BANGLADESH

INTRODUCTION

by Abdul Wahab Akonda

Area: 144,054 sq.km**.**
Population: 104,000,000 (1987).

Bangladesh lies between latitudes 20°34'N and 26°38'N and longitudes 88°0l'E and 92°41'E. It is bounded by India in the west and north, by India and Burma in the east, and by the Bay of Bengal in the south. Zoogeographically, Bangladesh is an interesting country lying at the junction of the Indian and Malayan sub-regions of the Indomalayan Realm. The country has a very long history of human settlement and agriculture. It is one of the most densely populated countries in the world, and the population continues to increase at about 2.6-2.9% per year.

Bangladesh may be divided into four physical regions: the Ganges- Brahmaputra Delta, the Barind Tract, the Central Region and the Chittagong Region. The Ganges, Brahmaputra, Meghna and several smaller rivers unite in Bangladesh to form the largest deltaic system in the world. The flood plains and coastal mangrove swamps of this delta cover almost one-third of the country. The older parts of the delta, in the north, are comparatively high with sandy soils; the lower central parts are subject to extensive flooding every rainy season, and the accreting coastal zone (Sundarbans) is subject to regular tidal inundation.

The Barind Tract consists of a group of high clay terraces of Pleistocene age in the northwestern part of the delta, except in Pabna and Bogra Districts. The soils are yellow or reddish in colour, in contrast to the grey or brown alluvial deposits of the plains. The land is undulating, and in the north, slopes rapidly up to the Himalayan foothills.

The Central Region includes the Madhupur Tract, the Haor Basin of Mymensingh arid Sylhet Districts, and the Tippera Surface. The Madhupur Tract is a region of raised undulating land with reddish soils, in Jamalpur, Tangail, parts of Mymensingh and parts of Dhaka. In the north, the land slopes gently up to the foot of the Garo Hills, the southernmost of which lie within Bangladesh. The Haor Basin is a region of low-lying plains in eastern Mymensingh and western Sylhet. The basin extends north to the foot of the Garo and Khasia Hills, and east along the upper Surma Valley to the Indian border. The Tippera Surface lies directly to the south of the Haor Basin, and is partly low and deltaic and partly higher ground with a piedmont fringe to the east.

The Chittagong Region, in southeastern Bangladesh, is comprised of a series of forested hill ranges and valleys running north to south parallel to the coast. There are four main hill ranges, the highest peaks exceeding 1,000m in the extreme mid-east and southeast. The coastal zone includes several large islands and estuarine systems with mangrove swamps. In

the extreme southeast of the region, there is a small coral island, St. Martin's Island, some ten km offshore.

A subtropical monsoonal climate prevails throughout Bangladesh. During winter, the climate is mild and dry, with minimum temperatures varying from about 7.2°C to 12.8°C and maximum temperatures from 23.9°C to 31.1°C. The monsoon season is preceded by a period of thunderstorms from March to May. Heavy monsoon rains begin in early June and continue to mid October; they account for about 80% of the total annual rainfall. The highest rainfall occurs in northern Sylhet and in the Chittagong area, the lowest in the north and west of the country. During the period 1976-1985, the annual rainfall varied from a minimum of 1,180 mm at Jessore in 1976 to a maximum 4,785 mm at Sylhet in 1983. Temperatures during the monsoon season usually reach a maximum of about 37°C, but temperatures in excess of 40.5°C have been recorded. The relative humidity ranges from about 75% in February and March to 85-90% from June to September.

There are three main types of forest in Bangladesh: wet evergreen and mixed evergreen forest in Chittagong and Sylhet, sal forest in the Madhupur Tract, and mangrove forest in the coastal zone. The wet evergreen and mixed evergreen forests are dominated by species of *Dipterocarpus, Artocarpus chaplasha, Pterygota alata, Tetrameles nudiflora, Swintonia floribunda, Hopea odorata and Toona ciliata.* The understorey is rich in bamboos, but these have been much degraded, and pure stands of bamboo are now rare. Deciduous riverine forest in the Chittaging Hill Tracts is interspersed with open grassy areas dominated by species of *Phragmites* and Saccliarum.
The sal forest of the Madhupur Tract is a moist deciduous forest dominated by sal *Shorea robusta.* Other common trees include *Albizzia spp, Dillenia pentagyna, Lagerstroemia speciosa, Ficus spp, Terminalia belerica, Cassia fistula, Careya arborea* and *Spongias mangifera.* A similar sal forest occurs in patches in the foothills of Garo, Dinajpur and Rangpur.

The mangrove forests of the Sundarbans and southeast coast have a very diverse flora; over 330 plant species have been recorded in the Sundarbans alone. The dominant species are *Heritiera fomes, Excoecaria agallocha, Sonneratia apetala, Avicennia officinalis, Amoora cucullata, Xylocarpus moluccensis, X. obovata, Ficus retusa, Aegiceras corniculatum, Ceriops decandra, Acanthus* ilicifolius, *Acrostichum aureum, Phoenix paludosa* and *Nypa fruticans.* Creepers include *Entada pursaetha, Derris sinuata,* and grasses include *Phragmites karka, Imperata cylindrica* and *Typha elephantina.*

The entire flood plain of Bangladesh was once well forested, but most of the native forests have disappeared in recent decades due to mounting pressure from human populations. Vast areas are now under cultivation, the principal crops being rice, jute, tobacco, sugar cane, potatoes, pulses, mangoes, coconuts, jackfruits, pineapples, bananas and goava. In many parts of the country, such as eastern Sylhet and northern Barisal, the abundance of plantations and groves of trees around villages creates an aspect of discontinuous forest. By contrast, in some areas of North Bengal, particularly on the sandy islands of the rivers in the Barind Tract, vegetation is very sparse.

Bangladesh was once very rich in wildlife. Some 120 species of mammals, 578 species of birds, 124 species of reptiles and 19 species of amphibians have been recorded. However, the situation is now serious for most wildlife, especially large mammals, birds of prey, many waterfowl, certain reptiles and some amphibians. Populations have been seriously depleted during the present century, and many species have become extinct in Bagladesh, or are now seriously threatened. The large mammals which have become extinct in recent times include One-horned Rhinoceros *Rhinoceros unicornis* (last sighted in the Chittagong Hill Tracts in about 1973), Javan Rhinoceros, Asiatic Two-horned Rhinoceros, Wild Buffalo, Nilgai and Swamp Deer (R. *sondaicus, Didermoceros sumatrensis, Bubalus bubalis, Bosephalus tragocamelus* and *Cervus duvauceli).* Gaur, Hog Deer and Hispid Hare (*Bos gaurus, Axis porcinus* and *Caprolagus hispidus)* may also be extinct. Extinct birds include Pink-headed Duck, Bengal Florican *(Rhodonessa caryophyllacea, Eupodotis bengalensis),* and possibly Common Peafowl and Green Peafowl (*Pavo cristatus, Pavo muticus).* Species currently on the verge of extinction include the White-winged Wood-Duck *Cairina scutulata,* Comb Duck *Sarkidiornis melanotos,* several other large water-birds and several birds of prey. Among the reptiles, the Gharial *Gavialis gangeticus* is almost extinct, the Estuarine Crocodile *Crocodylus porosus* is confined to one part of the Sundarbans, and turtles and terrapins are severely threatened by massive uncontrolled commercial exploitation. The Marsh Crocodile or Mugger *Crocodylus palustris* is probably extinct in the wild, although there is a small "feral" population at Khan Jahan Ali Shrine Tank in Bagerhat, Khulna.

Summary of Wetland Situation

Bangladesh possesses enormous wetland areas, and indeed during the rainy season, about half of the country could be classified as wetland. The principal wetlands are rivers and streams, shallow freshwater lakes and marshes (haors, baors and beels), water storage reservoirs, fishponds, seasonally flooded cultivated plains, and estuarine systems with extensive mangrove swamps.

There are about 700 rivers in Bangladesh, including small mountain streams, meandering seasonal creeks, muddy channels (khals) and major rivers with their numerous tributaries and distributaries. The total length of the rivers has been estimated at 24,140 km. In some regions, such as Patuakhali and Barisal, they form an intricate network across the land. All of the rivers, with the exception of those in the Chittagong region, belong to one or other of the three major river systems, the Ganges-Padma, the Brahmapatra-Jamuna and the Surma-Meghna. The largest river in Bangladesh, the Lower Meghna, is the joint stream of the Padma, the Meghna and the Dhaleswari.

The numerous permanent and seasonal freshwater lakes and marshes of the flood plains are known as haors, baors and beels. A haor is a bowl-shaped depression between the natural levees of a river, or a succession of such depressions. Haors are flooded every year by the monsoon floods, and most retain some water throughout the dry season. Most are found in eastern Mymensingh and Sylhet, in a region known as the Haor Basin. A baor is an oxbow lake or other wetland formed in a dead arm of a river. Baors range in size from about 50 ha to 1,300 ha, and most retain water throughout the year. All are situated in the moribund delta of the Ganges in Kushtia, Jessore and Faridpur. Beels are usually saucer-like depressions which

generally retain water throughout the year. Most become overgrown with marsh vegetation during the dry season, but a few dry out completely. There are over a thousand beels in the country, the greatest concentrations being in the main delta region (Rajshahi, Pabna, Kushtia, Jessore, Faridpur, Comilla and Noakhali) and in the Haor Basin (eastern Mymensingh and Syihet). There are very few beels in the Chittagong region, and most of these contain water only in the rainy season. There are, however, extensive grass and reed marshes along many of the rivers in the Chittagong Hill Tracts, particularly along the lower course of the Sajjak river.

There are only three true lakes in the country: Rainkhyongkine and Bogakine in the Chittagong Hill Tracts, and Ashuhila Bee! at the northern end of the Barind Tract. The only large artificial lake is Kaptai Reservoir, a hydro-electric dam which was completed in 1963 and has since flooded over 76,600 ha of forested valleys and cultivated land in the Chittagong Hill Tracts. Other artificial water bodies include many thousands of small tanks and fish ponds scattered throughout the country, and large areas of shrimp ponds, particularly in the Chittagong and Khulna regions. The Government is actively encouraging shrimp culture, and major aquaculture schemes have been developed in recent years in the Chokoria Sundarbans and Moheshkhali area in Cox's Bazar.

Vast areas of the low-lying alluvial plains between the rivers are flooded during the rainy season. The floodwaters remain for a minimum of two months to a maximum of five months. Then, as the floods recede, the exposed land can again be cultivated for rice, jute and other crops.

The coastal zone extends for some 480 km from the Indian border in the west to the Burmese border in the southeast. It includes the numerous low-lying islands and vast mangrove swamps (Sundarbans) in the eastern part of the Ganges- Brahmaputra delta, the similar but much smaller estuarine systems along the Chittagong coast (Chokoria Sundarbans and Naaf Estuary), and a single coral island off the extreme southern tip of the country (St. Martins Island).

The total area of wetlands in Bangladesh has been variously estimated at between seven and eight million hectares, i.e. about 50% of the total land surface. This includes at least 480,000 ha of permanent rivers and streams, 610,000 ha of estuaries and mangrove swamps, between 120,000 and 290,000 ha of haors, baors and beels, over 90,000 ha of large water storage reservoirs, 150,000-180,000 ha of small tanks and fish ponds, 90,000-115,000 ha of shrimp ponds, and some 5,770,000 ha of land which is seasonally inundated to a depth of 30 cm or more.

Not surprisingly, this abundance of wetlands supports a wide variety of wildlife. The rivers, haors, baors and beels support a very rich fish fauna including many commercially important species such as *Labeo rohita, L. calbasu, L. gonius, Catla catla, Cirrhina mrigala, Wallago attu, Mystus aor, M. tengra, M. vittatus, Puntius spp, Channa spp, Anabas testudineus, Clarius batrachus, Heteropnuestes fossilis, Notopterus* spp and *Hilsa* spp. The estuaries are very rich in prawns and shrimps, notably species of *Macrobrachium, Penaeus, Metapenaeus, Parapenaeopsis* and *Palaemon.* Reptiles include Gharial *Gavialis gangeticus,* Estuarine

Crocodile *Crocodylus porosus,* about 25 species of turtles and tortoises, three species of monitor lizards *Varanus* spp and numerous snakes. About 150 species of waterfowl have been recorded, but over 70 of these are now rare and several have not been reported for many years. Common species include *Tachybaptus ruficollis, Phalacrocorax niger,* a variety of herons and egrets, *Anastomus oscitans, Leptoptilos javanicus, Threskiornis melanocephalus,* several ducks, notably *Dendrocygna javanica, Nettapus coromandelianus* and *Anas acuta, Amaurornis phoenicurus, Gallicrex cinerea, Porphyrio porphyrio, Fulica atra, Hydrophasianus chirurgus, Metopidius indicus,* and a wide variety of shorebirds, gulls and terns. A small population of the endangered White-winged Wood-Duck *Cairina scutulata* still exists in the Kassalong Forest Reserve in the Chittagong Hill Tracts. Mammals associated with the wetlands include the Ganges River Dolphin *Platanista gangeticus,* which is still common in most large rivers, and also the Fishing Cat *Felis viverrina* and three species of otter, *Lutra lutra, L. perspicillata* and *Aonyx cinerea.*

The wetland resources of Bangladesh are of enormous economic importance. The main activity in the wetlands is fishing, which is practiced under a system of lease/auction from Government or government agencies. More than five million people are dependent on fishing for their livelihood. The total harvest of finfish, crustaceans and frogs in Bangladesh is currently estimated to be in the region of 675,000 to 725,000 metric tonnes per year. Of this total, 64% comes from the riverine fisheries, 15% from small freshwater bodies, 1% from large freshwater bodies, 1% from brackish water ponds, and the remaining 19% from the marine fisheries. In 1983, export earnings from fishing ranked third after jute and jute products, and amounted to 7.2% of the country's total export earnings.

The mangrove forests of the Sundarbans are exploited for a wide range of forest products, in particular timber, pulp wood and firewood. The leaves of *Nypa fruticans* are used for thatching, and those of *Phoenix paludosa* for making house walls. Large quantities of honey and beeswax are gathered from wild bees' nests, and mollusc shells are collected for the production of lime.

Cultivation of rice is a major activity in and around the wetlands of the Ganges-Brahmaputra flood plain and Haor Basin. Low-lying lands under private ownership are used almost exclusively for the cultivation of rice, and the state-owned margins of beels, baors, haors and rivers are often leased on an annual basis for paddy cultivation. During the dry season, large numbers of domestic livestock, mainly cattle and buffalo, are allowed to graze in the marshes, and the aquatic vegetation is harvested to provide fodder during the monsoon. In recent years, the wetlands have also been used for rearing domestic ducks. The once extensive forests of *Barringtonia* in the Haor Basin and around the flood plain wetlands provided an important source of firewood, but these forests have now been almost completely destroyed, and today various herbs and aquatic plants are collected for use as fuel. In recent years, aquatic plants have also been collected for use as fertilizers. Some of the wetlands have considerable potential for tourism, and provide excellent opportunities for scientific research and conservation education.

Because of the very high human population density, land is a scarce commodity in Bangladesh. National policy has therefore always aimed at full utilization of all kinds of land.

As a result, the extent of government owned lands (khas land) is decreasing year by year as the land is transferred to private ownership. Thus most of the haors and beels have now been sold or leased to private individuals for cultivation during the dry season.

The intensity of fishing is very high, and in many areas stocks are being depleted as a result of over-fishing. In the larger beels, fishing is controlled by the Fisheries Department and is usually limited to once in three years, but in practice the regulations are ignored and fishing is carried out every year. In the Sundarbans, a change is occurring in the ecology of the mangrove forest as a result of reduced inflow of freshwater during the dry season, and the forest resources are being over-exploited. In the Chokoria Sundarbans, large areas of mangrove forest are being cleared for the construction of shrimp ponds. Siltation is a serious problem at many of the flood plain wetlands, and flash floods have become a common phenomenon, particularly at the beginning of the monsoon season.

Conservation efforts began in 1966, prior to independence, when the Government of Pakistan invited World Wildlife Fund to assess the status of its wildlife and recommend measures to arrest deterioration and promote wildlife tourism. Two international expeditions were mounted and several areas were investigated, including wetlands in the Haor Basin and the Sundarbans. The Government was urged to appoint its own Wildlife Enquiry Committee to follow up this work. The Committee was established in 1968, and by 1970 had drafted a report. Considerable progress was made with the establishment of protected areas, and several research projects were undertaken, particularly in the Sundarbans, where some 78,000 ha of the Katka and Nilkamal forests were notified as a Tiger Sanctuary. Following the War of Liberation, the Bangladesh Wildlife (Preservation) Order was promulgated in 1973, and an ambitious programme of wildlife management was developed. A scheme entitled "Development of Wildlife Management and Game Reserve" was incorporated in the country's First Five Year Plan. This proposed the establishment of numerous national parks, wildlife sanctuaries and recreation parks covering some 8% of the country. Several reserves were established, but the scheme was much reduced in later plans and little further progress has been made. A conservation programme covering fifty-one wetland areas has been drawn up by the Government, but economic constraints have severely hampered progress, and the wetlands remain poorly protected.

The very low priority apparently now accorded by the Government to wildlife conservation in Bangladesh is reflected in the recent abolition of the Wildlife Circle, the reassignment of staff to normal duties, the lack of any separate financial provision within the Forest Department's budget and the relative inactivity of the Wildlife Advisory Board. There has, however, been a great increase in interest in nature conservation amongst the private sector, particularly in the last decade. A small number of wildlife enthiusiasts founded the Wildlife Preservation Society (now Wildlife and Nature Conservation Society) in 1972, and actively participated in the formulation of the Bangladesh Wildlife (Preservation) (Amendement) Act of 1973. Since then, several other non-governmental conservation bodies have been established to promote the study of the fauna and flora of Bangladesh and raise public awareness to conservation issues.

Wetland Research

No systematic programme of research has been conducted on the wetlands of Bangladesh. Several national bodies and many visiting scientists have carried out research in the Sundarbans, and this region has now been extremely well documented. The Fisheries Department has conducted some studies of the inland fisheries, and the Forest Department has investigated several important wetlands in the Hoar Basin. The Bangladesh Space Research and Remote Sensing Organization (SPARSSO) has prepared detailed maps of the mangrove resources for the Forest Department, and is preparing maps of the inland freshwater bodies for the Fisheries Department. The Department of Zoology at the University of Dhaka has carried out a number of faunistic studies at wetland areas, particularly in the Sundarbans and Chittagong Hill Tracts.

Wetland Area Legislation

There is no specific legislation relating to wetland conservation. Various Acts, Ordinances, and regulations have been promulgated for the purpose of conserving natural resources, and several of these pertain to wetlands. They include:

1. The Forest Act, 1927, which established the Forest Department.
2. The East Bengal State Acquisition and Tenancy Act, 1950 (Act XXVIII of 1951).
3. The East Bengal Protection and Conservation of Fish Act, 1950 (East Bengal Act XVIII).
4. The Bangladesh Wildlife (Preservation) Order, 1973, promulgated under Presidential Order No. 23 in March 1973 and subsequently enacted and amended as the Bangladesh Wildlife (Preservation) (Amendment) Act, 1973. This Act provides for the establishment of national parks, wildlife sanctuaries and game reserves, and also provides for the establishment of a Wildlife Advisory Board.
5 The Haor Development Board Ordinance (Ordinance No. IX of 1977).
6. The Protection and Conservation of Fish Rules, 1985.

Bangladesh joined the World Heritage Convention in August 1983.

Wetland Area Administration

Wildlife conservation, including the management of protected areas, is the responsibility of the Forest Department. In 1973, a Wildlife Circle was established within the Forest Department, with specific responsibility for wildlife matters. This Circle was headed by the Conservator of Forests (Wildlife), with responsibility directly to the Chief Conservator of Forests. The Wildlife Circle was subsequently abolished in June 1983, allegedly in the interests of economy. The post of Conservator of Forests (Administration and Wildlife) remains, but the incumbent has many other administrative duties unrelated to wildlife. Following its general down-grading within the Forest Department, wildlife conservation has become the theoretical responsibility of the various Divisional Forest Officers.

A Wildlife Advisory Board was set up in 1977 under the Chairmanship of the Minister of Agriculture. The Board is supposed to approve important management decisions and directives, and attempt to create a comprehensive nation-wide system of protected areas, but it has been relatively inactive in recent years.

Rivers, haors, baors and beels are under the direct control of the Revenue Department in the Ministry of Land Administration and Land Reforms. The Deputy Commissioners are the principal executives in the District Administrations, and the Additional Deputy Commissioners (Revenue) are the officials concerned. These authorities allocate and distribute lands, and lease fishing rights to private individuals. The Upazilla Councils control fishing rights at beels of less than about eight hectares in extent. The management and development of wetlands are shared by other Government and semi-Government authorities including the Forest Department (management of mangrove resources and protection of wildlife), Directorate of Fisheries (protection and management of fishes), and Bangladesh Water Development Board (flood control, irrigation and drainage).

A Directorate of Environmental Pollution Control has been created within the Ministry of Local Government, Rural Development and Cooperatives, and an Environmental Pollution Control Board was set up in 1977 under a Government Ordinance. These two bodies are jointly responsible for formulating environmental policy and recommending improvements in the environmental legislation to the Ministry of Planning.

Organizations involved with Wetlands

a) Governmental and Semi-governmental Organizations

- Forest Department, Ministry of Agriculture (Forest Division)

Responsible for the exploitation of forests (including the Sundarbans) and protection of wildlife.

- Directorate of Fisheries, Ministry of Fisheries and Livestock

  Responsible for fisheries protection.

- Bangladesh Water Development Board, Ministry of Irrigation and Water Resources

Responsible for irrigation, drainage and flood control for agriculture.

- Revenue Department, Ministry of Land Administration and Land Reforms

The Department controls the exploitation of Government lands including rivers, haors, baors and beels. The Additional Deputy Commissioners (Revenue) collect revenue from fishing leases and temporary leases for the cultivation of wetlands during the dry season.

- Directorate of Environmental Pollution Control, Ministry of Local Government, Rural Development and Cooperatives

With the EPCB, jointly responsible for formulating environmental policy and recommending improvements in environmental legislation.

- Bangladesh Wildlife Advisory Board

The Board advises the Government and makes recommendations regarding the conservation of wildlife.

- Environmental Pollution Control Board (EPCB)

Established in 1977; assists in formulating environmental policy and makes recommendations concerning environmental legislation.

- Survey Department and Space Research and Remote Sensing Organization (SPARRSO)

The national mapping agency.

- Upazilla Councils

Responsible for the management of fisheries in water bodies of less than eight hectares in area.

- Natural History Department, Bangladesh National Museum b) Non-governmental Organizations

- Society for Conservation of Nature and Environment (SCONE)

The Society's main areas of concern are environmental education, creation of awareness to conservation problems among the public in general, and environmental pollution. It publishes a "Bulletin" with financial assistance from the Science and Technology Division of the Ministry of Education. Fifty-one Youth Science Clubs and Organizations, scattered throughout the country, are associate members of SCONE.

- Bangladesh Wildlife and Nature Conservation Society

The Society, formerly the Wildlife Preservation Society, was founded in 1972. The Vice-Chairman, Mr Fazlul Karim, is the ICBP Representative for Bangladesh.

- Wildlife Society of Bangladesh The Society, which is based at the Department of Zoology, Dhaka University, organizes seminars, educational programmes and field trips for students. It publishes a 'Wildlife Newsletter" in English and "Paribesh Parikrama in the local Bangla language.

- Bangladesh Bird Preservation Society

Based at the Department of Zoology, Dhaka University.

- Nature Conservation Movement

A newly formed organization, established to promote nature conservation, research and education. The Movement is initially focusing on wetlands, coastal and offshore islands, and reptiles.

c) Universities

- University of Dhaka
- University of Rajshahi
- University of Chittagong
- Bangladesh Agricultural University
- The Islamic University (Gazipur District)
- Institute of Life Sciences, Jahangirnagar University

WETLANDS

Site descriptions based on a report prepared for this Directory by Abdul Wahab Akonda of the Forest Department in collaboration with S.M. Abdur Rashid of the Nature Conservation Movement, Raguibuddin Ahmed and Syed Abul Kalam.

Wetland name: The Ganges- Brahmaputra Flood Plains
Country: Bangladesh
Coordinates: 22°30'-26°00'N, 88°l0'-90°45'E;
Location: the northern, central and western plains of Bangladesh from the Indian border to the northern edge of the coastal zone in Khulna, Barisal, Patuakhali and Noakhali.
Area: Approximately 650,000 ha of permanent inland waters and over 5,000,000 ha of land liable to flooding during the monsoon.
Altitude: 0-13m.
Biogeographical Province: 4.3.1.
Wetland type: 10, 11, 13, 14, 15, 17, 19 & 20.
Description of site: Two mighty rivers, the Ganges and the Brahmaputra, unite within Bangladesh to form one of the largest delta systems in the world. The flood plains of this delta cover over one-third of Bangladesh, from the extreme north and northwest of the country to the mouths of the many river channels in the south. The flood plains can be divided into three main regions: a) the northern region between the Ganges and the Brahmaputra, in Dinajpur, Rangpur, Bogra, Rajshahi and Pabna; b) the central region in Tangail, Dhaka, Comilla and Noakhali, east of the Brahmaputra, Padma and Lower Meghna; c) the main delta west of the Ganges-Padma and south to the coastal zone, in Kushtia, Jessore, Faridpur, Khulna, Barisal and Patuakhali. The oldest parts of the delta in the northern region are comparatively high with sandy soils and relatively few wetlands away from the rivers. The lower areas in the central region and main delta are dotted with numerous shallow lakes and marshes, and are subject to extensive flooding every rainy season.

The wetlands of the flood plains include rivers, irrigation canals, seasonally flooded cultivated plains, freshwater lakes and marshes (baors and beels), small water storage reservoirs and fishponds. The major rivers are the Brahmaputra-Jamuna, Ganges-Padma and Meghna, and their various tributaries and distributaries such as the Tista, Karatowa, Atrai, Mahananda and Dhaleswari. The Lower Meghna, the largest river in Bangladesh, is the joint stream of the Padma, Meghna and Dhaleswari rivers, all three of which are about 5 km in width along their lower courses. In addition to the major rivers, there are hundreds of smaller meandering seasonal creeks, muddy channels (khals) and irrigation canals which in some regions, such as Patuakhali and Barisal, form an intricate maze across the plains. The larger rivers, particularly the Padma and Jamuna, contain numerous low-lying islands (chars) which are continually being accreted and eroded as the river channels change their course.

Vast areas of the low-lying alluvial plains between the major rivers are flooded during the rainy season. The floodwaters remain for a minimum of two months to a maximum of five months. As the water level recedes, most of the exposed land is cultivated for rice and jute.

In the moribund delta in Kushtia, Jessore and Faridpur, there are numerous freshwater lakes, mainly of the oxbow type, in old river channels. These lakes, which are known as baors, generally retain water throughout the year, and range in size from about 50 ha to 1,300 a. The

principal baors are Ata Danga (site la), Sagarkhali, Jeleshwor, Bokor, Thampar, Khedapara, Rampur, Pathanpara, Katgarar, Jogini-Bhagini, Ichamati, Baluborer, Joydia, Marjat, B uk hona, Harina and Arol.

Away from the rivers, the most important natural wetlands of the flood plain are beels. These are saucer-shaped depressions, which usually retain water throughout the year. They flood in the rainy season to form shallow lakes, and then, as the water level recedes, become overgrown with sedges and other marsh vegetation. Most beels remain marshy throughout the dry season, but some dry out completely in March and April. There are more than one thousand heels in the country, ranging in size from a few hectares to many thousands of hectares. The principal beels are as follows:

1. Tagrai, Lunikpur and Bara beels in Rangpur.

2. Raktadaha, Nurail, Keshpathar, Sat and Gobarahapa beels in Bogra.

3. Bhatia, Boro Mirzapur, Paticola, Chakchaki, Sabul, Ghugri, Kanchon, Manda, Utrail, Siddheshwar, Ghona, Hilna, Kumari, Shona, Bagrimli, Anjum, Maeshi, Augra, Podda, Shewti, Gondi, Parul and Shonarkanda beels in Rajshahi.

4. Chalan Beel in Sirajganj, Bogra, Natore and Pabna.

5. Chala, Purba, Madhnagar, Piprul, Dangapara, Laror, Tajpur, Niala, Majhgaon, Briasho, Choumohan, Satail, Khardaha, Darikushi, Kazipara, Ganja, Barn Sonapatila, Ghugudanga, Kuralia, Chiral, Dishki and Gurka beels in Pabna.

6. Kamaladaha, Chakli, Taleria, Jhonja, Boalia, Malar and Jaleswar beels in Kushtia.

7. Danthbhanga, Boyra, Shahapur, Dakatia Pabla, Bakar, Boro, Kola, Patla, Baronal and Srirampur beels in Jessore.

8. Katli, Nalua, Chatal, Moura, Nagarkanda, Kazlidanga, Baghila, Atadanga, Chanda, Pathram, Ujan, Digra, Ishwordi, Rothnoranga, Harhora, Ghazorai, Soladanga, Patnidanga, Kosmera, Pabania, Gopalpur, Bashor, Kajalis, Ramshil Dighi, Boghia, Janjhania, Tungi, Dopura, Deulbari, Poddo, Dumaria, Satla, Ashkar, Suga, Baldia and Harta beels in Faridpur.

9. Anal, Satarkul, Belai, Kalma and Kuthabari in Dhaka.

10.Buroli, Hatia, Kahla, Fada, Horkhar, Gogra, Sandipa, Bayeshakaha, Shafla, Belanga, Shahzadpur, Hagh, Languhia and Satbaria beels in Comilla and Noakhali.

In addition to the baors and beels, there are over 117,000 ha of small water storage reservoirs (tanks) and fish ponds, with an average size of about 0.11 ha. Almost all of the tanks and ponds are fished, and some 55% are used for fish culture.

One of the most interesting baors, Ata Danga Baor, and Chalan Beel are described separately below (sites in & ib).

Climatic conditions: Subtropical monsoonal climate with three seasons: a mild, dry winter from November to February; a pre-monsoon period of thunderstorms from March to May; and a hot, humid monsoon season from June to October. Temperatures in winter range from a minimum of 7.2-12.8°C to a maximum of 23.9-31.1°C. During the monsoon, the maximum temperature is usually about 36-37°C, but temperatures in excess of 40°C have been recorded in some areas. The average annual rainfall varies from about 1,200 mm in the northwest to over 2,700 mm on the coast. The heavy monsoon rains, which begin in early June and continue to mid October, account for about 80% of the total rainfall. The relative humidity ranges from a low of 75% in February and March to a high of 85% in June, July, August and September.

Principal vegetation: The floral composition is relatively uniform throughout the riverine marshes, beels, baors and tanks, but the dominance varies seasonally. The most abundant aquatic plants are *Pislia stratiotes, Lemna minor, L. pausicostata, Eichhornia spp, Trapa bispirosa, Nasturtium palustre, Lepidium sativum, Vallisneria spiralis, Nymphaea spp, Euryale lerox, Aldrovenda vesiculosa, Jpomoea spp, Eliydra flucluosa, Sagitiaria spp, Polenlilla SPA Geum spp, Ranunculus aqualilis, Menyanthes spp, Utricularia spp, Hottonia spp, Polygonum amphibium, Alisina spp, Potamogelon spp, Butomus* spp and *Hydrocharis* spp. Reed-beds and grassy marshes around beds and along river banks are dominated by *Saccharum spp, Arundo sp, Arundinaria sp, Phragmites spp, Erianthus ravanae, Andropogon contortus, Thysanoleana maxima and Ammophila arenaria.* Other common aquatic plants include species of *Cyperus, Eleocharis, Scirpus, Fimbristylis, Panicum, Oryza, Hygrorhiza, Paspalum, Setaria, Hydrilla, Ottelia, Nechamandra, Spirodela, Monochoria, Alternanthera, Polycarpacea, Nymphoides, Ceratophyllum, Eclipta* and *Myriophyllum,* along with numerous algae.

The flood plains are intensively cultivated, and little natural vegetation remains. The principal crops are rice *Oryza sativa, jute Corchorus spp, Lathyrus sativus, Lens culinaris, Brassica unca, Phaseolus aureus* and *Phaseolus mungo.* The commonest fruits and vegetables are *Carica papaya, Ananassa sativa, Solanum melongena, Solanum tuberosum, Lablab sp* and *Brassica spp.* Trees and shrubs around the villages include *Mangifera spp, Artocarpus heterophyllus, Azadirechta spp, Musa spp, Syzigium cumini, Bambusa spp, Zizyphus spp, Albizzia spp, Cocos nucifera, Phoenix sylvestris, Areca catechu, Ficus spp* and *Dalbergia sissoo.*

Land tenure: The great majority of beels, baors, rivers and canals are owned by the Government, although some of the beels are jointly owned by the Government and private individuals. The flood plains are mainly private agricultural land.

Conservation measures taken: No protected areas have been established in the wetlands north of the coastal zone.

Conservation measures proposed: A request has been made to the Government that all the nesting sites and habitat of the endangered Gharial *Gavialis gangeticus* in both the Padma and Jamuna River systems be safeguarded, and that an artificial breeding and rearing centre be established at Rajshahi.

Land use: Fishing is the main activity in the wetlands and is very intensive. It is practiced under a system of lease/auction from the Government or government agencies. Beel fisheries can be divided into three categories on the basis of intensity of fishing: a) fishing permitted every year; b) fishing permitted every other year; and c) fishing permitted once in every three years. Carp have been stocked in many of the larger baors and beels. The most successful

attempt to increase productivity of large water bodies has been the Oxbow Lake Fishery Project in Jessore. A large hatchery has been completed, and in one baor of 281 ha, productivity has been increased to 900 kg/ha/year (1984/85).

The margins of the beels, baors and rivers are leased on an annual basis for the cultivation of rice, while higher lands owned by the Government are sometimes leased on an annual basis for the cultivation of wheat. Low-lying lands under private ownership are used almost exclusively for the cultivation of rice, while the higher lands nearer to the villages are used for growing potatoes and other vegetables.

During the dry season, large numbers of domestic livestock, mainly cattle and buffalo, graze in the wetlands. These are often brought from considerable distances and remain with their herders at the wetlands throughout the dry season. The marsh grasses and other aquatic vegetation are harvested for fodder; various herbs and trees, especially *Xanthium, Barringtonia, Pongamia* and Ficus, are cut for firewood, and grasses and reeds are used as building materials and in cottage industries. In recent years, aquatic plants have been gathered for use as fertilizers.

The elaborate network of rivers and canals provides a major transportation and communication system used by countless steamers, launches and smaller vessels. The wetlands also provide a year-round source of water for irrigation and domestic water supply.

Disturbances and threats: Most of the baors, beels and shallow channels of the Ganges-Brahmaputra flood plains have already been converted into agricultural land. The intensity of fishing has increased to levels at which over-exploitation is becomimg a problem. Small beels are being drained annually to increase catches, and this is increasing the rate of sedimentation. In the larger beels, fishing levels are set by the Fisheries Department, and in general, fishing is permitted only once in every three years. In wetlands reserved by the Fisheries Department for research purposes, the fishing is carried out as scheduled by the authorities. However, in most other wetlands, the regulations are ignored and fishing is carried out every year. As a result, fish populations are decreasing in many areas.

Severe soil erosion in the water catchment areas of all the great rivers has resulted in greatly increased rates of siltation, and this has now become a serious problem at many of the wetlands. At the same time, flash floods have become a common phenomenon and these now cause considerable damage to rice paddies at the beginning of every monsoon season.

Wildlife populations have suffered very badly from the great increase in human population and destruction of natural wetland habitat in recent decades. Many species of mammals, birds and reptiles have become rare and in some cases extinct in Bangladesh, and the large concentrations of waterfowl which occurred as recently as thirty years ago have all but disappeared.

Economic and social values: The flood plain wetlands contribute directly to the economy of the country by supporting major fisheries and rice-growing industries, providing water for irrigation and domestic use, and providing rich grazing land and fodder for domestic livestock. They also act as reservoirs for surplus flood waters during the monsoon, and thereby reduce the ravages of the annual floods. The total fish production in the inland fisheries of Bangladesh in the year 1984/85 was over 586,000 metric tonnes, a large proportion of this coming from the wetlands of the Ganges- Brahmaputra flood plain. In the past, there were extensive forests of *Barringtonia* around many of the beels, and these provided an important source of firewood for local villagers. However, most of these forests have now been cleared, and today the villagers rely mainly on the aquatic vegetation and

herbs growing around the *beds* for firewood. The wetlands are of value for tourism, particularly during winter when concentrations of waterfowl can create an impressive spectacle, arid also provide important opportunities for scientific research and conservation education.

Fauna: The wetlands support an extremely rich and diverse fish fauna. The indigenous species of greatest economic value are *Catla catla, Labeo rohita, L. calbasu* and *Cirrhina mrigala.* Other common species in the rivers, boars and beels include *Labeo gonius, Wallago attu, Mystus aor, M. tengra, M. vittatus, Anabas testudineus, Clarius batrachus, Heteropnuestes fossilis, Tor tor, Amblypharyngodon mola, Pangasius pangasius, Nandus nandus* and species of *Puntius, Channa, Notopterus, Hilsa, Barilius, Oxygaster, Chela, Danio* and *Eleotris.* A variety of exotic carp species are now being introduced into the wetlands, notably *Hypophthalrnichthys molitrix, Ctenopharyngodon idella, Cyprinus carpio* and to a lesser extent *Aristichihys nobilis and Mylopharyngodon piceus.* The wetlands also support very large populations of the commercially important freshwater shrimp *Macrobrachium rosenbergii.*

The flood plain wetlands provide habitat for a great diversity of both resident and migratory waterfowl. The region was formerly an extremely important wintering area for migratory ducks and geese; flocks of 1,000 or more *Anser anser,* hundreds of *Tadorna ferruginea* and tens of thousands *of* other ducks were reported in the 1960s. *Dendrocygna javanica* was abundant, and other resident ducks such *as Dendrocygna bicolor, Sarkidiornis melanotos* and Nettapus *coromandelianus* were common. In recent years, however, numbers have decreased dramatically, and the larger species such as *Anser anser, Tadorna ferruginea and Sarkidiornis melanotos* have all but disappeared. *D. javanica* and *N. coromandelianus* remain common residents, and large numbers of wintering ducks are still to be found in some areas, the commonest species being *Anas acuta* and *A. querquedula.* Other common ducks include *Anas strepera, A. crecca, A. poecilorhyncha, A. clypeata, Aythya ferina, A. nyroca* and *A. fuligula,* Major concentrations are still to be found on the well protected artificial lakes within the enclosure of Dhaka Zoological Gardens. Over 10,000 ducks were reported in January and February 1987, including:

7,600 *Dendrocygna javanica*
2,600 *Anas acuta*
30 *A. crecca*
40 *A. quequedula* and small numbers of *Aythya nyroca* and *A. fuligula.*

Several species of Ardeidae, such as *Ixobrychus cinnamomeus, Ardeola grayii, Buhulcus ibis,Egretta garzetta* and *E. alba,* remain common in the delta, but the only known breeding colony *of Nycticorax nycticorax* (at Ruhitpur, 12 km southwest of Dhaka City) is declining rapidly. The population was estimated at 500 birds in April 1979, but only 150 birds were located in March 1984, and only 30 in October 1987. The storks *Ciconia episcopus* and *Leptoptilos javanicus* and the ibis *Threskiornis melanocephalus* are now only occasional visitors in very small numbers.

Other common residents include *Tachybaptus ruficollis, Phalacrocorax niger, Anhinga melanogaster, Amaurornis phoenicurus, Gallicrex cinerea, Porphyrio porphyrio, Fulica atra, Hydrophasianus chirurgus, Metopidius indicus, Rostratula benghalensis, Glareola lactea, Vanellus indicus, V. spinosus, V. malabaricus, Gelochelidon nilotica, Sterna aurantia, S. melanogaster* and *S. albifrons.* Many species of shorebirds occur on migration and in winter.

The most abundant are *Vanellus cinereus, Pluvialis dominica, Charadrius dubius, C. alexandrinus, Numenius phaeopus, N. arquata, Limosa limosa, Tringa totanus, T. nebularia, T. ochropus, T. glareola, Actitis hypoleucos, Gallinago stenura, G. gallinago, Calidris minuta, C. temminckii, C. ferruginea* and *Philomachus pugnax.* Common wintering gulls and terns include *Larus brunnicephalus* and *Chlidonias hybrida.*
Several species of birds of prey, such as *Haliastur indus, Haliaeetus leucoryphus, Icthyophaga* ichthyaetus, Spilornis cheela and *Circus aeruginosus,* are associated with the wetlands, but their populations are declining, and only one pair of *H. leucoryphus* is now known to nest outside the Sundarbans.
The Ganges Dolphin *Platanista gangeticus* remains common in all the major rivers. Other mammals include the Smooth-coated Otter *Lutra perspicillata, Canis aureus, Vulpes bengalensis, Felis viverrina* and *Herpestes spp.*
The endangered Gharial *Gavialis gangeticus* still occurs in very small numbers in the Padma and Jamuna Rivers. Five individuals were reported along the Padma between Godagari and Sardah in 1984/85, and a few individuals are known to survive between Tista and Nagarbari on the Jamuna. The total population is believed to be less than 20 individuals, and may be as few as 8-10. Nesting is thought to have occurred in the late 1970s on an accreting island (Char Dia Khidirpur) in the Padma near the border with India. The Marsh Crocodile or Mugger *Crocodylus palustris* is now thought to be extinct in the wild in Bangladesh.
Special floral values: No information.
Research and facilities: A considerable amount of fisheries research has been carried out, but no systematic study has been made of the wetland ecosystems and the documentation of the region's fauna and flora has been fragmentary.
References: Anon (1981 & 1985a); Chowdhury (1986); Forest Department (1974 & 1976); Groombridge (1982); Husain & Sarker (1984); Islam (1983); Karpowicz (1985); Maltby (1986); Rashid & Khan (1986); Reza Khan (1982 & 1985); Sarker *et al.* (1984); Savage & Abdulali (l97O) Shafi & Quddus (1982); Tsai & Au (1984); van der Yen (1987).
Criteria for inclusion: 123.
Source: Abdul Wahab Akonda.

Wetland name: Ata Danga Baor
Country: Bangladesh
Coordinates: 23°18'N, 89°50'E;
Location:2 km south of the Headquarters of Muksudpur Upazilla, Gopalganj District, Faridpur.
Area: 102 ha.
Altitude: c.7m.
Biogeographical Province: 4.3.1.
Wetland type: 13, 19 & 20.
Description of site: A freshwater marsh and seasonal lake in a dead arm of the Padma River, connected to the river by a narrow canal. During the rainy season, the wetland floods to form a shallow lake about 3m deep; during the dry season, the water level drops by 2m and only the central portion remains flooded. Several dams and canals have been constructed for irrigation and drainage purposes.

Climatic conditions: Subtropical monsoonal climate with an average annual rainfall of 1,900 mm. The temperature at Faridpur normally varies between a maximum of 34.7°C and a minimum of 11.9°C.
Principal vegetation: The aquatic vegetation includes *Eichhornia crassipes* and species of *Pistia, Sagittaria, Cryptoryne, Ceratophyllum* and *Hydrilla.* Dominant plants in adjacent areas include *Cocos nucifera, Mangifera indica, Syzigium spp, Phoenix sylvestris, Musa spp, Barringtonia acuatangula* and *Bambusa spp.*
Land tenure: The wetland is partly state owned and partly privately owned; surrounding areas are privately owned.
Conservation measures taken: None.
Land use: Fishing; cultivation of rice and jute during the dry season.
Disturbances and threats: Intensive agriculture and fishing activities are causing a siltation problem in the wetland.
Economic and social values: The local inhabitants gain considerable benefit from fishing and cultivation at the wetland.
Fauna: Freshwater shrimps of the genus *Macrobrachium* are common. The fish fauna includes *Mystus spp, Channa spp, Oampok pabda, Wallago attu, Clarius batrachus, Heteropnuestes fossilis*, *Anabas* spp and *Colisa* spp. Waterfowl observed during a census in January 1987 included 190 *Phalacrocorax niger, 180* herons and egrets of five species, mainly *Ardeola grayii, Bubulcus ibis* and *Egretta garzetta,* and small numbers of *Threskiornis melanocephalus, Dendrocygna javanica, Metopidius indicus, Vanellus indicus, Actitis hypoleucos and Gallinago gallinago.* Other waterfowl recorded at the lake include *Ixobrychus cinnamomeus, Ardea cinerea* and *Gallicrex cinerea.* Mammals and reptiles include the Clawless Otter *Aonyx cinerea,* a variety of freshwater turtles and tortoises, and several snakes such as *Xenochrophis* spp and *Atretium spp. A* few individuals of the endangered Gharial *Gavialis gangeticus* have occurred in the baor in recent years, the animals entering the wetland through the channel from the Padma River.
Special floral values: None known.
References: van der Yen (1987).
Criteria for inclusion: lb.
Source: Raguibuddin Ahmed and Abdul Wahab Akonda.

Wetland name: Chalan Beel
Country: Bangladesh
Coordinates: 24°23'-24°35'N, 89°05'-89°18'E;
Location: about 50 km west of Sirajganj, in the Upazillas of Singra and Gurudashpur (Natore), Chatmohar, Bhangura and Faridpur (Pabna), Ullapara, Raiganj and Tarash (Sirajganj), and Sherpur and Nandigram (Bogra).
Area: c.26,000 ha in the 1970s; originally 107,500 ha.
Altitude: 10m.
Biogeographical Province: 4.3.1.
Wetland type: 13, 17, 19 & 20.
Description of site: Chalan Beel was once the largest and best known of the beels in northern Bangladesh. It originally covered an area of approximately 107,500 ha, and consisted of a series of beels connected to one another by various channels to form a more or

less continuous sheet of water during the rainy season. The principal constituent beels were, from east to west, Purba Madhanagar, Piprul, Dangapara, Loror, Tajpur, Niala, Chalan, Majhgaon, Briasha, Chonmohan, Satail, Khardaha, Darikushi, Kajipara, Gajna, Bara, Sonapatila, Ghughdaha, Kuralia, Chiral, Dikshi and Gorka. The beel was formed when the old Brahmaputra changed its course into the Jamuna channel. The Jamuna impeded the flow of the Padma, thereby causing the latter to deposit sediments at the mouths of the Karatoya and Atrai rivers. The diverted flow of these two rivers created the beel. The southern edge of the bee! is flanked by the Gumani River, which carries water from the beel to the Bara Baral and eventually the Jamuna River. During the rainy season, the Gumani overflows its banks and floods the beel. The water level remains high as long as the Jamuna is in flood, but with the onset of the dry season, the greater part of the beel dries out, leaving only a small area of shallow, interconnected water bodies (not more than 2,500-3,000 ha in recent years).

The beel is rapidly silting up. During the last 150 years, the southern edge of the bee! has shifted northwards by about 20 km as a result of silt deposition by the Padma. In 1909, an investigation conducted by the Public Works Department revealed that siltation from distributaries of the Ganges had reduced the area of the bee! to 36,300 ha. Only 8,400 ha of the bee! remained under water all year round, and large areas had dried out and were under cultivation. It was calculated that about 169 million cubic feet of silt were being deposited in the beel each year, equivalent to an average rise in land surface of half an inch per year. By 1950, the permanently flooded areas of the bee! had been reduced to about 2,500 ha. Siltation is continuing at a rapid rate; an extensive but rather haphazard system of dams and embankments has been constructed for irrigation and flood control, land is constantly being reclaimed for agriculture, and new villages are springing up throughout the area. Almost the whole of the beel has now been settled and is under cultivation during the dry season. In June 1987, just prior to the onset of the monsoon, the bee! was completely dry except for some small man-made water storage reservoirs (tanks). However, the whole region continues to be flooded to a depth of 3-4 metres from August to October.

Climatic conditions: Subtropical monsoonal climate with an average annual rainfall of 1,775 mm, a mean minimum temperature of 8.2°C and a mean maximum temperature of 40.9°C.

Principal vegetation: The dominant aquatic plants include *Trapa natans, Vallisneria sp, Potamogeton sp, Enhydra sp, Utricularia* sp and *Nymphaea* spp. The terrestrial vegetation includes *Tamarix sp, Acacia nilotica, Bombax ceiba, Ficus sp, Dendrocalamus sp, Melia azadirachta, Calamus sp, Borassus flabellifer, Phoenix sylvestris, Musa* sp and *Ipornoea spp.*

Land tenure: Approximately 95% of the beel is under private ownership; the remaining 5% is state owned and under the management of the respective Deputy Commissioners (khas lands). Surrounding areas are privately owned.

Conservation measures taken: None.

Land use: Cultivation of rice and other crops.

Disturbances and threats: The major threat to the wetland is siltation. As the level of the land has risen, the area, which remains flooded throughout the year, has decreased. Embankments constructed for irrigation purposes and purportedly also for flood control are thought to increase the level of flooding during the monsoon by retarding run-off.

Economic and social values: Several villages are dependent on dry-season cultivation in the beel for their existence.

Fauna: Chalan Beel was formerly a very important wintering area for ducks, geese and shorebirds, but now that the wetland dries out in early winter, few migrant waterfowl visit the area. During the rainy season, however, the beel remains important for a wide variety of resident waterfowl. Species known to occur include *Tachybaptus ruficollis, Phalacrocorax niger, Ixobrychus sinensis, I. cinnamomeus, Nycticorax nycticorax, Ardeola grayii, Bubulcus ibis, Egretta garzetta, Ardea purpurea, A. cinerea, Mycteria leucocephala, Anastomus oscitans, Ciconia episcopus, Leptoptilos javanicus, Threskiornis melanocephalus, Pseudibis papillosa, Plegadis falcinellus, Dendrocygna javanica, D. bicolor, Nettapus coromandelianus, Amaurornis phoenicurus, Gallicrex cinerea, Gallinula chloropus, Porphyrio porphyrio, Hydrophasianus chirurgus, Metopidius indicus* and *Rostratula benghalensis.* No information is available on the other fauna of the beel.
Special floral values: None known.
Criteria for inclusion: Ib, 3b.
Source: Abdul Wahab Akonda and Syed Abul Kalam.

Wetland name: The Haor Basin of Spinet and eastern Mymensingh
Country: Bangladesh
Coordinates: 24°05'-25°12'N, 90°35'-92°20'E;
Location: wetlands scattered throughout Sunamganj, Sleet and Moulavi Bazaar Districts, Spinet, and in neighbouring Netrakona District, Mymensingh.
Area: Area of wetlands unknown; the entire basin is about 1,000,000 ha in extent.
Altitude: c.5m.
Biogeographical Province: 4.3.1.
Wetland type: 11, 13, 14, 15, l9&20.
Description of site: The Haor Basin of Sleet and eastern Mymensingh comprises a vast alluvial plain with a mosaic of wetland habitats including numerous rivers, streams and irrigation canals, large areas of seasonally flooded cultivated plains, and hundreds of shallow freshwater lakes and marshes (haors and beels). The basin is bounded to the north by the hill ranges of Meghalaya, to the south by the hills of Tripura and Mizoram, and to the east by highlands of Manipur. The numerous rivers rising in these hills provide an abundant supply of water to the plains and cause extensive flooding during the monsoon season. The drainage is southwest via the Surma and Kalni rivers into the Meghna River and Bay of Bengal.
The haors, from which the region takes its name, are back swamps or bowl-shaped depressions between the natural levees of a river, or in some cases, much larger areas incorporating a succession of these depressions. The haors flood to a depth of several metres during the rainy season, and in many cases two or more neighbouring haors link up to form large water bodies. During the dry season, most of the water drains out leaving a single shallow lake or a series of small isolated ponds often known as beels. Beels are also shallow, saucer-shaped depressions, which become overgrown with aquatic vegetation or dry out completely during the dry season. As the water level recedes during the dry season, rich alluvial soils are exposed around the margins of the haors and beels, and these are extensively cultivated for rice.
The Haor Basin contains about 400 haors and beels varying in size from a few hectares to many thousands of hectares. The principal systems are as follows:

1. Baram, Banka, Habibpur, Maka and Makalkandi haors (which unite to form a single large water body during the rainy season), the Ghulduba haors, and Ranga and Baudha beels; in the eastern and lowest part of the basin (Mymensingh).

2. Tanguar, Sanir and Matian haors in the deep northern basin at the foot of the Meghalaya Hills. These haors link up during the rainy season.

3. Dekhar Haor, Pathar Chanli Haor, and the Jhilkar and Jhinkar haors, to the east of the Tanguar system.

4. The Jamaikata, Mahai, Nalua and Parua haor system, on the eastern rim of the basin.

5. Hakaluki, Chatal Bar, Haila, Kawadighi, Pagla and many smaller haors, in the central Sleet lowlands.

6. Oail Haor, between the Tarap and Bhanugach hill ranges in the southeast.

7. Dingapota, Ganesher, Tolar, Anganer, Bara and Humaipur haors, in the south of the basin.

8. Khaliaghuri Haor, east Mymensingh.

9. Etna Haor and Sania Haor, Kishorganj District.

10.Bhatipara Haors; a group of three haors in the Sunamganj-Sleet area, under private ownership and management both for fishing and bird hunting and netting.
The haor basin of Sleet and Mymensingh is a wetland ecosystem of outstanding international importance. The lakes, beels and ponds support major subsistence and commercial fisheries, the seasonally flooded lake margins support a major rice-growing industry, and the abundant aquatic vegetation provides rich grazing for domestic livestock and a source of fuel and fertilizers for the local people. The wetlands are home to a very wide variety of resident and migratory waterfowl, including perhaps as many as 100,000 to 150,000 ducks, and provide a refuge for many other species of wildlife, which are becoming increasingly rare elsewhere in Bangladesh.
Ten of the most important haors and beels are described separately below.

Wetland name: Meda Beel
Country: Bangladesh
Coordinates: 25°03'N, 90°55'E;
Location:in Kalmakanda Upazilla, 25 km northeast of Netrakona, Netrakona District, Mymensingh.
Area: 122 ha.
Altitude: 5m.
Biogeographical Province: 4.3.1.
Wetland type: 13 & 19.

Description of site: A perennial freshwater lake and marsh, formed as an oxbow lake. The water level fluctuates according to the season, the depth varying from a maximum of 3m during the rainy season to a minimum of lm during the dry season.
Climatic conditions: Subtropical monsoonal climate with an average annual rainfall of approximately 4,000 mm. Temperatures at Mymensingh normally vary between a maximum of 33.8°C and a minimum of 11.9°C.
Principal vegetation: The aquatic vegetation includes species of *Hydrilla, Potamogeton, Vallisneria, Trapa, Typha, Nymphaea, Euryale* and *Polygonum,* and *Eichhornia crassipes, Xanthium indicum, Vitex negundo, Strablus asper* and *Lippia gemminata.* Dominant plants in adjacent areas include *Barringtonia acuatangula, Pongamia pinnata, Trewia polycarpa, Erythrina spp, Mangifera indica, Bambusa* spp and *Musa spp.*
Land tenure: State owned (Government of Bangladesh); the use of the wetland is under the control of a local government agency (Additional Deputy Commissioner, Revenue). Surrounding lands are privately owned**.**
Conservation measures taken: None.
Land use: The heel is open to fishing once in every three years. Surrounding areas are under cultivation, mainly for rice.
Disturbances and threats: Sedimentation is a serious problem and the beel is rapidly silting up.
Economic and social values: The heel has been an important fishing area since time immemorial, providing food and a source of income for the local people.
Fauna: The freshwater shrimp *Macrobrachium binmanieus* and the fishes *Labeo rohita, L. gonius, Channa spp, Puntius spp, Wallago attu, Catla catla, Anabas* spp, and *Heteropnuestes fossilis* are common. Waterfowl include *Tachybaptus ruficollis, Phalacrocorax niger, Bubulcus ibis, Egretta garzetta, Anastomus oscitans, Leptoptilos javanicus, Dendrocygna javanica, Nettapus coromandelianus, Anas crecca, A. acuta, Gallicrex cinerea, Porphyrio porphyrio and Metopodius indicus.* Mammals known to occur in the area include the otters *Lutra lutra* and *L. perspicillata, Canis aureus, Vulpes bengalensis, Viverricula indica, Paradoxurus herrnaphroditus* and *Herpestes* spp; reptiles include monitor lizards *Varanus* spp and a variety of snakes, freshwater turtles and tortoises.
Special floral values: None known.
References: Rashid (1987).
Criteria for inclusion: lb. 3b.
Source: Abdul Wahab Akonda and Syed Abul Kalam.

Wetland name: Tanguar Haor
Country: Bangladesh
Coordinates: 25°06'-25°11'N, 91°01'-91°06'E;
Location: 10 km northwest of the Headquarters of Tahirpur Upazilla and 30 km WNW of Sunamganj, Sunamganj District, Sleet.
Area: 1,566 ha.
Altitude: 5m.
Biogeographical Province: 4.3.1.
Wetland type: 13, 15 & 19.

Description of site: A complex of over 46 beels, the most important of which are Bherbaria, Rupabhuri, Lechna Mara, Puran Chatal and Tekunia Beels. The beels are interconnected with one another through narrow canals. During the rainy season, the entire wetland is inundated and the beels merge into a single, large body of water. The maximum depth of water in the beels varies from approximately 6-8m during the rainy season to 2-6m during the dry season.
Climatic conditions: Subtropical monsoonal climate with an average annual rainfall of approximately 4,000 mm. Temperatures at Syihet normally vary between a maximum of 31.2°C and a minimum of 12.3°C.
Principal vegetation: The aquatic vegetation includes species of *Hydrilla, Vallisneria, Potarnogeton, Blyxa, Utricularia, Najas, Nitella, Nymphaea, Trapa, Ottelia, Polygonum* and *Phragmites,* along with *Hygrorhiza aristata, Eichhornia crassipes, Hemarthria protensa, Ipomoea crassicaulis, Lippia gemminata, Strablus asper* and *Crataeva nurvula.* Plant communities in adjacent areas include *Barringtonia acuatangula, Pongamia pinnata, Crataeva nurvula, Trewia polycarpa, Mangifera indica* and species of *Erythrina, Calamus* and *Musa.*
Land tenure: The wetland is owned by the Government (khas land), and is under the control of a local government agency (Additional Deputy Commissioner, Revenue). Surrounding areas are privately owned.
Conservation measures taken: The wetland has been earmarked by the Forest Department for the establishment of a Wildlife (Bird) Sanctuary. The wetland is at present being managed for nine years under a fishery development scheme.
Conservation measures proposed: There is a proposal to extend the management of the wetland under the fishery development scheme for twenty years. The long-term objective of the scheme is to develop the wetland into a major fish-breeding centre, while at the same time conserving the natural fauna and flora of the region, and particularly the migratory waterfowl. The scheme includes plans to develop facilities for nature-oriented tourism.
Land use: The principal activity is fishing. Trees and reeds *(Phragmites)* growing on embankments and higher ground around the beels are collected during the dry season and used for cooking and thatching materials. Fallow lands are used for grazing. In some cases, the edges of the beels are leased for one year periods for the cultivation of wheat. Surrounding areas are under cultivation, mainly for rice.
Disturbances and threats: Fishing activities cause some disturbance to waterfowl populations.
Economic and social values: Tanguar Haor supports one of the largest fisheries in the country. In the current nine-year fishery development scheme, the net profit is estimated at 300 million Takas. The local people are dependent on the fishery and agricultural production of the wetland for their livelihood.
Fauna: The economically important fishes include *Labeo rohita, L. calbasu, L. gonius, Puntius spp, Anabas testudineus, Clarius batrachus, Heteropnuestes fossilis, Channa spp, Wallago attu, Catla catla, Mystus aor, M. tengra* and *Tor spp.* Freshwater shrimps of the genus *Macrobrachium* are also harvested. A very wide variety of waterfowl has been recorded, including almost all of the Anatidae known to occur in Bangladesh. Tens of thousands of ducks were reported to winter in the area in the 1960s, but numbers have declined in recent years. The most abundant species are *Dendrocygna javanica, Nettapus coromandelianus, Anas poecilorhyncha, A. acuta, Aythya ferina, A. nyroca* and *A. fuligula.* Other common species of waterfowl include *Tachybaptus ruficollis, Phalacrocorax niger,*

Egretta garzetta, E. intermedia, E. alba, Ardea cinerea, Gallicrex cinerea, Porphyrio porphyrio and *Fulica atra.* Mammals include the otters *Lutra lutra* and *L. perspicillata, Vulpes bengalensis, Canis aureus* and *Herpestes spp.* Reptiles include snakes of the genera *Amphiesma, Rhabdophis, Xenochrophis, Atretium, Enhydris,* monitor lizards *Varanus spp,* freshwater turtles and tortoises.
Special floral values: None known.
Research and facilities: Preliminary studies have been carried out on the fisheries, fauna and flora of the haor, but no detailed research has been conducted.
References: Savage (1970).
Criteria for inclusion: lb. le, 3a.
Source: Abdul Wahab Akonda and S.M. Abdur Rashid.

Wetland name: Aila Beel
Country: Bangladesh
Coordinates: 24°52'-24°54'N, 91°12'-91°13'E;
Location:in Jamalganj Upazilla, 25 km southwest of Sunamganj, Sunamganj District, Sleet.
Area: 160 ha.
Altitude: 5m.
Biogeographical Province: 4.3.1.
Wetland type: 13, 15 & 19.
Description of site: A perennial freshwater marsh (beel) which floods in the rainy season to form a shallow lake. The maximum depth of water varies from about 5m during the rainy season to lm during the dry season.
Climatic conditions: Subtropical monsoonal climate with an average annual rainfall of approximately 4,000 mm. Temperatures at Sleet normally vary between a maximum of 31.2°C and a minimum of 12.3°C.
Principal vegetation: The aquatic vegetation includes species of *Hydrilla, Vallisneria, Utricularia, Trapa, Nymphaea, Ipomoea, Polygonum* and *Phragmites,* along with *Hygrorhiza aristata, Hemarthria protensa, Eichhornia crassipes, Ficus heterophyla* and *Lippia gemminata.* Plant communities in adjacent areas include *Barringtonia acuatangula, Crataeva nurvula, Pongamia pinnata, Mangifera indica, Trewia polycarpa, Musa spp* and *Erythrina spp.*
Land tenure: Over 60% of the wetland is privately owned and the rest is state owned; surrounding areas are privately owned.
Conservation measures taken: None.
Conservation measures proposed: The land owners wish to establish a Wildlife Sanctuary under the Bangladesh Wildlife (Preservation) (Amendment) Act, 1973, and to manage the Sanctuary for the conservation of waterfowl and other natural resources.
Land use: Fishing in every third year, and cultivation of rice on the edges of the beel during the dry season. Trees, shrubs, herbs and grasses are collected for use as cattle fodder and fuel for cooking. Surrounding areas are under cultivation, mainly for rice.
Disturbances and threats: Fishing activities cause some disturbance to waterfowl populations.
Economic and social values: Aila Beel has been an important fishery since time immemorial, and the local inhabitants are dependent on the wetland for their livelihood.

Fauna: Economically important species of fishes include *Labeo rohita, L. gonius, Wallago attu,Notopterus chitala, Puntius spp, Mystus aor, Anabas spp* and *Colisa spp.* Freshwater shrimps of the genus *Macrobrachium* are also harvested. Waterfowl include *Phalacrocorax niger, Egretta garzetta, E. alba, Ardea cinerea, Threskiornis melanocephalus, Dendrocygna javanica, Nettapus coromandelianus, Anas crecca, A. acuta, Aythya ferina, A. nyroca, Amaurornis phoenicurus, Porphyrio porphyrio* and *Fulica atra.* Mammals known to occur in the area include *Lutra lutra, L. perspicillata, Canis aureus* and *Vulpes bengalensis;* reptiles include snakes of the genera *Amphiesma, Rhabdophis* and *Atretium,* freshwater turtles and tortoises.
Special floral values: None known.
Criteria for inclusion: 1b, 3b.
Source: Abdul Wahab Akonda and S.M. Abdur Rashid.

Wetland name: Dekhar Haor
Country: Bangladesh
Coordinates: 25°03'N, 91°26'E;
Location: north of the Sleet to Sunamganj road in Sunamganj Sadar Upazilla, east of Sunamganj Town, Sunamganj District, Sleet.
Area: Over 325 ha.
Altitude: c.5m.
Biogeographical Province: 4.3.1.
Wetland type: 13, 15 & 19.
Description of site: A group of several small freshwater ponds and marshes (beels) in a region of cultivated fields and villages. During the rainy season, the entire wetland is flooded by monsoon floodwater, but during the dry season, water remains only in the larger beels, which are then isolated from one another. The maximum depth of water varies from about 1 m during the dry season to 3-4m during the rainy season.
Climatic conditions: Subtropical monsoonal climate with an average annual rainfall of approximately 4,000 mm. Temperatures vary between a maximum of 39°C and a minimum of 6°C.
Principal vegetation: The aquatic vegetation includes *Hygrorhiza aristata, Eichhornia crassipes, Hemarthria protensa, Rumex polygonum, Ficus heterophyla* and species of *Blyxa*, *Hydrilla, Potamogeton, Vallisneria, Nymphaea, Trapa, Nymphoides, Pistia, Scirpus* and *Ipomoea.* Plant communities in adjacent areas include *Barringtonia acuatangula, Crataeva nurvala, Pongamia pinnata, Trewia polycarpa, Erythrina spp, Calamus spp, Mangifera indica, Bambusa* spp and *Cocos nucifera.*
Land tenure: Part of the wetland is owned by the Government (khas land); the management and use of this land are under the control of a government agency (Additional Deputy Commissioner, Revenue). The remainder of the wetland and surrounding areas are privately owned.
Conservation measures taken: The Forest Department has earmarked the wetland as a site for the conservation of waterfowl.
Land use: Fishing and cultivation of rice. Fishing rights are leased from the Additional Deputy Commissioner (Revenue), Sunamganj District, and the Chairman, Upazilla Parishad,

Sunamganj Sadar Upazilla. The edges of the beels are used for rice-growing during the dry season. Surrounding areas are under cultivation for rice.
Disturbances and threats: Fishing and agricultural activities cause a considerable amount of disturbance to waterfowl populations, and over-fishing may be a problem.
Economic and social values: The local people are dependent on the fishery and agricultural production of the wetland for their livelihood.
Fauna: Fishes of economic importance include Oampok *pabda, Heteropnuestes fossilis*, *Clarias batrachus* and species of *Labeo, Mystus, Channa, Puntius, Anabas* and Colisa. Freshwater shrimps of the genus *Macrobrachium* are also harvested. Other wildlife known to occur in the area includes *Lutra lutra, L. perspicillata, Herpestes spp, Varanus* spp, and a variety of snakes, freshwater turtles and tortoises. No information is available on the waterfowl.
Special floral values: None known.
Criteria for inclusion: lb.
Source: Abdul Wahab Akonda and S.M. Abdur Rashid.

Wetland name: Kuri Beel
Country: Bangladesh
Coordinates: 24°56'N, 91°3l'E;
Location: to the north of the Sleet to Sunamganj road, 35 km west of Sleet Town, Sunamganj District, Sleet.
Area: 73 ha.
Altitude: c.5m.
Biogeographical Province: 4.3.1.
Wetland type: 13 & 15.
Description of site: A small freshwater lake and marsh (bee!) with one small island in the centre. The lake is permanent but water levels fluctuate widely according to season. The maximum depth during the dry season is 3m.
Climatic conditions: Subtropical monsoonal climate with an average annual rainfall of approximately 4,000 mm. Temperatures at Sleet normally vary between a maximum of 31.2°C and a minimum of 12.3°C.
Principal vegetation: The relatively sparse aquatic vegetation includes *Eichhornia crassipes* and species of *Hydrilla, Vallisneria, Potamogeton* and *Nymphaea.* Plant communities in adjacent areas include *Barringtonia acuatangula, Crataeva nurvala, Trewia polycarpa, Calarnus spp, Pongamia pinnata, Erythrina spp, Mangifera indica* and *Bambusa spp.*
Land tenure: The wetland is owned by the Government and under the control of a local government agency (Additional Deputy Commissioner, Revenue); surrounding areas are privately owned.
Conservation measures taken: None.
Land use: Fishing by local people for personal consumption or sale in local markets. The beel is open to fishing every year. Surrounding areas are under cultivation, with rice as the main crop. *Calamus* is harvested for the manufacture of furniture.
Disturbances and threats: Fishing activities cause some disturbance to waterfowl populations. Economic and social values: The fishery is of considerable importance in the local economy.

Fauna: Economically important fishes include *Wallago attu, Mystusaor, M. tangra, Oampok pabda* and species of *Puntius, Channa, Colisa* and *Labeo.* Freshwater shrimps of the genus *Macrobrachium* are also harvested. Waterfowl include *Phalacrocorax niger, Egretta garzetta,Dendrocygna javanica, Nettapus coromandelianus* and *Anas acuta.* Other fauna includes *Lutra sp, Canis aureus* and *Vulpes bengalensis.*
Special floral values: None known.
Criteria for inclusion: lb.
Source: Abdul Wahab Akonda.

Wetland name: Erali Beel
Country: Bangladesh
Coordinates: 24°5l'N, 92°03'E;
Location: 6 km southeast of the Headquarters of Golapganj Upazilla and 18 km ESE of Sleet, Sleet District, Sleet.
Area: 320 ha.
Altitude: c.5m.
Biogeographical Province: 4.3.1.
Wetland type: 13 & 15.
Description of site: A freshwater lake and marshes (bee!) in undulating country, with villages on all sides. The lake is permanent and has a depth of about 5m during the rainy season.
Climatic conditions: Subtropical monsoonal climate with an average annual rainfall of approximately 4,000 mm. Temperatures at Sleet normally vary between a maximum of 31.2°C and a minimum of 12.3°C.
Principal vegetation: The aquatic vegetation includes *Eichhornia crassipes* and species of *Hydrilla, Vallisneria, Potamogeton* and *Utricularia.* Plant communities in adjacent areas include *Bambusa spp, Artocarpus heterophyllus, A. chaplasha, Mangifera indica, Musa spp, Drosera* sp and *Cocos nucifera.*
Land tenure: The lake is owned by the Government and under the control of a local government agency (Additional Deputy Commissioner, Revenue). Surrounding areas are privately owned.
Conservation measures taken: None.
Land use: Fishing, which is permitted on an annual basis. Surrounding areas are under cultivation.
Disturbances and threats: None known.
Economic and social values: The lake supports a locally important fishery and provides water for the irrigation of adjacent agricultural land.
Fauna: Economically important fishes include *Oampok pabda, Amblypharyngodon mola, Wallago attu* and species of *Puntius, Labeo, Colisa* and *Channa.* Freshwater shrimps of the genus *Macrobrachium* are also harvested. Waterfowl include *Tachybaptus rujicollis, Podiceps cristatus, Phalacrocorax niger, Ardeola grayii, Bubulcus ibis, Egretta garzetta, Dendrocygna javanica, Nettapus coromandelianus* and *Anas acuta.* Other fauna includes *Canis aureus, Vulpes bengalensis, Herpestes spp, Felis chaus* and *Varanus spp.*
Special floral values: None known.
Criteria for inclusion: lb.

Source: Abdul Wahab Akonda and Raguibuddin Ahmed.

Wetland name: Dubriar Haor
WetlandID: 2g
Country: Bangladesh
Coordinates: 24°44'N, 9l°54'E;
Location: to the west of the Syihet to Fenchuganj road, 21 km south of Syihet, Syihet District.
Area: 156 ha.
Altitude: c.5m.
Biogeographical Province: 4.3.1.
Wetland type: 13, 15 & 19.
Description of site: A group of freshwater lakes and marshes (beets) including one large beet in Bataganj Upazilla and two small beets to the east in Fenchuganj Upazitta. The eastern side of the wetland borders on several villages. During the rainy season, large areas are flooded to a depth of 3m; during the dry season, about three-quarters of the wetland dries out and the maximum depth falls to about lm.
Climatic conditions: Subtropical monsoonal climate with an average annual rainfall of approximately 4,000 mm. Temperatures at Sythet normally vary between a maximum of 31.2°C and a minimum of 12.3°C.
Principal vegetation: There is relatively little aquatic vegetation, mainly species of *Trapa and Typha.* Plant communities in adjacent areas include *Pongamia pinnata, Barringtonia acuatangula, Anthocephalus chinensis, Musa spp, Bambusa spp, Mangifera indica* and *Cocos nucifera*.
Land tenure: The wetland is owned by the Government and is under the control of a local government agency (Additional Deputy Commissioner, Revenue). Surrounding areas are privately owned.
Conservation measures taken: In 1980, Dubriar Haor was included in the schedule of the Haor Development Board (Amendment) Ordinance of 1977. The main functions of the Board were to prepare, approve and execute projects for the development of the wetlands of the country.
Land use: Fishing and cultivation. Fishing rights are leased out by the local authority. The edges of the beels are leased out on an annual basis for rice cultivation. Surrounding areas are under cultivation, with rice as the principal crop.
Disturbances and threats: Siltation is a serious threat; the level of the wetland is rising rapidly and much of it now dries out in the driest months. In January 1988, almost the whole area of the beets in Fenchuganj Upazilla was under rice cultivation.
Economic and social values: Local people are dependent on the fishery and agricultural production of the wetland for their livelihood.
Fauna: Economically important fishes include *Wallago attu, Oampok pabda* and species of *Mystus, Channa, Colisa* and *Labeo.* Freshwater shrimps of the genus *Macrobrachium* are also harvested. Waterfowl observed during a survey in January 1987 included 36 *Egretta garzetta, 52 Dendrocygna javanica,* 68 *Anas acuta* and small numbers of terns. Other waterfowl recorded at the wetland include *Phalacrocorax niger, Ardeola grayii, Bubulcus ibis* and *Egretta alba.* Mammals and reptiles known to occur in the area include *Lutra sp,*

Canis aureus, Vulpes bengalensis, Herpestes spp, and a variety of snakes, freshwater turtles and tortoises.
Special floral values: None known.
References: van der Yen (1987).
Criteria for inclusion: lb.
Source: Abdul Wahab Akonda and Raguibuddin Ahmed.

Wetland name: Hakaluki Haor
Country: Bangladesh
Coordinates: 24°35'-24°44'N, 92°O1'-92°O9'E;
Location: 30 km southeast of Syihet, Moulavi Bazar District, Syihet.
Area: 20,400 ha, including 4,440 ha of beels.
Altitude: c.5m.
Biogeographical Province: 4.3.1.
Wetland type: 13, 14, 15, & 19.
Description of site: A complex of more than 80 interconnecting freshwater lakes (beels) in a shallow basin with the Patharia and Madhab Hills to the east and the Bathera Hills to the west The most important beels are Chatla, Pinglar, Haor Khal, Chakia, Foot, Tural, Fuala, Juala, Kaiarkuna, Balijuri, Kukur Dubi, Katooa, Nirai, Baia and Chinaura. The beels are permanent, but as water levels fall during the dry season, they become isolated from one another. Land between the beels is cultivated or left fallow, and some of the beels are drained and fished in rotation. Earthen dams and embankments have been constructed around some of the beels to facilitate the management of fisheries, improvement of communications, drainage and irrigation. The major sources of water are the Juri, Kantinala and Kuiachari rivers, which traverse the wetland and drain through a single outlet, the Kushiara River. During the rainy season, the entire area is flooded, and all the beels are united in a single large lake. The maximum depth of water varies from 5-6m during the rainy season to about lm at the end of the dry season. The pH value is 5.5 in the rainy season and between 5.0 and 5.5 at other times of the year.
Climatic conditions: Subtropical monsoonal climate with an average annual rainfall of approximately 4,000 mm. Over 80% of the rain falls during the monsoon season from June to October. Temperatures at Sleet normally vary between 26°C and 31°C in the pre-monsoon period (March to May), 28°C to 31°C in the rainy season, and 26°C to 27°C in winter. Extreme temperatures in the ten-year period 1975-1984 were 6.4°C and 39.3°C.
Principal vegetation: The haor supports a rich aquatic vegetation which varies in composition from season to season and from beel to beel. In the pre-monsoon period, the margins of the beels and fallow lowlands between the beels are converted into rice paddies. The dominant aquatic plants at this time are *Salvinia cucullata, S. natans, Polygonum hydropiper, Sagittaria sagittifolia, Cyperus rotundus, C. distans* and *Luduvigia ripens.* During the rainy season, the dominant aquatic plants are *Nymphoides indica, N. cristata, Eichhornia crassipes, Pislia stratiotes, Hydrilla verticillata* and *Ipomoea acuatica.* In winter, as water levels start to fall, *Trapa natans* becomes abundant and other new species such as *Trapa bispinosa, Scirpus fistulosa* and *Cynodon dactylon* form green carpets over the bare land. Many other aquatic plants have been recorded at the wetland, including *Sagittaria guayanensis, Cyperus procerus, C. exalt atus, Eleocharis fistulosa, E. plantagiuea,*

Fimbristylis dichotoma, Panicum sp, Hygrorhiza aristata, Paspalum sp, Sataria glauca, S. sagittifolia, Vallisneria spiralis, Otielia alismoides, Nechamandra alternifolia, Lemna minor, Spirodela polyrhiza, Potamogeton crispus, Monochoria vaginalis, M. host ata, Alternanthera sessilis, Polycarpacea sp, Ceratophyllum demersum, Enhydra fluctuosa, Eclipta prostata, Myriophyllum indicum, Barringtonia acuatangula, Utricularia stellaris, Clinogyne dichotoma, Nymphaea nouchali, N. stellata, Euryale ferox, Portulaca oleraua, Lindernia sp, Torenia sp, Oenanthe bengalensis, Xanthium indicum, Ficus heterophyla, Lippia gemminata, Haliotrapicum indicum, Cleome hassleriana and *Strablus asper.* Plant communities in surrounding areas include *Barringtonia acuatangula, Crataeva nurvula, Pongamia pinnata, Trewia polycarpa, Erythrina spp, Calamus* spp and *Asperagus racemosus.*

Land tenure: The wetland is owned by the Government (khas land), and its management and use are under the control of a local government agency (Additional Deputy Commissioner, Revenue). Undulating fallow land between the beels is leased to local people for agriculture. The surrounding areas are privately owned.

Conservation measures taken: The site has been earmarked by the Forest Department for the establishment of a Wildlife (Bird) Sanctuary. There are two waterfowl protection centres supervised by the Forest Department in nearby villages.

Conservation measures proposed: At the seventh meeting of the Bangladesh Wildlife Advisory Board, it was decided that a Wildlife (Bird) Sanctuary should be established at Pingar Beel.

Land use: Fishing is the principal activity at the wetland. The large beels are fished once in every three years, the smaller beels once every year. Beels of over eight hectares in extent are leased by the District Authority (Additional Deputy Commissioner, Revenue); smaller beels (up to about 9 ha) are leased by the Chairman, Upazilla Parishad. During the dry season, the margins of the beels are used for rice-growing, and dry vegetation is collected for use as fuel for cooking. Each winter, several herds of cattle are allowed to graze throughout the marshes. Surrounding areas are under cultivation, with rice as the principal crop.

Disturbances and threats: Fishing is very intensive and over-fishing has become a problem. The periodic removal of water from the smaller beels to increase the harvest of fish has been particularly harmful. Although fishing in the larger beels is supposedly restricted to one year in three, in reality fishing takes place every year. As a result, populations of *Labeo rohita* and *L. gonius* have decreased, and *Catla catla* is now rare. Serious soil erosion in the water catchment area has resulted in increased sedimentation in the wetland, and flash floods have become a common phenomenon. Each year the floodwaters deposit large quantities of silt in the wetland; the level of the beels is rising and the entire haor is silting up rapidly. The problem is compounded by rice cultivation and fishing activities in the beels. The intensive fishing activities along with some hunting also cause a considerable amount of disturbance to waterfowl populations.

Economic and social values: Hakaluki Haor supports one of the largest inland fisheries in Bangladesh, and provides the Government with a considerable source of income. Most of the local inhabitants are in some way dependent on the wetland for their livelihood.

Fauna: Economically important fishes include *Labeo rohita, L. gonius, L. calbasu, Catla catla, Mystus aor, Wallago attu, Oampok pabda, Mystus tengra* and M. *vittatus.* Hakaluki Haor is a very important wetland for a wide variety of waterfowl, particularly Anatidae. In the 1960s, the wintering population of ducks was estimated at between 40,000 and 60,000, mainly *Anas acuta* and *Dendrocygna javanica,* with smaller numbers of *D. bicolor* (e.g. 750

in December 1967), *Nettapus coromandelianus, Anas strepera, A. crecca, A. poecilorhyncha, A. querquedula, A. clypeata, Aythya ferina, A. nyroca* and *A. fuligula.* Numbers have, however, decreased in recent years, and only 15,000 ducks were observed during a waterfowl census in January 1987. Other common species include *Tachybaptus ruficollis, Phalacrocorax niger, Bubulcus ibis, Egretta garzetta, E. intermedia, E. alba, Gallicrex cinerea, Porphyrio porphyrio, Fulica atra, Hydrophasianus chirurgus, Metopidius indicus, Gelochelidon nilotica* and *Chlidonias hybrida. Podiceps cristatus* and *Phalacrocorax carbo* occur in small numbers, and *Leptoptilos javanicus* and *Anser anser* have been recorded as occasional winter visitors. The Grey-headed Fish-Eagle *Ichthyophaga ichthyaetus* occurs at the wetland.

Mammals and reptiles known to occur in the area include *Lutra lutra, L. perspicillata, Canis aureus, Vulpes bengalensis, Herpestes spp*, the cobra *Naja naja* and a variety of water snakes, freshwater turtles and tortoises.

Special floral values: *Asperagus racemosus* is important for its medicinal values; the plant grows in winter in bushy areas around the beels, but has now become scarce as a result of over-exploitation.

Research and facilities: The Fisheries Resources Survey System has conducted some research on fish populations and production in the wetland. An international team sponsored by WWF visited the wetland in 1967, and several waterfowl surveys have been carried out.

References: Anon (1985b); Forest Department (1974 & 1976); Islam & Paul (1978); Savage (1970); Savage & Abdulali (1970); van der Yen (1987).

Criteria for inclusion: 1b, le, 3a.

Source: Abdul Wahab Akonda, Raguibuddin Ahmed and Syed Abul Kalam.

Wetland name: Kawadighi Haor

Country: Bangladesh

Coordinates: 24°33'-24°37'N, 9l°46'-9l°49'E;

Location: 12 km NNE of Moulavi Bazar, Moulavi Bazar District, Sleet.

Area: 414 ha.

Altitude: c.5m.

Biogeographical Province: 4.3.1.

Wetland type: 13, 14, 15 & 19.

Description of site: A group of six freshwater lakes (beels): Majirband, Pata Singra, Rukna, Salkatua, Jibnia and Melaghar. The beels are isolated from one another during the dry season, but unite to form a large shallow lake during the rainy season. The margins of the beels are converted into rice paddies during the dry season. Dams and embankments have been constructed around the beels to improve the possibilities for fishing and agriculture. The maximum depth of water is 3-4m during the rainy season and about lm during the dry season.

Climatic conditions: Subtropical monsoonal climate with an average annual rainfall of approximately 4,000 mm. Temperatures at Srimangal normally vary between a maximum of 32.8°C and a minimum of 7.0°C.

Principal vegetation: The aquatic vegetation includes species of *Trapa, Pistia, Hydrilla, Vallisneria* and *Potamogeton.* Plant communities in adjacent areas include *Mangifera indica, Crataeva nurvula, Cocos nucifera* and species of *Musa, Bambusa* and *Erythrina.*

Land tenure: The wetland is owned by the Government, and is under the control of a local government agency (Additional Deputy Commissioner, Revenue). Surrounding areas are privately owned.
Conservation measures taken: Kawadighi Haor has been earmarked by the Forest Department for the establishment of a Wildlife (Bird) Sanctuary for the conservation of waterfowl.
Land use: Fishing is the principal activity. The fishing rights are leased out by the Government, and fishing is permitted once in every three years. The margins of the beels are cultivated for rice during the dry season, and surrounding areas are also under cultivation, mainly for rice.
Disturbances and threats: The principal threat is increased sedimentation as a result of soil erosion in the water catchment area. The excessive trapping and hunting of water birds is also reported to be a problem.
Economic and social values: The local inhabitants are dependent on fishing as a source of food and income.
Fauna: Fishes include *Puntius spp, Mastacembelus spp, Macrognathus aculeatus, Mystus tengra, M. vittatus, Anabas testudineus, Amplypharyngodon mola, Gadusia spp, Channa spp, Heteropnuestes fossilis, Oampok pabda, Clarius batrachus* and *Colisa* spp. Freshwater shrimps of the genus *Macrobrachium* are common. The haor was a very important wintering area for Anatidae in the 1960s, but numbers have decreased drastically in recent years, and only 120 ducks were observed during a census in January 1987 (92 *Dendrocygna javanica* and 28 Atlas *acuta).* The wetland remains important for a wide variety of other waterfowl including *Tachybaptus ruficollis, Ardeola grayii, Bubulcus ibis, Egretta garzetta, Net apus coromandelianus, Gallicrex cinerea, Porphyrio porphyrio, Hydrophasianus chirurgus, Metopidius indicus, Rostratula benghalensis,* migratory shorebirds, gulls and terns. Reptiles known to occur in the area include the snakes *Xenochrophis spp, Atretium schistosum* and *Amphiesma stolata,* and a variety of freshwater turtles and tortoises.
Special floral values: None known.
Research and facilities: Some waterfowl surveys and botanical studies have been carried out.
References: Savage (1970); van der Yen (1987).
Criteria for inclusion: 1b, 3b.
Source: Abdul Wahab Akonda and Raguibuddin Ahmed.

Wetland name: Hail Haor
Country: Bangladesh
Coordinates: 24°18'-24°26'N, 91°38'-91°45'E;
Location: 3 km northwest of Srimangal and 14 km southwest of Moulavi Bazar, Moulavi Bazar District, Sleet.
Area: From a minimum of 3,643 ha in the dry season to a maximum of 8,906 ha in the iainy season.
Altitude: c.5m.
Biogeographical Province: 4.3.1.
Wetland type: 13, 14, 15 & 19.

Description of site: A large shallow lake in a saucer-shaped depression, bounded in the south, east and west by low hills and in the north by the plains of the Manu and Kushiara Rivers. The haor is almost encircled by a chain of tea estates and natural forest blocks. The River Gopla flows through the wetland in a north-south direction. The lake floods during the rainy season, and almost dries up during the dry season. Land exposed as the water level recedes is converted to rice paddies. Much of the lake's surface is overgrown with lotus and water hyacinth. The maximum depth of water during the rainy season is about 3m.

Climatic conditions: Subtropical monsoonal climate with an average annual rainfall of approximately 4,000 mm. Temperatures at Srimangal normally vary between a maximum of 32.8°C and a minimum of 9.0°C.

Principal vegetation: The aquatic vegetation includes *Typha elephantina, Trapa bispinosa, Nelumba nucifera, Hygrorhiza aristata, Eichhornia crassipes* and species of *Utricularia, Ceratophyllum, Vallisneria, Hydrilla, Najas, Potamogeton, Nymphoides, Pistia, Lemna* and *Azolla.* Plant communities in adjacent areas include *Bambusa spp, Musa spp, Mangifera indica, Erythrina spp* and *Crataeva nurvula.*

Land tenure: The wetland is owned by the Government, and is under the control of a local government agency (Additional Deputy Commissioner, Revenue). Surrounding areas are privately owned.

Conservation measures taken: The Forest Department has established a centre at the wetland for the protection of waterfowl from illegal hunting and trapping.

Conservation measures proposed: A Wildlife (Bird) Sanctuary of 1,427 ha was to be declared at Hail Haor in 1984, but this did not materialize as the Forest Department did not get possession of the land from the Department of Fisheries. There remains a possibility that a sanctuary will be established at some future date.

Land use: Fishing is the principal activity at the wetland. However, large portions of the lake basin are being leased to local people for cultivation, and as a result, the areas available for fishing are being reduced. During the dry season, aquatic vegetation is collected for the preparation of compost. There is also a considerable amount of legal and illegal hunting at the lake. Surrounding areas are under cultivation, mainly for rice.

Disturbances and threats: The level of the wetland is rising as a result of increased siltation caused by soil erosion in the water catchment area, and large areas of the lake basin are being converted to agricultural land. There is a considerable amount of disturbance to waterfowl populations from hunting, fishing and agricultural activities, which continue throughout the year. There was reported to be very heavy hunting pressure on both resident and migratory species of waterfowl in the winter of 1984/85.

Economic and social values: Local inhabitants, especially the poor villagers, are dependent on fishing in the lake for their livelihood. The lake has considerable potential for tourism as it is within walking distance of Srimangal Town.

Fauna: Fishes include *Catla catla, Labeo rohita, L. calbasu, L. gonius, Cirrhina mrigala, Barbus spp, Wallago attu, Mystus tengra, M. aor, Oampok pabda, Gadusia chapra, Clupea spp, Notoplerus notopterus, Clarius batrachus, Heteropnuestes fossilis, Channa spp, Anabas testudineus* and *Colisa fasciata.* Freshwater shrimps of the genus *Macrobrachium* are common.

Hail Haor is one of the most important wetlands in the Sleet basin for both resident and migratory waterfowl. The lake is particularly important as a refuge in periods of drought, when many other wetlands in the area dry out completely. In the 1960s, it was estimated that

some 100,000 *Dendrocygna javanica*, 1,000 *D. bicolor* and 40,000-50,000 migratory ducks frequented the lake in early winter. In recent years, however, the number of Anatidae visiting the lake has decreased dramatically, although there may still be 10,000-15,000 ducks present in late November and even larger numbers in late February and March. *Dendrocygna javanica and Netcapus coromandelianus* are common residents, breeding at small lakes and ponds throughout the region and congregating in large numbers at Hail Haor during the cold season. *Dendrocygna bicolor* is a cold season visitor, usually arriving in January and sometimes in very large numbers (e.g. 10,000 in January 1987). Much the commonest migrant ducks are *Anas querquedula, A. acuta, A. clypeata,* although *A. crecca* and *Aythya nyroca* sometimes occur in large numbers; as many as 4,000-5,000 *A. nyroca* have been recorded in years when there is an abundant growth of aquatic vegetation. *Anas strepera, A. poecilorhyncha* and *Aythya* fuligula are regular in small numbers. *Anser indicus* was formerly a regular winter visitor to the area, but now occurs only as an occasional passage migrant in flocks of up to 40 birds. *Anser anser, Tadorna ferruginea, Sarkidiornis melanotos, Anas falcata, A. platyrhynchos, Netta rufina, Aythya ferina* and *A. baeri* have been recorded as rare visitors. (Mashu Kabir, pers. comm.).

Hail Haor is also important for many other species of waterfowl such as *Tachybaptus ruficollis, Phalacrocorax niger, Ardeola grayii, Bubulcus ibis, Egretta garzetta, E. intermedia, E. alba, Gallicrex cinerea, Gallinula chloropus, Porphyrio porphyrio, Fulica atra, Hydrophasianus chirurgus, Metopidius indicus, Rostratula benghalensis, Vanellus indicus,* a wide variety of migratory shorebirds, and *Chlidonias hybrida.* Shorebirds recorded during a census in January 1987 included:

100 Himantopus himantopus
38 *Vanellus cinereus*
1 6 Numenius arquata
90 *Gallinago stenura*
100 G. gallinago

and small numbers of *Tringa totanus, T. nebularia* and *Actitis hypoleucos.* Other common passage and wintering shorebirds include *Glareola maldivarum, Pluvialis dominica, Charadrius dubius, C. alexandrinus, Tringa stagnalilis, T. glareola, Calidris temminckii* and *Philornachus pugnax.* The Open-bill Stork *Anastomus oscitans* is a regular visitor (e.g. 200 in April and May 1984), and the rare Goliath Heron *Ardea goliath* and Blyth's Kingfisher *Alcedo hercules have* been recorded. Birds of prey include *Pandion haliaetus, Circus aeruginosus* and *C. melanoleucos.* Other wildlife known to occur in the area includes a variety of snakes, monitor lizards, freshwater turtles, tortoises and frogs.

Special floral values: None known.

Research and facilities: Some research has been carried out on the waterfowl populations, notably a study by the Forest Department in 1980 and a survey by scientists from the Bangladesh Zoological Society in 1985. Mashu Kabir made regular observations of the Anatidae between 1973 and 1987. Botanical studies have also been carried out.

References: Forest Department (1974 & 1976); Millin (1987); Reza Khan (1985); Sarker & Fazlul Huq (1985); Savage (1970); Savage & Abdulali (1970); Shahid et al. (undated); van der Yen (1987).

Criteria for inclusion: 1b, 3a.

Source: Abdul Wahab Akonda and Raguibuddin Ahmed.

Wetland name: The Sundarbans
Country: Bangladesh
Coordinates: 21°38'-22°29'N, 89°02'-89°53'E;
Location: at the southern edge of the Ganges/ Brahmaputra Delta, on the shores of the Bay of Bengal, Khulna Division. The mangrove forests extend 80 km inland from the coast.
Area: 577,100 ha, including 407,100 ha of mangrove forest and 170,000 ha of river channels, canals and creeks.
Altitude: 0-3m.
Biogeographical Province: 4.3.1.
Wetland type: 02, 03, 05, 06 & 07.
Description of site: The Sundarbans, covering some 1,000,000 ha of land and water, are part of the world's largest delta (80,000 sq.km.), which has been formed from sediments deposited by three great rivers, the Ganges, Brahmaputra and Meghna, converging on the Bengal Basin. The western part of the Sundarbans lies in India; the remainder (almost 60%) is in Bangladesh. The region as a whole contains one of the largest continuous blocks of mangroves in the world. The Bangladesh Sundarbans are dominated by high mangrove forest cover, and are subject to tidal inundation during spring tides. About one-third of the total area is comprised of river channels, canals and tidal creeks varying in width from a few metres to five kilometres.
Until comparatively recently, all the rivers were connected to the Ganges, but as the main course of the Ganges has gradually migrated eastwards, many of the western rivers have been cut off. The River Baleswar, in the east, now constitutes the main supply of freshwater to the Sundarbans. Several other rivers, such as the Passur, Sipsah, Arpangasia, Malancha and to a lesser extent the Jamuna and Raimangal, also bring flood waters into the system from the Ganges during the rainy season.
New islands are constantly being formed along the coast. Easily eroded sands collect at the river mouths and form banks and chars, which are blown into dunes above the highwater mark. Mudflats form in the lee of the dunes, and eventually become overlain with sand and covered in grasses. The alluvial deposits are geologically very recent in origin, and extremely deep. The soil is a silty clay loam with alternate layers of clay, silt and sand. The surface is clay except on the seaward side of islands in the coastal limits, where sandy beaches occur. A wide range of salinities has been recorded at different sites and at different times of the year. In general, the salinity increases from east to west, and from north to south. Conditions are most saline in February-April, when the inflow of freshwater is at its lowest and soil moisture is depleted; the salinity falls abruptly in June with the onset of the rainy season. The pH value averages 8.0. The tidal pattern is of the semidiurnal type, with a maximum amplitude of 3m at spring tides**.**
The maximum speed of the tidal bore ranges from about 50 km per hour at the coast to 25 km per hour in the upper reaches of the rivers. There is an unusually large seasonal fluctuation in the mean sea level of the adjacent Bay of Bengal, the average level in March being 94 cm lower than the average level in September.
Climatic conditions: Humid tropical maritime climate, with an annual rainfall of about 1,650-1,800 mm in central and northern areas, and as much as 2,790 mm along the outer coast. On average, 80% of the rain falls during the monsoon season from June to October. During the monsoon, the humidity is high (over 80%) and the sky remains overcast for long

periods; maximum temperatures seldom exceed 32°C. By November, the rains have subsided, the sky is usually clear, and temperatures can fall to as low as 2-4°C. The winters are mild and dry, with average maximum temperatures in January around 23.9'C. During the pre-monsoon period in March and April, temperatures can rise to 43°C. From October to mid March, the prevailing winds are from the north and northeast; during the monsoon season they are from the southwest. Violent storms are frequent during the pre-monsoon period, and again in September, October and November. These may develop into cyclones, which are usually accompanied by huge tidal waves.

Principal vegetation: Almost entirely mangrove forest; there are small patches of brackish marshes on accreting islands and riverbanks, and sandy areas with grasses and low shrubs on some of the outer islands. The two dominant mangroves are *Heritiera fomes* and *Excoecaria agallocha,* but there are at least another 25 common tree species. Three major zones have been recognized on the basis of salinity: a freshwater zone, a moderately saline zone, and a saline zone. The freshwater zone is dominated by *H. fomes. E. agallocha is* present in varying amounts, and Xylocarpus *moluccensis* and *Bruguiera gymnorhiza* occur in the more frequently flooded areas. The understorey is dominated by *Cynmetra ramiflora* on dry soils and *Amoora cucullata on* moister soils. In the moderately saline zone the dominant species is *E. agallocha;* it is mixed with *H. fomes* and *Xylocarpus moluccensis,* and has a dense understorey of *Ceriops decandra.* The saline zone supports sparse *E. agallocha* with a dense understorey *of C. decandra,* and dense patches of the palm *Phoenix paludosa* on drier soils.

Other common species of mangrove include *Xylocarpus obovata, Sonneratia apetala, Avicennia officinalis, Aegiceras corniculatum, Acanthus ilicifolius* and *Rhizophora* spp. The palm *Nypa fruticans* and the grasses *Oryza coarctata* and *Imperata cylindrica* are widespread on the mudflats along river banks. Other important species include Ficus *retusa,* the fern *Acrostichum aureutn,* the creepers *Entada pursaetha, Derris sinuata,* and the grasses *Phragmites karka, Typha elephantina.* In all, over 330 species of plants have been recorded. The plains to the north and east a e almost entirely under cultivation, mainly for rice, although there are some plantations of *Cocos nucifera, Mangifera indica* and *Musa* around the villages.

Land tenure: State owned (Goverment of Bangladesh); adjacent agricultural land is privately owned.

Conservation measures taken: The entire area is a Forest Reserve under the Forests Act, 1927, and lies within the Sundarbans Forest Division of Khulna District. Three Wildlife Sanctuaries, totalling 32,386 ha, were established in 1977 under the Bangladesh Wildlife (Preservation) (Amendment) Act, 1973: Sundarbans West (9,069 ha), Sundarbans South (17,878 ha) and Sundarbans East (5,439 ha). Sundarbans West lies between the Raimangal and Malancha Rivers at 21°42'-21°47'N, 89°l2'-89°l8'E; Sundarbans South, including Putney Island., lies between the Malanga and Kunga Rivers at 2l°44'-2l°55'N, 89°19'-89°28'E; Suridarbans East consists of that portion of Forest Compartment 6 lying between the Katka and Supati creeks at 21°50'-21°57'N, 89°45'-89°50'E. All three sanctuaries are bounded to the south by the Bay of Bengal. Parts of the area were declared a World Heritage Site in 1987.

There are no recognized local rights within the Forest Reserve, entry and the harvesting of forest products being subject to permits issued by the Forest Department. The Department may issue hunting licenses under the Bangladesh Wildlife (Preservation) (Amendment) Act, 1973, but in practice none is issued and the whole of the Bangladesh Sundarbans is thus effectively closed to legal hunting. Within the Wildlife Sanctuaries, all logging is prohibited

and only fishing and the collection of minor forest products are permitted. Management of the Forest Reserve has included the planting or replanting of mangroves in some areas to protect embankments and new land. Some 25,000 ha have already been planted, and another 40,000 ha are scheduled to be planted by 1990.

Conservation measures proposed: Since its declaration as a Forest Reserve, the Sundarbans has been the subject of a series of successively more comprehensive working plans. A plan relating specifically to wildlife conservation was prepared under the joint sponsorship of the World Wide Fund for Nature and the National Zoological Park, Smithsonian Institution (Seidensticker & Hai 1983). The emphasis of this management plan is on the management of the Tiger and all other wildlife as an integral part of forest management that assures the sustainable production of forest resources to meet the needs of the local human population. More recently, Blower (1985) reviewed wildlife conservation in the Sundarbans Forest Reserve as part of the Forest Inventory Project carried out by the Forest Department and the U.K. Overseas Development Administration. The main purpose of this project was to provide the necessary data on which to base future exploitation of the forest for sustainable production of timber, fuel-wood and other forest products, with due consideration to wildlife conservation and the social amenity value of the area. Several recommendations have been made concerning the expansion of the existing Wildlife Sanctuaries and establishment of a National Park (e.g. Blower 1985 and Reza Khan 1986).

It has been recommended that the Sundarbans be managed as a single unit with full protection afforded to both wildlife and habitat in the Wildlife Sanctuaries, and wildlife protected but exploitation of forest resources carefully controlled in the remainder of the Forest Reserve. Buffer zones, in which disturbance is kept to a minimum through restriction of access, should be established in areas peripheral to the sanctuary boundaries (Blower 1985).

Land use: The Sundarbans forests have been exploited since time immemorial, and have been managed for the last 100 years by the Forest Department. The principal activities are fishing and the harvesting of timber, mainly *Excoecaria agallocha, Heritiera tomes* and *Sonneratia apetala,* for timber, pulpwood, firewood and wood for making matches, hardboard and pallets. The leaves of *Nypa fruticans* are used for thatching, and those of *Phoenix paludosa* for making house walls. Large quantities of honey and beeswax are harvested from wild bees' nests in the mangrove forest. The honey-gathering season is limited to two and a half months commencing annually on 1 April. Mollusc shells are gathered and used to produce lime for consumption with betel nut. An FAO study revealed that some 158,000 persons were engaged in fishing during the 12 year period 1971-83, during which time the average number of fishing boats and other vessels employed was almost 54,000. Fishermen from as far away as Chittagong come to the region, bringing their boats and households, and establishing temporary encampments along the coast.

Disturbances and threats: A long-term ecological change is taking place in the Sundarbans as a result of the eastward migration of the Ganges, abandonment of some distributaries, diversion of water for irrigation, and groundwater abstraction. Up to 40% of the dry season flow of the Ganges has been diverted upstream, following the completion of the Farraka Barrage in India in 1974. Decreased freshwater flushing of the Sundarbans has resulted in increased saline intrusion, particularly in the dry season. The increased salinity has affected the natural regeneration of mangroves, and in some areas there is now no regeneration at all. Other signs of deterioration have included localized die-back of *Heritiera tomes,*

commercially the most valuable of the tree species. A gradual replacement of *Heritiera tomes* with *Excoecaria agallocha* is a likely long-term effect. The impact of these changes on the fauna has not been studied, but it is perhaps significant that the density of Spotted Deer appears to be lower in western areas, where salinity is highest, than in the east where it is lowest.

Oil spills are another potential threat and could cause immense damage, especially to the aquatic fauna and sea-birds. Likely sources of oil pollution are the Port at Mongla on the northern edge of the mangrove forest, and the numerous large shipping vessels, which pass through the Sundarbans every day via the northeast-shipping route.

The most immediate threat to the Sundarbans is over-exploitation, both of the timber resources and of the fauna. It is clear that the mangrove forests are being heavily exploited. One report indicates that the merchantable stock of *Heritiera tomes* has declined by 40% since the forest inventory of 1959, while that of *Excoecaria agallocha* has fallen by 45%. The exploitable age of the trees has been estimated at 50-160 years, but more and more areas are being cut on a shorter rotation. As plantation forestry increases, the natural diversity and ecological quality of the original mangrove forest is declining.

Agricultural encroachment has already occurred to a limited extent on the northern and eastern boundaries and, with increasing population pressure in surrounding settled areas, could reach serious proportions unless checked. Fishermen's camps are a major source of disturbance, and there is extensive illegal hunting and trapping, not only by fishermen and wood-cutters, but also by high officials of civil and defense services stationed in the area. The small population of Estuarine Crocodiles *Crocodylus porosus* remains under pressure from illegal hunting for the skin trade. Populations of the Green Frog *Rana hexadactyla* have declined rapidly in recent years as a result of commercial exploitation, despite a Government ban on the catching of frogs during the breeding season. Populations of the Rock Python *Python molurus* and the three species of monitor lizard *Varanus* spp have also decreased as a result of illegal hunting and excessive disturbance, as have many species of birds, notably the larger waterfowl, birds of prey and *Gallus gallus.* At least six species of mammals have already become extinct in the Sundarbans, and the populations of several others are declining.

Economic and social values: The Sundarbans are of immense economic and social importance to the people of Bangladesh. The mangrove forests comprise over half of the remaining natural forest in Bangladesh, and the mangrove ecosystem provides a livelihood for some 300,000 people at certain times of the year. Fisheries production increased from 640 metric tonnes in 1971-72 to 14,000 metric tonnes in 1982-83, the average yield over the 12 year period being 7,160 metric tonnes. Many thousands of people are engaged in collecting honey and wax, and in 1983, the harvest was estimated at 232 metric tonnes. This represents an appreciable source of income for the local communities. The area is of outstanding biological interest, and provides incomparable opportunities for outdoor recreation, scientific research and conservation education.

The mangrove forest also has an important buffer function, protecting the densely settled agricultural areas to the north from the full force of cyclonic storms and tidal waves. Some of these storms can cause a tremendous amount of damage. Eleven storms during the 1960s killed some 54,000 people; the 1970 storm surge killed between 150,000 and 300,000 people, and a storm in June 1985 killed over 40,000.

Fauna: The Sundarbans support a very rich and diverse fish fauna. Over 120 species of fish are commonly caught by commercial fishermen. The most important species are *Eleutheronema tetradactylum, Polynemus paradiseus, Liza tade, Rhinomugil corsula, Mystus golio, Gonialosa manminna, Hilsa ilisha, Ilisha megaloptera, Coilia ramcarati, Septipinna phasa, Stolephorus tn, Thryssa purava, Apocryptes bato, Glossogobius giurus, Odontamblyopus nubicundus, Scathophagus argus, Lates calcarifer, Otolithoides pama, Cynoglossus cynoglossus, Harpadon nehereus, Sillago domina* and *Lepturacanthus savala.*

Over 270 species of birds have been recorded in the Sundarbans, including about 95 species of waterfowl. Common residents include *Phalacroconax niger, Anhinga melanogasten, Andeola grayii, Bubulcus ibis, Butonides stniatus, Egnetta garzetta, E. intenmedia, E. alba, Esacus recurvirostnis, Vanellus indicus, Gelochelidon nilotica* and *Sterna albifrons.* The Lesser Adjutant *Leptoptilos javanicus* is a fairly common resident; the total population is estimated at about 100 indidviduals, the birds breeding in the mangroves in August-December. About 50-70 Open-bill Storks *Anastomus oscitans* have been observed in recent years, but apparently the species no longer breeds in the area. The elusive and poorly known Masked Finfoot *Heliopais personata* appears to be resident in the mangroves, and is perhaps much commoner than the records suggest.

The Sundarbans were formerly an important wintering area for Aantidae, but although a wide variety of species has been recorded in recent years, numbers have been small. During an avifaunal survey of the eastern part of the Sundarbans in early February 1987, only 140 ducks were observed, mainly *Anas crecca* and *A. querquedula.* The area is much more important as a staging and wintering area for migratory shorebirds, gulls and terns. About 35 species of shorebirds have been recorded, the commonest being *Pluvialis squatarola, Charadnius alexandninus, C. mongolus, Numenius phaeopus, N. arquata, Tninga totanus, T. nebulania, Tninga glareola, Xenus cinereus, Actitis hypoleucos, Calidnis minuta* and *C. ferruginea.* Large numbers of gulls and terns winter along the coast, mainly *Lanus brunnicephalus, L. nidibundus, Chlidonias hybnida, Gelochelidon nilotica, Hydroprogne caspia* and several species of *Sterna.* The Indian Skimmer *Rynchops albicollis* is regularly encountered but its status is uncertain.

Many other species of waterfowl occur as uncommon migrants or occasional visitors from freshwater wetlands on the flood plains to the north. These have included *Pelecanus philippensis, Ardea goliath, Myctenia leucocephala, Ciconia episcopus, C. ciconia, Threskiornis melanocephalus, Platalea leucorodia* and *Anser anser.* The rare and poorly known Great White-bellied Heron *Ardea impenialis* has been observed in the mangroves, but its status is uncertain.

The Sundarbans are extremely rich in birds of prey; 35 species have been recorded, including *Pandion haliaetus, 26* species of Accipitridae, four species of Falconidae, and four species of owls. *Haliastur indicus* is abundant throughout, and there are about 60 breeding pairs of *Haliaeetus leucogaster.* Other breeding species include *Haliaeetus leucoryphu* (two pairs), *lchthyophaga ichthyaetus* (rare), *Gyps bengalensis* (common), and *Spilornis cheela* (common). The populations of many species are decreasing, and this has been attributed to destruction of suitable nesting trees, excessive human disturbance, and use of pesticides in surrounding areas (Sarker & Sarker 1985).

The Red Junglefowl *Gallus gallus,* typically a species of dry forest, is common and widespread in the mangrove forests of the Sundarbans. Eight species of kingfisher (Alcedinidae) have been recorded, and five of these, *Alcedo atthis, Pelargopsis amauroptera,*

Halcyon smyrnensis, H. pileata and *H. chloris,* are common. The forests support a wide variety of passerines including *Pachycephalus grisola* and *Dicaeum trigonostigma, two* species with very restricted distributions in the Indian Subcontinent.

Some forty-two species of mammals still occur in the Sundarbans. The Bangladesh Sundarbans together with the Indian Sundarbans comprise the largest remaining tract of habitat for the Royal Bengal Tiger *Panthera tigris*, and provide the last refuge in the region for a variety of mammals which are rare elsewhere in Bangladesh. Common mammals include the Rhesus Macaque, Smooth-coated Otter, Clawless Otter, Leopard Cat, Jungle Cat, Fishing Cat, Spotted Deer and Wild Boar *(Macaca mulatta, Lutra perspicillata, Aonyx cinerea, Felis benga/ensis, Fells chaus, Fells viverrina, Axis axis* and *Sus scrofa).* Recent estimates suggest total populations of about 350 Tigers, 40,000-70,000 Rhesus Macaques, 50,000-80,000 Spotted Deer, 20,000 Wild Boars and 20,000 Smooth-coated Otters. The Ganges River Dolphin *Platcnista gangeticus* is common in the rivers, and the Melon-headed Dolphin *Peponocephala electra* and several other small cetaceans occur in the adjacent waters of the Bay of Bengal. At least six large mammals have become extinct in the area in recent times: Hog Deer, Swamp Deer, Water Buffalo, One-horned Rhincoceros, Javan Rhinoceros and Leopard *(Axis porcinus, Cervus duvauceli, Bubalus bubalis, Rhinoceros unicornis, Rhinoceros sondaicus* and *Panthera pardus).*

No less than 50 species of reptiles and eight species of amphibians are known to occur. The Sundarbans now support the only population of the Estuarine Crocodile *Crocodylus porosus* in Bangladesh. The population is restricted to the southern parts of the Sundarbans, and is estimated at less than 200 individuals (in an area of about 78,000 ha). *Crocodylus palustris* is now probably extinct in Bangladesh, but a few individuals could still be surviving in the northern (less saline) parts of the Sundarbans. A significant breeding population of the endangered River Terrapin Batagur baska was discovered in 1982. Local inhabitants have been taking 200 or more adults each year for many years, but there is minimal exploitation of eggs. Other reptiles include the snakes *Python molurus, Bungarus caeruleus, B. fasciatus, Naja naja, Ophiophagus hannah, Vipera russelli, Fordonia leucobalia, Gerardia prevostiana* and *Hydrophis caerulescens,* and the monitor lizards *Varanus bengalensis, V. salvator* and V. *flavescens.* Four species of marine turtle, *Chelonia mydas, Caretta caretta, Lepidochelys olivacea and Eretmochelys imbricata,* visit the coastal waters along the southern edge of the delta, and two of these, *C. mydas* and *L. olivacea,* are known to nest. Amphibians include the Green Frog *Rana hexadactyla,* a commercially important species, which frequents brackish ditches along the northern edge of the Sundarbans, the toad *Bufo melanostictus* and the tree frog *Rhacophorus maculatus.*

Crustacea account for by far the largest proportion of animal biomass, with fiddler crabs and mud crabs being particularly abundant. Shrimps and prawns are also abundant and yield a considerable harvest. The most important species are *Penaeus indicus, P. monodon, Metapenaeus brevicornis, M. monoceros, Parapenaeopsis scuiptilis, M. stylifera,* four species of *Macrobrachium, Palaemon karnafuliensis, P. styliferus* and *Acetes indicus.*

Special floral values: The mangrove forests of the Sundarbans are amongst the richest and most extensive mangrove forests in the world.

Research and facilities: A considerable amount of research has been carried out on the mangrove ecosystem and its wildlife both by national and by international organizations, and there is an extensive published literature on the region. The Forest Department and University of Dhaka, in particular, have undertaken numerous studies and produced many

publications and unpublished reports. Various population studies have been carried out on the Tiger, Rhesus Macaque, Spotted Deer, Wild Boar and Estuarine Crocodile. The ecology and population dynamics of the birds of prey have been studied by Sarker *et al.* The management plans prepared by Seidensticker and Hai (1983) and Blower (1985) include detailed accounts of the fauna and flora, and consider many management problems and options. The economic values of the mangrove ecosystem and some of the threats to the region have recently been summarized by Mahmood (1986).

Few tourists visit the Sundarbans because of the difficulties of arranging transportation and scarcity of suitable accomodation. Some possibilities are, however, available for limited special-interest tourism from October to April or May. There is a large well-equipped rest house belonging to the Port Authority at Nilkamal, and a smaller Forest Department Guest House at Katka.

References: Blower (1985); Forest Department (1974 & 1976); Groombridge (1982); Husain & Sarker (1984); Husain et al. (1983); Islam & Khan (1988); IUCN (1987); Karpowicz (1985); Mahrriood (1986); Maltby (1986); Rabanal (1984); Rashid & Scott (in press); Reza Khan (1982, 1985 & 1986a); Salter (1984); Sarker (1985a, 1985b & 1986); Sarker & Sarker (1985 & 1986); Sarker *et al*. (1984); Savage & Abdulali (1970); Seidensticker & Hai (1983).

Criteria for inclusion: 123.

Source: Abdul Wahab Akonda, S.M. Abdur Rashid and Derek A. Scott.

Wetland name: Char Kukri-Mukri

Country: Bangladesh

Coordinates: 21°55'N, 90°38'E;

Location: off the southern tip of Dakhin Shahbazpur Island in the outer delta of the Ganges/ Brahmaputra rivers, 90 km SSE of Barisal, in southern Charfession Upazilla, Bhola District, Barisal.

Area. 2,500 ha, including a wildlife sanctuary of 40 ha and 1,500 ha of plantations.

Altitude: 0-1m.

Biogeographical Province: 4.3.1.

Wetland type: 03, 06 & 07.

Description of site: A small low-lying island in the outer delta of the Ganges/ Brahmaputra, with extensive intertidal mudflats and mangrove forest. The island is dissected by small creeks or khals, and the central part (1,500 ha) is under cultivation. At high tide, most of the island with the exception of the agricultural land is under water.

Climatic conditions: Humid tropical maritime climate with an average annual rainfall of 2,800 mm, about 80% of which falls in the monsoon from June to September. Temperatures are equable and the humidity is high due to the influence of the Bay of Bengal.

Principal vegetation: Mangrove forest with *Sonneratia apetala, Bruguiera gymnorhiza, Acanthus ilicifolius, Aegiceras majus, Avicennia* spp, and patches of *Typha elephantina.* The vegetation in the centre of the island includes plantations of *Cocos nucifera, Musa spp* and *Mangifera indica.*

Land tenure: The mangrove forests are state owned (Government of Bangladesh), and are under the control of the Forest Department; cultivated areas in the interior of the island are privately owned.

Conservation measures taken: The mangrove forests are included within a Forest Reserve. In 1981, an area of 40 ha including the best mangrove forest on the island was declared a Wildlife Sanctuary under the Bangladesh Wildlife (Preservation) (Amendment) Act, 1973.
Conservation measures proposed: None
Land use: No forestry activity is carried out in the mangroves except for the purpose of protecting and conserving wildlife populations. The interior of the island is under cultivation, and nearby newly accreted islands are also being cultivated.
Disturbances and threats: None known.
Economic and social values: No information.
Fauna*: Fishes include Hilsa ilisha, Danio* spp and Glossogobius *giuris.* The Wildlife Sanctuary contains a large breeding colony of herons and egrets, mainly *Nycticorax nycticorax, Ardeola grayii, Bubulcus ibis, Egretta garzetta, Ardea cinerea* and *A. purpurea.* Other waterfowl, which have been recorded on the island, include *Pelecanus philippensis, Dendrocygna javanica, Anser indicus, Tadorna tadorna, T. ferruginea, Nettapus coromandelianus, Aythya fuligula, Amaurornis phoenicurus, Gallicrex cinerea* and a wide variety of shorebirds, gulls and terns. The Clawless Otter *Aonyx cinerea* and Fishing Cat *Felis viverrina* are common. Reptiles known to occur include three species of monitor lizard, *Varanus bengalensis, V. flavescens* and *V. salvator,* as well as several species of snakes, turtles and tortoises.
Special floral values: None known.
Research and facilities: Some preliminary faunal and floral surveys have been carried out. References: IUCN (1987); Sarker & FazIul Huq (1985).
Criteria for inclusion: 1b, 2c, 3b.
Source: Abdul Wahab Akonda.

Wetland name: Wetlands in Pablakhali Wildlife Sanctuary
Country: Bangladesh
Coordinates: 23°08'N, 92°16'E;
Location: 70 km north of Rangamati at the northern end of Kaptai Reservoir, Chittagong Hill Tracts.
Area: Sanctuary 42,087 ha; area of wetlands unknown.
Altitude: 100-300m.
Biogeographical Province: 4.9.4.
Wetland type: 11, 12, 17 & 21.
Description of site: The perennial rivers, riverine forest, oxbow lakes and small forest pools in Pablakhali Wildlife Sanctuary, situated in a region of forested hills and valleys in the northern part of the Chittagong Hill Tracts. Some 3,885 ha of lowlands in the southern part of the Sanctuary have been under water since 1963, following the construction of the Kaptai Dam. Soils in the valleys are typically clay or clay loams.
Climatic conditions: Subtropical climate with a long dry season lasting from November to May. The average annual rainfall is 2,500 mm, and the average temperature ranges from 23°C in December to 35°C in May. The relative humidity is high throughout the year.
Principal vegetation: No information is available on the aquatic vegetation. Tropical moist deciduous forest occurs in new alluvial areas along rivers and streams. The forest is interspersed with extensive patches of grassland and stands of wild banana. Characteristic

tree genera include *Albizzia, Salmalia, Terminalia* and *Ficus*. Tropical wet evergreen forest occurs in the valleys and on sheltered slopes with a plentiful supply of water. This forest is characterized by species such as *Swintonia floribunda, Dipterocarpus spp, Pterygota alata, Quercus spp* and *Castanopsis* spp. Elsewhere in the Sanctuary, the dominant forest type is tropical semi-evergreen forest with species of *Dipterocarpus, Mangifera, Arnoora, Cinnamomum, Syzygium, Tetrarneles, Artocarpus, Salmalia* and *Albizzia.* Bamboo grows beneath the canopy of all three-forest types. None of the forest is virgin; all has been worked on a selective or clear-felling basis, or at least has had its bamboo understorey removed.

Land tenure: State owned (Government of Bangladesh).

Conservation measures taken: First established as a Game Sanctuary in June 1962, and declared a Wildlife Sanctuary (42,087 ha) in 1983 under the Bangladesh Wildlife (Preservation) (Amendment) Act, 1973. The Sanctuary lies in the southeastern part of the Kassalong Valley Forest Reserve (170,000 ha). Under the working plan due to expire in 1988/89, the Sanctuary is divided into two units. In Working Unit 1(25,900 ha), the emphasis is on wildlife protection, and forestry operations are supposedly prohibited. This unit includes 3,885 ha of Kaptai Lake and 20,461 ha of natural forest. In Working Unit II, normal forestry operations are permitted, and the natural forest is steadily being converted to forestry plantations. Conservation measures proposed: The original management prescriptions included restricting forestry operations to the thinning of existing plantations, imposing a three-year cycle for the collection of bamboo, establishing an elephant sanctuary, and the provision of artificial feeding sites, water holes and salt-licks.

Conservation measures proposed: None

Land use: The principal activity in the Sanctuary is forestry, but in recent years agriculture has been permitted and there is a considerable amount of livestock grazing.

Disturbances and threats: Due to unavoidable circumstances, implementation of the original management prescriptions has been difficult. In the mid 1980s, the Government started leasing out forested lands within the Sanctuary and neighbouring areas to settlers from the plains. This has posed a serious threat to all wildlife populations, because the settlers not only clear the forest given to them, but also encroach on the reserved forest and hunt and fish throughout the area. Rice is cultivated by the reservoir, grass is cut for fodder and thatching material, and cattle roam freely inside the Sanctuary. The most serious threat is encroachment on the narrow strip of natural forest, which runs north-south through the Sanctuary. In many places, this has either gone or has been reduced to a strip only a few hundred metres in width, thereby isolating the smaller southern part of the Sanctuary from the rest. This destruction of primary forest of all categories and replacement with commercially important timber species is the principal threat to the White-winged Wood-Duck population. The ducks continue to be hunted, and their young are caught and reared in captivity for food.

Economic and social values: No information.

Fauna: Pablakhali Wildlife Sanctuary is the main and perhaps only locality in Bangladesh for the endangered White-winged *Wood-Duck Ciiirina ululala.* All records of the species in Bangladesh in the 1970s and 1980s have referred to this small population. The species used to be fairly common in the area; about 30 were reported in 1978, and the population was estimated at about 20 pairs in 1981. However, local reports indicate that the numbers have decreased in recent years, and the status of the species is now uncertain.

Following the formation of Kaptai Lake and flooding of a part of the sanctuary, increasing numbers of resident and migratory waterfowl occur in the Sanctuary, including up to *30 Anastomus oscitans.* The new lacustrine habitat is, however, unsuitable for White-winged Wood-Ducks, and the species has never been observed on the lake.
A small population of Asian Elephants *Elephas maximus* commonly uses the southern part of the Sanctuary, probably because of the mosaic of habitats and permanent water supply. Other large mammals still believed to occur in the Sanctuary include Tiger, Leopard, Wild Dog, otters, Wild Boar, Indian Muntjac and Sambar *(Panthera tigris, P. pardus, Cuon alpinus, Lutra spp, Sus scrofa, Muntiacus muntjac* and *Cervus unicolor).* Reptiles include the Indian Python *Python molurus.*
Special floral values: The Wildife Sanctuary contains some of the finest lowland forest remaining in Bangladesh.
Research and facilities: A study has been carried out on the population dynamics and breeding behaviour of the White-winged Wood-Duck, and the elephant population has been surveyed by the Forest Department. There are two rest houses in the Sanctuary. In 1982, access to the Hill Tracts District was restricted, and no research has been carried out in the Sanctuary since then.
References: Husain & Sarker (1984); IUCN (1987); Karpowicz (1985); Olivier (1979); Reza Khan (1985 & 1986b); Sarker & Fazlul Huq (1985).
Criteria for inclusion: lb. 2a, 2b.
Source: See references.

Wetland name: Kaptai Reservoir
Country: Bangladesh
Coordinates: 22°29'-23°02'N, 92°02'-92°23'E;
Location: 45 km ENE of Chittagong, Rangamati District, Chittagong Hill Tracts.
Area: About 76,600 ha.
Altitude: 100m.
Biogeographical Province: 4.9.4.
Wetland type: 17.
Description of site: A large reservoir in the Chittagong Hill Tracts, constructed as part of the Karnafuli Hydro-electricity Project and completed in 1963. The reservoir is surrounded by hills and has an extremely indented shoreline with numerous branches and narrow inlets, and many small islands covered in scrub and tall grasses.
Climatic conditions: Subtropical climate with a long dry season lasting from November to May. The average annual rainfall is 2,500 mm and the average temperature ranges from 23°C in December to 35°C in May. The relative humidity is high throughout the year.
Principal vegetation: No information is available on the aquatic vegetation. The natural vegetation of the region is tropical moist deciduous forest along rivers and streams, tropical wet evergreen forest in the valleys and on sheltered slopes with a plentiful supply of water, and tropical semi-evergreen forest on drier hill slopes. Much of the forest around the reservoir has, however, been cleared for agriculture.
Land tenure: State owned.
Conservation measures taken: Some 3,885 ha at the northeastern tip of the reservoir lie within the Pablakhali Wildlife Sanctuary (42,087 ha), established in 1973 (site 5).

Conservation measures proposed: None
Land use: Fishing and generation of electricity.
Disturbances and threats: The reservoir is silting up rapidly as a result of serious soil erosion in the water catchment area.
Economic and social values: The reservoir supports a major commercial fishery; the harvest was estimated at 2,700 metric tonnes in 1984-85.
Fauna: Since its completion, the reservoir has rapidly become an important area for both resident and migratory waterfowl, notably *Tachybaptus ruficollis,* a variety of herons and egrets, *Gallinula chloropus* and *Fulica atra.* The Open-bill Stork *Anastomus oscitans* has become a regular visitor, and up to 30 have been recorded in the Pablakhali Wildlife Sanctuary at the northeastern tip of the reservoir.
Special floral values: None known.
Research and facilities: Some limnological studies are being carried out by Chittagong University and UNDP.
References: Forest Department (1974 & 1976); IUCN (1987); Karpowicz (1985); Olivier (1979).
Criteria for inclusion: le, 3b.
Source: Abdul Wahab Akonda.

Wetland name: Bostami Pond
Country: Bangladesh
Coordinates: 91°30'N, 22°23'E;
Location: at the shrine of Hazrat Sultan Bayazid Bostami, on a hill at Nazirabad, 7 km northwest of Chittagong, Chittagong District.
Area: 0.5 ha.
Altitude: c.75m.
Biogeographical Province: 4.4.1.
Wetland type: 17.
Description of site: An artificial pond (tank), lOOm long by 50m wide, associated with the shrine of the Islamic saint Hazrat Sultan Bayazid Bostami. The pond was excavated centuries ago, presumably with the purpose of storing rain-water for drinking, cooking and washing before prayer at the shrine. It has since been excavated and enlarged several times. The banks have two tiers; the upper tier has a 3m wall on two sides, and the lower tier slopes gently downwards for another 3m to the bottom of the pond. There are flights of steps on two sides, allowing visitors access to the pond (to feed the turtles). The water is extremely turbid, except when water levels are high (up to Sm) during the monsoon. During the dry season, the upper tier dries up completely, and the level drops to about 2.5m.
Climatic conditions: Humid tropical maritime climate with an average annual rainfall of about 3,500 mm, over 80% of which falls during the monsoon from June to September. The temperature and humidity remain high throughout the year.
Principal vegetation: There is no aquatic macro-vegetation in the pond.
Land tenure: No information.
Conservation measures taken: There is no legal habitat protection, but the semi-captive population of the turtle *Trionyx nigricans* is strictly protected by the authorities at the shrine.

Conservation measures proposed: Groombridge (1982) has recommended that to minimize the risk of disease decimating the population of turtles, a second population should be established in another pond. The reproductive biology of the species is virtually unknown, as is the extent to which its survival is dependent on artificial feeding. These, and other biological parameters, should be investigated.
Land use: Some domestic use, e.g. washing, in association with prayer at the nearby shrine. Introduced fishes are often harvested.
Disturbances and threats: The turtle is inherently at risk because of its extremely small population, restricted to a single pond. The rather unhygienic conditions in which the turtles live would seem to be conducive to disease. All old individuals have a skin disease evident on the head, neck and feet, and there is a distinct possibility of serious disease affecting the entire population.
Economic and social values: The pond, and particularly the turtles, are of considerable religious significance. The turtles are venerated by the Islamic population and are generally held to be associated with the saint Bayazid Bostami.
Fauna: The only known locality in the world for the Dark Soft-shell Turtle *Trionyx nigricans,* a large freshwater turtle which grows to about 80 cm in length. In the late 1970s, the population was estimated to include 150-200 individuals, comprising 30-40 young, 60-90 juveniles and 60-70 adults. The turtles depend almost entirely on food supplied by visitors to the shrine. Suitable food items, such as cattle offal, puffed rice, plantains, prawns and fish fry, may be purchased at the pond. The origin of this semi-captive population of turtles is unknown. The turtles appear to have been introduced into the pond, but no specimens are known from elsewhere. Several species of fishes have been introduced into the pond, including *Tikipia niloliea, Leibw* spp and other carp. Other smaller fishes, crabs and prawns present in the pond may be of natural occurrence.
Special floral values: None.
Research and facilities: A study of the population and breeding biology of *Trionyx nigricans* was undertaken by Chittagong University in 1985-86.
References: Groombridge (1982); Reza Khan (1980).
Criteria for inclusion: 2a.
Source: See references.

Wetland name: Bogakine Lake
Country: Bangladesh
Coordinates: 22°01'N, 92°33'E;
Location: near the Sangu River east of Ruma Police Station, 160 km ESE of Chittagong, Rangamati District, Chittagong Hill Tracts.
Area: c.60 ha.
Altitude: 375m.
Biogeographical Province: 4.4.1.
Wetland type: 14.
Description of site: A small freshwater lake, about 1.25 km long by 0.5 km wide, in remote forested hills near the Indian and Burmese borders. The lake is reported to be quite deep and has little aquatic vegetation. It is one of the very few permanent freshwater lakes in Bangladesh, and the only significant highland lake in the country.

Climatic conditions: Subtropical climate with a long dry season lasting from November to May. The average annual rainfall is about 2,500 mm.
Principal vegetation: No information.
Land tenure: No information.
Conservation measures taken: None.
Conservation measures proposed: None
Land use: No information.
Disturbances and threats: No information.
Economic and social values: No information.
Fauna: No information.
Special floral values: No information.
Research and facilities: No research seems to have been carried out at the lake despite the fact that in view of its isolation it must be of considerable limnological interest.
Criteria for inclusion: la.
Source: Abdul Wahab Akonda.

Wetland name: Chokoria Sundarbans
Country: Bangladesh
Coordinates: 2l°30'-22°00'N, 91°50'-92°03'E;
Location: from Cox's Bazar north for 60 km along the Bay of Bengal coast, Cox's Bazar District, Chittagong Division.
Area: c.20,000 ha including 8,540 ha of mangrove forest.
Altitude: 0-3m.
Biogeographical Province: 4.4.1.
Wetland type: 02, 03, 05, 06, 07 & 10.
Description of site: A complex of newly formed grassy islands, mud banks, river channels, tidal creeks, aquaculture ponds, mangrove forests and intertidal mudflats in the estuarine system of the Matamohuri River and several smaller rivers in the Bay of Bengal north of Cox's Bazar. The mangrove forests formerly covered an area of over 20,000 ha, but large tracts have been cleared for shrimp ponds and other aquaculture projects. The hydrology of the Matamohuri estuary is unusual in that there are large seasonal variations in salinity. For five months of the year during the rainy season (June to October) the salinity is below 15 p.p.t., and can fall as low as 0.4 p.p.t. During the dry season, when the inflow of fresh water is at its minimum, the salinity can reach 32.6 p.p.t. The surface water temperature varies between 21.4°C and 31.6°C. The tidal pattern is of the semidiurnal type, with maximum amplitude of 3m at spring tides. There is an unusually large seasonal fluctuation in the mean sea level of the Bay of Bengal, the average level in March being 94 cm lower than the average level in September.
Climatic conditions: Humid tropical maritime climate with an average annual rainfall of 3,560 mm, 80-90% of which falls during the monsoon from June to September. The average temperature reaches a maximum of 31.1°**C** in March and April, and the humidity remains high throughout the year. The region is prone to violent storms in the pre-monsoon period (March and April) and again in the post-monsoon period (October and November).
Principal vegetation: The dominant species of mangroves are *Acanthus ilicifolius, Aegialilis rotundifolia, Avicennia alba, A. officinalis, Bruguiera gymnorhiza, Ceriops decandra,*

Dalbergia spinosa, Excoecaria agallocha, Heritiera tomes, Phoenix paludosa, Sonneratia alba and *S. apetala.*
Land tenure: No information.
Conservation measures taken: In the 1920s, some 18,200 ha of mangrove forest had the status of a mangrove forest reserve, but the reserve has been ineffective and almost all of the forest has now been cleared or severely degraded.
Conservation measures proposed: None
Land use: Fishing, aquaculture and harvesting of mangrove forest products. In recent years, the principal activity has become the culture of shrimps, particularly *Penaeus monodon,* in shrimp ponds. The wetland is in a very densely populated area, and subject to intensive use.
Disturbances and threats: In recent decades, almost all of the once extensive mangrove forests have been cleared for the construction of shrimp ponds. Even the small remaining patches of forest still retained by the Forest Department are exploited by local people for shrimp and fish culture. The most harmful form of exploitation has been the construction of "giant-deep" aquaculture ponds, created by blocking off tidal channels and distributaries of the Matamohuri River by cross dams. Rapid deforestation of the Matamohuri water catchment area is increasing both the discharge rate and sediment load of the river. As increasing areas of the former delta are isolated by embankments for shrimp ponds or other purposes, it is anticipated that silting of the distributary channels of the delta will increase.
Economic and social values: The mangrove forests were once of great importance as breeding and nursery grounds for shrimps and fin fish; they constituted a valuable forestry resource, and provided protection against storms and tidal waves. Massive destruction of the mangrove forest for short-term gain in aquaculture projects has greatly diminished the natural values of the area. The importance of the mangrove forests as a forestry resource and in coastal protection have been lost, and their role as a breeding and nursery ground for shrimps and fin fish of commercial importance is now seriously threatened.
Fauna:The mangrove ecosystem supports a rich invertebrate fauna including the shrimps *Penaeus indicus, P. monodon, Metapenaeus monoceros, M. brevicornis* and *Palaemon styliferus.* The wetland remains important for a variety of resident and migratory waterfowl, notably herons and egrets, *Threskiornis melanocephalus,* migratory shorebirds, gulls and terns. The Estuarine Crocodile *Crocodylus porosus* formerly occurred, but had disappeared by the early 1950s. The monitor lizard *Varanus salvator* is still reported to occur in the mangroves.
Special floral values: None known.
Research and facilities: Studies have been carried out on the effects of shrimp farming and other impacts on the mangrove ecosystem (Mahmood 1986).
References: Forest Department (1974 & 1976); Karpowicz (1985); Mahmood (1986); Reza Khan (1986a).
Criteria for inclusion: le, 2c, 3b.
Source: See references.

Wetland name: Teknaf Peninsula and the Naaf Estuary
Country: Bangladesh
Coordinates: 20°43'-2l°08'N, 92°12'-92°22'E;

Location: at the extreme southeastern tip of Bangladesh on the Burmese border, 45-90 km SSE of Cox's Bazar, Cox's Bazar District, Chittagong Division.
Area: c.16,000 ha including 1,800 ha of mangrove forest.
Altitude: 0-3m.
Biogeographical Province: 4.4.1.
Wetland type: 02, 05, 06, 07, 10 & 19.
Description of site: The Teknaf Peninsula is a long, narrow forested peninsula rising to 300 metres above sea level, and separating the Bay of Bengal from the lower reaches and estuary of the Naaf River. The western shore of the peninsula is a sand beach which extends for over 75 km in a single stretch, and averages about 160m in width at high tide. Sand flats up to two km in width and patches of dead coral and boulders are exposed at low tide. The Naaf Estuary to the east of the peninsula has extensive mangrove swamps and intertidal mudflats. Much of the western bank of the river has been converted into rice paddies which remain flooded for most of the year. The estuary contains many low islands such as Tutardia, Lal Char, Goraidia, Ochodia, Rukumodia, Bilasodia, Birmirdia and Jolodia, which support mangrove vegetation and are surrounded by mudflats up to 60m wide at low tide. From 1982 onwards, many of the paddy lands, mudflats and mangrove swamps have been converted into shrimp ponds, and this activity has now spread to some of the islands.
Climatic conditions: Humid tropical maritime climate with an average annual rainfall of about 4,060 mm and a relative humidity of over 80%. Most of the rain falls during the monsoon from June to September. Temperatures are more or less uniform throughout the year.
Principal vegetation: The dominant mangrove species are *Sonneratia apetala, S. lucida, Avicennia alba, A. officinalis, Acanthus* ilicifolius and *Nypa fruticans;* other mangrove species include *Excoecaria agallocha, Ceriops roxburghii* and *Bruguiera gymnorhiza.* The riverbanks are covered in a dense growth of *Oryza coaretata.* The lowlands on the west bank of the river are under cultivation; the hills of the Teknaf Peninsula are covered in tropical wet evergreen and semi-evergreen forest.
Land tenure: Most of the wetland is privately owned, but some areas (khas lands) are owned by the Government and leased to private individuals on 2-5 year leases.
Conservation measures taken: The Government was supposed to have declared some of the islands as Game Reserves under the Bangladesh Wildlife (Preservation) (Amendment) Act, 1973, but these reserves have never been implemented and the islands continue to be exploited. The forested hills of the Teknaf Peninsula are protected in the Teknaf Game Reserve (11,651 ha), established in 1983.
Conservation measures proposed: The Government should implement the reserves which have already been planned, and should extend these to include all other islands and some of the tidal mudflats at Shahpurdwip, Teknaf, Muchoni and Whykeong.
Land use: Fishing, cultivation of rice, shrimp farming and hunting.
Disturbances and threats: Large areas of the mangrove forest, mudflat and rice paddy have been converted into shrimp ponds since 1982, and this destruction of wetland habitat continues. There is heavy grazing by domestic livestock on the riverbanks and islands, and a considerable amount of trapping and shooting of waterfowl, including migrating Open-bill Storks *Anastomus oscitans.* The Teknaf Peninsula is a densely populated region, and there is reported to be a serious problem of encroachment in the Teknaf Game Reserve, as well as in adjacent forested areas.

Economic and social values: No information.
Fauna: An important area for a wide variety of waterfowl; Rashid and Khan (1987) recorded 81 species including 40 residents and 41 migrants. Common residents include *Tachybaptus ruficollis, Phalacrocorax niger, Anhinga melanogaster, Ixobrychus cinnamomeus, Egretta alba, Ardea cinerea, Dendrocygna javanica, Amaurornis phoenicurus, Gallicrex cinerea, Metopidius indicus, Glareola maldivarum, Vanellus indicus, V. malabaricus* and *Gelochelidon nilotica.* Other noteworthy residents include *Ixobrychus flavicollis, Egretta gularis, Nettapus coromandelianus, RaIlus striatus, Porzana fusca, Porphyrio porphyrio, Himantopus himantopus, Vanellus spinosa, Sterna aurantia* and *S. albifrons.* Several pairs of the Lesser Adjutant *L. javanicus* nest in the mangroves, and one pair of the much rarer Greater Adjutant *Leptoptilos dubius* has recently been found nesting in the area. Common migrants and winter visitors include *Anas acuta, Pluvialis dominica, P. squatarola, Charadrius dubius, C. alexandrinus, C. leschenaultii, C. mongolus, Numenius phaeopus, N. arquata, Tringa totanus, T. nebularia, Gallinago stenura, G. gallinago, Calidris alba, Philomachus pugnax, Larus ridibundus, Chlidonias hybrida and Sterna hirundo.* Large numbers of Open-bill Storks *Anastomus oscitans* occur on migration, and flocks of up to several hundred birds have been recorded. Other migrants and winter visitors recorded in small numbers include *Threskiornis melanocephalus, Pseudibis papillosa, Anser indicus, A. anser, Sarkidiornis melanotos, Haematopus ostralegus, Tringa stagnatilis, Xenus cinereus, Calidris tenuirostris, Larus ichthyaetus, L. brunnicephalus* and *Rynchops albicollis.* Birds of Prey include one pair of White-bellied Sea-Eagles *Haliaeetus leucogaster.*
The Crab-eating Macaque *Macaca fascicularis* and the monitor lizard *Varanus salvator* occur in the mangroves.
Special floral values: No information.
Research and facilities: Rashid and Khan (1987) carried out a study of the waterfowl of the Teknaf Peninsula between May 1982 and December 1983.
References: Forest Department (1974 & 1976); Husain & Sarker (1984); IUCN(1987); Karpowicz (1985); Mahmood (1986); Rashid & Khan (1987); Reza Khan (1986a).
Criteria for inclusion: 1b, 2a, 3b.
Source: S.M. Abdur Rashid.

Wetland name: St. Martin's Island
Country: Bangladesh
Coordinates: 20°37'N, 92°19'E;
Location: in the Bay of Bengal 10 km south of the southern tip of Teknaf Peninsula, Cox's Bazar District, Chittagong Division.
Area: 600 ha.
Altitude: O-5m.
Biogeographical Province: 4.4.1.
Wetland type: 03, 05, 06 & 07.
Description of site: A small offshore island in the Bay of Bengal, with extensive live coral reefs off the western, southern and eastern shores, a large area of intertidal sand flats and mudflats along the eastern and southern shores, and stunted mangrove vegetation covering the southwestern part of the island. Coral boulders are scattered over the island, and there are large areas of sand dunes. The underlying rock formations are similar to those of the

Chittagong Hills to the northeast. St. Martin's Island (or Jinjira) is the only coral island in Bangladesh.
Climatic conditions: Humid tropical maritime climate with an average annual rainfall of about 4,000 mm and a relative humidity of over 80%. Most of the rain falls during the monsoon from June to September. Temperatures are more or less uniform throughout the year.
Principal vegetation: There is some stunted mangrove forest in the southwest of the island, and the sand dunes support an extensive growth of *Ipomoea pescaprae* with some *Vitex nigunda* and *Pandanus odoratissimus.*
Land tenure: No information.
Conservation measures taken: None.
Conservation measures proposed: Reza Khan (1985) has recommended that the whole island be declared either a marine national park or protected coral island to prevent the uncontrolled exploitation of coral, limestone deposits and the eggs of marine turtles.
Land use: Fishing and subsistence agriculture. About 3,000 people live on the island. Fresh water is in short supply and is the controlling factor for growth of agriculture and human population.
Disturbances and threats: Uncontrolled exploitation of coral reefs and limestone desposits, and collection of the eggs of marine turtles for human consumption.
Economic and social values: As the only coral island in Bangladesh, St. Martin's is of considerable interest for scientific research and has potential for tourism and conservation education.
Fauna: During a ten day survey of the island, Reza Khan (1982) recorded ten species of mammals, 80 species of birds, 20 species of reptiles and two or three species of amphibians. The island is particularly important as a wintering area for a wide variety of migratory shorebirds, gulls and terns, and as a nesting area for marine turtles. All five species of marine turtle known to occur in Bangladesh have been reported in the area, namely *Chelonia rnjdas, Caretta caretta, Lepidochelys olivacea, Eretmochelys imbricata* and *Dermochelys coriacea.* Three species are known to nest: *L. olivacea, C. mydas* and *E. imbricata* (Rashid, 1986a). Other reptiles include *Varanus salvator* and the sea-snakes *Laticauda laticauda, L. colubrina* and *Enhydrina schistosa.*
Special floral values: None known.
Research and facilities: Basic faunal and floral surveys have been carried out, but no detailed research seems to have been conducted on the island.
References: Fugler (1984); Rashid (1986a); Reza Khan (1982 & 1985).
Criteria for inclusion: lb, 2a, 2c, 3b.
Source: See references.

Wetland name: Hatiya Island and neighbouring Chars
Country: Bangladesh
Coordinates: 22°00'-22°35'N, 91°00'-91°20'E
Location: in the outer estuary of the Meghna River**,** 35-80 km south of Noakhali, Greater Naokhali District.
Area: c.75,000 ha of islands, mudflats and channels; area of wetlands unknown.
Altitude: O-4m.

Biogeographical Province: 4.3.1.
Wetland type: 02, 03, 06 & 07.
Description of site: Hatiya Island is one of the largest and most densely populated of the low-lying islands in the outer Gangetic delta. It has a very old history of human settlement and culture. The shape of the island is subject to continuous change as a result of erosion, tidal insurgence and other natural calamities. The whole island has been surrounded by an embankment, constructed by the Water and Power Authority to protect the island from tidal insurgence. There are extensive intertidal mudflats outside this sea-wall at Mach Char Char in the northwest and at Sagaria in the southeast. Neighbouring low-lying islands (chars) include:
1.Ghasiar Char: 22°22'-22°24'N, 91°00'-91°Ol'E; about two km west of Hatiya Island and north of Dhal Char. A small island with extensive intertidal mudflats and some mangrove plantations.

2.Maulvir Char: 22°2l'-22°25'N, 91°0l'-91°02'E; a small island with extensive intertidal mudflats, subject to serious erosion in the northeast, north and west.

3. Shahebani Char: 22°26'-22°27'N, 91°10'-9l°ll'E; a small uninhabited island (c.750 ha) in the Hatiya Channel northeast of Hatiya Island, with intertidal mudflats along the eastern and southeastern shores.

4.Char Bhata: 22°35'N, 91°l0'-91°20'E; approximately 1,000 ha of intertidal mudflats and sand bars along the mainland coast north of Hatiya Island.

5.Nijhum Dweep (Char Osman): 22°05'-22°09'N, 9l°0l'-91°05'E; a recently accreted island with very extensive mudflats and associated sand bars, to the south of Hatiya Island. The waters around the islands are brackish, with a tidal rise and fall of about l-2m.
Climatic conditions: Tropical maritime climate with temperatures generally in the range l2-25°C.
Principal vegetation: Most of the mudflats are covered with *Oryza coeractata.* Much of Nijhum Dweep and parts of Ghasiar Char and Char Bhata have been planted with mangroves such as *Sonneratia apetala* and *Avicennia sp. Saccharum* sp occurs along the inland creeks at Char Bhata. The vegetation in the interior of Hatiya Island includes *Albizzia* sp, various bamboos, *Acacia sp, Anthocephalus chinensis, Ficus benghalensis, Syzygium sp, Azadirachta indica, Streblus asper, Diospyros peregrina, Zizyphus sp, Erythrina sp, Cassia fistula, Delonix regia, Phoenix sylvestris, Borassus flabellifer* and *Cocos nucifera.* Seasonal crops include rice and *Brassica juncea.*
Land tenure: Most of Hatiya Island, Ghasiar Char and Maulvir Char and the whole of Shahebani Char are under private ownership. Part of Ghasiar Char is owned by the Forest Department; most of Char Bhata is owned by the Government and under the control of the Forest Department, and the whole of Nijhum Dweep is owned by the Government.
Conservation measures taken: Most of Nijhum Dweep and parts of Ghasiar Char and Char Bhata have been planted with mangroves by the Forest Department under the Coastal Afforestation Programme.
Conservation measures proposed: Rashid (in press) has recommended that Nijhuni Dweep, Ghasiar Char, Char Bhata and the mudflats on the northwest and southeast coasts of Hatiya

Island be designated as waterfowl conservation areas. Top priority should be given to the establishment of a conservation area at Nijhum Dweep, before illegal encroachment causes any further damage to the environment.

Land use: Human settlement, grazing by domestic livestock, fishing, cultivation, river transportation and local trade. Hatiya is a densely populated island with numerous towns and villages. There is a ferry port at Char Bhata. Fishing provides one of the main sources of income. Rice, seasonal vegetables and various fruits are cultivated on most of the islands, and fuelwood is collected by the local people from the afforested areas. Illegal settlement began on Nijhum Dweep about four or five years ago, and by January 1988, approximately 3,500 people, mostly fishermen, had settled on the island. No measures have as yet been taken to clear these illegal settlers.

Possible changes in land use: Hatiya Island has been proposed as the site for a new seaport.

Disturbances and threats: Fishing activities and livestock grazing on the mudflats cause considerable disturbance to waterfowl, and there is some illegal hunting, particularly on Ghasiar Char, Maulvir Char, Char Bhata and Nijhum Dweep. Illegal settlers on Nijhum Dweep are clearing land for rice cultivation and encroaching on the mangrove plantations.

Economic and social values: Hatiya Island is an important area for local trade as well as fishing, agriculture and river transport. The other islands are important for rice production, livestock grazing and fishing.

Fauna: Some of the common reptiles include *Calotes versicolor, Mabuiya sp, Varanus bengalensis, V. flavescens, Xenochrophis piscator, Naja naja* and *Lessimys punctata. Enhydrina schistosa* is commonly reported by fishermen in the waters around Nijhum Dweep.

The islands are very important staging and wintering areas for a wide variety of waterfowl, particularly migratory shorebirds. During a brief survey in mid-January 1988, S.M. Abdur Rashid recorded over 108,000 waterfowl of 49 species. The largest concentrations of birds were at Hatiya (19,000), Ghasiar (39,500), Maulvir (28,500) and Nijhum (14,500). The counts included:

170 *Ardeola grayii*
500 *Egretta garzetta*
400 *E. intermedia*
160 *E. alba*
70 *Anser indicus*
420 *Tadorna ferruginea*
6,200 *Anas penelope*
1,550 *A. strepera*
200 *Netta rufina*
2,000 *Aythya ferina*
60 *Recurvirostra avosetta*
6 *Drornas ardeola*
90 *Pluvialis squatarola*
710 *P. dominica*
50 *Charadrius placidus*
2,700 *C. alexandrinus*
19,400 *C. mongolus*
100 *Limosa limosa*

1,350 *Numenius arquata*
100 *Tringa erythropus*
1,400 *T. totanus*
525 *T. stagnatilis*
1,780 *T. nebularia*
300 *T. guttifer*
1,200 *T. ochropus*
430 *Xenus cinereus*
1,030 *Actitis hypoleucos*
250 *Calidris ferruginea*
3 *Eurynorhynchus pygmeus*
370 *Larus ichthyaetus*
740 *L. brunnicephalus*
1,300 terns of four species
as well as 5,500 unidentified ducks and 56,500 unidentified shorebirds. The large number of Nordmann's Greenshanks *Tringa guttifer* and the presence of Crab Plover *Dromas ardeola* and Spoon-billed Sandpiper *Eurynorhynchus pygmeus* were particularly noteworthy. The Ganges River Dolphin *Platanisia gangetica* is reported to be common. Other common mammals include *Canis aureus, Herpestes auropunctatus, Aonyx cinerea, Viverra zibetha* and *Bandicota indica.*
Special foral values: None known.
Research and facilities: Shorebird surveys were carried out by S.M. Abdur Rashid in January 1988. There is a permanent Forest Beat Office on Nijhum Dweep where short-term accommodation facilities are available.
References: Rashid (in press).
Criteria for inclusion: 1 b, 2a, 2c, 3a.
Source: S.M. Abdur Rashid.

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