundarbans with its different products has attracted the interest of various traders and consumers. The medieval Phoenicians and the Arab mariners preferred the Sundari poles for the masts of their ships and the timbers of Passur for making furniture as those were considered to be more saline tolerant than other woods. The Sundari was widely used in shipbuilding throughout the medieval period. The value of the mangroves had long been glorified by the local people living along the coastal regions, particularly for its use as building materials, medicinal plants, fuelwood and natural barrier against the rages of the sea.

Currently, officials said, more than 18,000 cubic metres of timber, 63,000 cubic metres of pulpwood/matchwood, 61,000 tonnes of

fuelwood, 69,000 tonnes of Golpata/Hantal, 3,700 tonnes of fishes, 1,400 tonnes of Crustaceans, 253 million shrimp fries, 200 tonnes of honey/wax and 8,300 tonnes of grass are extracted annually from the SRF.

According to forest department estimates, the annual value of wood products extracted from the SRF is about Tk. 68 crore (Tk. 678 million). Almost half this value is from Gewa pulpwood. Market prices at the ghat (terminals) are used for all products except for Gewa pulpwood because there is no competitive market price for this wood (the newspaper mills have a monopoly right of purchase of Gewa). Therefore an economic price was derived from imported pulp landed at the mills.

The value of the forest from the perspective of its standing volume has been calculated upon volume information from permanent sample plots, multiplied with market prices to determine a value per hectare. Once this is multiplied by the current forest area (406,900 hectares) the value of standing timber is calculated at Tk. 12,521 crore (Tk.125 billion).

The annual value of fishes caught is Tk.183 crore (Tk. 1.84 billion), which is three times higher than the annual value of forest products being removed. Assuming that this recorded level of production represents a sustainable level of production, the present value of the Sundarbans resources to the nation at a discount rate of 12 percent is Tk. 1,525 crore (TK.15.3 billion).

Non-wood forest products (NWFP) from the SRF play a major role in the lives of hundreds of thousands of people who live in its vicinity. These products are harvested for both subsistence and commercial purposes and represent an important source of income for landless poor families, especially during the winter months of food deficit. The annual value of non-wood products like varieties of thatches, honey and wax being harvested from the Sundarbans is Tk. 53 crore (Tk. 533 million). At a discount rate of 12 percent, this gives a present value of Tk. 443 crore (Tk. 4.4 billion).

But because of its very nature, it is extremely difficult to quantify the level of illegal extraction. Forest officials admit unrecorded use and under-measurement of extraction of trees and other resources in the SRF involve a huge amount. According to a UNDP-sponsored Integrated Resource Management Plan (IRMP) study, the unrecorded extraction represents lost revenue of around Tk. 300 million, i.e. one and half times the officially recorded revenue of Tk. 200 million.

Under-measurement occurs because of conservation errors and the use of proxy measures or assumed rates of harvest per unit effort (amount per person per day) where it is considered difficult to measure the actual resource extraction. A so-called "Boat Loading Certificate" (BLC) is issued as a means of recording the production of fuel-wood, Golpata, Hantan, shell and other minor products. The BCL is a weight measure calculated on the basis of an estimate of the volumetric carrying capacity of the boat. The formula was derived last century and at that time it might have given a reasonably accurate measurement of cargo capacity. But such measurement system is not applicable today. The IRMP report said that the use of BLC may under-estimate extraction by 40 percent.

The report estimated that the illegal harvest of Goran might be around 20 percent of the officially recorded cut; the illegal harvest of Golpata might be around 25 percent of the official record, actual honey and wax production might be 3.5 percent higher than what is recorded, the illegal harvest of the Sundari might be 100 percent of the officially recorded cut (because of the ban) and the illegal harvest of the Gewa might be around 50 percent of the officially recorded cut. A valuable indirect use that the SRF provides is a nursery function for many different species of marine fishes.

According to a consultant report prepared in 1996, the total direct benefit from the Sundarbans in terms of revenue is Tk.14,736 crore while indirect benefit was calculated at Tk. 2,033 crore. The total net benefits were calculated to be Tk. 167 billion (Tk.1,670 crore). On the other hand, the total cost was calculated at Tk. 62 crore or US$ 3.839 billion after deducting the management cost of the SRF. This estimate suggests the value of per square kilometre of the reserve forest including its water bodies to be $638,068 or $9,267 per hectare of land.

But whatever may the economic value of the Sundarbans, a fuller understanding of the ecosystem and its components is required both for its sustainable production models and for its conservation over the longterm.

"It is imperative that mangrove-based terrestrial and aquatic resources be managed in an integrated manner. This implies that no single-resource use should be maximised per se to the point where the sustainable potential of another resource is adversely affected. The traditional management paradigm implying that if forests are well managed then, ipso facto, the non-wood ecosystem components will remain stable is notionally flawed. Mangrove fishery, mariculture, and

wildlife management programmes have to be structured and integrated into the overall policy implementation, and control levels of an integrated resource management system," a Food and Agriculture Organisation (FAO) report in 1994 on mangrove forests noted. The understanding and managing of the Sundarbans as an ecosystem and not simply as a reserved forest is therefore very crucial.

Chapter
11

Exploration of oil and gas: concern for the Sundarbans

Stubs of dead trees Photo: FEJB

Exploration of oil and gas: concern for the Sundarbans

By Quamrul Islam Chowdhury with Anisur Rahman

While the Sundarbans, the world's largest mangrove forest, is faced with growing problems of deforestation and biodiversity loss, the government's decision to allow hydrocarbon exploration by some international oil companies in the area caused wide concerns as mangroves are known to be the most vulnerable coastal habitats to such activities.

The fragile and delicate mangrove ecosystem depends on many variable components like tides, salt contents in water and soil, duration of sunlight, contents of sediment and organic substances in water, and temperature and density of seawater and fresh water. The composition of terrestrial and marine flora and fauna also plays an important role in the mangrove ecosystem. If sun is regarded as the source of all energy flow, water must be considered as the nursing mother of an ecosystem.

In the Sundarbans, the flow of fresh water received from the tributaries of the Ganges (Padma) is lighter in the turbidity than that of the Bay of Bengal waters. The temperature of the two waters also varies seasonally. The fresh water carries loads of mineral and microbe-rich silts, which do not flow easily into the tidal waters from the sea as the influence of the tides make the water flow back and forth. The mixture of the flows of fresh water and brackish water and the mineral-microbe silts from upstream and the forest wastes like overmature leaves creates an ideal environment for different mangrove organisms.

Many experts fear that far-reaching changes are taking place in the delicate ecosystem due to growing pollution and human interference in the areas adjacent to the forest. The Mongla Port on the northern edge of the forest and its associated marine traffic are a frequent source of oil spills and there is a permanent risk of accidents from handling chemicals in the port area.

Oil spills take place during transfer of refined petroleum from tankers to receiving stations in Mongla and Khulna towns. Besides, fuel oil

spillage and discharge of oily ballast and sewages from some 600 ships anchored at Mongla Port and residual heavy oil sludge, lubricants and engine oils discharged during ship breaking operations in Khulna have been identified as major sources of water pollution, affecting the Sundarbans forest.

Reversing an earlier government decision, the production-sharing contract (PSC) with Anglo-Dutch oil giant Shell and its British partner Cairn Energy on hydrocarbon blocks 5 and 10 covering the Sundarbans and its adjacent areas would pose a severe threat to the forest and its ecosystem. Earlier, another PSC was signed with US company Unocal on Block 7, also in the neighbourhood of the Sundarbans.

The oil companies are worldwide known for the disruptive and adverse impact they cause to the environment. Available records suggest that oil and gas exploration activities anywhere in the world usually caused some kind of environmental damages and social disruption. And in Bangladesh, the memories of Haripur and the Magurchhara disasters are still alive in the people's mind.

"The exploration in and around the Sundarbans will pose a new threat for the forest since the exploration activities are always a risky business. The possible spills from pipelines and large-scale economic activities in the Sundarbans would affect the region's ecosystem, particularly in blocks 5 and 10," says Professor Ainun Nishat, the IUCN representative in Dhaka.

"We can't ignore the concerns as the experiences of Haripur and Magurchhara (explosions in gas fields) are still vivid in our mind," he added, referring to the "very bad track records" of some of the international oil giants like Shell in Africa, particularly in Nigeria.

The Sundarbans, which extends over 10,000 square kilometres in Bangladesh and India (60 % in Bangladesh & 40% in the Indian state of West Bengal), provides habitat for some 334 plant and 453 animal species, including the Royal Bengal Tiger, estuarine crocodile, the country's major export item shrimps and many kinds of birds. Several critically endangered species like rare shark also find refuge here. Around four million people live in and around the Sundarbans, most of them deriving part of their subsistence out of the resources of the forest that include fisheries, fuel wood, and non-wood forest products like honey. The mangrove system also provides a vital barrier to the country's southwestern part, including the regional townships and city like Khulna, against tidal surges during monsoon.

For more than 100 years, the Sundarbans has a reserve status. In recognition of the global significance of the Sundarbans, UNESCO -- in December 1997 -- declared it as one of the three wildlife sanctuaries that have been categorised as a World Heritage Site. It is also a Ramsar Site and in the IUCN list it has been recorded as a protected area (type-2).

The Energy Ministry, in line with suggestions made by the Environment Ministry, had earlier decided to exclude the areas of Block 5 and Block 7 form oil and gas exploration activities and declared them as "ring-fenced areas". The decision had come in response to campaigns by environmental watchdogs and the civil society, which expressed concern over the plans for hydrocarbon exploration in the Sunderbans.

"We feel deeply concerned that gas exploration activities being undertaken by two foreign companies would be extended to some parts of the Sunderbans mangrove forest and the coastal wetlands alongside the Sunderbans, identified as blocks 5, 7 and 10," a joint statement of the Association of Development Agencies of Bangladesh (ADAB) -- the apex body of NGOs, Forum of Environmental Journalists of Bangladesh (FEJB), Bangladesh Environmental Lawyers Association (BELA) and Bangladesh Centre for Advanced Studies (BCAS) said.

"Exploration of oil and gas, if allowed in the blocks within and around the area of the reserve forest of the Sunderbans, would expose the fine-tuned, fragile and invaluable ecosystem to great danger of extinction and all the commitments of the government of Bangladesh would lose significance, putting the country and its citizens into a shameful situation of undermining the trust of the world community," the statement added.

In 1997, a severe gas field explosion in Srimangal area of northeastern Sylhet region damaged vast forestlands, agriculture, and infrastructures including a nearby railway track. US oil company Occidental was carrying out drilling when the explosion occurred. Until today, the dispute over the environmental damage and compensation could not be settled though the company has left Bangladesh, winding up their business in the country.

The Haripur explosion in a nearby gas field in Sylhet 45 years ago is another example as the hills there are still literally burning. The accident in 1955 changed the ecosystem of the region, damaging its flora and fauna.

Experts fear that in case of any such explosion in the Sundarbans, the consequence will go beyond any control as the environmental as well as economic losses would exceed any limit because of the sensitivity of the mangrove forests. In 1995, Australian Petroleum Production and Exploration Association (APPEA) had conducted a study on "Fate and effects of oil and dispersants on mangroves in Australia" by releasing some 1,600 litres of oil on a selected mature mangrove habitat. Preliminary analysis of the experiment suggested that dispersed-oil treatments affected trees more than other treatments since the experiment plots had disproportionately greater leaf fall compared to oil-only treatments and controls. A large number of dead fauna, including crabs (Grapsids), pistol shrimps (Alpheids) and mud monsters (Thalassinids) were collected from the area within 40 hours following the treatments.

Shell's performance in the Niger Delta, in Nigeria, provides a classic example of environmental and social crisis caused by the exploration activities. Since 1958, when the company arrived in the region, the Ogoni indigenous people, who are the traditional inhabitants of the delta, have been suffering environmental devastation, the loss of their livelihoods, as well as high unemployment and poverty rates. Threats, abuses, imprisonment and murders had also been rampant in the area as a result of popular resistance to the exploration activities.

The international oil companies which have secured the PSCs in Bangladesh, however, said that they would not conduct any exploration activities inside the Sundarbans while carrying out the primary seismic surveys on the region. They assured that they would be using modern "aero-magnetic" method of using aeroplanes for the survey without affecting the forest and its ecosystem.

"Moreover, the possibility of oil spill is bleak as we are not expecting any oil deposits there. We are looking for gas, which is not likely to cause any spillage," a spokesman for a foreign oil company said. The oil company official who is a geologist further added that unlike the fields in the northeastern part of the country, the existence of liquid elements in gas was absent in the gas fields in the southern regions and that factor ruled out the possibility of any spill from pipelines during explorations and production.

But according to environmental experts, besides the possibility of oil spills, vibration, fouling, chemical toxicants and thermal impact are likely to affect the vulnerable bio-diversity of the Sundarbans.

The environmentalists and civil society leaders have been demanding

that the oil companies must stay away from the Sundarbans and the government takes all necessary steps to ensure that exploration activities are undertaken only in compliance with the relevant laws of the land and various international conventions and treaties including the Ramsar Convention, Bio-diversity Convention, the convention concerning the Protection of World Cultural and Natural Heritage and CITES, for preserving important eco-systems for the benefit of the global community. Bangladesh is a signatory to these conventions.

Professor Ainun Nishat of IUCN said that the oil companies must use the modern technology during the exploration, even if that would be costly, to avoid any accidents that could cause irreparable loss to the Sundarbans during explorations in the vicinity of the forestlands. Petrobangla, the state oil company which also works as the regulatory body, must equip itself with necessary expertise and resources to constantly monitor the exploration activities of the foreign oil companies. It should also ensure application of an effective EIA (environmental impact assessment) and risk assessment procedures. The Department of Environment (DoE) must carry out the task of independent evaluator of the entire process and act as a watchdog.

The government has declared the Sundarbans as an "ecologically critical area", manifesting its concern for the conservation of the delicate equilibrium of the precious forests and launched the US$ 82 million "Sunderbans Biodiversity Project" for realisation of its commitment with support from the Asian Development Bank (ADB).

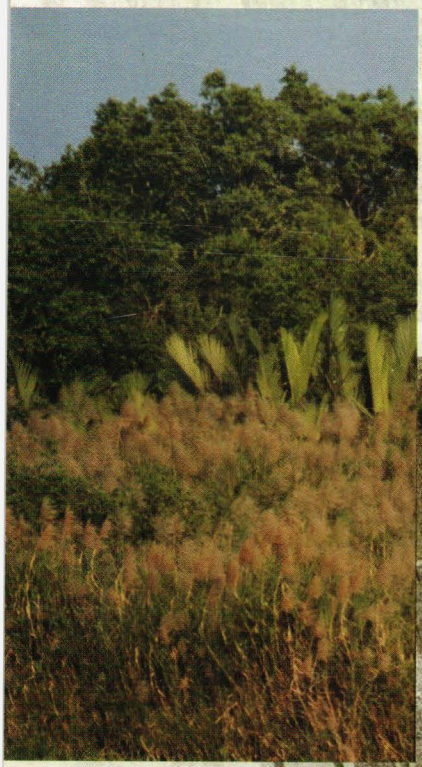
But concerns persist about the risks involved in allowing exploration activities in the Sundarbans area, particularly following the Magurchara blow-out, which created suspicions about the precautionary measures taken in such operations by the oil companies.

Under the 1927 forest laws, any commercial activities other than aforestation around the 20 kilometres of the Sundarbans Reserve Forest (SRF) is prohibited. The 1997 forest law has recognised the five kilometres within the purview of the Sundarbans as "sensitive area" disapproving any such exploration activities in the region.

But the government's decision giving the foreign oil companies the exploration rights in the Sundarbans area has now raised the question in the minds of many whether the authorities are really serious about protecting this valuable mangrove forest. It is also being questioned whether it would be wise to sacrifice the gains from visible and surface resources of the forest for the sake of the unseen hydrocarbon resources that might be hidden underground in the Sundarbans area.

Chapter
12

Terror at the Sundarbans sanctuary



Clockwise from above:
A creek submerged by high tide; a golpata hedge; fishing in a Sundarbans
during the high tide; a melange of the mangrove flora. Photo: FEJB

Terror at the Sundarbans sanctuary

By Sahidul Islam Chowdhury with Gouranga Nandi

"Terrible tigers in the Sundarbans
Their eyes express the country's anger
Their claws so sharp and the teeth a row of scimitars
Ye crocodile - go to the dying river
The boat will be smashed to pieces
Land of the cobras
In the end strike with hood upright"

The description that Bishnu Dey gave of the Sundarbans in his 'Lullaby for the old' is no longer valid. The description of the tiger and crocodile infested Sundarbans that used to produce gooseflesh on the hearers are turning insipid, thanks to the greedy hand of man. Even the creation of sanctuaries to protect the forested land and the fauna from the assault of men is of no avail. Terror within the sanctuaries themselves is now great.

Hundreds of reports, features and editorials have been written on the Sundarbans in the local and foreign newspapers and magazines during the last few years. The electronic media also carried a lot of reports. Barring a few exceptions, almost all the reports revealed the greedy claws of man. Hundreds of headlines have appeared like 'Endangered Sundarbans, 'Won't the Sundarbans Survive', '50 thousand fishermen are hostage to 25 terrorists, 'More than a thousand deer killed', Why Sundarbans tigers come repeatedly to human habitation', 'Extinction of tigers', 'Mysterious death of a Royal Bengal tiger', etc. The lone good news (for the time being) is that the UNESCO has declared the Sundarbans as a part of the world heritage. When we learnt that the three sanctuaries are becoming part of the world heritage we had great hopes. But after a tour of the sanctuary we realised that if we let our hopes run wild, we would be greatly disappointed.

As part of a nine-members delegation of the Forum of Environmental Journalists of Bangladesh (FEJB) we toured the Sundarbans for three

days. After the visit we can say with confidence that nobody in doing anything to protect the Sundarbans except declaration of sanctuaries, uttering of some emotional words and unveiling the plaque of the world heritage. Let us describe some incidents in support of this statement.

The first day of the Sundarban tour. With the sun set darkness has engulfed the forest. Two launches were at anchor at the Katkaghat of the forest department in the Katka-Kachikhali sanctuary. Two picnic parties have come on these two rented launches from Khulna. On one of the launches microphones were blaring at full volume. About 15 to 20 youths from the other launch have lit a 'camp fire' by gathering the some tree stumps. Around that big fire they were dancing and singing loudly some cinema songs. On the other side, a youth was chasing a fawn. Such incidents are happening often right in front of the office-cum-residence of the Assistant Forest Officer, Ranger and Forester. The incidents we described had happened in presence of the forest guards on duty at Katka. But nobody prevented the perpetrators of such mischief. It was learnt that such incidents occur not only at Katka but also in the other two sanctuaries at Neel Kamal and Mandarbaria. These are happening despite the fact that under the Forest Act, the Conservation of Wildlife Act and rules concerning the administration of world heritage any kind of hunting, cutting of trees, lighting a bonfire and blaring of microphones are prohibited and illegal. Even outside the sanctuaries, in the whole of the Sundarbans carrying of arms and weapons is banned. These are clearly stated in the entry permits given by the Forest Department.

Even punishments for violation of these prohibitory orders are also mentioned. But many people do not abide by these rules or even do not care about them. Besides, many people throw polythene and other polluting substances in the rivers of the Sundarbans. Though these are happening within the sight and hearing of the officials and employees of the Forest Department but it seems nobody had any interest in preventing such acts. Of course when the members of the FEJB delegation informed the local Ranger, Mr. Ghulam Mostofa, at Katka of the fire, he sent an employee to ask the picnic-party people to put out the fire. But when the perpetrators refused to extinguish the fire, the journalists did it. In the similar way when the local Forester Biplab Chakravorty was informed of the blaring of mikes, he arranged to stop it.

Ranger Ghulam Mostafa told us that many pieces of dead wood and tree branches lie scattered on both the banks of innumerable rivers and islands in the Sundarbans. The force of the tide water

automatically brings those in a line as if those had been arranged on purpose. If a spark from the fire lit in fun comes into contact with such dead wood then the flames may spread quickly and create a very big forest fire. These are, however, violation of rules by the visitors to the Sundarbans. The often do it out of their ignorance. Felling of trees and hunting in the Sundarbans including the sanctuaries are banned till 2005. Only cutting of gewa trees is permissible for use in the newsprint mills. But despite all those prohibitory rules, destruction of the forest could not been stopped.

A group of tourists went to the beach near the Jamtala observation tower. When they saw many trees lying on the earth, two of them went there to investigate. The place is known as Badamtala. They saw some persons cutting the trees and lifting those onto two boats. When the persons saw the journalists they mistook them to be officials from the Forest Department and tried to flee in their boats. The two boats however returned when the journalists hailed them and requested to come back. Two of them identified themselves and said that their names were Jahangir and Mostafa. They came from Aadmashuri village under Patharghata. When we asked them what they had been doing they said that they were fishing. "Cutting trees and fishing in the sanctuaries are prohibited. Why are you doing it?," asked one of us. One of them said that fishing was permissible in the area. But the other fellow disagreed with him. We noticed that hundreds of trees were lying on the ground as if some giants had been on a rampage to destroy the forest. Some trees had been totally uprooted, some were partially. Jehangir and Mostafa informed us that there were thousands of such uprooted trees all along the Sundarbans coast. Besides, there are the top-dying trees.

Fishing in the sanctuaries has not stopped though the prohibition has been announced. The matter of fishing came up when a journalist was looking for cigarettes. He could not buy cigarettes because we had been on the water continuously for three days. When he enquired if cigarettes would be available a forest official pointed at a boat near the Katka ghat and said bidis could be procured from Ram Babu's boat. When we asked why does he keep the stock of bidis, we were told that 40 to 50 people under Ram Babu catch fish and stock of bidis are kept for them. Every one was surprised to learn that under one mahajan alone 40 to 50 persons catch fish in the sanctuary where fishing is prohibited. Three more boatmen informed us that fishing had not stopped anywhere in the Sundarbans. When we enquired why then fishing boats are not being visible so much, we were told that the Minister had come here the other day. So the Forest Department officials had asked them not to launch their boats. In two days time

they would be there to catch fish again. Everyone goes fishing on the full moon. During the new moon less fish are caught. On the other hand, the catch is good during the full tide. It may be mentioned that thousands of boats go fishing during the full moon. When we enquired about hunting of tigers and deer nobody openly acknowledged it. A forest guard at the ghat informed us that tigers were not killed often but deer are often caught. We discussed the issue with Ranger Ghulam Mostafa and Forester Biplob Chakravorty. They are the field level officials there. An assistant forest official of a project there was not at his station. Ghulam Mostafa did not admit of hunting of deer, fishing and felling of trees. About hundreds of big trees lying on the ground, he said those had been uprooted by strong wind and waves. About the dead trees standing like huge skeletons he said those had died because sands brought in by the tide had buried their respiratory roots. The Ranger who had stationed there for eight months, said he had seen tigers twice -- once from the Jamtala Tower at noon and thhe other time at dusk from of his office.

Forester Biplob Chakravorty said the biggest problem in the sanctuaries is dacoity. Wood thieves and the dacoits have a 'golden chain' relationship. It is they who guard the looters of wood. The boats used by the dacoits move faster then those of the Forest Department. Their weapons are modern. "We have only one engine boat with which it is difficult to patrol the vast expanse of Katka. And we have very little manpower to fight with the dacoits, he said. Besides, there is no guideline to control the tourists. Except such vessels like 'Chhuti', 'Abasar' and 'Royal', passengers of other launches do not care much for rules and regulations. There was even incident of picnic pasty of 700 college students carried by 8 to 10 launches. In early 2000, some 17 launches came to the sanctuary on one Friday. It was difficult to manage hundreds of people at a time. Besides, many people enter the forest without paying 'revenue'. They threaten the forest officials with political influence if they try to intercede. Revenue is collected in the Sundarbans through Supati, Dangmari and Chandmari forest stations. The FEJB delegation had detailed discussions with forest Ranger Firoze Kabir Khan and Deputy Ranger Khandkar Shahidullah.

Firoze Kabir Khan said there was no hard and fast rule on the number of tourists. One has to obtain permission to enter the Sundarbans from the Divisional Forest Office. More or less 50 launches per month enter the Sundarbans during the winter. He said if somebody with a powerful boat or launch avoided the officials and proceeded along the far bank they could do nothing. It was not possible to pursue them with a small engine boat. Previously, 1200 litres of fuel was sanctioned for the Forest Department boat per month. After the declaration of the

sanctuary, it was reduced to 100 litres, though the responsibility of patrolling became greater now. Firoze Kabir Khan said that manpower had been inadequate and they had only six antiquated weapons. We could understand that the weapons of the forest guards were antiquated when two of them boarded the launch with two 303 rifles. Many passengers were astonished to see those weapons. The barrel of one of the rifles was attached with the wooden butt with the help of a scotch tape. The other was secured with a thick thread. Both the rifles butts were bound by white nylon rope so that the rifles do not ship out of hand and are lost. We asked one of the guards if the rifles can shoot a bullet. He replied that it once did last year at Chandmari.

Whenever we talked to in the Sundarbans had admitted that the forest was being damaged. But nobody takes initiative to redress it. There is an intense competition to loot the forest resources defying the laws protecting the forest and the wild animals. Anybody will doubt if there is any effective authority to see if people are abiding by the laws in the Sundarbans. As a result the laws protecting the Sundarbans and the mighty Royal Bengal tigers have in fact been turned into paper tigers. Transfer to the sanctuaries is considered a punishment for officials because the scope to plunder in areas outside it is greater compared to the sanctuaries. After the tour of the Sundarbans, it appeared that many things were lacking to ensure the proper protection of the forest and its flora and fauna. There are no mutual understanding among different authorities of the government in protecting the forest. There is no incentive, no training, no adequate arms, no budget, and no manpower. There is not even any fruitful supervision.

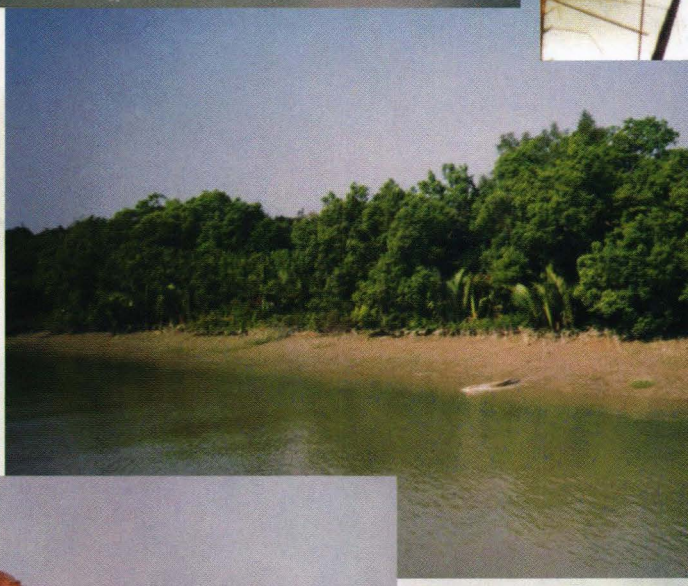
If will be a denial of truth to say that nobody has the minimum role in protecting the Sundarbans. For Rimon, who acted as our guide during the visit of the Sundarbans, exercised constant vigilance so that nobody throws anything in the rivers. He was greatly opposed to throwing of polythenes and water bottles in the rivers. He collected all plastic things found on the beach at Katka, put them into bags so that he could dispose those of in dustbins at Khulna. He even opposed to throwing anything into the rivers as fish feed. He used to say that they did not need food from anybody. May be the student of Environment Science at the North-South University, Rimon, will one-day become famous. Alas, those who are now high and mighty could show some unselfish love for the Sundarbans, then this majestic forest would have been doubly gratified.

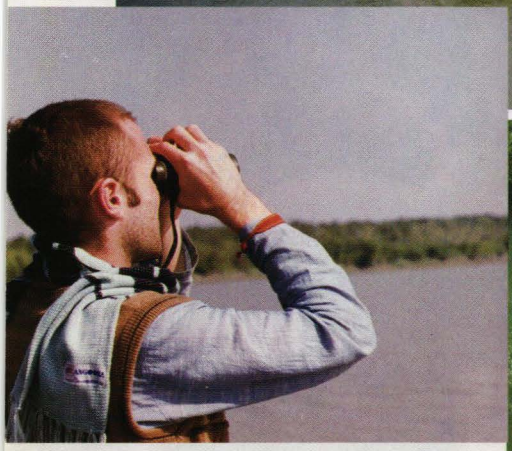
'Rupantor', a khulna-based Sundarbans study group, in their publication 'Sundarbans: Environmental Resources and Man' said that the role of the Sundarbans is great for the environment of

Bangladesh. But the Sundarbans and the adjacent areas are isolated from the state and private programmes. The ways the Forest Department is conducting the programme to protect the forest are being considered the rules. On the other hand, there is no mechanism to inform the people of the decisions being taken on the Sundarbans at the state and international levels. Rupantor think that the people residing in the localities adjacent to the Sundarbans should be made to understand that there may be a little relief in earning a living by destroying the Sundarbans, but it would make their future bleak. The natural defence would be destroyed if the Sundarbans is destroyed. People are not being cautioned against this danger. All the information regarding the Sundarbans should be made available to the people if their active participation in protecting the forest is to be ensured. Rupantor wants that what a few people are thinking about the proper way to preserve the Sundarbans should be thought by millions, especially those who are mainly dependent on the Sundarbans.

Chapter
13

In the light of nature





lockwise from above: Beauty of the mangroves along a rivulet; a solitary bir
njoying the beauty of the Sundarbans; taking a binocular view of the wonde
undarbans. Photo: FEJB

In the light of nature

By Michael Galvin

The Sundarbans mangrove forests form the roots of the mighty Padma (Ganges) river, that branch into the Yamuna and Jamuna rivers and their tributaries shared by Bangladesh and India. Deep into the jungle the nature is divine, an array of plants and animals in all their glories sharing this massive live delta of rivers and tributaries with millions of people upstream. The Sundarbans is a unique wilderness area, being the largest mangrove forest in the world that stretches some 6017 square kilometers across southwestern Bangladesh and into India. Listed as a World Heritage Site by UNESCO in 1988, this precious wilderness is one of the last refuges of the Royal Bengal Tiger, and home to a diversity of plants and animals some of which are found nowhere else in the world.

Through the network of estuaries, many varieties of plants compete for light and space. Common to these forests are the Sundori Mangrove that are endemic to this region and the Gewa Mangroves. The tall Sundori (beautiful) mangroves loom 30-40 feet high, constituting about 6% of the wood volume and are mostly found in less saline conditions. The Gewa Mangroves are more salt-tolerant and become more dominant closer to the beaches, constituting about 28% of the total wood volume. The mangrove trees that grow here have complex roots called Pnenmetophors. The rigid roots spike up through the mud and play an important role holding together the soil. Protecting the land from cyclones and land degradation, they absorb carbon and release oxygen in water and by the process of photosynthesis in the presence of sunlight. The Keora tree is common. It is quite tall with many branches that house the Rhesus monkeys and birds and have tasty leaves that are popular snacks for the Horeen (deer). Many other trees can be seen here, including Raintrees that actually look like rain clouds, Nipa Palms (Golpata trees) that have leaves which are used to build roofs, Horgoza trees and vines that strangle the mangrove trees.

Herds of Horeen are seen on the mud flats, grazing in the Jamtala grasslands. The larger male stags have antlers that look like the branches of a tree -- they guard the grazing Horeens, watching out for

predators. The mud flats are shared by Horeens, Rhesus monkeys, and the smooth coated otters and different species of birds. There is the less adjutant stork that stands tall with long pointy legs and neck with a pointy beak, and a bright white intermediate egret with a sharp yellow beak who sits gracefully on a stump of tree. An estuarine alligator lounges on the mud flat. This prehistoric reptile is at least 12 feet long with powerful tail and jaw that could kill a person in a death roll. It is startled and dashes for the water never to be seen again. The brown-winged kingfisher has a bright blue crest and a beak that could kill a snake. The less common ruddy kingfisher has a distinctive white spot on its back and a long tail. The lesser racketale drogo has straight black feathers and greater racketale drogo has a crest and long helical feathers - they are seen dashing from tree to tree. A rare musk fin-foot duck waddles across the estuary and hides in some grasses. The Brahmanini Kites are birds of prey that have brown and white feathers. They soar and with their sharp eye sight dive into the water to catch fish.

We all share one world

Further inland around the villages grow many varieties of fruits and vegetables, including dates, jam fruit trees, mangoes, papaya, bananas, coconuts, cabbages, cauliflower, tomatoes and potatoes. With scarcity of land, the local villagers here make the best possible use of the land growing crops for food and not for cash. This ensures adequate food for their families, friends and some fair trading with their neighbors.

'We have not inherited the land from our parent, we have borrowed it from our children.'

Many small fishing boats can be seen on the water. Some fishermen look humble fishing in their traditional ways. They sit in their little boats with a fishing line, sipping tea and waving to boats as they pass by. Other less responsible fishermen use bigger boats and nets for bigger fish catches, some are even cheating by using explosives and chemicals which are highly illegal.

In addition to fish netting is shrimp netting that has large by-catch that put the aquatic ecosystems out of balance and reduce the presence of water lillies that are habitat and a major food source for many aquatic species, including turtles, fish, shrimp, and frogs. These practices are not sustainable and pose a threat to the long-term livability of these very important aquatic ecosystems.

'There is enough food for everyone's need but not everyone's greed.'

The Sundarbans forests contain natural resources that are the livelihood of many locals. Small traditional practices such as timber harvesting, grass cutting, and extracting honey from bee-hives must be kept small so that the next generation, too, has the privileges that nature provides. Recognition of constitutional laws and enforcement of rules and regulations by forest authorities and forest courts are necessary for the protection and sustainable use of natural resources in Bangladesh. Raising awareness and education among the wider community is important so that we can respect the earth and take responsibility of our actions.

Eco-tourism is environmentally friendly tourism that gives people the opportunity to experience the beauties of nature, to learn about the wildlife and how to be more environmentally responsible. Scientific researches on the Sundarbans are valued by people who are studying plants and animals. Scientific research is groundwork for educating people about nature and field studies help to find new species, explain reasons for declines in species, and help develop new medicines.

Managing for the future

People and the forests are natural partners with a great deal to offer each other. They have been natural partners for thousands of years; there are records of collecting revenues and earnings of people in the forests in Mogul Suttons some 500 years ago. The British recognised the importance of these forests in 1875-1876 and protected them as parks since the 1860s. Today, the Sundarbans remain uninhabited because the saline conditions make crops difficult to grow, fear of attack from the ferocious Royal Bengal Tiger, and due to the rules and restrictions on access. The remaining wilderness area is managed as the Sundarbans Forest Reserve that ensures preservation and sustainable utilisation of natural resources under environmental laws.

The Government of the People's Republic of Bangladesh launched the Sundarbans Conservation Project (SCP) on April 1, 1999. The SCP recognises areas of international conservation significance and is aimed at long-term sustainable conservation of bio-diversity in the Sundarbans Reserved Forest.

The SCP demonstrated the government's commitment to the environment and recognition of International Agreements. Bangladesh is a signatory to: Ramsar Convention, 1971; Convention of International Trade of Endangered Species, 1973; Convention of

Marine Pollution, 1973; and Convention on Biodiversity, 1973. These International Laws are non-legally binding documents that are not enforceable. However, a commitment at the highest possible level is recommended. The Government has a moral obligation for the benefit of future generations and the long-term livability of the country.

As an environmental engineering student from Australia, a volunteer for UNAA Earth Repair promoting earth repair action, I found the ferry journey into the Sundarbans to be most rewarding and truly a memorable experience. I breathed the fresh air and felt energised, I bathed in the Bay of Bengal and felt revitalised, and I sat on the white sandy beach and questioned 'who I am' and 'who is God'. I saw the water in the ocean, soil on the land, and the sun in the sky in their purest forms. The trees that grow protect soil from cyclones and land degradation, and help increase the land's fertility. They absorb carbon and release oxygen in water and air, improving water quality and air quality. The trees also play an important role in the biosphere through evotranspiration, reducing global warming and the greenhouse effect.

Trees are for life. Trees give us AIR, WATER and SOIL on which we, as human beings, depend for our survival. We, as custodians of the land, can exploit this precious resource, by reaping what we sow. We can conserve the land for the people by planting trees, or we can preserve the resources from the people to ensure protection and sustainable use of those resources. We live in a world that binds us and are all Spiritual by Nature.

Chapter
14

Sanctuary for plunderers, not for animals

Collecting stubs, breathing roots and branches of dead trees in the Sundarbans. Photo: FEJB

Sanctuary for plunderers, not for animals

Loggers' and fishermen's depredations destroying Sundarbans

By Ruhul Amin Rushd

The sanctuaries in the Sundarbans, which has been declared a World Heritage Site, have become sanctuaries for plunderers instead of sanctuaries for wild animals. Felling of trees is going on unhindered though the entire Sundarbans has been declared a reserve forest. Even the sanctuaries are not free from depredation. Fishing in the rivers and canals of the Sundarbans and within the 5-mile limit from the seashore has been prohibited but the fishermen are fishing freely, without any hindrance by the legal authority. A cargo boat was detained on November 11, 2000 on Alibanda canal in Sarankhola range while it was smuggling out Sundari wood worth Tk. 5 lakhs. Experts on the Sundarbans have blamed avaricious smugglers of timber and forest dacoits and their criminal collaboration with a section of forest officials. The forest officials, however, bemoaned their limited manpower and unsophisticated weapons. They also said that they do not have modern vessels to patrol the forest areas. Even the sanctioned amount of fuel for the vessels has been reduced, they complained.

It was decided at a Cabinet meeting in May, 2000 that no tree can be cut in the reserve forests up to the year 2005 in order to preserve bio-diversity. Before that the Cabinet decided in 1990 that no trees could be felled till August 12, 2000. The period of this ban has been further extended by five years.

Similar flouting of the law was noticed on a recent inspection of the Sundarbans, especially in the Kalka sanctuary. After we proceeded by boat along Jamtala tower canal in Kalka and entered a narrow canal we saw a huge boat standing still, blocking the entire canal. Nearby, on the canal bank, a shed had been built with felled trees of the forest and roofed with chhan (a species of reeds that grows on river banks). When we neared the shed we found 14/15 persons of different age groups busy with their morning chores. Smoke was spiralling up from the stove; cooking was being done by burning wood from the sanctuary. We talked to Haroon (20). He hails from Sarankhola. They were there for the last one month and would stay there for 15 days

more. They would cut chhan and take the boatload to Bagerhat and sell it there. About 20 gewa trees would be cut and placed cross-wise on the boat and then covered with chhan before their departure. A few steps away we talked to labourer Jasim (25) who was busy cutting chhan. He informed us that they have been dependent on the Sundarbans for several generations. Previously they used to fell trees, but now they cut chhan. Their mahajan (employer) would get Tk. 20,000 per boatload of chhan. However, the wage of the labourers was only Tk. 60 per day.

Though fishing is banned in the rivers and canals of the Sundarbans and up to 5 miles from the seashore, the fishermen were fishing there freely. They usually procure a permit to fish outside the banned areas and then fish both inside and outside such areas. Previously fishing was being carried out under the patronage of big businessmen. They were told to leave the area by the forest department after the three sanctuaries were declared to be part of the world heritage in 1997. A fish trader named Rambabu is staying at Katka and conducting his fishing business. About 40 to 50 fishermen under him are fishing without hindrance within the Katka sanctuary and its surrounding areas. He is well known to the officials and employees of the forest department.

On paper it is recorded that about 400 species of fish are found in the rivers, canals and creeks in the Sundarbans and the nearby sea. But the existence of many kinds of fish is threatened. About 80 per cent of the shrimp fry is collected from the rivers of the Sundarbans and the adjacent sea. It is known that two to two and a half lakh fishermen go to the Sundarbans every year to fish. They use various types of nets, including the 'Behundi net', the 'Ilisha net' and 'current net', and catch fish and shrimps and prawns. Experts think that in the process the fry of 235 other species are killed. In the meantime two kinds of fish- bundi beley and auspati- have become extinct.

These fishermen have played a very destructive role in the forest. During the spawning season about 30 boats go to catch bagda (prawn) fries every week, according to 'Rupantar', the Sundarban study group. On an average 10,000 fishermen catch fish in the Sundarban area. They catch at least 10 metric tons of fish everyday. At the same time they destroy the fry and discard the bodies of 100 tons more of fish that are not considered to be edible. They return home after a week or two. Every time they enter the forest they cut trees and golpata to make boat roofs (Chhai). They also make anchors with timber. Moreover, the fishermen cook thrice daily, burning about 50 tons of dry wood. While walking along Katka sea beach we found two

fishing boats lying close to the bank. One boat fled before we could approach it. The other was also preparing to flee but we hailed the people on the boat. "We are tourists, we have come to visit the Sundarbans. We want to talk to you," we told them. There were four persons squatting on the boat. They were Jalil, Jehangir, Fakir and Mostofa. They hail from the village Padmashumi of Patharghata thana in Borguna district. We were told that the place in which we were standing was Badamtala. Later the forest officials informed us that the place is named Bhulurdia.

Among the fishermen Mostafa (36) replied to most of the questions. He informed us that they pay the forest department personnel Tk. 83 per head for permits to catch fish.

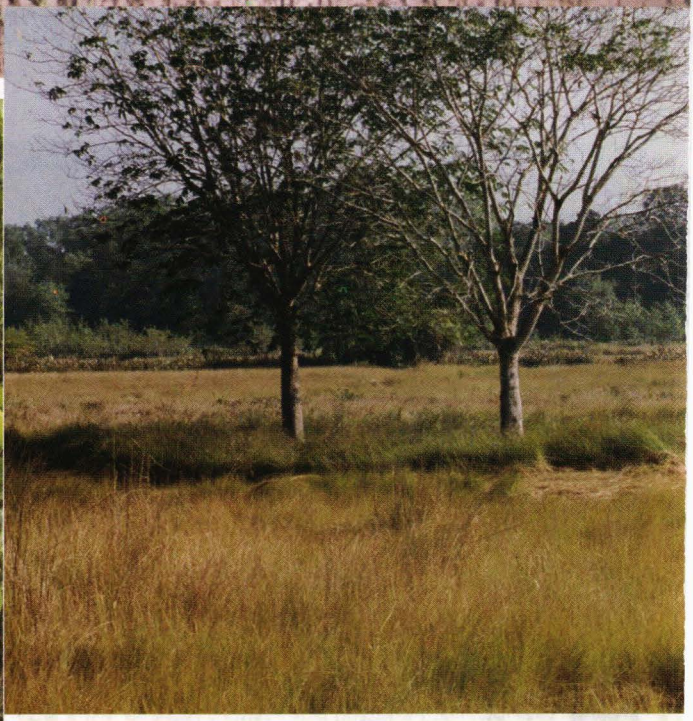
Previously they could fish unhindered in areas near Katka Kachikhali but after the Awami League came to power the forest department had asked them not to fish in the area because the sanctuary had been declared a part of the world heritage. But they informed us that they are continuing to catch fish.

The deputy ranger, K. M. Shahidullah of the Supati station, said that the forest guards have only 6 firearms with them and the manpower is also inadequate. Earlier, 1,200 litres of fuel were sanctioned per month to patrol the area in spite of the fact that the actual requirement was 2,000 litres. But now they get only 100 litres per month. This has resulted in reduction of patrol duty.

A large portion of the Badamtala Bhulurdia coastal forest looked as if it had been devastated by a cyclone. Fishermen Jehangir (25) and Jalil (40) informed us that actually it was not due to a cyclone-the trees were uprooted by the tidal surge and wave action of the sea between Chaitra and Ashwin (roughly March-September). It was found that trees had fallen either due to shifting of the soil around the roots or because their trunks had been broken a few inches up from the roots.

Chapter
15

The Sundarbans at a glance



Above: a fallen tree on a patch of stubs of plants after an ebb-tide left; two solitary *keora* tree on a green patch; another shrub. Photo: FEJB

The Sundarbans at a glance

By Sahidul Islam Chowdhury

World's biggest single mangrove forest -- the Sundarbans - is a unique reservoir of bio-diversity. The forest is five thousand three hundred years old.

Geographical location: Sixty-two percent of the Sundarbans is in Bangladesh and the rest 38 percent is in West Bengal in India. This forest is situated between 890 and 89.550 north latitude.

To the north of the Sundarbans are Shayamnagar Upazila in Satkhira district, Kaira and Dakope Upazilas in Khulna district and Morelganj and Sarankhola in Bagerhat district, to the east is Mathbaria Upazila in Pirozepur district, to the west is the Indian portion of the Sundarbans and to the South lies the Bay of Bengal. Not to speak of the eighteenth century, even at the beginning of the nineteenth century the Sundarbans extended up to the suburbs of Kolkata city.

Area / Extent: The area of the Sundarbans is about five lakh 77 thousand 285 hectares; in kilometers 10 thousand square kilometers. Of this, 5,800 square kilometers is in Bangladesh.
The forest area is 4 lakh 1600 hectares and rivers and canals occupy one lakh 75 thousand 685 hectares. For convenience of administration, the Sundarbans has been divided into 55 parts known as compartments. This mangrove forest is 4.2 per cent of the total area of Bangladesh and 44 per cent of the total forestland in the country.

Climate: Average annual rainfall in the Sundarbans is 2,000 millimeters. Hottest months are April and May and the coldest is January.

Soil and water: The Sundarbans soil is alluvial loam. PH in the soil is between 5.4 and 7.8. Water is mainly saline. There are 102 islands in the Sundarbans area, of which some 58 are inhabited. Soil in the Sundarbans is very fertile. But the degree of salinity is not constant in the soil and water of this forest. The degree of salinity varies from year to year and from season to season. This has a negative effect. However

the general tendency is that salinity is increasing. This increase in salinity is a serious threat to the environment and habitation in the Sundarbans.

Associate Professor Dr. Mahmudul Hasan and two lecturers, MS Hasan and MZ Haider in their article 'Some observation on the rivers of the Sundarbans and salinity' said increase in salinity has become an obstacle to natural growth and spread of flora and fauna in the Sundarbans. If one moves from east to west one will find the condition of *sundari* trees is deteriorating day by day. They feared that if the trend of increase in salinity remains uninterrupted, then quite a few species of trees including *sundari* and *goran* may vanish in the near future. Salinity may also cause some species of animals to vanish gradually.

Rivers: There are rivers and canals spread across this forest like a net with their innumerable branches. Nearly 450 large and small rivers occupy about one lakh 75 thousands 685 hectares or about 30 per cent of the Sundarbans. The biggest river is the Pusur. Other rivers worth-mention are Baleswar, Sibsa, Arpangasia, Bhola, Horinbhanga, Kalindi, Andharmanik, Raimangal, Kapotaksha, Koira, Shela Bhadra etc. As one proceeds to the south, the rivers widen. Some rivers are so wide that one can not see one bank form the other. Baleswar and Pusur rivers and their tributaries and distributaries are connected with the Ganges. As a result, these rivers and their branches have flow of sweet water. The Sibsa and other rivers in the western part have their source of sweet water only in the Ganges and the northern portion of the Sundarbans depends upon the rain water. As a result, the sweet water flow in these rivers decreases during the dry season when there is a massive intrusion of saline water. Moreover, the condition of the rivers and canals in the Sundarbans is deteriorating. Shoals are forming and navigability is declining. River erosion is taking place at some places.

Forest, forest fauna and fish: Of the total area of the Sundarbans, some 3,80,340 hectares comprises classified forests and about 26,807 hectares unclassified forest. Of all the trees in this forest, 64 per cent is sundari and 36 per cent is gewa, goran, golpata, keora, dhundul and various other kinds of tree. Though there are innumerable trees in the Sundarbans, actual fruit-bearing trees are rare. Fruits borne by certain trees are unfit for human consumption. The trees here are 30 to 60 feet tall but they are less bulky. There are 49 species of mamals, 315 species of birds, 53 species of reptiles, eight species of amphibians and more than 120 species of fish available in the forest. The main attractions of this forest are the Royal Bengal Tiger, deer and

crocodiles. Though the Bangladesh portion of the forest is generally supposed to have 450 tigers, experts believe that their actual number is more or less 200.

Productivity: Productivity of the Sundarbans is 1.12 cubic metre per hectare per year, which is the lowest among the mangrove forests in the world. And productivity is reducing day by day because all kinds of flora and fauna, including trees, fish and birds, are decreasing.

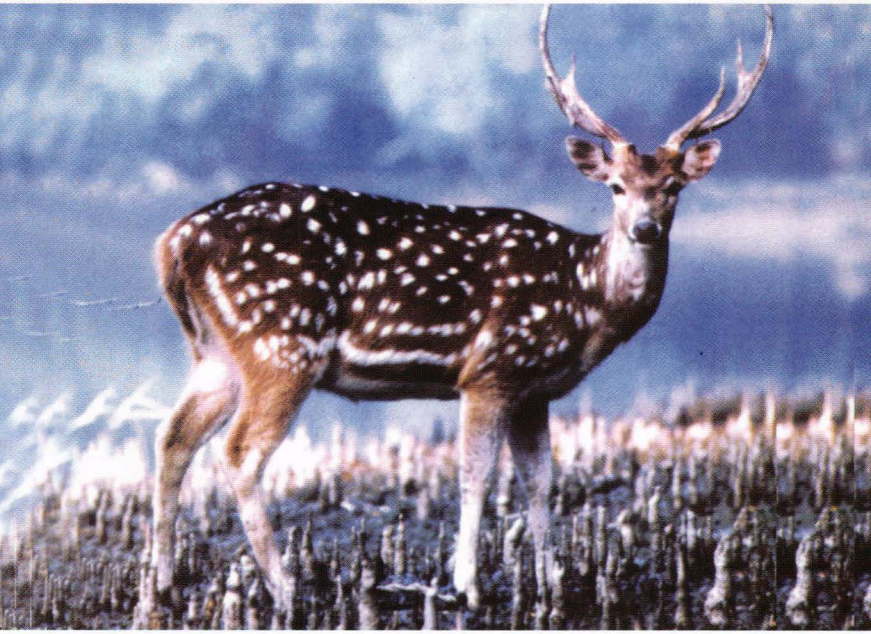
World heritage: Considering the importance of preserving bio-diversity of the Sunderbans, the United Nations Educational, Scientific and Cultural Organisation (UNESCO) had on December 6, 1997, declared this forest as the 798th world heritage site. Under the world heritage site are 1,39,700 hectares area of the eastern, southern and western sanctuaries of the Sunderbans. The southern sanctuary is constituted with the compartment nos. 43 and 44, Sundarbans east sanctuary with compartment nos. 4, 5 and 6 part of compartment no. 7 and Sundarbans west sanctuary with compartment nos. 53, 54 and 55 part of compartment no 49.

People's dependence: There is no correct statistics on how many people are dependent on this forest. A rough estimate says that 50,000 people enter the Sundarbans daily to extract resources for their livelihood. During the dry season, this figure becomes double. The Sundarbans is like a natural shield for the thousands of people of the south-western coastal areas of the country. For centuries, this forest has been protecting people in the coastal belt from the onslaughts of cyclones and tidal surges. During the last century, 17 disastrous cyclones had struck the area along the Sundarbans. But due to the vast expanse of the Sundarbans forest, those storms could not cause much damage on the coastal habitations.

New danger: As it is, the Sundarbans is vanishing little by little, day after day due to human encroachment. With this two more threats have been added. The Sundarbans is being brought under oil and gas exploration and plans are afoot to set up a nuclear power station in the Indian portion of the forest. These are causing a new concern with regard to the future of this ancient mangrove forest.

Chapter
16

Dreams and reality around the Sundarbans



Victims of the onslaughts of cyclonic storms; local inhabitants being interviewed by a visiting FEJB team. Photo: FEJB

Dreams and reality around the Sundarbans

By Syed Badrul Ahsan

There has always been a sustained kind of interest in the Sundarbans, the mangrove forest in the country's southwestern shores. And of course there are all the reasons for it, the most fundamental of those being the pre-eminent position the forests hold in Bangladesh's not so happy environmental scene. Over the years, indeed over the decades, the news coming out of the Sundarbans, has been anything but good. There are, first of all, the cumulative stories of lawlessness which has characterised the forests over a span of time. Elements not particularly environment-friendly have been indulging in what is clearly an indiscriminate felling of trees in the Sundarbans. Early in 2001, reports appeared in the nation's newspapers to the effect that as many as 250 people had been held to ransom deep inside the forests. At the same time, ten wood-cutters had been kidnapped by people who had clearly encroached on the resources of the forests.

Apart from the question of crime making its surreptitious way into the Sundarbans, there has forever been the thought of what has been done to the forests over the years, to a point where today it is a national concern in Bangladesh to go full-steam into the job of saving the forests. That was probably an important reason behind a two-day seminar, early in 2001, in the southwestern city of Khulna on the issue of ensuring the safety of the Sundarbans. But the idea that even as important a social issue as saving a woodland can throw up politics of a dark sort surfaced when the entire Cabinet stayed away from the inaugural of the seminar. The country's President, Justice Shahabuddin Ahmed, ceremonially declared the seminar open, but what became rather conspicuous was the government's reluctance to be a party to the exercise. The reason was simple enough: the organisers had decided that Save the Sundarbans would be an appropriate theme for the seminar. Miffed, the authorities suggested that Conserve the Sundarbans would be more to the point. The organisers disagreed. Hence, the ire of the government.

That, at least, is one way of showing the degree to which the Sundarbans is today in peril, despite their status as the largest

mangrove forest in the world. To be sure, a considerable part of the forests happens to be within Indian geographical territory. But the portion which lies within Bangladesh happens to be of immense benefit to the country. Observe the figures which explain the reason why that is so. The Sundarbans covers as much as 51 per cent of the total reserved forest area in Bangladesh. In addition, the forests provide the state with 41 per cent of the nation's total forest revenue. The figures thus speak for themselves. And there is more: the Sundarbans account for approximately 45 per cent of timber and fuelwood output in Bangladesh. Where employment is the matter, the forests are directly responsible for the economic welfare of half a million, if not more, people. But if a broad view of the employment aspect of the Sundarbans is taken, the estimates show an increase: as many as 2.5 million people are directly as well as indirectly benefited by the forests in terms of economic well-being.

There is quite a bit of history that comes with the Sundarbans. In 1869, the forests were taken under the control of the British colonial authorities. Nine years later, in 1878, the Sundarbans was officially designated a reserve forest. The total area of the Sundarbans, the part of it now within Bangladesh, covers 6,017 square kilometers. Of the total area, land covers 4,143 square kilometers while water (and that includes rivers, wetland and streams) is to be found on 1,874 square kilometers. The Sundarbans, declared by UNESCO as a World Heritage Site in 1997, is home to 334 plant species together with 165 algae. No fewer than 13 orchid species have been spotted in the forests. Containing some 373 species of fauna, the Sundarbans have 73 per cent of the land area covered by the Sundari, the tree from which it is said to have derive its name. About 16 per cent of the area is given over to the Gewa, another breed of trees. As well as being a safe habitat for the legendary Royal Bengal Tiger, the forests also provide a home to a variety of other animal species, such as the spotted deer, barking deer, foxes, et al.

So where is the point of concern, or call it worry, about the Sundarbans at present? The response to that query is that at present the forests are under assault, both from the environment and the people. Or one could say that the environment in the forests has in the recent past been gravely affected by the depredations carried on by people or organised groups of people. Illegal felling of trees as well as unlawful hunting of animals placed a great deal of pressure on the Sundarbans. That was one reason why the Bangladesh government, in 1989, placed a ten-year moratorium on the harvesting of timber in the forests. Early in 2001, a new five-year moratorium was imposed, the objective of course being a further conservation of resources in the

Sundarbans. That is as it should have been. For the Sundarbans happens to be the focal point of livelihood for as many as 45,000 people every day. All across the forests, 1,50,000 boats are seen to ply, with each boat manned by two boatmen. The assumption then is clear: the Sundarbans serves as a strong lifeline to the poor. It is these poor whose future is in need of security, both from ill-intentioned individuals and a corrupt bureaucracy. As a step towards sustaining, indeed buttressing the resources of the forests, a programme of planting 42,00,000 saplings was undertaken for the fiscal year ending in the middle of 2001. At the same time, the need for a prevention of salinity creeping into the Sundarbans necessitated, in the not too distant past, the undertaking of a programme, the Gorai River Restoration Project.

All of which goes to show the many dreams which Bangladesh continues to shape around the Sundarbans. A slip, a minor failure to keep priorities on the right track, can only cause nightmares to environmental planners in Bangladesh.