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A Study on Sundarbans As Described By Amitav Ghosh

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Abstract – Sundarbans a difficult place to live for humans, but, at the same time, a unique habitat for fauna and flora. The mangrove swamps are dominant, and they provide the shelter for many species of animals, which are specific to the region or very rare in other areas. The example is the Royal Bengal Tiger, a man-eater featuring in "The Hungry Tide" together with several species of dolphins and deadly crocodiles.

The novel starts with the meeting of two mains characters, Piyali (Piya), an Indian-American field biologist specialized in dolphins, and Kanai a sophisticated interpreter and businessman, on the train to Canning. Piya has a plan to collect data on the life of the rare river dolphins, which are the subject of her research. Kanai was summoned by his aunt, Nilima, to the island of Lusibari (he spent there only one summer as a schoolboy), where she runs a charity, to get the package left to him in the will of his late uncle, Nirmal, a leftist schoolteacher with literary ambitions. Kanai is interested in Piya, and when they part in Canning, he invites her to Lusibari.

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INTRODUCTION

The Sundarbans freshwater swamp forests are a tropical moist broadleaf forest eco-region of India and Bangladesh. It represents the brackish swamp forests that lie behind the Sundarbans Mangroves where the salinity is more pronounced. The freshwater eco-region is an area where the water is only slightly brackish and becomes quite fresh during the rainy season, when the freshwater plumes from the Ganges and Brahmaputra rivers push the intruding salt water out and also bring a deposit of silt. It covers an area of 14,600 square kilometer (5,600 square miles) of the vast Ganges-Brahmaputra Delta, extending from India's West Bengal state into western Bangladesh. The Sundarbans freshwater swamp forest lie between the upland Lower Gangetic plains moist deciduous forest and the brackish-water Sundarbans mangroves bordering the Bay of Bengal.

The fertile soils of the delta have been subject to intensive human use for centuries, and the ecoregion has been mostly converted to intensive agriculture, with few enclaves of forest remaining. The remaining forests, together with the Sundarbans mangroves, are important habitat for the endangered Bengal Tiger (Panthera tigris). In addition to the endangered tiger, there are several other threatened mammal species, such as the capped langur (Semnopithecus pileatues), smooth-coated other (Lutrogale perspicillata), Oriental small-clawed otter (Aonyx cinerea), and great Indian civet (Viverra zibetha). The eco-region also contains the leopard (Panthera pardus) and several smaller predators such as the jungle cat (Felis chaus), fishing cat (Prionailurus viverrinus), and leopard cat (Prionailurus bengalensis).

This ecoregion is nearly extinct, the victim of large-scale clearing and settlement to support one of the densest human population in Asia. Hundreds of years of habitation and exploratation by one of the world's densest human populations have exacted a heavy toll of this eco-region's habitat and biodiversity. There are two protected areas – Narendrapur (110 square km) and Ata Danga Baor (20 square km) that cover a mere 130 square km of the eco-region. Habitat loss in the eco-region is so extensive, and the remaining habitat is so fragmented, that it is difficult to ascertain the composition of the original vegetation of this eco-region. According to Champion and Seth (1968), the freshwater swamp forests are characterized by Heritiera minor, Xylocarpus molluccensis, Bruguiera conjugate, Sommeratia apetala, Avicennia officinalis, and Sonneratia caseolaris, with Pandamus tectorius, Hibiscus tiliaeus, and Nipa fruticans along the fringing banks.

The Sundarbans Mangroves ecoregion is the world's largest mangrove ecosystem, with 20,400 square kilometer (7,900 square miles) of area covered. Named after the dominant mangrove species Heritiera fomes, locally known as sundry, it lies in the vast delta formed by the confluence of the Ganges, Brahmaputra, and Meghna rivers across southern Bangladesh and Indian state of West Bengal. This is the only mangrove ecoregion that harbors the Indo-Pacific region's largest predator, the Bengal Tiger. Unlike in other habitats, here tigers live and swim among the mangrove islands, where they hunt scare

prey such as chital deer (Cervus axis), barking deer (Munticacus muntjak), wild pig (Sus scrofa), and even macaques (Macaca mulatta). Mangroves are a transition from the marine to freshwater and terrestrial systems. They provide critical habitat for numerous species of fishes and crustaceans that are adapted to live, reproduce, and spend their juvenile lives among the tangled mass of roots, known as pneumatophores, that grow upward from the anaerobic mud to get the trees' supply of oxygen.

Mangroves are not diverse compared with most other terrestrial ecosystem. The undisturbed forests have an unstratified, dense canopy and an undergrowth made up of seedlings and saplings of the canopy trees. In the Sundarbans, the mangrove forests are characterized by Sundari, a species valued for its timer. Other species that make up the forest assemblage include Avicennia spp., Xylocarpus mekongensis, Xylocarpus granatum, Sonneratia apetala, Bruguiera gymnorrhiza, Cereops decandra, Aegiceras corniculatum, Rhizophora mucronata, and Nypa fruticans palms. Several predators dwell in this labyrinth of channels. Two species of crocodiles – Crocodylus porosus and Crocodylus palustris – dwell here, as well as the Gangetic gavial Gavialis gangeticus), and the water monitor lizard VAramus salvator) use both land and water to hunt and bask in. sharks and the Gangetic freshwater dolphins Platanista gangetica) inhabit the waterways. And several birds of prey patrol the sky overhead. More cyptic but equally fascinating are the mudskippers, a gobioid fish that clims out of the water into mudflats and even clims trees. An abundance of crabs, hermit crabs, and shrimp scavenge among the roots.

As Bangladesh supports one of the world's highest human population densities, the population pressure resulted in half of this ecoregion's mangrove forests cut down to supply the feulwood and other natural resources extracted from these forests by this large population. Despite the intense and large-scale exploration, the ecoregion still is one of the largest contiguous areas of mangroves in the world. There are seven protected areas – Sajnakhali (2,090 squar km), Sundarbans East (210 squar km), Char Kukri-Mukri (30 squar km), Sundarbans South (200 squar km), Sundarbans West (130 squar km), Halliday Island(4 squar km), Lothian Island (20 squar km) – that cover almost 2,700 squar km, or 15 percent of the ecoregion. Among these only Sajnakhali is large enough to support a space-dependent species such as the tiger.

MUDFLATS IN SUNDARBANS

The physical development processes along the coast are influenced by a multitude of factors, comprising wave motions, micro and macro-tidal cycles and long shore current typical to the coastal tract. The shore currents vary greatly along with the monsoon. These are also affected by cyclonic action. Erosion and accretion through these forces maintains varying levels, as yet not properly measured, of physiographic change whilst the mangrove vegetation itself provides a remarkable stability to the entire system. During each monsoon season almost all the Bengal Delta is submerged, much of it for half a year. The sediment of the lower delta plain is primarily advected inland monsoonal coastal setup and cyclonic events. One of the greatest challenges people living on the Ganges Delta may face in coming years is the threat of rising sea levels caused mostly by subsidence in the region and partly by climate change.

In many of the Indian mangrove wetlands, freshwater reaching the mangroves was considerably reduced from the late 19th century due to diversion of freshwater in the upstream area. Also, the Bengal Basin is slowly tilting towards the east due to neo-tectonic movement, forcing greater freshwater input to the Bangladesh Sundarbans. As a result, the salinity of the Bangladesh Sundarbans is much lower than that of the Indian Sundarbans. A 1990 study noted that there "is no evidence that environmental degradation in the Himalayas or a 'greenhouse' induced rise in sea level have aggravated floods in Bangladesh": however, a 2007 report by UNESCO, "Case Studies on Climate Change and World Heritage" has stated that an anthropogenic 45-cm rise in sea level (likely by the end of the 21st century, according to the intergovernmental Panel on Climate Change), combined with other forms of anthropogenic stress on the Sundarbans, could lead to the destruction of 75% of the Sundarbans mangroves.

FLORA

The Sundarbans flora is characterized by the abudance of Heritiera fomes, Excoecaria agallocha, Ceriops decandara and Sonneratia apetala. A total 245 genera and 334 plant species were recorded by David Prain in 1903. since Prain's report there have been considerable changes in the status of various mangrove species and taxonomic revision of the man-grove flora. However, very little exploration of the botanical nature of the Sundarbans has been made to keep up with these changes. Whilst most of the mangroves in other parts of the world are characterized by members of the Rhizophoraceae, Avicenneaceae or Laganculariaceae, the mangroves of Bangladesh are dominated by the Sterculiaceae and Euphorbiaceae.

The Bangladesh mangrove vegetation of the Sundarbans differs greatly from other non-deltaic coastal mangrove forest and upland forest associations. Unlike the former, the Rhizophoraceae are of minor importance. Differences in vegetation have been explained in terms of freshwater and low salinity influences in the Northeast and variations in drainage and siltation. The Sundarbans has been classified as a moist tropical forest demonstrating a whole mosaic of seres, comprising primary colonization on new accretions to more mature beach forests, often conspicuously dominated by Keora (ISonneratia apetala) and tidal forests. Historically

three principal vegetation types have been recognize in broad correlation with varying degrees of water salinity, freshwater flushing and physiography and which are represented in the wildlife sanctuaries:

Sundari and Gewa occur prominently throughout the area with discontinuous distribution of Dhundul (Xylocarpus granatum) and Kankra. Among grasses and Palms, Poresia coaractata, Myriostachya wightiana, Imperata cylindrical, Phragmites karka, Nypa fruticans are well distributed. Keora is an indicator species for newly accreted mudbanks and is an important species for wildlife, especially spotted deer (Axis axis). Besides the forest, there are extensive areas of brackish and freshwater marshes, intertidal mudflats, sandflats, sand dunes with typical dune vegetation, open grassland on sandy soils and raised areas supporting a variety of terrestrial shrubs and trees.

Succession is generally defined as the successive occupation of a site by different plant communities. In an accreting mudflats the outer community along the sequence represents the pioneer community which is gradually replaced by the next community representing the seral stages and finally by a climax community typical of the climatic zone. Troup suggested that succession began in the newly accreted land created by fresh deposits of eroded soil.

The pioneer vegetation on these newly accreted site is Sonneratia, followed by Avicennaia and Nypa. As the ground is elevated as a result of soil deposition, other trees make their appearance. The most prevalent, though one of the late species to appear, is Excoecaria. As the level of land rises through accretion and the land is only occasionally flooded by tides, Heritiera fomes begins to appear.

FAUNA

The Sundarbans is very rich in wildlife. The management of wildlife is presently restricted to the protection of fauna from poaching and designation of some areas as wildlife sanctuaries where no extraction of forest produce is allowed and the wildlife face few disturbances. Although the fauna of Bangladesh have diminished in recent times and the Sundarbans has not been spared from this decline, the mangrove forest retains several good wildlife habitats and their associated fauna. Of these the tiger and dolphin are target species for planning wildlife management and tourism development. There are high profile and vulnerable mammals living in two contrasting environments and their statuses and management are strong indicators of the general condition of wildlife and its management. The Sundarbans were home to approximately 500 Bengal tigers in 2004, one of the largest single population of tigers.

The Sundarbans provide a unique ecosystem and wildlife habitat. The river terrapin (Batagur baska), Indian flap-shelled turtle (Lissemys punctata), peacock soft-shelled turtle (Trionyx hurum), yellow monitor (Varanus flasvescens), water monitor (Varanus salvator), Indian python (Python molurus) and the Bengal tiger (Panthera tigris tigris) are some of the resident species. Some of these species are protected by legislation, notably by the Bangladesh Wildlife (Preservation) Order, 1973 (P.O. 23 of 1973). Some species such as hog deer (Axis duvauceli), Javan rhinoceros (Rhinoceros sondaicus), single horned rhinoceros (Rhinoceros unicornis) and the mugger crocodile (Crocodylus palustris) have become extinct in the Sundarbans at the beginning of the last century.

Recent studies revealed that the Bangladesh Sundarbans support diverse biological resources including at least 120 species of commercially important fishes, 270 species of birds, 42 species of mammals, 35 reptiles and eight amphibian species. This represents a significant proportion of the species present in Bangladesh (about 30% of the reptiles, 37% the birds and 34% of the mammals) and includes a large number of species which are now extinct elsewhere in the country. Two amphibians, 14 reptiles, 25 aves and five mammals are presently endangered. The Sundarbans is an important wintering area for migrant water birdsand is an area suitable for watching and studying avifauna.

The Sundarbans were home to approximately 500 Bengal tigers in 2004, one of the largest single population of tigers. Tiger attacks are frequent in the Sundarbans. Between 100 and 250 people are killed per year. However, owing to various measures taken for safety, there have been no reports of deaths since 2004 in the Indian portion of the Sundarbans.

ECONOMY

The Sundarbans play an important role in the economy of the southwestern region of Bangladesh as well as in the national economy. It is the single largest source of forest produce in the country. The forest provides raw material for wood based industries. In addition to traditional forest produce like timber, fuel wood, pulpwood etc., larger scale harvest of non wood forest products such as thatching materials, honey, bees-wax, fish, crustacean and mollusk resources of the forest takes place regularly. The vegetated tidal lands of the Sundarbans also function as an essential habitat, nutrient producer, water purifier, nutrient and sediment trap, storm barrier, shore stabilizer, energy storage unit and aesthetic attraction.

The forest also has immense protective and productive functions. Constituting 51% of the total forest estate of Bangladesh it contributes about 41%

of total forest revenue and accounts for about 45% of all timber and fuel wood output of the country (FAO 1995). A number of industries (newsprint mill, match factory, hardboard, boat building, furniture making) are based on the raw material obtained from the Sundarbans ecosystem. Various non-timber forest products and plantations help generate considerable employment and income generation opportunities for at least half a million poor coastal population. Besides production function of the forest, it provides natural protection to life and properties of the coastal population in cyclone prone Bangladesh.

Despite human habitations and economic exploitation of the forest, Sundarbans retained a forest closure of about 70% according to the Overseas Development Administration (ODA) of the United Kingdom in 1985.

Forest inventories reveal a decline in standing volume of the two main commercial mangrove species – sundari (Heritiera fomes) and gewa Excoecaria agallocha) – by 40% and 45% respectively between 1959 and 1983 (Forestal 1960 and ODA 1985). Also, despite a total ban on all killing or capture of wildlife other than fish and some invertebrates, there appears to be a pattern of depleted biodiversity or loss of species (notably at least six mammals and one important reptile this century), and that the "ecological quality of the original mangrove forest is declining" (IUCN 1994).

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