BANGLADESH FLOOD ACTION PLAN

NORTHEAST REGIONAL WATER MANAGEMENT PROJECT (FAP 6)

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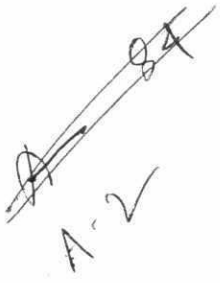
DRAFT FINAL REPORT

WETLAND ASSESSMENT AND ORNITHOLOGY MAIN SURVEYS

by
Derek A. Scott
Asian Wetlands Bureau
Kuala Lampur

and

S.M.A. Rashid
Nature Conservation Movement
Dhaka, Bangladesh



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1. INTRODUCTION

The Northeast Regional Project (NERP), funded by the Canadian International Development Agency (CIDA) as part of the Bangladesh Flood Action Plan (FAP 6), seeks to develop a comprehensive water resources management plan for the Northeast Region of the country.

To achieve this objective, NERP has identified the need to obtain field information on a wide variety of environmental parameters in order to develop the understanding required to identify, plan, design, implement, operate, and monitor projects such that they are environmentally acceptable.

Within this context, a high priority was to identify wetland sites of international and national importance for wild animals and plants, especially migratory and threatened species; to identify priority areas for nature conservation; and to establish a basis for a monitoring programme designed to assess the impact of development projects on wildlife populations.

To achieve these ends, NERP has engaged a team of national and international consultants in the areas of ornithology, wildlife biology, and botany. A series of technical papers and data reports will be produced by this team, based mainly on field observations.

The wetland appraisal and ornithology main survey efforts were carried out by a team of two consultants, Dr. Derek Scott and S.M.A. Rashid. Wetland appraisal and ornithology were combined for several reasons: (a) the ornithology main survey was the first fielded; (b) Dr. Scott, while primarily an ornithologist, has extensive experience in wetland assessment (as editor of the *Directory of Asian Wetlands*, designer of the Ramsar data sheet, etc.); and (d) Mr. Rashid has extensive experience in Bangladesh wetlands as both an ornithologist and wildlife biologist (wildlife observations from this survey period will be presented in the first wildlife biology technical paper).

The completed and planned ornithology reports are:

1. Ornithology section (complete), Draft Thematic Study - Miscellaneous Non-engineering Studies (other sections incomplete)
2. Final report, wetland assessment and ornithology main surveys 16 Feb - 18 May 92 (this document; includes interim results of first three monthly waterfowl counts)
3. Monthly data reports of monthly waterfowl count results (first three in preparation, remaining nine are planned)
4. Final report, monthly counts (planned)

2. OBJECTIVES

The principal objectives of the main ornithology survey, as outlined in the NERP Work Plan of Sep 91, for the Northeast Region, were as follows:

- review and summarize existing information on waterfowl;
- undertake rapid field surveys of wetlands and assess their importance for waterfowl;
- identify key areas and make recommendations for the conservation and management of these sites;
- assess the likely impacts of ongoing and proposed water development projects; and
- propose appropriate mitigation measures.

3. BACKGROUND

3.1 Northeast Region

The Northeast Region covers an area of approximately 24,500 sq km, bounded by the international border with India to the north and east, the Old Brahmaputra to the west, and the Nasir Nagar (to Madhabpur) and Meghna rivers to the south. The greater part of this region is taken up by the *haor* basin which comprises the floodplains of the Meghna tributaries, and is characterized by the presence of numerous large, deeply flooded depressions, known as *haors*, between the rivers. This vast alluvial plain possesses some 6,000 permanent shallow water bodies known as *beels* (usually in the lowest parts of the *haors* or in abandoned river channels), surrounded by large areas of seasonally flooded plains. 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, with much of the region being flooded to a depth of up to six metres. The drainage is southwest via the Surma, Kushiyara, Baulai and Kalni rivers into the Meghna River and Bay of Bengal. Almost all land above the maximum flood level is under permanent cultivation and human settlement. There are extensive plantations and groves of trees around most villages and homesteads, and in many areas this creates an aspect of discontinuous forest.

The climate is subtropical monsoonal 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 normally vary between 26 and 31 C in the pre-monsoon period (Mar to May), 28 to 31 C in the rainy season, and 26 to 27 C in winter. Extreme temperatures at Sylhet in the ten-year period 1975-1984 were 6.4 and 39.3 C.

3.2 Wetlands

The wetlands of the *haor* basin have recently been described in *A Directory of Asian Wetlands* (Scott, 1989). Information on the wetlands of Bangladesh in the Directory was provided by Abdul Wahab Akonda of the Forest Department, and by S.M.A. Rashid and Raguib Uddin Ahmed of the Wildlife Society of Bangladesh. The following brief description of the wetlands is taken from their account, which was based to a large extent on their own field investigations.

The *haors*, from which the region takes its name, are back swamps or bowl-shaped depressions between the natural levees of rivers, or in some cases, much larger areas incorporating a succession of these depressions. The *haors* flood to a depth of as much as six metres during the rainy season, and in many cases two or more neighbouring *haors* link up to form much larger water bodies. During the dry season, most of the water drains out, leaving one or more shallow lakes (*beels*). Many of these become overgrown with aquatic vegetation, and some dry out completely by the end of the dry season. The term *beel* is also used for oxbow lakes and other permanent water bodies in abandoned river channels; these are especially numerous along the lower courses of the Baulai and Kalni Rivers. As the monsoon flood waters recede during the dry season, rich alluvial soils are exposed around the margins of the *beels*, and these are extensively cultivated for rice.

The *haor* basin contains about 47 major *haors* and some 6,300 *beels* of which about 3,500 are permanent and 2,800 are seasonal. These wetlands vary in size from as little as a few hectares to many thousands of hectares. The principal systems are as follows:

- 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*; located in the eastern and lowest part of the basin in Mymensingh.
- Tangua, Shanir, and Matian *haors* in the deep northern basin at the foot of the Meghalaya Hills; these form a single water body during the rainy season.
- Dekhar Haor, Pathar Chanli Haor, and Jhilkar and Jhinkar Haors, to the east of the Tangua system.
- The Jamaikata, Mahai, Nalua, and Parua haor system, on the eastern rim of the basin.
- Hakaluki, Chatal Bar, Haila, Kawadighi, Pagla and many smaller *haors*, in the central Sylhet lowlands.
- Hail Haor, between the Tarap and Banugach hill ranges in the southeast.
- Dingapota, Ganesher, Tolar, Anganer, Bara, and Humaipur Haors, in the south of the basin.
- Etna and Sania Haors, Kishorganj district.
- Khaliaghuri Haor, east Mymensingh.

A more detailed account of the wetland ecosystems of the *haor* basin is given by Syed Iqbal Ali (1990).

The *Directory of Asian Wetlands* (hereafter the *Directory*) identifies the wetlands of the *haor* basin of Sylhet and Mymensingh as a wetland ecosystem of outstanding international importance on the basis of criteria established in relation to the he Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat. The *haors*, *beels*, and ponds support major subsistence and commercial fisheries, the seasonally flooded plains support a major rice-growing industry, and the abundant aquatic vegetation provides rich grazing for domestic livestock and a source of fuel, food and fertilizers for the local people. The wetlands are home to a very wide variety of resident and migratory waterfowl, including an estimated 100,000-150,000 ducks, and provide a refuge for many other species of wildlife which are becoming increasingly rare elsewhere in Bangladesh.

The *Directory* treats the *haor* basin as a single wetland system. However, within this system, six of the larger *haors* and four individual *beels* are singled out as being of special importance for their wildlife, and are described in greater detail. These accounts are reproduced in an abbreviated form in Annex A. Four of the *haors* (Tangua, Hakaluki, Kawadighi, and Hail) had long been known to be of outstanding importance for their waterfowl populations, while recent field surveys by Akonda, Rashid, and Ahmed had indicated that the other six sites (Dekhar Haor, Dubriar Haor, Meda Beel, Aila Beel, Kuri Beel, and Erali Beel) could at times support large numbers of waterbirds. However, much of the region remained poorly known, and it was acknowledged by these authors that other sites, equally important for wildlife, might remain to be discovered.

The international significance of the wetlands of the *haor* basin for their waterfowl populations was first drawn to the attention of the international conservation community at an International Regional Meeting on Conservation of Wildfowl Resources held in St. Petersburgh (at that time Leningrad) in Sep 68. At that meeting, Savage (1970) and Savage and Abdulali (1970) presented papers on the status of the main wildfowl resorts and wildfowl species in East Pakistan. They identified four wetland systems within the

haor basin as being of special importance for waterfowl: Tangua Haor, Hakaluki Haor, Kawadighi Haor, and Hail Haor.

Further information on the important wetlands of the *haor* basin was presented by Fazlul Karim on behalf of the Forest Department at an International Conference on Conservation of Wetlands and Waterfowl held in Heiligenhafen, Germany, in Dec 74 (Forest Department, 1976). This report placed special emphasis on the importance of Hakaluki and Hail Haors for their rich and diverse waterfowl populations. More recently, Scott and Poole (1989), in their *Status Overview of Asian Wetlands,* stressed the importance of the wetlands of the *haor* basin, and urged that ongoing studies in the region be expanded with a view to the development of a regional wetland management plan.

3.3 Birds

Although the wetlands of the *haor* basin have long been known to be of considerable importance for waterfowl and other wildlife, most of the published information on the region, and especially the earlier literature, is either very anecdotal or consists of little more than a description of specimens collected in the area.

One of the most useful early accounts of the birds of Sylhet is that of Hume (1888) who lists 178 species for Sylhet including the now extinct Pink-headed Duck *Rhodonessa caryophyllacea*. (The scientific names of all species mentioned in the text are given in Appendices 7, 8, and 9). Stuart Baker (1922-1930) did some work on the birds of the Northeast, and makes several references to "plains of reeds" - a habitat type which has now almost disappeared from the region. More recently, the 1966 World Wildlife Fund Expedition to West and East Pakistan made some observations in the region; these are summarized by Guy Mountfort (1969).

Haroun Er Rashid (1967) gives a brief summary of the status of all bird species in each of the ten main regions of Bangladesh, one of which comprises the lowlands of the *haor* basin ("North-East Lowlands"). However, Rashid admits that for many species the information which he gives on status is based more on assumption than on positive records, largely because of the impreciseness of locality information in earlier accounts.

The most recent comprehensive listing of the birds of Bangladesh (Harvey, 1990), adopts a much more cautious approach, and includes only those species and records for which there is full documentation. Harvey divides Bangladesh into six regions (one of which is the Northeast) and gives an indication of the status of each species in each region. He also includes useful information on habitat preferences and breeding seasons. However, his summaries of status relate almost entirely to the situation in the last 20 or so years, and he gives little indication of the former status of many species which must once have been widespread and common in Bangladesh, but which are now rare or extinct.

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S.U. Sarker and K.Z. Husain (1990) have recently given a listing of 174 species of birds which occur in the wetlands and mangrove areas of Bangladesh, and have discussed some of the implications for their conservation. However, there have been few studies relating specifically to the waterbirds of the Northeast. Some preliminary investigations have been carried out by personnel of the Forest Department, University of Dhaka, and Bangladesh Zoological Society; most of this work has focussed on Hakaluki Haor and Hail Haor. Mid-winter waterfowl censuses were undertaken in the Northeast by Forest Department and NACOM personnel in the years 1987, 1988, 1990 and 1991, as part of the Asian Waterfowl Census that is organized by the International Waterfowl and Wetlands Research Bureau

(IWRB) and the Asian Wetland Bureau (AWB). However, these censuses covered only four sites (Hakaluki, Hail, Kawadighi, and Tangua Haors), and the counts give little more than a rough indication of the species present and their relative abundance.

The site accounts in the *Directory* give preliminary lists of waterfowl known to occur at each of the ten sites described in detail. Other useful sources of information on the birds of the wetlands of the Northeast Region include an unpublished list of bird sightings at Hail Haor by D.J. Millin (1984-88) and J.D. Woolner (1986-91), with notes on 108 species, and unpublished notes on scarce waterfowl in the Northeast Region by Altamash Kabir. Khan (1987) summarizes the status of the storks and other large waterbirds in Bangladesh and makes a numbers of references to the importance of the wetlands of the *haor* basin, but gives little specific information. Similarly, many other recent authors have referred to the importance of the *haor* basin for waterbirds, especially migratory species and several rare and endangered species, but have been unable to provide any useful quantitative information.

Of the 125 species of waterfowl known or thought to have occurred in the *haor* basin, ten are listed in the *IUCN Red List of Threatened Animals* (1990; Annex B). Other globally threatened species associated with the wetlands of the *haor* basin include a fish-eating bird of prey (Pallas's Fish-Eagle), a partridge, a bustard, and four species of passerines associated with floodplain grasslands, and a kingfisher of ponds and streams in forested areas (Annex B).

There is a need for a well-reasoned and officially-recognized list of nationally-threatened birds and other wildlife in Bangladesh, based on well-formulated criteria and representing a consensus of opinion. This might best be achieved through the establishment of a panel of experts including representatives of all relevant Government departments, academic institutions and NGOs. The proposed National Wetlands Committee, which is likely to be established in the near future, could perhaps make a start by compiling a list of threatened wetland fauna in Bangladesh.

Several lists of bird species considered to be "threatened" or "endangered" in Bangladesh, including some wetland species occurring in the Northeast Region, do exist (Annex C). Two of these lists appeared in different versions of the Draft National Conservation Strategy for Bangladesh, in the Wildlife and Protected Areas section; a third list was prepared by NACOM in 1991 (Annex C). None of the lists meets any of the criteria mentioned above, however, and all exhibit poor species choices (omission of species known to be on the verge of extinction in Bangladesh e.g. Black-necked Stork and Red-naped Ibis; inclusion of very common and widespread species e.g. Little Grebe, Northern Shoveler, Brahminy Kite).

4. METHODOLOGY

4.1 General

In view of the almost complete lack of good quantitative data on the waterfowl populations of the *haor* basin, and very fragmentary information on the importance of all but the two best known sites, it was felt that the most urgent need in the present study was for rapid field surveys and waterfowl censuses at as many wetlands as possible in the short time available. Two field surveys were carried out, one during late winter (dry season) and one during late spring (pre-monsoon period). These included extensive ground surveys (by vehicle, by boat, and on foot) as well as three aerial surveys, each of two to three hours in duration.

4.2 Timing of the surveys

Any assessment of the importance of wetlands for resident and migratory waterbirds should as a basic minimum involve two surveys: one undertaken during the mid-winter period, to assess the importance of the sites as wintering areas for migratory species that breed at more northerly latitudes; and another during the main breeding season, to assess the importance of sites for resident breeding birds and any breeding summer visitors that spend the winter further south. Ideally, surveys should also be carried out at the height of the spring and autumn migration seasons, to assess the importance of the wetlands as staging areas for migratory waterfowl on their way between wintering areas further south and breeding areas further north.

In wetland systems subject to wide fluctuations in water level and extensive desiccation during an annual dry season, it is also essential that a survey be conducted at the time when water levels are at their lowest, since it is only then that critical dry season refuges for waterfowl can be identified. A survey at the time of maximum flooding is usually less important, as at that time there is an abundance of wetland habitat available for waterbirds; the birds themselves are widely scattered and it is often difficult to pin-point the important areas.

In the Northeast Region of Bangladesh, it was also clearly important to conduct a survey during the pre-monsoon period since many of the proposed water management projects are aimed at controlling the flash-flooding which occurs at this time. The impact of these projects on the wetlands, their waterfowl and other wildlife populations is likely to be at its greatest during this pre-monsoon season.

Fortunately, in the Northeast Region of Bangladesh most of these requirements can be met with just two surveys: one in late winter and one in late spring. Wintering populations of waterfowl are still present in the region until early March, and this is the time when water levels are generally at or near their lowest levels. Late spring (the pre-monsoon period) is typically the season of flash-flooding, and is also the time when many of the waterbirds are preparing to breed. Surveys were therefore carried out during these periods; the first between 18 Feb and 12 Mar 92, and the second between 19 Apr and 9 May 92. Although the main spring migration (Mar, Apr) was largely missed by these two surveys, some early migrants were already passing through the region by the end of the first survey, while a number of late migrants were still present at the time of the second survey. The itineraries of the two field surveys are given in Annex D.

4.3 Scope and access

The principal objective of these two surveys was to carry out a rapid assessment of the importance of the wetlands of the *haor* basin for waterbirds. Efforts were made to visit as many sites as possible throughout the region, and especially to visit any sites known or rumoured to be of particular importance for waterfowl. Most wetlands in peripheral areas of the basin are readily accessible by vehicle, by boat and/or on foot, and these were the principal means of access. However, there are large areas in the deeper, central portion of the *haor* basin, particularly along the lower Baulai and Kalni Rivers, which are far from the nearest vehicular access and, by the end of the dry season, are inaccessible by boat. These areas were surveyed by air on 25 and 26 February and again on 9 May in a Cessna 182 on hire from Dhaka Flying Club. The first aerial survey covered the central portion of the *haor* basin along the lower Baulai River, while the second covered the east-central basin along the lower Kalni River to the Sylhet region and also wetlands along the southeastern rim of the basin (Hakaluki Haor, Kawadighi Haor and Hail Haor). The third survey, in early May, covered the same areas along the lower Baulai and Kalni rivers, as well as the Surma River between Sylhet and Sunamganj and the important Aila Beel complex.

4.4 Participants

The two principal investigators (DAS and SMAR) were joined for a part of the time by Dr Sara Bennett (Environmental Coordinator at NERP), Mr Anisuzzaman Khan (President) and Mr Abu Saeed (Field Biologist) of the Nature Conservation Movement (NACOM), Mr S.A. Hussain (South Asian Coordinator for the Asian Wetland Bureau) and Mr Ron Livingston (Consultant Resource Manager).

4.5 Data gathering

Detailed records were maintained of all birds observed at the wetlands and elsewhere in the region, and counts were made of all waterfowl and most birds of prey. Details were also kept of all evidence of mammals, reptiles and amphibians in the wetlands (sightings of live animals, corpses, tracks etc). At each wetland, basic information was gathered on the condition of the wetland (water level, aquatic vegetation and surrounding terrestrial vegetation), fishing activities, hunting activities and the general level of disturbance from other human activities.

Waterfowl census data were recorded on the standard waterfowl census forms used by IWRB and AWB in the Asian Waterfowl Census. Examples of these census forms are given in Annex E. The counts made during the late winter survey have been submitted to IWRB for inclusion in the 1992 Asian Waterfowl Census Report (to be published later in the year) and Asian Waterfowl Database maintained at IWRB Headquarters in the U.K.

4.6 Site evaluation

The evaluation of sites has been based on the criteria developed in relation to the Ramsar Convention (Annex F). These criteria are now widely recognized as a sound basis for the identification of "wetlands of international importance", and are appropriate for use in Bangladesh as this country has recently become a Contracting Party to the Convention. In the absence of any formal criteria for the identification of wetlands of "national importance" in Bangladesh, those sites which narrowly fail to qualify as internationally important wetlands under the Ramsar criteria are regarded as being of "national importance".

4.7 Coverage and limitations

Sixty-three sites, mostly individual *beels* or small groups of *beels*, were visited by vehicle, by boat or on foot, 60 of these during the February/March survey and 51 during the April/May survey (i.e. 48 sites during both surveys). Most of the 12 sites visited in Feb/Mar but not in Apr/May were rather small, isolated and relatively unimportant *beels* in the Habiganj, Netrakona and Mymensingh areas. Together, these sites held less than 6% of the waterfowl recorded during the Feb/Mar survey.

Many of the 63 sites visited on the ground were also surveyed from the air. In addition, the aerial surveys covered two large areas in the central and lowest portion of the *haor* basin (the extensive floodplains and numerous small *beels* along the lower Baulai River, and similar habitat along the lower Kalni River), as well as three smaller areas (a 30 km stretch of the Old Brahmaputra south of Mymensingh, the Chapra and Singai *beels* east of Sylhet, and Jaor Beel near Sunamganj).

It had been anticipated that the aerial surveys would locate a number of sites with hitherto unknown concentrations of waterfowl. In fact, very few wetlands of any significance for waterfowl were located from the air. Most of the *beels* and oxbow lakes in the central part of the *haor* basin are too small, too widely separated, and too intensively fished and farmed to support waterfowl other than a few egrets and shorebirds. The only significant "new" concentration of ducks located from the air was in Maijeil Haor

(Patachatal and Borachatal Beels), where there were an estimated 3,000 ducks on 26 Feb. A ground survey of these two *beels* on 8 Mar confirmed the presence of 4,180 ducks.

During the two surveys, the investigators were able to visit all of the wetlands known or thought to be of special importance for waterfowl, as well as a large number of sites of only regional or local importance. Special attention was given to the ten sites described in the *Directory*: eight of these were visited during both surveys, and the other two once each (Meda Beel during the Feb/Mar survey and Aila Beel during the Apr/May survey). While only a tiny fraction of the 6,300 or so *beels* in the Northeast Region could be visited, it soon become apparent that the great majority were of very little significance for wildlife, and it was felt that few, if any, wetlands of international significance had been overlooked. The only possible major gap in coverage is thought to have been in the northwest, between the Kaluma Kanda region and the west end of Gurmar Haor. Restrictions on flying within 10 miles (16 km) of the Indian border ruled out an aerial survey, and shortage of time prevented a ground survey. No surveys were undertaken in Karchar, Joalbangha, Angurali or Shanir Haors, west of Sunamganj, but it seems that these embanked *haors* are relatively unimportant for wildlife. (Some wildlife investigations will be undertaken in Shanir Haor by biologists from NACOM as part of the NERP's Project Monitoring Program).

It must be stressed that the site evaluations in this report are based very largely on the importance of the wetlands as habitat for waterfowl. While waterfowl are often regarded as good indicators of the general ecological status of wetlands, and thus good indicators of the value of sites from the point of view of nature conservation, absence of large numbers of waterfowl does not necessarily mean that a site has little value. There may be sites in the *haor* basin which are of outstanding limnological or botanical interest (e.g. sites with endemic aquatic invertebrates or threatened species of aquatic plant), but which are of negligible importance for birds. Ideally, detailed limnological and botanical surveys should be carried out throughout the region, with a view to identifying any such sites. However, it seems unlikely that in a floodplain system, where most of the small permanent wetlands are united into huge lake systems during the monsoon season, there would be many individual wetlands (in this case *beels*) with unique or unusual limnological or botanical characteristics.

4.8 Other habitat types

Although the present work has focused very largely on the wetland ecosystems of the *haor* basin, some observations were made in the other major habitat types present in the region. In particular, observations were made on numerous occasions in agricultural land (principally rice fields) and homestead forest, both of which constitute very extensive habitat types in the Northeast Region. In addition, brief avifaunal surveys were carried out in two relict patches of tropical evergreen/semi-evergreen forest (West Banugach Reserved Forest east of Srimangal and Shatchari Reserved Forest near Madhabpur), while some casual observations were made in tea estates near Srimangal, and in secondary scrub near Maulvibazar and Srimangal.

5. ESTABLISHMENT OF MONTHLY MONITORING PROGRAMME

5.1 Justification

The wetlands of the *haor* basin are situated in a highly seasonal environment. Temperatures in mid-winter regularly fall below 10 deg C, while during the pre-monsoon period they often exceed 35 deg C. Over 80% of the annual rainfall of about 4,000 mm falls during the monsoon season from June to October,

and the region may remain completely dry for weeks on end during the winter months. Wetlands which are dry or almost completely so in late March or early April may be flooded to a depth of six metres by the end of the monsoon, while during the pre-monsoon period, flash-flooding may cause river levels to rise by as much as four metres in just two or three days. These wide fluctuations in the physical conditions are reflected in the changing structure of the plant communities in the wetlands, as well as in the agricultural activity and fishing activity of the local people. These in turn affect the wildlife populations. Waterbirds, being highly mobile, are especially well adapted to these fluctuating conditions, being able to move rapidly from one region to another as feeding conditions change.

In order to gain a better understanding of the way changing water levels, changing wetland vegetation and changing patterns of human activity in the wetlands affect waterbird populations and distributions in the *haor* basin, the ornithological survey programme includes regular monthly counts for a period of one year at a representative sample of wetlands throughout the region. These monthly waterfowl censuses will also provide systematic information on the migration of waterfowl through the region - the arrival and departure of winter visitors, the occurrence of passage migrants in spring and autumn, and the arrival and departure of summer visitors. At the same time, information will be gathered on the breeding seasons of waterbirds in the region. These are known to be complex, with some species breeding during the pre-monsoon period, others during the monsoon, and yet others after the monsoon.

5.2 Procedures

Censuses are to be undertaken at 15 wetlands during the last ten days of each month for one full year. As far as possible, the same individuals will carry out the counts each month, and will cover the same area. All waterbirds will be counted, and any evidence of breeding and migration recorded. Information will be gathered on the condition of the wetlands (water level, aquatic vegetation), fishing activity, agricultural activity, hunting activity and the presence of other fauna (mammals, reptiles and amphibians). This information and the waterfowl counts will be recorded on standardized data sheets. Appendices G gives examples of the two data sheets to be employed, while Annex H gives a suggested outline for the final report.

5.3 Criteria for site selection

The fifteen sites selected for the monthly censuses are listed in Table 1. An indication is given of the nature of each wetland and its status with respect to flood control, drainage and irrigation projects. These fifteen sites have been selected on the basis of the following criteria:

- the sites should be readily accessible and relatively easy to census at all times of the year;
- the sites should include a representative cross-section of the major wetland types present in the region;
- the sites should include at least a part of each of the six most important wetlands in the region (see Section 7.4.);
- the sites should include some sites as yet unaffected by FCDI projects, as well as at least one site within an existing full-flood embankment, and one site within an existing submersible embankment.

In fact, the 15 sites include two sites within full-flood embankments, two sites within existing submersible embankments, one site within an ongoing drainage improvement project and nine sites as yet unaffected by FCDI projects (all of these are, however, within proposed projects). The fifteenth site is a totally artificial group of fish ponds within a full-flood embankment.

TABLE 1: Sites selected for the Monthly Waterfowl Monitoring Programme

Name of Site	Wetland Type	FCDI Project
Tangua/Rauar Beel Tangua Haor	Large, permanent *beels*, emergent/floating veg.	Proposed submersible (72)
Pana Beel Tangua Haor	Medium-sized permanent *beel*, little emergent veg.	Proposed submersible (72)
Banuar Beel Matian Haor	Large shallow *beel*, rich emergent/floating veg.	Completed submersible (19)
Pasua Beel Gurmar Haor	Large *beel*, good natural vegetation + swamp forest	Completed submersible (49)
Kuri Beel Dekhar Haor	Isolated deep *beel* with little vegetation	Proposed submersible (71)
Deochapra Beel Khai Haor	Small, shallow *beel* with extensive floating veg.	Proposed submersible (81)
Erali Beel	Isolated deep *beel* in hilly terrain; little veg.	Proposed submersible (87)
Balai Haor	Group of large *beels* with rich aquatic vegetation	Proposed submersible (70)
Deodar/Chalnia Beels Damrir Haor	Group of small to large *beels* with little veg.	Ongoing drainage improvement project (9)
Haor Khal Hakaluki Haor	Very large, shallow *beel* with mud flats; little veg.	Proposed submersible (64)
Chatla/Pingla Beels Hakaluki Haor	Two large *beels* in much larger complex	Proposed submersible (64)
Patachatal/Borachatal Maijeil Haor	Two large *beels*, little vegetation	Proposed submersible (50)
Kawadighi Haor	Three large *beels* with good vegetation and mudflats	Existing full-flood embankment (94)
Hail Haor	Very large *beel*, extensive floating and emergent veg.	Existing full-flood embankment (97)
Fish ponds Hail Haor	Artificial ponds, little vegetation, protected	Within full-flood embankment (private)

5.4 Months one to three

The fifteen sites for the monthly waterfowl monitoring programme were identified during the late February/early March survey, and this in effect constituted the first of the monthly counts. SMAR, Anisuzzaman Khan and Abu Saeed carried out the second monthly count in late March (23 March - 1 April), refining the count procedures in the process. The third monthly count (late April) was carried during the course of the second main survey. (Only the highlights of the second monthly census are included in this report, as the results of the 12 monthly censuses will be presented in full in a separate report).

An indication of the effectiveness of the monthly censuses in providing an adequate sample of the waterfowl present in the region has been obtained from the first and third censuses, which took place as part of much more comprehensive waterfowl counts throughout the region. In late February/early March, the 15 monthly census sites held 66% of the waterfowl recorded during the entire survey, while in late April/early May, the corresponding figure was 54%. Clearly, this sample size is sufficient to give a very good indication of the real fluctuations in waterfowl numbers in the region during the course of the year.

6. FINDINGS

6.1 Wetlands

Table 2 lists all 68 sites visited during the present surveys, along with information on location, area and wetland type. Information on changes in water level between the two surveys, intensity of fishing activity and occurrence of hunting is given in Tables 3, 4, and 5 respectively. The location of the 68 sites is indicated in Figure 1.

Water levels

At the time of the Feb/Mar survey, water levels in most wetlands were at or near their lowest. Many of the shallower *beels* were almost entirely covered in mats of floating vegetation, and at a few there were extensive areas of emergent marsh vegetation. However, at the great majority of *beels*, cultivation of rice had kept pace with falling water levels, and the dominant emergent "marsh" vegetation around the edges was rice. Presumably, under natural conditions, large areas of bare mud would have been exposed around most *beels* by the end of the dry season. However, almost no areas of mudflat had been left uncultivated, and there was very little of this important feeding habitat available for waterbirds.

The main exceptions to this were at those *beels* which had recently been drained by fishermen to facilitate fishing. This was the case at Petangi Beel and Majherbanda Beel in Kawadighi Haor, and at Mehdi Beel near Sylhet. These *beels* were especially attractive to many species of waterfowl and several species of birds of prey. The exposed mudflats and mats of rotting aquatic vegetation provided excellent feeding areas for jacanas and shorebirds; fishing conditions were ideal for herons and egrets, and the mounds of "waste" fish tossed aside by fishermen were attracting large numbers of scavengers, particularly Black and Brahminy Kites, but also Pallas's and Grey-headed Fish-Eagles.

By the time of the Mar/Apr survey, the water level in most *beels* had increased slightly, generally by between 10 and 20 cm (Table 3). In most cases, this appeared to be due to local rainfall and run-off within the *haors*, and not to the over-topping of levees as a result of flash-flooding. However, there were some notable exceptions. The level of the Someswari River had risen by as much as two metres, and

TABLE 2: Sites visited during surveys: location, area, type

Name	Haor System	District	Coordinates	Area (ha)	Type*
Old Brahmaputra River	-	Mymensingh	24.27-24.45N 90.33-90.26E	(30 km)	1
Lower Baulai River	-	Netrakona Kishorganj	24.11-24.50N 91.00-91.09E	?	1
Lower Kalni River	-	Kishorganj Sunamganj	24.11-24.45N 91.00-91.41E	?	1
Sankardanga Beel	-	Habiganj	24.23N, 91.17E	100	4
Ratna Beel	-	Habiganj	24.23N, 91.21E	100	4
Khowai River	-	Habiganj	24.23N, 91.23E	50	6
Hail Haor	Hail	Maulvibazar	24.22N, 91.41E	2,800	3
Hail Haor Fish Ponds	Hail	Maulvibazar	24.19N, 91.41E	50	7
Petangi Beel	Kawadighi	Maulvibazar	24.34N, 91.47E	350	3
Majherbanda/Ulauli	Kawadighi	Maulvibazar	24.35N, 91.48E	900	3
Patachatal Beel	Maijeil	Sylhet	24.40N, 91.50E	50	4
Borachatal Beel	Maijeil	Sylhet	24.40N, 91.51E	80	4
Dubriar Beel	Dubriar	Sylhet	24.43N, 91.53E	80	4
Baisha Beel	Dubriar	Sylhet	24.44N, 91.54E	80	4
Chalnia Beels	Damrir	Sylhet	24.45N, 91.56E	200	4
Deodar Beels	Damrir	Sylhet	24.47N, 91.56E	80	4
Juri River	-	Sylhet	24.42-24.43N 91.57-92.03E	(14 km)	1
Kair Gang & *beel*	Hakaluki	Sylhet	24.41N, 92.03E	100	4
Haor Khal	Hakaluki	Sylhet	24.41N, 92.04E	250	2
Puala Beel	Hakaluki	Sylhet	24.42N, 92.05E	100	4
Pingla Beel	Hakaluki	Maulvibazar	24.39N, 92.06E	100	4
Chatla Beel	Hakaluki	Maulvibazar	24.38N, 92.06E	300	2
Tural Beel	Hakaluki	Maulvibazar	24.38N, 92.05E	150	4
Dulla Beel	Hakaluki	Maulvibazar	24.38N, 92.04E	300	2
Chakia Beel	Hakaluki	Maulvibazar	24.37N, 92.03E	200	4
Gharkuri Beel	Hakaluki	Maulvibazar	24.37N, 92.04E	250	2
Khakra Kuri Beel	Balai	Sylhet	24.56N, 92.22E	50	5
Dubail Beel	Balai	Sylhet	24.56N, 92.21E	110	4
Jugni Beel	Balai	Sylhet	24.55N, 92.21E	60	5
Chunnia Beel	-	Sylhet	24.55N, 92.10E	80	4
Erali Beel	-	Sylhet	24.52N, 92.03E	320	4
Chapra, Singari etc.	Bara	Sylhet	24.53N, 91.57E	?	4
Mehdi Beel	-	Sylhet	24.51N, 91.54E	40	5
Deochapra Beel	Khai	Sunamganj	24.55N, 91.32E	40	5
Dabor Beel	Khai	Sunamganj	24.55N, 91.29E	30	4
Kuri Beel	Dekhar	Sunamganj	24.56N, 91.31E	73	4
Goraduba Beel	Dekhar	Sunamganj	24.58N, 91.26E	325	2
Dapha, Ruwa, Guinga	Dekhar	Sunamganj	24.59N, 91.25E	200	4,5

continued on next page

Jaor Beel	Dekhar	Sunamganj	25.03N, 91.25E	150	4
Surma River	-	Sunamganj	25.04-24.53N 91.24-91.10E	(45 km)	1
Aila Beel	Panger	Sunamganj	24.53N, 91.13E	250	2
Pangna Beel	Panger	Sunamganj	24.54N, 91.12E	300	2
Karul Dhan Beel	Panger	Sunamganj	24.54N, 91.11E	20	5
Someswari River	-	Sunamganj	24.53-25.03N 91.10-91.06E	(20 km)	1
Patnai Gang	-	Sunamganj	25.10N, 91.08E	(12	km)1
Pasua Beel	Gurmar	Sunamganj	25.02N, 91.05E	400	2,3
Kecharia Beel	Halir	Sunamganj	25.03N, 91.07E	50	5
Kanamaiya Haor	Kanamaiya	Sunamganj	25.04N, 91.06E	250	2
Pakertala Beel	Kanamaiya	Sunamganj	25.05N, 91.06E	250	2
Bara Beel	Matian	Sunamganj	25.07N, 91.08E	400	3
Banuar Beel	Matian	Sunamganj	25.08N, 91.07E	200	3
Palair Beel	Matian	Sunamganj	25.08N, 91.08E	400	3
Pana Beel	Tangua	Sunamganj	25.06N, 91.06E	100	4
Biaskhali Beel	Tangua	Sunamganj	25.07N, 91.07E	40	5
Rauar Beel	Tangua	Sunamganj	25.08N, 91.06E	500	2
Main Tangua Beel	Tangua	Sunamganj	25.08N, 91.05E	500	2
West Tangua Beel	Tangua	Sunamganj	25.08N, 91.04E	120	4
Two un-named *beels*	Tangua	Sunamganj	25.09N, 91.04E	50	5
Ainna Beel	Tangua	Sunamganj	25.10N, 91.03E	500	2
Ghaniakuri Beel	Tangua	Sunamganj	25.09N, 91.07E	80	5
Arabiakona Beel	Tangua	Sunamganj	25.10N, 91.06E	200	3
Un-named Beel	Tangua	Sunamganj	25.10N, 91.07E	50	5
Samsar Beel	Tangua	Sunamganj	25.11N, 91.07E	200	4
Uglar Beel	Ubdakhali	Netrakona	25.03N, 90.56E	50	5
Meda Beel	Ubdakhali	Netrakona	25.02N, 90.55E	122	4
Netrakona/Kaluma Kanda	Ubdakhali	Netrakona	24.54N, 90.50E	50	5,6
Kendua area	-	Netrakona	24.46N, 90.50E	10	6
Boraduba Beel	-	Mymensingh	24.55N, 90.12E	200	3

* Wetland types are coded as follows:

1. River
2. Large, deep *beel*; mostly open water with abundant aquatic vegetation around the margins
3. Large, shallow *beel*, with rich aquatic vegetation; water surface mostly overgrown with floating vegetation
4. Medium-sized to small *beel* with little floating or emergent aquatic vegetation (generally surrounded by rice)
5. Small shallow *beel* with large areas of floating and emergent vegetation
6. Small pools and muddy areas in rice fields
7. Man-made fish ponds

TABLE 3: Changes in water level between Feb/Mar and Apr/May

NAME OF SITE	WATER LEVEL IN APR/MAY COMPARED TO FEB/MAR
7. Hail Haor	10 cm higher
8. Hail Haor Fish Ponds	variable; some ponds being drained
9. Petangi Beel	10-20 cm higher; little exposed mud
10. Majherbanda/Ulauli	10-20 cm higher; no exposed mud
11. Patachatal Beel	10-20 cm higher
12. Borachatal Beel	10-20 cm higher
13. Dubriar Beel	10 cm higher
14. Baisha Beel	10 cm higher; no exposed mud
15. Chalnia Beels	10-20 cm higher
16. Deodar Beels	10-20 cm higher
17. Juri River	75 cm higher; no exposed mud banks
18. Kair Gang & *beel*	very high; back flow from Juri River
19. Haor Khal	very high; flooding; no exposed mud
21. Pingla Beel	20 cm higher; no exposed mud
22. Chatla Beel	10 cm higher
23. Tural Beel	20 cm higher; no exposed mud
26. Gharkuri Beel	10-20 cm higher
27. Khakra Kuri Beel	20 cm higher; no exposed mud
28. Dubail Beel	20 cm higher; no exposed mud
29. Jugni Beel	20 cm higher
30. Chunnia Beel	20 cm higher
31. Erali Beel	20 cm higher
33. Mehdi Beel	much higher; re-flooded (emptied in Feb/Mar)
34. Deochapra Beel	20 cm higher

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haors along this river and the Patnai Gang which are not protected by submersible embankments had been deeply flooded, with some loss of the *boro* crop. Thus, Pakertala Beel had become united with Kanamaiya Haor in a single large, open body of water, while most of the *beels* in Tangua Haor were deeply flooded. Rauar Beel, Tangua Beel, West Tangua Beel, Ainna Beel and nearby smaller *beels* had been united into a single, large water body, as had Samsar Beel and the large un-named *beel* to the south. One *beel* in this system, Arabiakona, is protected by a submersible embankment, and here the water level was slightly down on the Feb/Mar level.

Water levels had also fallen slightly at the three large, protected *beels* in Matian Haor (Bara, Banuar and Palair), at Kecharia Beel in Halir Haor (also protected), and at the small and as yet unprotected *beels* in the southwest portion of Dekhar Haor. The presence of protected *beels* with low water levels in Matian Haor adjacent to the unprotected and deeply-flooded *beels* in Tangua Haor presented an excellent opportunity to compare the waterfowl populations in the two types of wetlands (see Section 7.5).

TABLE 3, continued from previous page

NAME OF SITE	WATER LEVEL IN APR/MAY COMPARED TO FEB/MAR
35. Dabor Beel	10-20 cm higher
36. Kuri Beel	30 cm higher
38. Dapha, Ruwa, Guinga	Few cm lower
40. Surma River	2 m higher
44. Someswari River	2 m higher
45. Patnai Gang	2 m higher
46. Pasua Beel	20 cm higher, little exposed mud
47. Kecharia Beel	slightly lower; almost overgrown
48. Kanamaiya Haor	very high; contiguous with Pakertala
49. Pakertala Beel	very high; contiguous with Kanamaiya
50. Bara Beel	slightly lower; overgrown
51. Banuar Beel	slightly lower; overgrown
52. Palair Beel	slightly lower; almost overgrown
53. Pana Beel	very high; open to river
54. Biaskhali Beel	very high; open to river
55. Rauar Beel	very high, almost contiguous with Tangua
56. Main Tangua Beel	very high; centre of vast water body
57. West Tangua Beel	very high; contiguous with Tangua
58. Two un-named *beels*	very high, contiguous with Tangua
59. Ainna Beel	very high, contiguous with Tangua
60. Ghaniakuri Beel	20 cm higher (protected)
61. Arabiakona Beel	slightly lower (protected)
62. Un-named Beel	very high, open to river
63. Samsar Beel	very high, open to river

Balai Haor was unusual in that flash-flooding occurred in March. Water levels were very low on 6 Mar, but had risen by about 50 cm by 27 March (during the Monthly Waterfowl Census). By 27 April, the water level had fallen again, almost to the low levels of early March.

Fishing activity

Some information was gathered on the intensity of fishing activity at the sites visited, as it was clear that the disturbance caused by fishermen was having a major effect on the utilization of sites by the warier species. This information is summarized in Table 4. Fishing activity was high at most *beels* during the Feb/Mar survey, but was greatly reduced by Apr/May, presumably because many of the *beels* had been fished out.

Some *beels* are fished only once every two or three years, and wherever this regime was being enforced (through the stationing of "fish guards" by the lease-holder), there was no or negligible disturbance from fishing. However, the fish guards were not protecting the *beels* from hunting, so even these sites were not always free from disturbance. The only sites at which there was little or no fishing during the present surveys were the private fish ponds at Hail Haor, Chatla Beel (Hakaluki Haor), Dubail Beel (Balai Haor), Kuri Beel, Goraduba Beel and the Dapha, Ruwa and Guinga Beels (Dekhar Haor), Aila Beel (Panger

TABLE 4: Fishing activity

Name of Site	Feb/Mar	Apr/May
1. Old Brahmaputra River	high (boat traffic)	-
2. Lower Baulai River	high throughout	low
3. Lower Kalni River	high throughout	low
4. Sankardanga Beel	moderate	-
5. Ratna Beel		high-
6. Khowai River	nil	-
7. Hail Haor	very high	very high (200 b)
8. Hail Haor Fish Ponds	nil	high; draining
9. Petangi Beel	very high	high (35 b)
10. Majherbanda/Ulauli	very high	high (65 f)
11. Patachatal Beel	low (2 b)	nil (protected)
12. Borachatal Beel	low	nil
13. Dubriar Beel	high	low (2 f)
14. Baisha Beel	high	low (2 b)
15. Chalnia Beels	high	high (10 b)
16. Deodar Beels	moderate	high (4 b, 26 f)
17. Juri River	high	low
18. Kair Gang & *beel*	low	nil
19. Haor Khal	very high	moderate (10 b)
20. Puala Beel	nil (almost dry)	-
21. Pingla Beel	very high	nil
22. Chatla Beel	nil (protected)	nil
23. Tural Beel	high	very high (35 b, 125 f)
24. Dulla Beel	very high	-
25. Chakia Beel	very high	-
26. Gharkuri Beel	moderate	very high (31 b, 161 f)
27. Khakra Kuri Beel	nil (almost dry)	high
28. Dubail Beel	low	nil (protected)
29. Jugni Beel	nil (almost dry)	high
30. Chunnia Beel	nil	low (1 b)
31. Erali Beel	moderate	low (2 b)
32. Chapra, Singari etc.	very high	-
33. Mehdi Beel	very high (draining)	moderate
34. Deochapra Beel	low (1 b)	moderate (5 b)

b = fishing boats active in *beel*
f = fishermen active in *beel*

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Haor), and Pana Beel and Biaskhali Beel (Tangua Haor). Fish guards were in evidence at the Hail Haor fish ponds, Chatla Beel, Dubail Beel and Aila Beel. These *beels* held some of the most spectacular concentrations of ducks recorded during the surveys. The Hail Haor fish ponds held the only significant concentration of ducks in the entire Hail Haor area, while there were over 17,000 ducks at Chatla Beel in late February. Although Dubail Beel held few birds in early March, when water levels were very low,

TABLE 4: continued from previous page

Name of Site	Feb/Mar	Apr/May
35. Dabor Beel	nil	nil
36. Kuri Beel	nil	low (1 b)
37. Goraduba Beel	nil	-
38. Dapha, Ruwa, Guinga	nil	nil
39. Jaor Beel		-low (1 b)
40. Surma River		lowlow
41. Aila Beel	-	nil (protected)
42. Pangna Beel	-	high
43. Karul Dhan Beel	-	nil
44. Someswari River	moderate	low
45. Patnai Gang	moderate	low
46. Pasua Beel	moderate	moderate
47. Kecharia Beel	high	nil (overgrown)
48. Kanamaiya Haor	high	moderate
49. Pakertala Beel	low	low
50. Bara Beel	high	moderate
51. Banuar Beel	moderate	low (3 b)
52. Palair Beel	high	low (2 b)
53. Pana Beel	low (2 b)	low (1 f; protected)
54. Biaskhali Beel	nil	low
55. Rauar Beel	very high	low
56. Main Tangua Beel	very high	moderate
57. West Tangua Beel	low	low
58. Two un-named *beels*	nil	low
59. Ainna Beel	high	moderate
60. Ghaniakuri Beel	moderate	low (2 b)
61. Arabiakona Beel	very high	low (2 b)
62. Un-named Beel	low	low (2 b)
63. Samsar Beel	high	high (8 b)
64. Uglar Beel	low	-
65. Meda Beel	very high (30 b, 140 f)	-
66. Netrakona/Kaluma Kanda	high	-
67. Kendua area	nil (rice fields)	-
68. Boraduba Beel	very high (25 b, 100 f)	-

b = fishing boats active in *beel*
f = fishermen active in *beel*

there were over 32,000 ducks there on 27 March when water levels were high. Kuri Beel, although rather small, held the only flock of geese recorded during the survey (albeit only four birds), while the Dapha, Ruwa and Guinga Beels, although also very small, held over 420 ducks. Pana Beel was outstanding for its species diversity; the 8,000 ducks present included 18 species - all but two of the species recorded during the surveys.

TABLE 5: Waterfowl hunting activity

Name of Site	Feb/Mar	Apr/May
Hail Haor	many nets	2 lines of nets
Petangi Beel	20+ nets	-
Majherbanda/Ulauli	4 men + guns; 15+ nets	-
Chalnia Beels	1 hunter + gun	-
Haor Khal	use of poisoned bait	-
Puala Beel	4 lines of nets	-
Pingla Beel	2 hunters + guns	-
Chatla Beel	boys chasing cripples	1 hunter + gun
Gharkuri Beel	1 hunter + gun	-
Khakra Kuri Beel	-	1 hunter + gun
Erali Beel	-	1 hunter + gun
Mehdi Beel	-	2 hunters + guns
Kanamaiya Haor	5 lines of nets	-
Pakertala Beel	1 line of nets	-
Palair Beel	2 lines of nets	-
Pana Beel	3 lines of nets	-
Biaskhali Beel	1 line of nets	-
Rauar Beel	many nets	-
Main Tangua Beel	many nets	-
Samsar Beel	many nets	-
Meda Beel	1 man with nets	-

Hunting activity

Although all hunting of wildlife including waterfowl is illegal in Bangladesh, hunting continues at a high level and there seems to be little if any enforcement of the regulations outside reserves protected by the Forest Department. Waterfowl hunting in the *haor* basin includes both sport hunting by wealthy individuals from as far afield as Dhaka, and subsistence or market hunting by local people. The sport hunters use shot-guns, and tend to concentrate on the ducks, while the local hunters mostly use flight nets set at night to catch ducks, shorebirds and even gulls. Poisoned bait is also used to kill fish-eating birds. One instance of this was observed at Haor Khal (Hakaluki Haor), where a hunter had used a fish poisoned with potash to kill a Grey Heron. Table 5 summarizes the waterfowl hunting activities observed during the present surveys.

The sale of game species is also illegal in Bangladesh, although again there seems to be little if any enforcement of the regulations. One market hunter was seen openly displaying his wares at a roadside market between Sylhet and Sunamganj in late February. The live birds on offer included about 30 Pintail, 20 Lesser Whistling Duck, 12 Garganey, three Northern Shoveler and 15 Brown-headed Gulls. These had reportedly been caught with nets. The ducks were selling at between 50 and 100 Taka each; the gulls at Tk. 50 each.

6.2 Birds

The principal focus of the ornithological surveys was to determine the current status and abundance of the waterfowl species occurring in the wetlands of the *haor* basin. To this end, a considerable amount of time was spent censusing waterfowl at the main wetland areas. Special attention was, however, also given to a variety of other bird species which are ecologically dependent on wetlands, such as the two fish-eagles, the Osprey, several kingfishers and a number of marsh-dwelling passerines. Many other bird species frequently occur in wetlands, although they are not necessarily dependent upon them, e.g. various birds of prey and many of the small birds more typical of the homestead forests and gardens.

Waterfowl

The present surveys were much the most comprehensive waterfowl surveys ever undertaken in the wetlands of the *haor* basin; indeed, almost all of the wetlands likely to be of major importance for waterfowl were visited. The results of the waterfowl counts are summarized in Table 6 (by individual site), Table 7 (by species group), Table 8 (by individual species) and Table 9 (by major wetland system). Copies of the original count data have been deposited in the files of NERP in Dhaka.

Approximately 108,000 waterfowl of 77 species were recorded during the February/March survey. By late April, the great majority of winter visitors had departed, and the spring migration of waterfowl was almost over. As a consequence, far fewer birds were observed: only 30,300 of 67 species. At the 48 sites covered during both surveys, the total number of waterfowl had fallen from 98,850 to 21,000. The 14 principal wetland systems listed in Table 9 accounted for 95% of the waterfowl in Feb/Mar and 90% in Apr/May. Much the largest concentrations of birds were located in the Tangua Haor, Matian Haor and Gurmar Haor complex in the north and at Hakaluki Haor. Together, these sites held about 71% (76,500) of the total in Feb/Mar and 44% (13,480) in Apr/May. However, in late April there was also a large concentration of ducks at Aila Beel, a site which had not been covered during the Feb/Mar survey.

Coverage of most of the areas was thought to be good; generally greater than 50% and often in excess of 75%. It seems very unlikely that any major concentrations of birds (i.e. numbering in the tens of thousands) were overlooked. Thus, for the conspicuous and easily counted species (e.g. cormorants, herons, egrets, ducks, coots, gulls and terns), it is thought that the counts represent at least 50% and in some cases over 75% of the total present in the region at the time of the surveys.

The counts in Feb/Mar included 76,000 ducks. If it is assumed that overall coverage was in the region of 50-75%, the total number of ducks present in the *haor* basin at the time of the first survey may be estimated at 100,000-150,000. This figure agrees with a similar estimate in the *Directory* - an estimate based on a few patchy counts and anecdotal information from sportsmen.

Some species of waterfowl are rather inconspicuous and/or tend to be widely dispersed, and are therefore much more difficult to count. These include Little Grebe (inconspicuous), Indian Pond Heron and Cattle Egret (widely dispersed in rice fields), most rails and crakes (secretive and inconspicuous), the snipes (inconspicuous and widely dispersed in rice fields) and many of the smaller shorebirds. For these species, the counts give only a general impression of abundance.

Although the Feb/Mar counts were undertaken rather later than the best time for mid-winter waterfowl censuses (the month of January), it appeared that most if not all of the waterfowl recorded during the survey were indeed birds which had spent the winter in the *haor* basin, as even by early March, there was little indication that the spring migration had started. The counts were, however, probably much

TABLE 6: Summary of waterfowl counts: by site

NAME OF SITE	FEB/MAR SURVEY			APR/MAY SURVEY		
	DATE(S)	SPECIES	COUNT	DATE(S)	SPECIES	COUNT
Old Brahmaputra River	25/2*	5	145	No count	-	-
Lower Baulai River	25/2*	10	1,668	9/5*	5	597
Lower Kalni River	26/2*	9	1,017	9/5*	3	123
Sankardanga Beel	9/3	13	126	No count	-	-
Ratna Beel	9/3	11	146	No count	-	-
Khowai River	9/3	15	335	No count	-	-
Hail Haor	21,23/2	23	729	2/5	25	920
Hail Haor Fish Ponds	18/2	14	886	29/4	6	18
Petangi Beel	22/2,8/3	21	4,844	3/5	19	519
Majherbanda/Ulauli	22/2	32	4,352	29/4	19	1,080
Patachatal Beel	8/3	19	3,073	28/4	12	234
Borachatal Beel	8/3	4	1,180	28/4	4	14
Dubriar Beel	5/3	6	108	26/4	15	218
Baisha Beel	5/3	10	103	26/4	8	93
Chalnia Beels	20/2,5/3	19	1,892	26/4	5	58
Deodar Beels	5/3	3	11	26/4	2	59
Juri River	20/2,5/3	14	105	25/4	5	8
Kair Gang & *beel*	7/3	17	857	25/4	1	40
Haor Khal	7/3	27	7,385	25/4	26	505
Puala Beel	20/2	15	1,380	No count	-	-
Pingla Beel	19/2	6	51	30/4	8	192
Chatla Beel	19/2	26	17,841	30/4	15	1,680
Tural Beel	19/2	11	98	30/4	3	20
Dulla Beel	19/2	4	2,021	No count	-	-
Chakia Beel	19/2	3	120	No count	-	-
Gharkuri Beel	19/2	22	7,378	30/4	3	56
Khakra Kuri Beel	6/3	22	192	27/4	15	589
Dubail Beel	6/3	17	131	27/4	12	440
Jugni Beel	6/3	13	236	27/4	14	136
Chunnia Beel	6/3	5	104	27/4	5	33
Erali Beel	6/3	4	6	27/4	3	62
Chapra, Singari etc.	26/2*	1	1	No count	-	-
Mehdi Beel	5/3	10	474	26/4	10	187
Deochapra Beel	29/2	14	247	20/4	9	55
Dabor Beel	29/2	10	69	20/4	5	12
Kuri Beel	29/2	18	374	20/4	9	27
Goraduba Beel	29/2	8	186	No count	-	-
Dapha, Ruwa, Guinga	29/2	23	1,018	20/4	10	102
Jaor Beel	No count	-	-	9/5*	3	15

* : aerial survey only.

continued on next page

TABLE 6: continued from previous page

NAME OF SITE	FEB/MAR SURVEY			APR/MAY SURVEY		
	DATE(S)	SPECIES	COUNT	DATE(S)	SPECIES	COUNT
Surma River	1/3,4/3	8	181	21/4,24/4	25	
Aila Beel	No count	-	-	21/4	21	8,327
Pangna Beel	No count	-	-	21/4	12	153
Karul Dhan Beel	No count	-	-	21/4	13	59
Someswari River	1/3,2/3,4/3	30	1,718	21-23/4	24	2,023
Patnai Gang	3/3	9	110	23/4	8	624
Pasua Beel	4/3	31	3,696	22-24/4	40	6,334
Kecharia Beel	4/3	7	62	22/4	7	29
Kanamaiya Haor	2/3,4/3	30	1,875	22-23/4	8	183
Pakertala Beel	2/3,4/3	30	5,079	22-23/4	10	330
Bara Beel	2/3,3/3	29	3,389	22/4	17	335
Banuar Beel	2/3	14	1,252	22/4	10	298
Palair Beel	3/3	19	1,746	23/4	12	92
Pana Beel	2/3	29	9,220	22/4	14	515
Biaskhali Beel	2/3	20	426	22/4	10	132
Rauar Beel	2/3,3/3	29	6,054	22-23/4	24	1,059
Main Tangua Beel	2/3	20	2,306	22/4	15	1,055
West Tangua Beel	2/3	11	2,922	22/4	of above	
Two un-named *beels*	2/3	11	1,317	22/4	of above	
Ainna Beel	2/3	5	294	22/4	of above	
Ghaniakuri Beel	3/3	9	348	23/4	5	20
Arabiakona Beel	3/3	13	1,062	23/4	6	431
Un-named Beel	3/3	17	1,789	23/4	9	118
Samsar Beel	3/3	10	264	23/4	11	86
Uglar Beel	11/3	15	1,083	No count	-	-
Meda Beel	11/3	11	248	No count	-	-
Netrakona/Kaluma Kanda	11/3	16	301	No count	-	-
Kendua area	10/3	5	33	No count	-	-
Boraduba Beel	12/3	8	172	No count	-	-

* : aerial survey only.

lower than they would have been in December or January because of the reduction in numbers which must have occurred as a result of the heavy hunting pressure throughout the region.

Annex I summarizes the present status of the 125 species of waterfowl which are known or thought to have occurred in the wetlands of the Northeast Region, and gives a summary of the observations of those 89 species which were recorded during the present surveys. (Eighty-seven species were recorded at the 68 wetlands, and two others, Black Bittern and Slaty-breasted Rail, were observed in areas of rice fields).

TABLE 7: Summary of waterfowl counts: by family/sub-family

FAMILY/SUB-FAMILY	TOTAL SPECIES	FEB/MAR SPECIES	FEB/MAR COUNT	APR/MAY SPECIES COUNT
Grebes	2	2	488	1534
Cormorants	2	2	5,331	26,091
Darters	1	1	21	121
Bitterns, herons and egrets	13	10	8,334	126,062
Storks	2	2	137	1315
Ibises and spoonbills	2	1	11	24
Whistling Ducks	2	2	18,831	23,054
Geese	1	1	4	00
Ducks	18	17	56,954	139,519
Rails, moorhens, coots etc	4	4	5,466	4866
Jacanas	2	2	1,059	2428
Painted snipes	1	0	0	13
Stilts and avocets	2	2	1,271	1376
Pratincoles	2	2	3	00
Plovers	7	7	2,635	3610
Sandpipers, snipes, godwits	19	17	4,942	16400
Gulls	2	2	199	2409
Terns	5	3	2,150	41,608
TOTAL	**87**	**77**	**107,836**	**6730,300**

Some of the more interesting observations during the two surveys were as follows:

- A total of 135 Great Crested Grebes at 11 sites in Feb/Mar. This species was previously thought to be only a scarce winter visitor to Bangladesh.
- A total of 54 Great Cormorants at 11 sites in Feb/Mar. The only other records of this species in Bangladesh in recent years are of small numbers wintering in the coastal zone.
- Single Chinese Pond Herons at Pasua Beel and Hail Haor in Apr/May. This was thought to be a rare visitor to Bangladesh.
- A total of 135 Asian Openbills in Feb/Mar and 315 in Mar/Apr, the great majority at Pasua Beel.
- A pair of Lesser Adjutants at Balai Haor on 6 March (see under threatened species below).
- A total of 9,815 Fulvous Whistling Ducks in Feb/Mar, the great majority in the Tangua Haor complex. This is much the largest concentration of the species recorded in the Indian subcontinent in recent years.
- A single drake Falcated Teal at Pana Beel in Tangua Haor; only the second record of this species in Bangladesh in recent years.
- Over 230 Spot-billed Ducks in the Tangua Haor complex in Feb/Mar, and 112 there in Apr/May, when many birds were showing signs of breeding. This was previously thought to be a rare winter visitor to Bangladesh.
- A total of 87 Red-crested Pochards at four sites in Tangua Haor in Feb/Mar. This species was thought to be a vagrant in Bangladesh, with only two recent records.

TABLE 8: Total waterfowl counts

SPECIES	FEB/MAR	APR/MAY
Tachybaptus ruficollis Little Grebe	353	534
Podiceps cristatus Great Crested Grebe	135	0
Phalacrocorax carbo Great Cormorant	54	1
P. niger Little Cormorant	5,277	6,090
Anhinga melanogaster Oriental Darter	21	21
Botaurus stellaris Great Bittern	1	0
Ixobrychus sinensis Yellow Bittern	0	3
I. cinnamomeus Cinnamon Bittern	0	8
Nycticorax Black-crowned Night-Heron	136	33
Ardeola grayii Indian Pond Heron	977	280
A. bacchus Chinese Pond Heron	0	2
Bubulcus ibis Cattle Egret	324	1,675
Butorides striatus Little Heron	7	6
Egretta garzetta Little Egret	1,121	970
E. intermedia Intermediate Egret	498	866
E. alba Great Egret	2,539	1,855
Unidentified egrets	2,120	201
Ardea purpurea Purple Heron	5	35
A. cinerea Grey Heron 606	128	
Anastomus oscitans Asian Openbill	135	315
Leptoptilos javanicus Lesser Adjutant	2	0
Threskiornis melanocephalus Black-headed Ibis	11	3
Platalea leucorodia White Spoonbill	0	1
Dendrocygna bicolor Fulvous Whistling-Duck	9,815	1,263
D. javanica Lesser Whistling-Duck	9,016	1,791
A. indicus Bar-headed Goose	4	0
Tadorna ferruginea Ruddy Shelduck	337	40
T. tadorna Common Shelduck	0	1
Nettapus coromandelianus Cotton Pygmy Goose	111	206
Anas penelope Eurasian Wigeon	101	91
A. falcata Falcated Teal	1	0
A. strepera	Gadwall	50751

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- A total of 697 Baer's Pochards, including a single flock of 660 at Pana Beel (see under threatened species below).
- A total of 1,970 Ferruginous Ducks in Feb/Mar, all but 21 in Tangua Haor and adjacent areas.
- A group of three male and two female Greater Scaup with Tufted Duck at Pana Beel on 22 March. This species is a very rare winter visitor to the Indian Subcontinent, and had not previously been recorded in Bangladesh for many years.
- A total of 685 Grey-headed Lapwings at 24 sites in Feb/Mar.
- Two Swinhoe's Snipe with Pintail Snipe and Common Snipe in rice fields at Hail Haor on 23 Feb. This constitutes the first confirmed record of the species in Bangladesh, although it has long

TABLE 8: continued from previous page

SPECIES	FEB/MAR	APR/MAY
A. crecca Common Teal	73	4
A. platyrhynchos Mallard	16	0
A. poecilorhyncha Spot-billed Duck	243	122
A. acuta Northern Pintail	20,283	72
A. querquedula Garganey	15,457	8,658
A. clypeata Northern Shoveler	12,913	214
Netta rufina Red-crested Pochard	87	5
Aythya ferina Common Pochard	119	0
A. baeri Baer's Pochard	697	0
A. nyroca Ferruginous Duck	1,973	1
A. fuligula Tufted Duck	2,351	54
A. marila Greater Scaup	5	0
Unidentified ducks	1,680	0
Gallicrex cinerea Watercock	2	11
Gallinula chloropus Common Moorhen	10	120
Porphyrio Purple Swamphen	134	670
Fulica atra Eurasian Coot	5,320	65
Hydrophasianus chirurgus Pheasant-tailed Jacana	1,022	393
Metopidius indicus Bronze-winged Jacana	37	35
Rostratula benghalensis Greater Paintedsnipe	0	3
Himantopus Black-winged Stilt	1,267	376
Recurvirostra avosetta Avocet	4	0
Glareola maldivarum Oriental Pratincole	1	0
G. lactea Little Pratincole	2	0
Vanellus cinereus Grey-headed Lapwing	685	24

been assumed that the species must occur as it a regular winter visitor to India south to Kerala, and has been recorded in neighbouring Assam, Manipur and West Bengal.

- A total of 135 Spotted Redshanks at ten sites in Feb/Mar and 18 at four sites in Apr/May. This species was first recorded in Bangladesh as recently as 1990, and was thought to be only a scarce winter visitor.

Other birds

Two hundred and eighty-four species of birds were recorded in the Northeast Region during the two surveys. These are listed in Annex J. They include four species which had not previously been recorded in Bangladesh (Swinhoe's Snipe, Red-throated Pipit, Firethroat and Black-browed Reed-Warbler) and three species of doubtful previous occurrence (Griffon Vulture, Pin-tailed Pigeon and Wedge-tailed Pigeon), as well as several species which had not been recorded in Bangladesh in recent decades. A full report on these observations is being prepared for publication in the scientific literature.

TABLE 8: continued from previous page

SPECIES	FEB/MAR	APR/MAY
V. indicus Red-wattled Lapwing	3	1
Pluvialis fulva Asiatic Golden Plover	821	585
P. squatarola Grey Plover	5	0
Charadrius dubius Little Ringed Plover	357	0
C. alexandrinus Kentish Plover	752	0
C. mongolus Mongolian Plover	12	0
Limosa Black-tailed Godwit	402	93
Numenius arquata Eurasian Curlew	0	3
Tringa erythropus Spotted Redshank	135	18
T. totanus Common Redshank	3	20
T. stagnatilis Marsh Sandpiper	434	6
T. nebularia Common Greenshank	119	7
T. ochropus Green Sandpiper	8	4
T. glareola Wood Sandpiper	848	133
Actitis hypoleucos Common Sandpiper	26	12
Gallinago stenura Pintail Snipe	41	6
G. gallinago Common Snipe	553	31
G. megala Swinhoe's Snipe	2	0
Calidris minuta Little Stint	741	4
C. temminckii Temminck's Stint	132	6
C. subminuta Long-toed Stint	0	2
C. alpina Dunlin	3	0
C. ferruginea Curlew Sandpiper	22	4
Limicola falcinellus Broad-billed Sandpiper	1	0
Philomachus pugnax Ruff	912	51
Unidentified shorebirds	560	0
Larus brunnicephalus Brown-headed Gull	185	408
L. ridibundus Black-headed Gull	14	1
Chlidonias hybrida Whiskered Tern	2,139	1,597
C. leucopterus White-winged Tern	0	1
Sterna aurantia River Tern	10	0
S. hirundo Common Tern	0	8
S. albifrons Little Tern	1	2
TOTAL WATERFOWL	**107,836**	**30,300**

Of the 284 species recorded, 60 were observed only in West Banugach and Shatchari Reserved Forests, while a further 63 were more or less confined to these and other dry-land habitats (tea estates, homestead forests, secondary scrub etc). However, in addition to the 89 true waterfowl, some 72 species were recorded in the wetlands or on the adjacent floodplains. Of these, 30 species are largely or wholly dependent on the wetland ecosystems. Observations of these wetland species, which include six birds of prey, are summarized in Annex K. The counts of all birds of prey, other than the ubiquitous Black (Pariah) and Brahminy Kites, are summarized in Table 10.

TABLE 9: Summary of waterfowl counts: by major system [missing]

Threatened species

Of the 18 wetland birds known to have occurred in the Northeast Region and currently included in the IUCN Red List of Threatened Animals (see Annex B), only three were recorded during the present surveys. These were as follows:

Lesser Adjutant *Leptoptilos javanicus*. A pair was observed at Khakra Kuri Beel (Balai Haor) on 6 Mar. This species is listed in the IUCN Bird Red Data Book in the category "Vulnerable". A small population survives in the Sundarbans, but elsewhere in Bangladesh, the species is now only a rare straggler. Further surveys at Balai Haor should reveal whether or not it is a regular visitor to the haor from neighbouring India.

Baer's Pochard *A. baeri*. No less than 697 were recorded during the Feb/Mar survey, with birds present at seven sites. Apart from five at Chatla Beel and five at Gharkuri Beel in Hakaluki Haor, all were in the Tangua, Matian and Pasua complex. Much the largest concentration was a single flock of 660 at Pana Beel (on 2 Mar), but there were also 20 at Palair Beel, four at Banuar Beel, two at Pasua Beel and one at West Tangua Beel. All had departed by the time of the Apr/May survey. This species is currently listed in the IUCN Bird Red Data Book in the category "Vulnerable". Although the species winters widely from south China through Vietnam, Thailand and Burma to northeastern India and occasionally even Nepal, it is everywhere rather scarce, and this concentration of almost 700 in the *haor* basin is thus of considerable international significance.

Pallas's Fish-Eagle *Halieetus leucoryphus*. Perhaps the most interesting discovery of the present surveys was the large and apparently healthy population of Pallas's Fish-Eagles in the Northeast Region. No less than 30 adults and 26 immatures were recorded during the Feb/Mar survey, and 17 adults and eight immatures during the Apr/May survey. These birds would appear to belong to a resident population. Most of the adults were paired and much display was noted during late February and early March. Three occupied nests were found; one on an electricity pylon at Dubriar Haor and two in tall trees on the edges of villages in the Tangua Haor area. The species was recorded at 27 sites, with major concentrations at Pasua Haor (two adults and 17 immature) and Tangua Haor (eight adults and five immature) in early March. Birds were less conspicuous in April/May, presumably because breeding pairs were already incubating. No aerial displays were observed, less calling was heard, and many of the adults were observed singly.

Single adults or pairs of adults were observed at the following localities: Sankardanga Beel, Ratna Beel, Chalnia Beel/Dubriar Haor, Juri River, Hakaluki Haor, Balai Haor, Mehdi Beel, Kuri Beel/Deochapra Beel, Dekhar Haor, Surma River (west of Sunamganj), Aila Beel, Someswari River (two pairs), Pasua Beel, Matian Haor, Tangua Haor (four pairs) and between Netrakona and Kaluma Kanda. These observations could represent as many as 20 pairs.

TABLE 10: Counts of selected raptors

SPECIES	FEB/MAR	APR/MAY
Elanus caeruleus Black-shouldered Kite	4	5
Haliaeetus leucoryphus Pallas's Fish-Eagle	56	25
Ichthyophaga ichthyaetus Grey-headed Fish-Eagle	11	3
Gyps bengalensis White-backed Vulture	83	152
G. indicus Long-billed Vulture	2	0
Spilornis cheela Crested Serpent-Eagle	6	5
Circus aeruginosus Western Marsh Harrier	33	7
C. spilonotus Eastern Marsh Harrier	15	3
C. melanoleucos Pied Harrier	18	14
Aquila pomarina Lesser Spotted Eagle	3	0
A. clanga Greater Spotted Eagle	1	0
A. nipalensis Steppe Eagle	11	0
Unidentified eagle	0	1
Pandion haliaetus Osprey	6	5
Falco tinnunculus Eurasian Kestrel	5	0
F. subbuteo Northern Hobby	0	3
TOTAL RAPTORS (excluding Black and Brahminy Kites)	**254**	**223**

Pallas's Fish-Eagle is currently listed in the IUCN Red Data Book in the category "Rare". It occurs from Kazakhstan and Pakistan east to China and Burma, but populations appear to be declining almost everywhere. In the mid 1980s, it was feared that the species had become endangered in Bangladesh, with perhaps only a few breeding pairs remaining (Husain and Sarker, 1984). It is clear, however, that a substantial population still survives in the *haor* basin, and this may now be one of the largest single populations in the world.

7. DISCUSSION

7.1 General

There has been mass extinction of the native flora and fauna of the *haor* basin of Northeastern Bangladesh. In its original form, the basin would have consisted of a rich mosaic of permanent and seasonal lakes and ponds with abundant aquatic vegetation, surrounded by vast areas of swampy ground with tall reeds and seasonally flooded grasslands dominated by elephant grass. There would have been large areas of swamp forest, dominated by *Barringtonia*, *Pongamia* and other flood-tolerant tree species, and this would have given way to scrub jungle and dense stands of bamboo on the higher ground. Tall gallery forest would have covered the river levees, and provided a secure refuge for terrestrial wildlife during the monsoon floods. Wildlife would have been abundant. Marsh Crocodiles and otters would have been common in every lake and swamp; One-horned Rhinoceroses, Wild Buffalo and Swamp Deer would have grazed in the marshes, and Asian Elephants, Gaur, Sambar Deer, Hog Deer and Wild Boar would have roamed the forests and tall grasslands. Tigers and Leopards would have been common, along with many smaller predators such as Wolves, Jackals and several species of wild cat. And everywhere, there

would have been birds - teeming flocks of migrant ducks and shorebirds from Siberia mingling in winter with the resident flocks of cormorants, pelicans, herons, egrets, storks, ibises, whistling-ducks, comb ducks, pygmy geese and many more species. During the breeding season, there would have been huge mixed colonies of cormorants, herons and storks in the patches of forest, while the marshes would have rung with the bugling calls of Sarus Cranes.

Today, although most of the permanent water bodies have survived, all other ecosystems have been almost completely destroyed. Vast areas of the seasonally flooded plains have been converted to monocultures of rice, while areas less suitable for rice are now heavily grazed by domestic livestock or cultivated for wheat and other crops. The swamp forests have been reduced to a few small patches of *Barringtonia* - often no more than ten or twenty widely scattered, and now very old, trees - while all land above the level of the monsoon floods has been utilized for permanent settlement and homestead forests. The gallery forests, scrub jungle, bamboo thickets and dense stands of elephant grass have disappeared almost without trace.

Although we have no good contemporary accounts of the *haor* basin in its natural condition, we can gain an impression of how it must once have appeared by visiting comparable areas in neighbouring countries which still survive in more or less their natural form. Kaziranga National Park and Manas Wildlife Sanctuary in Assam and Royal Chitwan National Park in Nepal still retain outstanding examples of floodplain wetland ecosystems and their associated forest communities, and provide a vivid contrast to the totally man-modified environments which now exist over most of the plains of the Ganges and Brahmaputra systems. Indeed, these three large and well-protected sanctuaries have become critical to the continued survival of a whole group of wildlife species which have now become extinct over most of their former ranges. These include the One-horned Rhincoceros *Rhinoceros unicornis*, Swamp Deer *Cervus duvauceli*, Hispid Hare *Caprolagus hispidus*, Swamp Partridge *Francolinus gularis*, Bengal Florican *Eupodotis bengalensis* and Marsh Babbler *Pellorneum palustre* - all now listed in the IUCN Red Data Books of threatened mammals and birds.

7.2 Avifauna

The present surveys have confirmed that the *haor* basin remains an internationally important wintering area for migratory waterfowl, principally ducks and shorebirds, and continues to support large numbers of some resident species, notably Little Grebe, Little Cormorant, a variety of herons and egrets, both species of whistling-duck, both jacanas, Common Moorhen and Purple Swamphen. The region is also undoubtedly of some importance for passage migrants in spring, and perhaps also in autumn. Unfortunately, little coverage was possible during the peak of the spring migration, between mid-March and mid-April, but observations of flocks of Ruff (an early migrant) in early March and Asiatic Golden Plover (a late migrant) in late April and early May suggested that for at least these two species of shorebirds, the wetlands of the *haor* basin are an important staging area during the spring migration.

A total count of 108,000 waterfowl during the Feb/Mar survey represents a substantial number of birds. However, in comparison to the numbers of waterfowl at many other wetland systems at about the same latitude in southern Asia, and in view of the vast extent of the wetlands of the *haor* basin, this is a very low figure. There are many quite small wetlands in the much less densely populated parts of Southwest Asia (e.g. in Iran and Pakistan) which regularly support between 250,000 and 500,000 waterbirds in winter. While no reliable information is available on the numbers of waterfowl wintering in the Northeast Region in the past, there can be little doubt that there has been a drastic decline in numbers, perhaps to only a few percent of former levels.

One of the aims of the Apr/May survey was to assess the importance of the wetlands for breeding waterfowl. However, although many of the resident birds had assumed breeding plumage, very little indication of breeding was obtained. The only species of waterfowl which appeared to be breeding or about to breed (i.e. showing courtship behaviour, calling, prospecting for nests sites or nest-building) were Little Grebe, Lesser Whistling-Duck, Cotton Pygmy Goose, Spot-billed Duck, Pheasant-tailed Jacana, Bronze-winged Jacana, Black-winged Stilt and Whiskered Tern.

The breeding seasons of waterbirds in Bangladesh are known to be complex. According to Harvey (1990), of the 33 species of waterfowl found breeding in Bangladesh in recent years, six begin nesting in March, six in April, 10 in May, four in June, four in July, one in August, one in September and one in November. Thus, some species begin breeding in the pre-monsoon period; others (mainly the herons and egrets) breed during the monsoon, while yet others breed during the dry season (e.g. Little Cormorant and Oriental Darter). The Monthly Waterfowl Censuses should be able to clarify this situation in the Northeast Region.

Only 30,300 waterfowl were recorded during the Apr/May survey, and of these, over 10,000 were winter visitors or passage migrants which had not yet departed for their breeding grounds further north (e.g. the flock of 7,000 Garganey at Aila Beel). Thus the total number of resident birds, and hence potential breeding birds, was only about 20,000. Again, in view of the extent of the wetlands in the *haor* basin and their obvious high productivity (e.g. fisheries production), this is a remarkably low figure.

The present surveys failed to find 36 species of waterfowl which are known or thought to have occurred in the wetlands of the Northeast Region. In many cases, this was not surprising. Eight species probably occur only as scarce visitors to the region, while another six species (mostly rails and crakes) are extremely secretive and easily overlooked. Three species, River Lapwing, Black-bellied Tern and Indian Skimmer, are almost exclusively birds of large rivers with extensive sand banks, a habitat type which in the Northeast Region appears to be restricted to the Old Brahmaputra River in the extreme west. This area was only investigated from the air, and these species could easily have been overlooked. The absence of two species, Indian Shag and White-breasted Waterhen, was, however, unexpected. The former is not uncommon in the wetlands of central Bangladesh, while the latter is reported to occur at wetlands throughout the country, and is a noisy and conspicuous bird, often living in close proximity to human dwellings. The remaining 17 species are now either extinct or almost so in the region.

Of the 125 species of waterfowl listed in Annex J, 53 are or were resident breeding species or breeding summer visitors and 42 are or were regular winter visitors or passage migrants from breeding grounds further to the north. The remaining 30 were probably never more than rare winter visitors or passage migrants, at or near the edge of their normal distribution, or stragglers from neighbouring regions.

Of the 53 breeding species, one is now globally extinct, nine are extinct in the region and six are almost certainly extinct as breeding birds (although they still occur as non-breeding visitors). The populations of many others, notably Oriental Darter and Cotton Pygmy Goose, are greatly reduced in numbers. Of the 42 regular winter visitors and passage migrants, two are extinct in Bangladesh, six are almost extinct in the region, and the populations of many others, especially the wintering ducks and geese, are obviously well below former levels.

The principal losses in the Northeast Region have been as follows:

(a) Breeding species

Spot-billed Pelican	Extinct in Bangladesh
Great Cormorant	? extinct as a breeding bird
Black-crowned Night-Heron	? extinct as a breeding bird
Grey Heron	? extinct as a breeding bird
White-bellied Heron	? extinct as a breeding bird
Painted Stork	Extinct in the region
Wooly-necked Stork	Extinct in the region
Black-necked Stork	Extinct in Bangladesh
Lesser Adjutant	? extinct as a breeding bird
Greater Adjutant	Extinct in the region
Black-headed Ibis	? extinct as a breeding bird
Black Ibis	Extinct in Bangladesh
White-winged Wood-Duck	Extinct in the region
Comb Duck	Extinct in the region
Pink-headed Duck	Globally extinct
Sarus Crane	Extinct in the region

(b) Winter visitors

Dalmatian Pelican	Extinct in Bangladesh
White Stork	Very rare
Glossy Ibis	Very rare
White Spoonbill	Very rare
Grey Lag Goose	Very rare
Bar-headed Goose	Rare
Common Crane	Extinct in Bangladesh
Demoiselle Crane	Very rare

Summing up the status of the 18 globally threatened species which are known to have occurred in the Northeast Region:

- Four species (and probably no more than this) have viable populations in the region (xx,xx,xx,xx);
- One species (Pink-headed Duck) is almost certainly globally extinct;
- Six species are almost certainly extinct in Bangladesh (Spot-billed Pelican, Dalmatian Pelican, Oriental White Stork, Marbled Teal, Swamp Francolin, Bengal Florican);
- Two species are almost certainly extinct in the Northeast Region (Greater Adjutant, White-winged Wood-Duck);
- Two species are now rare in the Northeast and probably occur there only as non-breeding visitors from neighbouring regions (White-bellied Heron, Lesser Adjutant);

- Three species may still survive in small pockets of near-natural vegetation in the Northeast, but have not been recorded for many years. These are small birds of floodplain grasslands and scrub, and could have been overlooked (Jerdon's Moupinia, Black-breasted Parrotbill, Swamp (Long-tailed) Prinia);

- Two species probably still survive in the Northeast Region in very small numbers. Both have been recorded in the region on one occasion in recent years, but were not found during the present surveys (Blyth's Kingfisher, Marsh Babbler); and

- Two species continue to survive in the Northeast Region in substantial numbers, and the region is therefore of considerable international significance for both of them (Baer's Pochard as a winter visitor, Pallas's Fish-Eagle).

The main reasons for the disappearance of so many wetland species from the Northeast Region are undoubtedly the massive conversion of floodplain grasslands and seasonal swamps to agricultural land, and almost complete elimination of swamp forest and other native floodplain forests which provide secure roosting and nesting sites for large waterbirds. Direct persecution by man has doubtless played a significant role in the demise of some species, but loss of permanent wetland habitat seems to be of less importance. Indeed, much of this habitat still remains.

On the whole, the migratory waterfowl have survived better than the resident species. The migratory species are in many ways much less demanding than the resident species in that all they require is an ample food supply and secure "loafing" and roosting areas. For many of the migratory waterfowl, there remains an abundance of suitable feeding habitat and habitat loss has not been the principal problem. However, resident species require secure nests sites, free from disturbance for several months each year. Species which build their nests on floating aquatic vegetation, such as Little Grebe, the jacanas and Whiskered Tern, face no difficulties, as plenty of suitable habitat remains. The grebe and the two jacanas at least are still fairly common and widespread breeding species in the region. However, species which nest in dense reed-beds or in rank vegetation at the water's edge, such as Yellow Bittern, Purple Heron, Spot-billed Duck, Purple Swamphen and some of the other Rallidae, are now confined to those few large permanent wetlands or less intensively cultivated areas where such vegetation persists (e.g. Hail Haor, Balai Haor, Pasua Beel and Tangua Haor). One species of extensive reed-beds and grassy marshes, the Sarus Crane, has disappeared entirely.

Cormorants, darters, pelicans, most species of herons and egrets, storks and ibises are colonial breeders, nesting in tall trees, often in huge mixed colonies. Under natural conditions, these colonies would have existed at traditional sites in tall stands of swamp forest in the *haors* or in gallery forest along the river levees. It is almost certainly the destruction of these forests in the *haor* basin that has been the primary factor responsible for the disappearance of many of the former breeding species (Great Cormorant, Spot-billed Pelican, five species of stork and two species of ibis) and present scarcity of some others (e.g. Oriental Darter). The disappearance of the White-winged Wood-Duck and Comb Duck can also be attributed to the destruction of the forests, as the former is very much a bird of forested wetlands, while the latter requires holes in large trees for nesting.

Undoubtedly, direct persecution in the form of hunting and egg-collecting combined with high levels of disturbance have contributed to the decline of many of these species. Wherever waterfowl are totally protected from hunting, they rapidly become extremely tame, and are able to utilize wetlands which in

the Northeast Region would be far too heavily disturbed. A good example of this can be seen at Dhaka Zoo, where in winter as many as 10,000 ducks can been seen on the small, artificial lake inside the perimeter fence. A similar concentration of ducks occurs on the small lake in the grounds of Calcutta Zoo, while at New Delhi Zoo, there is a large breeding colony of Painted Storks within a few yards of the thousands of people who visit the zoo every day.

The bird community to have suffered the worst as a result of habitat loss in the *haor* basin is that of the floodplain grasslands. These grasslands, with tall stands of elephant grass interspersed with marshy pools and wet meadows, must once have been very extensive in the basin, but have now been totally converted into rice fields or grazed almost bare by domestic livestock. Only one species of waterfowl, the extinct Pink-headed Duck, seems to have been dependent on this habitat type. However, at least 12 species which are typical of this habitat and which are known or thought to have occurred in the Northeast Region are now either very rare or extinct in Bangladesh. These include: Swamp Francolin *Francolinus gularis*, Bengal Florican *Eupodotis bengalensis*, Australasian Grass Owl *Tyto longimembris*, White-tailed Bushchat *Saxicola leucura*, Jerdon's Bushchat *Saxicola jerdoni*, Swamp (Long-tailed) Prinia *Prinia burnesii cinerascens*, Large Grass-Warbler *Graminicola bengalensis*, Bristled Grass-Warbler *Chaetornis striatus*, Marsh Babbler *Pellorneum palustre*, Jerdon's Moupinia *Chrysomma altirostris*, Black-breasted Parrotbill *Paradoxornis flavirostris* and Slender-billed Babbler *Turdoides longirostris*. The present surveys failed to locate any of these, although there are single records of two species, Jerdon's Bushchat and Marsh Babbler, in the Northeast in recent years (Harvey, 1990).

Despite these dramatic losses in its avifauna, the *haor* basin still continues to support a wide variety of bird species, many of which are very common. Most of these species have survived because they have been able to adapt to, and in some cases benefit from, man's changes to the environment. The dominant birds of the cultivated plains and homestead forests are those species which can live alongside man, and several have become true commensals, now being almost confined to man-made environments (e.g. House Crow, Common Myna and House Sparrow). The homestead forests, in particular, constitute a rich and varied habitat with a great diversity of bird species. Most of these were originally birds of open woodland and forest edge, although a few species more typical of true forest are able to exist in some of the denser stands. In general, however, the species which have been able to adapt to these man-made environments and live in close proximity to man are the commonest and most widespread species in the Subcontinent, and thus of no conservation concern.

Amongst wetland birds, those species that have been able to switch from natural grassy marshes to rice fields have been very successful. Several of these, notably the weavers and munias, are seed-eaters, and can become serious pests in the rice crop, while others, such as various species of wagtails, pipits and warblers, are insectivores and are probably beneficial to the farmer. A number of waterfowl have also been able to take advantage of the rice fields, and most of these remain common. Those species most frequently observed feeding in this habitat included Indian Pond Heron, Cattle Egret, Little Egret, Lesser Egret, Asiatic Golden Plover, Grey-headed Lapwing, Temminck's Stint, Pintail Snipe, Common Snipe, Marsh Sandpiper and Wood Sandpiper. The two snipe and the Wood Sandpiper were particularly common, and for these species, the rice fields of the *haor* basin may now constitute a very important wintering area. Several species of ducks feed in rice fields at night, particularly the two whistling-ducks, and Openbill Storks will also utilize this habitat. However, even in disturbance-free areas, most large waterbirds seldom visit rice fields, presumably because of the absence of suitable food items.

Most other wetland birds have been able to survive in the *haor* basin either because they are migrants, moving to less densely populated regions further north to breed, or because they have been able to utilize the small remnants of natural or near-natural vegetation which persist in areas of "waste" ground, on abandoned plots, or on "marginal" land which has not as yet been brought under cultivation or human settlement. Only in the Tangua Haor, Matian Haor and Gurmar Haor complex in the north are there sufficiently large tracts of relatively undisturbed wetlands to support the less adaptable species, and several species are now almost entirely confined to this part of the basin.

One group of birds which seems to be surviving extremely well in the *haor* basin is the birds of prey. Two species of kite were common and widespread, the Brahminy Kite as a resident and the Black Kite primarily as a winter visitor. Concentrations of over 100 kites were observed on several occasions at rubbish tips and at *beels* which were being drained for fishing. The White-rumped Vulture was also common and widespread. Over 150 were recorded during the Apr/May survey including one flock of 80 at Kawadighi Haor. In addition to these common species, 171 raptors of 13 species were recorded during the Feb/Mar survey, and 72 raptors of ten species during the Apr/May survey (Table 10). Birds of prey are generally regarded as good indicators of "environmental health" because of their position at the top of the food-chain. Any serious build up of harmful pesticides and other bioaccumulative pollutants in natural ecosystems is quickly reflected in a rapid decline in the number of birds of prey. It seems likely, therefore, that excessive use of harmful pesticides is not as yet a serious problem in the Northeast Region.

It rapidly became apparent during the surveys that a major limiting factor for many waterfowl species in the Northeast Region was not so much a shortage of wetland habitat *per se* (i.e. habitat where birds could find sufficient food) but a shortage of undisturbed habitat where birds could feed, "loaf" and roost in peace. This was particularly important for the ducks which, because of heavy hunting pressure in the region and probably elsewhere in the flyway, are very wary of humans. At most of the larger *beels*, intensive fishing activity in Feb/Mar was causing constant disturbance to waterbirds, while at many of the smaller *beels*, the presence of large numbers of farmers in the rice fields surrounding the *beels* precluded their use by many waterfowl species. As noted above, it was at those *beels* which were being protected from fishing during the 1991/92 season that some of the largest concentrations of ducks were observed, e.g. Chatla Beel, Aila Beel and Pana Beel.

Heavy hunting pressure is clearly an important factor in limiting the distribution of waterfowl in the region through the direct disturbance which it causes. This is especially the case with shooting, which reinforces the wariness of the birds and prevents them from utilizing areas with high densities of humans, whether or not they are hunters. However, the impact of hunting on waterfowl populations through direct mortality (hunter kill) is less clear. Shooting may not have a significant impact, as there are relatively few hunters with guns, and their efficiency would appear to be low. A more important factor may be the effects of constant disturbance on the species' energetics. Birds which are spending much of their time on the wing, avoiding hunters and other forms of disturbance, have less time to feed, and may, by the end of the winter, be in poor condition. This could lead to reduced survival during the northward migration in spring and reduced breeding success. A series of weights of netted or shot birds throughout the winter, compared with weights of birds at totally protected wetlands (e.g. at the Bharatpur Sanctuary in Rajasthan) might throw some light on this matter.

While the number of waterfowl shot might be relatively small, the number of waterfowl caught in flight nets would appear to be substantial. Flight-netting occurs in all the main areas for wintering waterfowl, and is very common. The mere fact that one hunter had 80 live birds in his possession at one time

suggests that this form of hunting can be very successful. In many parts of the world, as in Bangladesh, flight-netting is illegal because it is largely indiscriminate, killing game and non-game species, and protected and unprotected species alike. Further study is urgently required to determine the extent of the flight-netting, the numbers of individuals of which species are being caught, and the significance of the "harvest" in the local economy.

The use of poison bait to kill fish-eating birds for human consumption is a particularly deplorable hunting technique, since it is likely to kill scavengers of dead fish indiscriminately. Birds of prey such as Brahminy Kite, Black Kite, Pallas's Fish-Eagle and Grey-headed Fish-Eagle are particularly at risk. There is also, of course, the possibility of harmful effects on the consumers of the dead birds. There have been numerous cases of severe food-poisoning resulting from the consumption of poisoned birds, one of the most famous being at a banquet for participants in a conference on wildlife management and sport hunting in Iran in the 1960s. (The speciality on the menu was Chukar Partridge, which subsequent investigation revealed had been "hunted" by poisoning springs).

7.4 Critical habitats

The *Directory* identified ten key sites within the *haor* basin. These sites were apparently selected for one of two reasons: either they were sites which had long been known to be of special importance for wildlife (Tangua Haor, Hakaluki Haor, Kawadighi Haor, and Hail Haor), or they were sites which the contributors to the Directory had surveyed and found to be particularly interesting (Meda Beel, Aila Beel, Dekhar Beel, Kuri Beel, Erali Beel and Dubriar Haor). It was recognized at the time that this list was not comprehensive, and that other equally interesting sites for nature conservation might remain to be discovered.

The present surveys covered all of these ten sites and as many other potentially interesting wetlands as was possible in the time available. The value of each wetland for nature conservation was assessed primarily on the basis of the abundance and diversity of the waterbirds and any other wildlife present. Consideration was, however, given to some of the more general values of the wetlands, as defined in the Ramsar criteria (Annex F). These criteria give prominence to characteristics such as representativeness, uniqueness, high ecological diversity and presence of threatened species.

The wetlands visited during the two surveys may conveniently be grouped into three categories according to their overall importance for wildlife, especially waterfowl, and general ecological significance:

A. Large sites comprising either a single large *beel* (Hail Haor) or a group of *beels*, of outstanding importance for wildlife and retaining some natural qualities of considerable ecological significance in a regional context. These sites clearly qualify as wetlands of international importance on the basis of the Ramsar criteria.

B. Mostly rather large *beels* or groups of *beels* supporting significant numbers of wintering waterfowl and in some cases also small populations of breeding birds. Some may be of particular limnological or ecological interest, but further study is required. These sites are of importance in a national context, but probably not of international importance.

C. Sites of little importance for wildlife and of limited ecological significance; generally either small, isolated *beels* in densely settled areas or highly modified wetlands given over almost entirely to the cultivation of rice.

TABLE 11: Ranking of sites and status with respect to FCDI

NAME OF SYSTEM/SITE	RANK*	STATUS WITH RESPECT TO FCDI PROJECTS**
Old Brahmaputra River	C	-
Lower Baulai River	C	Three existing projects: Haijda (109), Nawtana Khal (111) & Humaipur (108); six proposed projects: Nickly Haor (119), Bara Haor (112), Mitamain Haor (118), Surma-Baulai Haor (114), Angarer Haor (117) & Khaliajuri (122)
Lower Kalni River	C	Three existing projects: Humaipur Haor (108), Bhanda Beel (48) & Tangua Haor (52); at least ten proposed projects: Dewgar Haor (113), Bara Haor (112), Surma-Baulai Haor (114), Zingri Nadi (32), Jamkhotar Haor (89), Nainda Haor (90) & Projects 30, 74, 88 & 91.
Khowai River	C	Ongoing full-flood embankment project (53)
Sankardanga Beel	c	
Ratna Beel	c	
Khowai River	c	
Hail Haor	A	Existing full-flood embankment (97)
Hail Haor Fish Ponds	B	Within private full-flood embankment
Kawadighi Haor	A	Existing full-flood embankment (94) (Manu River Project)
Petangi Beel	a	
Majherbanda/Ulauli	a	

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The major haor systems and the individual sites within them are ranked into one of these three categories in Table 11, which also gives their status with respect to existing, ongoing and proposed flood control, drainage and irrigation projects. The project numbers in the table and the following accounts have been taken from the Inception Report of the Northeast Regional Water Management Project, Bangladesh (Apr 90).

"A" Sites

Six systems have been identified as being of outstanding national and international importance for their nature conservation values. These systems, which will be the subject of more detailed studies by NACOM field biologists during the coming year, are as follows:

TABLE 11: continued from previous page

NAME OF SYSTEM/SITE	RANK*	STATUS WITH RESPECT TO FCDI PROJECTS**
Maijeil Haor	B	Proposed submersible embankment (59) (Dubriar Haor and Maijeil Haor Projects)
Patachatal Beel	b	
Borachatal Beel	b	
Dubriar Haor	C	Proposed submersible embankment (59)
Dubriar Beel	c	
Baisha Beel	c	
Damrir Haor	B	Existing drainage improvement project (9)
Chalnia Beels	b	
Deodar Beels	c	
Juri River	C	-
Hakaluki Haor	A	Proposed submersible embankment (64)
Kair Gang & *beel*	b	
Haor Khal	a	
Puala Beel	c	
Pingla Beel	b	
Chatla Beel	a	
Tural Beel	b	
Dulla Beel	b	
Chakia Beel	c	
Gharkuri Beel	b	

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(a) Tangua Haor.

A group of large *beels* to the west of the Patnai Gang, close to the Indian border. The principal *beels* are Pana, Rauar, Tangua, Ainna, Arabiakona and Samsar. The system as a whole is unprotected from flash-flooding, although Arabiakona Beel and one or two small *beels* are surrounded by submersible embankments. The entire wetland is included within the area of a proposed submersible embankment project (Tangua Beel Project, No. 72).

Tangua Haor was identified as a key site in the *Directory* and is described in some detail (see Annex A). Three of the main *beels*, Pana, Rauar and Tangua, have been selected as sites for the Monthly Waterfowl Censusing Programme.

Tangua Haor is of outstanding importance for its large and diverse waterfowl populations. It is perhaps the most "natural" large wetland remaining in the Northeast Region, and possesses extensive stands of emergent marsh vegetation. There is little permanent human settlement in the immediate vicinity, and there remain significant areas of higher ground between the *beels* which are not under cultivation and which still support some natural herbaceous vegetation. The haor forms the core area of a much larger

TABLE 11: continued from previous page

NAME OF SYSTEM/SITE	RANK*	STATUS WITH RESPECT TO FCDI PROJECTS**
Balai Haor	A	Proposed submersible embankment (70) (Surma-Kusiyara Project)
Khakra Kuri Beel	b	
Dubail Beel	b	
Jugni Beel	b	
Chunnia Beel	C	Proposed submersible embankment (66) (Kakur Mohanpur Project)
Erali Beel	B	Proposed submersible embankment (67)
Bara Haor	C	Proposed submersible embankment (57)
Chapra, Singari etc.	c	
Mehdi Beel	C	Proposed submersible embankment (70)
Khai Haor	C	Proposed submersible embankment (81)
Deochapra Beel	c	
Dabor Beel	c	
Dekhar Haor	B	Proposed submersible embankment (71)
Kuri Beel	b	
Goraduba Beel	b	
Dapha, Ruwa, Guinga	b	
Jaor Beel	c	
Surma River	C	-

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region of *haors*, several of which are of importance for waterfowl (e.g. Gurmar Haor, Kanamaiya Haor and Matian Haor). This group of *haors* together held 40% of all the waterfowl recorded during the Feb/Mar survey and 36% of those during the Apr/May survey. The corresponding figures for Tangua Haor itself were 24% and 11%, respectively.

Many species of waterfowl, especially the cormorants, Oriental Darter, several species of ducks and Eurasian Coot, are largely confined to this northern system of *haors*, undoubtedly because it provides the largest contiguous area of permanent water bodies in the Northeast Region and remains relatively thinly populated. The outstanding importance of this system for some species is demonstrated by the results of the Feb/Mar survey. The percentages given in Table 12 represent the proportion of all individuals recorded that the system held during this survey.

TABLE 11: continued from previous page

NAME OF SYSTEM/SITE	RANK*	STATUS WITH RESPECT TO FCDI PROJECTS**
Panger Haor	B	Existing submersible embankment (79)
Aila Beel	b	
Pangna Beel	b	
Karul Dhan Beel	c	
Someswari River	C	-
Patnai Gang	C	-
Gurmar Haor	A	Existing submersible embankment (49)
Pasua Beel	a	
Halir Haor	C	Existing submersible embankment (15)
Kecharia Beel	c	
Kanamaiya Haor	B	None known
Kanamaiya Haor	b	
Pakertala Beel	b	
Matian Haor	B	Existing submersible embankment (19)
Bara Beel	b	
Banuar Beel	b	
Palair Beel	b	

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The northern system is also very important for herons and egrets. It held 49% of all herons and egrets recorded during the Feb/Mar survey and 68% of those during the Apr/May survey. The presence of complex of large and relatively undisturbed *beels* still in a near-natural condition at Tangua Haor is undoubtedly the key factor in supporting these major concentrations of waterfowl in the northern system as a whole.

(b) Pasua Beel, Gurmar Haor.

Pasua Beel comprises a single large *beel* with two smaller *beels* nearby in the extreme southeast portion of Gurmar Haor, adjacent to the Patnai Gang. The *beels* are surrounded by higher ground with dense grasses, scrub and *Pongamia* forest, the entire area covering about 400 ha. Gurmar Haor has recently been surrounded by a submersible embankment to protect against flash-flooding (Gurmar Haor Project, No. 49, completed in 1991).

Pasua Beel was not mentioned in the *Directory*, as its importance had not been recognized at that time. It has been selected as one of the sites for the Monthly Waterfowl Censusing Programme.

TABLE 11: continued from previous page

NAME OF SYSTEM/SITE	RANK*	STATUS WITH RESPECT TO FCDI PROJECTS**
Tangua Haor	A	Proposed submersible embankment (72)
Pana Beel	a	
Biaskhali Beel	b	
Rauar Beel	a	
Main Tangua Beel	a	
West Tangua Beel	b	
Two un-named *beels*	b	
Ainna Beel	b	
Ghaniakuri Beel	b	
Arabiakona Beel	b	
Un-named Beel	b	
Samsar Beel	b	
Ubdakhali Haor	B	Proposed submersible embankment (123)
Uglar Beel	b	
Meda Beel	b	
Netrakona/Kaluma Kanda	c	
Kendua area	C	None known
Boraduba Beel	C	None known

*** Ranking**

A/a = system/site of outstanding importance for wildlife (international)
B/b = system/site of considerable importance for wildlife (national)
C/c = system/site of only limited importance for wildlife

** Project numbers are taken from the Inception Report of the Northeast Regional Water Management Project, Bangladesh (April 1990) xxcite fig no. of this rptxx.

The main value of Pasua Beel lies not so much in the *beel* itself, as in the fact that the surrounding area supports much the finest stands of natural floodplain vegetation located during the present surveys. These include a dense stand of *Pongamia* forest, large areas of tall grasses and patches of dense shrubbery. Although the main *beel* is intensively fished and there are a few small rice fields near the river embankment, there has obviously been little other exploitation in the area in recent years. Some people were observed harvesting grasses on the shores of the *beel*, presumably for fodder, but otherwise the area was undisturbed.

Pasua Beel was leased to the Pearl and Fishery Resources Development Program on a nine-year lease in 1983. The head of this program is reported to have been a Minister under the Ershad regime. Armed guards have been stationed at the *beel* to prevent illegal fishing, but it is apparent that these guards, and perhaps also a respect for the Minister, have been effective in preventing other forms of exploitation as

TABLE 12: Proportion of individuals held by northern haor system

Great Cormorant	80%	Mallard	100%
Little Cormorant	86%	Spot-billed Duck	99%
Oriental Darter	95%	Red-crested Pochard	100%
Asian Openbill	95%	Baer's Pochard	99%
Fulvous Whistling Duck	93%	Ferruginous Duck	99%
Ruddy Shelduck	99%	Purple Swamphen	99%
Cotton Pygmy Goose	86%	Eurasian Coot	96%

well. The lease comes up for renewal in 1992, and is apparently to be given out by open auction on a three-year basis. It is quite likely, therefore, that the excellent level of protection which has been afforded to the habitats around the *beel* over the past eight years will not be maintained.

The importance of Pasua Beel in a regional context is quite outstanding. It contains what would appear to be the best remaining examples of the *Pongamia* forest and tall grassland ecosystems in the Northeast Region. It provides a secure roosting site for huge numbers of cormorants, herons and egrets (at least 4,600 in late April), and supports a number of species which are scarce or local elsewhere in the region (e.g. Purple Heron, Black-headed Ibis, Spot-billed Duck and Purple Swamphen). A large flock of Asian Openbills frequented the area from at least early March until late April, and numbered about 400 at the end of March. Very few of this scarce species were observed elsewhere in the Northeast Region during the present surveys. Concentrations of 19 Pallas's Sea-Eagles in early March and 28 in late March are of great significance, as this is a globally threatened species. Finally, the area supports a much higher diversity of waterfowl and other wetland birds than any other site investigated. Fifty species of waterfowl were recorded at the *beel* during the two main surveys - 56% of all the species recorded during the surveys. Of the many passerines observed in the surrounding forest and shrubbery, one, a male Firethroat *Erithacus pectardens*, was a new species for Bangladesh and apparently only the second record for the Indian Subcontinent.

(c) Hakaluki Haor.

Hakaluki Haor comprises a large group of *beels* surrounded by heavily grazed grassland and rice fields. The entire wetland is included within the area of a proposed submersible embankment project (Hakaluki Haor Project, No.64), and has been suggested as an area suitable for water storage during the peak of the monsoon floods.

Hakaluki Haor was identified as a key site in the *Directory*, and is described in some detail (see Annex A). Three of the main *beels*, Haor Khal, Chatla Beel and Pingla Beel, have been selected as sites for the Monthly Waterfowl Censusing Programme.

Hakaluki Haor has long been known to be a major wintering area for migratory waterfowl, especially ducks, and is a popular duck-hunting area for sportsmen from Dhaka. The haor remains very important for wintering ducks, despite high levels of disturbance from hunters and fishermen, and is also a very important wintering area for migratory shorebirds. However, it seems to be much less important for

cormorants, herons and egrets, and appears to have only limited value for breeding birds. During the Feb/Mar survey, Hakaluki Haor held 34% of all the waterfowl recorded, including 44% of the ducks and 31% of the shorebirds, but only 3% of the cormorants and 2% of the herons and egrets. At this time, the haor was particularly important for Great Crested Grebes (41% of the total), Lesser Whistling-Duck (67%), Northern Shoveler (73%), Little Ringed Plover (49%), Kentish Plover (86%), Asiatic Golden Plover (53%), Little Stint (74%) and Marsh Sandpiper (56%). During the Apr/May survey, the relative importance of the haor had fallen considerably, and it now held only 8% of all waterfowl recorded (with 14% of the ducks and 12% of the shorebirds).

(d) Hail Haor.

Hail Haor is a very large, rather isolated, shallow permanent lake with extensive floating and emergent vegetation, surrounded on three sides by low hills. It thus differs considerably in character from most other *haors* in the *haor* basin. The haor is included within an ongoing flood control and drainage project initiated in 1985 (Hail Haor Project, No. 97). However, it seems that the construction of a submersible embankment along the northeastern periphery of the haor has had little if any effect on the flood regime within the basin.

Hail Haor was identified as a key site in the *Directory*, and is described in some detail (see Annex A). Parts of the *haor* have been selected as sites for the Monthly Waterfowl Censusing Programme.

The nature conservation values of Hail Haor relate primarily to its unique status in the region as the largest, shallow, permanent lake. The lake supports a very rich and diverse aquatic plant community, which in turn supports a wide variety of resident bird species, several of which are scarce or local elsewhere in the region (Yellow Bittern, Purple Heron, Watercock, Purple Swamphen and Black-breasted Weaver). The lake would undoubtedly be of great importance for wintering waterfowl were not it for the high levels of disturbance from fishing activities.

(e) Balai Haor.

Balai Haor is an isolated haor between the Surma and Kushiyara rivers in the extreme east of the project area. It comprises three principal *beels* (Dubail, Jugni and Khakra Kuri) surrounded by heavily grazed pastureland and rice fields. Most of the many low embankments and margins of the water courses have been invaded by dense stands of the introduced exotic plant *Ipomoea acuatica* (Convolvulus), and this is now spreading out into the cultivatable areas. The entire haor is included within the area of a proposed flood control project (Surma-Kusiyara Project, No.70), and has been suggested as part of an area suitable for water storage during the peak of the monsoon floods.

Balai Haor was not mentioned in the *Directory*. It has been selected as one of the sites for the Monthly Waterfowl Censusing Programme.

Observations during the present surveys suggest that the area is of special interest for its diversity of fauna and flora, the presence of at least two threatened species (Lesser Adjutant and Pallas's Fish-Eagle), and the presence of large concentrations of ducks during periods of deep flooding. Few ducks were observed at the Haor in early March and late April, when water levels were very low, but over 32,000 were present in late March (during the Monthly Waterfowl Census) when water levels were high. The haor may also be of considerable importance as a staging area for passage migrants, because of its strategic position as the first or last major wetland that migrants encounter on their way to and from the

lowlands of the Northeast Region. Much more work needs to be carried out before the importance of the site for nature conservation can be fully determined.

(f) Kawadighi Haor.
Kawadighi Haor comprises two large, shallow *beels*, Petangi and Majherbanda, and a third, smaller *beel*, Ulauli, adjacent to the latter. The entire wetland lies within an existing full-flood embankment (the Manu River Project, No. 94). This embankment has
caused some reduction in water levels during the dry season, but has not been as effective as anticipated because of annual breaching of the embankment by local people.

Kawadighi Haor was identified as a key site in the *Directory*, and is described in some detail (see Annex A). The haor has been selected as one of the site for the Monthly Waterfowl Censusing Programme.

Despite the changes which must have occurred to the wetlands since the construction of the full-flood embankment, Kawadighi Haor remains very important for a wide variety of waterfowl. The haor held 8.5% of the waterfowl recorded during the Feb/Mar survey, and 5.3% of those during the Apr/May survey. The shallow *beels* with large areas of rotting aquatic vegetation and exposed mud were particularly attractive to shorebirds and several species of herons and egrets. The haor held 16% of all shorebirds recorded during the first survey, and 25% of those recorded during the second. The corresponding figures for herons and egrets were 23% and 17%, respectively. The *beels* may also be of some importance for breeding birds. In early May, Black-winged Stilts and Whiskered Terns were showing courtship and nest-building behaviour at Petangi Beel. Neither of these species has as yet been found breeding in Bangladesh.

It is unclear as to what extent the conditions for waterfowl at Kawadighi Haor have been affected, either negatively or positively, by the full-flood embankment. However, it seems likely that with improved maintenance of the embankment, further changes will occur. The situation should be monitored closely, as it will give considerable insight into the impact of other similar projects on the *beel* ecosystems and their waterfowl. The selection of Kawadighi Haor as another permanent monitoring site for the Northeast Regional Project is therefore recommended.

"B" Sites

(a) Hail Haor Fish Ponds.
A group of privately owned and well-protected fish ponds south of Hail Haor. These are primarily of interest as a secure resting area for ducks which presumably feed at night in Hail Haor.

(b) Patachatal Beel and Borachatal Beel, Maijeil Haor
Two large, deep *beels* with little emergent vegetation, surrounded by rice fields. Of principal interest as a resting area for wintering ducks which presumably feed in the surrounding rice-fields. Over 4,000 ducks were present in early March. Patachatal Beel was poisoned with rotenone during the first week of April and stocked with carp hatchlings on 26 April, as part of the Second Aquaculture Development Project supported by the Asian Development Bank (ADB). There appears to have been some misuse of the poison at the *beel*, as not only the gill fishes were killed, but also a large numbers of turtles, snakes and frogs. The two *beels* will be monitored on a monthly basis until January 1993.

(c) Chalnia Beels, Damrir Haor

Two large, deep *beels* with little emergent vegetation, surrounded by rice fields. Of principal interest as a wintering area for ducks. A flock of 1,200 Tufted Ducks in late February was the largest concentration of this species recorded during the surveys. A pair of Pallas's Fish-Eagles nests nearby.

(d) Erali Beel.
A large, deep *beel* with little emergent vegetation, set amongst low hills and relatively isolated. The *beel* appears to be of very little value for waterfowl, but may be of considerable limnological and/or ecological interest because of its unique character and isolation. This wetland was described as a key site in the *Directory* (Annex A).

(e) Dekhar Haor.
A number of large and small *beels*, mostly shallow with a considerable amount of floating and emergent aquatic vegetation, surrounded by rice fields. Kuri Beel differs from the others in being much deeper and being surrounded by steep grassy banks. The haor is of some value for a wide variety of wintering waterfowl, and also supports a small number of resident species. Almost 1,600 birds of 30 species were present in late February, including the only Bar-headed Geese recorded during the surveys. Dekhar Haor and Kuri Beel were described separately as key sites in the *Directory* (Annex A).

(f) Aila Beel and adjacent beels, Panger Haor
A group of four large *beels* and several smaller *beels* with some emergent aquatic vegetation, surrounded by rice fields. The system lies within a submersible embankment (Panger Haor Project, No. 79). Apparently an important wintering area for ducks, gulls and terns. No survey was possible in late February or early March, but a survey on 22 March revealed 9,600 birds including 3,600 ducks, almost 400 Brown-headed Gulls and 5,000 Whiskered Terns. On 21 April, the *beels* held over 8,000 ducks, the most recorded at any site during the Apr/May survey. Aila Beel was described as a key site in the *Directory* (Annex A).

(g) Kanamaiya Haor including Pakertala Beel
Two large unprotected *beels* on the Patnai Gang, with some emergent aquatic vegetation. The *beels* are separated from adjacent Gurmar and Mohalia *haors* by submersible embankments. Of considerable importance for wintering ducks and shorebirds, holding almost 7,000 waterfowl in early March when water levels were low, but of little if any importance for breeding birds. Much of the importance of this and the following site is likely to be related to the presence of the very important Tangua Haor a few km to the north and Pasua Beel a few km to the south.

(h) Bara Beel, Banuar Beel and Palair Beel, Matian Haor
Three large, shallow *beels*, with extensive floating and emergent vegetation, surrounded by rice fields. The *beels* lie within a submersible embankment (Matian Haor Project, No.19), and are adjacent to the Patnai Gang. Tangua Haor lies on the opposite side of the river. The *beels* are important for wintering ducks, and resident cormorants, herons and egrets, Cotton Pygmy Geese and the two species of jacanas. Over 6,300 waterfowl were present in Feb/Mar and 725 in Apr/May. The dense aquatic vegetation provides nesting habitat for a variety of species.

(i) Meda Beel and Uglar Beel, Ubdakhali Haor
Two medium-sized shallow *beels* with large areas of floating and emergent aquatic vegetation, surrounded by rice fields. The *beels* lie within a proposed project area (Ubdakhali, No.123). Probably of some

importance for wintering ducks, although only 1,130 were recorded in Feb/Mar. No survey was carried out in Apr/May. Meda Beel was described as a key site in the *Directory* (Annex A).

"C" Sites

All other sites listed in Table 7 are considered to be of very little importance for wildlife, other than those common and widespread species which have been able to adapt to man-modified environments and are able to tolerate high levels of disturbance.

The extensive floodplains along the lower Baulai and Kalni rivers, with their innumerable small *beels* and abandoned river channels, fall into this category. Almost the entire area which is not permanently under water has been converted to rice fields or is now heavily grazed pastureland. Aerial surveys in late February and in early May failed to locate any significant concentrations of waterfowl, and in fact, very few birds were seen other than Indian Pond Herons and several species of egrets. The rice fields may be of considerable importance for some wintering shorebirds, especially the snipe and Wood Sandpiper, but no single area appeared to be of special significance. The scarcity of most waterfowl species can readily be attributed to the absence of any major groupings of large *beels* (most *beels* being rather small and widely scattered), the high levels of disturbance from fishing and farming activities, and the almost complete absence of emergent marsh vegetation or other cover.

7.5 Implications of flood control, drainage, and irrigation

Full implementation of the National Water Plan (by 2015) could affect some 1,213,000 ha of land in the Haor Basin. As much as 620,000 ha could be provided with flood control and drainage, 102,000 ha with surface water irrigation and 491,000 ha with groundwater irrigation. The numerous ongoing and proposed water development projects in the region will undoubtedly have a far-reaching, and in many cases devastating, effect on the wetland ecosystems, as more and more of the seasonal wetlands are brought under permanent cultivation (Figure 2). Two of the six critical areas for nature conservation identified during the present surveys (Hail Haor and Kawadighi Haor) have already been at least partially enclosed within full-flood embankments; one site (Pasua Beel) has been enclosed within a submersible embankment, and the other three (Tangua Haor, Hakaluki Haor and Balai Haor) lie within the area of proposed projects. Of the six other sites which were described in the *Directory*, one (Aila Beel) has been enclosed within a submersible embankment, while the other five (Meda Beel, Dekhar Haor, Kuri Beel, Erali Beel and Dubriar Haor) are within proposed projects. The status of all 68 sites visited during the present surveys with respect to existing, ongoing and proposed flood control projects is indicated in Table 11.

In a report entitled *Bangladesh Action Plan for Flood Control: Achievements and Outlooks* (anon., Mar 92), it is stated that "improvements in flood control and drainage will not lead to a significant loss of natural wetlands since virtually all of the lands likely to be affected have been under cultivation for centuries". The validity of this statement depends to some extent on which definition of "wetland" is being applied. The author was presumably using the very narrow definition used in North America, which limits "wetlands" to areas of shallow flooding, whether permanent or seasonal, which support certain characteristic "wetland" plants. Most lakes, rivers and seasonally flooded grasslands are excluded. Key species of aquatic plant have been identified to assist in the application of this definition.

As emphasized earlier in this report, there is now very little natural wetland habitat of this type remaining in the Haor Basin. Almost all areas which would have supported permanent marsh vegetation have been

converted to rice fields or have been extensively modified by grazing, cutting and the introduction of exotic species (e.g. *Eichhornia crassipes* and *Ipomoea acuatica*).
Thus it might be true to say that improvements in flood control will lead to little loss of this type of wetland, simply because there is very little left to lose. However, the very fact that natural or near-natural swamp and marsh communities are now so rare in the Northeast Region makes any further loss very significant. As more and more of these wetlands are destroyed, those that survive play an increasingly important role in the maintenance of ecological biodiversity in the region.

In many parts of the world, the generally accepted definition of the term "wetland" is that given in the text of the Ramsar Convention. This reads as follows:

> "Wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which does not exceed six metres at low tide".

On the basis of this definition, 60% of the Northeast Region is a wetland, i.e. all that part subject to inundation during the height of the monsoon. All *haors*, *beels*, rivers and *khals* are included, as well as man-made systems such as fish ponds, tanks and even the rice fields themselves. Using the term wetland in this broad sense, the statement that "virtually all of the lands likely to be affected have been under cultivation for centuries" is less convincing. The present surveys have revealed that there remain at least six extensive wetlands in the Haor Basin the loss of which would be of considerable significance in both a regional and a national context. All six of these wetlands are potentially threatened by flood control, drainage and irrigation projects.

Any major hydrological change to a natural or near-natural wetland ecosystem will inevitably have some negative effects, if only by reducing the "naturalness" of the system and thereby its values for baseline research on the functioning of these ecosystems. Of the six critical areas identified in this report, much the most important in terms of size and naturalness is Tangua Haor, northwest of Sunamganj. It is believed that this wetland now plays a crucial role in the maintenance of biodiversity in the region, primarily because of its large size, the richness of its aquatic vegetation and its relative remoteness. It is therefore strongly recommended that the Tangua Haor system be excluded from any proposed flood control, drainage or irrigation projects which could have any adverse effects on its ecological character.

Hakaluki Haor has been subjected to considerable manipulation by man, and has now lost much of its natural vegetation. Nevertheless, it remains an internationally important wintering area for a variety of migratory waterfowl, and will doubtless continue to do so if the present high levels of hunting (both shooting and netting) and associated disturbance can be brought under control. Any FCDI project that would result in a general lowering of water levels in the haor would have a negative impact on the waterfowl populations (mostly ducks), and should therefore be avoided. However, any project which would increase the amount of water remaining in the *beels* during the dry season would probably have a beneficial effect on most species of waterfowl which utilize the area in winter.

The nature conservation values of Balai Haor are far less well understood than those of the other five critical areas, and further study is required before any firm statements can be made as to which are the principal values of the system or how these might be affected by FCDI interventions. At first glance, the very low water levels in early March and the presence of huge numbers of waterfowl following flash-flooding in late March would suggest that enclosure of the wetland within a submersible embankment

would have a detrimental effect on the wintering waterfowl, while utilization of the area for storage of flood waters could be beneficial.

The situation with respect to the impact of FCDI projects at the other three critical areas is rather different in that all three are already within completed FCDI projects. Pasua Beel presents no problems, and serves as a very vivid demonstration of how an abundance of wildlife can survive at a *beel* within a submersible embankment, provided that protection is given to the natural vegetation and disturbance is kept to a minimum. (The vegetation around the *beel* and hence the conservation value of the site would, however, change dramatically if the submersible embankment were to be raised to full-flood levels).

Hail Haor and Kawadighi Haor are both supposedly protected by full-flood embankments. However, the embankment at Hail Haor was apparently ill-conceived, and seems to have had no effect in controlling flood levels, while the efficiency of the full-flood embankment around Kawadighi Haor has been seriously impaired by annual breaching.

As argued above, Hail Haor is primarily of interest for its rich and diverse aquatic plant communities and the varied wildlife which these support. Were it not for the extremely high levels of disturbance from fishing activities, the haor would undoubtedly support large numbers of wintering waterfowl. Any major FCDI project at Hail Haor would almost certainly detract from the ecological values of the site, and should therefore be discouraged. Aside from any general ecological considerations, the extremely high values of Hail Haor for fisheries production, its role as a natural flood storage basin, and the high cost that would be entailed in reclaiming the land for agriculture, would also seem to favour maintaining the haor as a permanent wetland ecosystem.

Kawadighi Haor continues to support significant numbers of a wide variety of waterfowl species in winter, and perhaps also several interesting breeding species. In the absence of any reliable historical information, it is not known whether or not the waterfowl populations have changed, either in numbers or species composition, since the major construction work on the full-flood embankment was completed in 1983. There have, however, been reports of a decline in fish catches in the haor in recent years (G. Bernacsek, pers. comm.). It also seems uncertain as to whether or not the *beels* have remained flooded because of the breaches in the embankment, or in spite of them. One report suggests that local people breach the embankment every year to accelerate drainage. The situation seems confusing, and further study is clearly required. Kawadighi Haor obviously constitutes an ideal site for a full-scale monitoring programme for several reasons, not the least of which is the insight it would give into the effects of full-flood embankments on a rich and diverse wetland ecosystem.

A strong case can be made for proceeding with great caution in any proposals for FCDI projects in these six critical areas. However, in most cases in the Northeast Region, the wetland areas which might potentially be affected by FCDI projects have already been extensively modified by man, and have few if any natural qualities. Thus the question becomes to what extent will the new man-made environments be better or worse for wildlife than the existing man-made environments. Defining "better" in this context becomes very subjective. Any project which tends to increase water levels will favour deep water species such as grebes, cormorants, diving ducks, coots and gulls, while any project which creates shallower water bodies with more extensive growth of floating aquatic vegetation will favour species such as the herons and egrets, Cotton Pygmy Goose, jacanas, moorhens and various rails. Few, if any, of these species will be of special conservation concern, since they are already species which have adapted to man-made environments and therefore tend to be very common.

In these circumstances, it is felt that a more useful question is to what extent will a proposed FCDI project affect the total area of wetland habitat. Any project, such as a full-flood embankment with full drainage facilities, which causes a permanent reduction in the area of wetland habitat is clearly detrimental to waterfowl and other wildlife ecologically dependent on wetlands.
The conversion of permanent water bodies into rice fields will undoubtedly favour only those species which have already been able to adapt to this grossly simplified "ecosystem" and which are generally, therefore, already extremely widespread and abundant in southern Asia. These species which are benefitting widely from man's modification of natural environments are scarcely of any conservation concern.

On the other hand, submersible embankment projects, which only protect against infrequent and exceptional flooding outside the monsoon period, may cause little if any permanent loss of wetland habitat. Certainly, the prevention of flash-flooding alone can have no serious repercussions on the wetland fauna and flora, since flash-flooding is by no means an annual event. Thus, for several years in a row, the embankment may not be "required", and will have no effect other than to delay the full monsoon flooding by a few days. Furthermore, there are indications that flash-flooding is becoming much more frequent because of deforestation and soil erosion in the water catchment areas. In so far as some of these flash floods may be regarded as being man-made, the submersible embankments are in effect mitigating against the impact of man's activities on the wetlands.

A visit to the adjacent Tangua and Matian *haors* in late April provided an excellent opportunity to compare the situation in unprotected wetlands deeply flooded by a flash flood (Tangua Haor) with that in protected wetlands in which the water level was very low (Matian Haor). Both held large numbers of birds of a wide variety of species, and had many species in common. However, Little Cormorants, Oriental Darters, both species of Whistling Duck, Garganey, Eurasian Coot and Brown-headed Gull were much more in evidence on the deeply flooded *beels*, while Little Grebes, egrets, both species of Jacanas, Black-winged Stilts and Whiskered Terns were more in evidence on the protected *beels*.

Most migratory shorebirds prefer to feed on exposed mudflats. This is a scarce habitat type in the Northeast Region, because most such areas are quickly planted with *boro* rice. Furthermore, with the first flash-flooding in late April, any areas of exposed mudflat are inundated. By preventing this early flooding, submersible embankments could prove beneficial to migrant shorebirds passing through the region in spring. On the other hand, flash-flooding at Balai Haor in late March, although rendering the area unsuitable for most shorebirds, created ideal conditions for ducks and attracted a huge concentration of birds.

It is concluded that, on balance, the construction of submersible embankments to protect against flash-flooding does not in itself pose a serious threat to waterfowl or other wildlife in the Northeast Region. However, the increased flood protection provided by these embankments will presumably lead to increased cultivation of *beel* margins with consequent loss of emergent marsh vegetation and exposed mudflats, and could also lead to increased human settlement in the area with consequent increase in disturbance levels. These induced developments will undoubtedly have a negative impact on the ecological values of the wetlands and their wildlife. Similarly, any improved drainage facilities which permit accelerated drainage of the protected *haors* during the post-monsoon period could have a detrimental impact on wetland flora and fauna if they resulted in a general lowering of water levels in the *beels* during the dry season.

The use of some of the larger wetland areas as flood storage areas during the monsoon is unlikely to have any negative impact on wintering waterfowl populations. The great majority of the migratory birds have departed for their breeding grounds by mid-May, when the wetlands are first likely to be used to store flood waters, and any development which causes a slight to moderate increase in the depth and duration of flooding during the dry season is likely to be beneficial to waterfowl populations, by providing larger water bodies (and therefore more disturbance- free areas) during the critical period at the end of the dry season. The likely impact on resident species is less clear, although this too might not be negative. Deep flooding in mid-May would have a similar effect to that of flash-flooding - a natural phenomenon - while prolonged deep flooding in the post-monsoon period would simply increase the amount of wetland habitat available through the dry season.

Four areas are currently being considered for use as flood storage areas: Hakaluki Haor, Hail Haor, the Surma-Sylhet hills area and the Surma-Kusiyara interfluvial area. Hakaluki Haor, Hail Haor and a part of the Surma-Kusiyara area (Balai Haor) are amongst the six critical areas for nature conservation.

While Hakaluki Haor is of major importance as a wintering area for migratory waterfowl, it seems to have little importance for breeding birds. Flood storage would probably, therefore, be beneficial for most of the waterfowl species which utilize the area in large numbers.

Hail Haor is of special interest as the region's largest, shallow, permanent lake. It supports an exceptionally rich and diverse aquatic plant community and a wide variety of breeding waterfowl, several of which are scarce or local elsewhere in the region. Increased flooding during the monsoon and especially prolonged deep flooding during the post-monsoon period is likely to have a major impact on the ecology of the lake, and could result in the disappearance of much of the emergent vegetation which now dominates most of the lake surface.

The Surma-Sylhet hills area appears to be of very little importance for waterfowl. The area was surveyed only once, from the air on 26 February, and only one bird (an Indian Pond Heron) was observed. Much of the area is under cultivation for rice and vegetables, and the region is densely populated. Use of this area for flood storage would undoubtedly increase its value for wildlife.

Balai Haor in the Surma-Kusiyara interfluvial area appears to be important for its diverse fauna and flora, at least two threatened species, and large concentrations of migratory waterfowl during periods of deep flooding, but further study is required. Use of the area for flood storage would probably improve the value of the area for migratory waterfowl in the pre- and post-monsoon periods, and certainly more water at the end of the dry season would be desirable, but prolonged deep flooding would undoubtedly cause some changes in the aquatic vegetation which may or may not be beneficial to breeding birds. By the end of the Monthly Waterfowl Censuses in early 1993, the value of the area for wildlife and the potential impact of deep flooding should be clearer.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 General conclusions

There has been massive loss of natural wetland habitats throughout the Northeast Region. Entire ecosystems have disappeared virtually without trace, and have been replaced by vast monocultures of rice, other croplands and homestead forests. This has been a direct consequence of the rapid increase in human population and ever increasing demands for more land and more food.

As early as the 1870, the Conservator of Forests for what was then part of Bengal became concerned at the rapid rate at which the human population was increasing and the stress that this was placing on the region's natural resources, especially the forests. This concern was translated into action, and a variety of reserves were established to conserve the region's rapidly diminishing forest resources. One of these reserves was the Sundarbans Reserved Forest, established in 1875. Few would now doubt that the establishment of this reserve was a wise decision. The Sundarbans Reserved Forest remains one of the largest contiguous blocks of mangrove forest in the world, with most of its fauna and flora almost intact, and the world's largest and perhaps only truly viable population of the Royal Bengal Tiger. As such, it is undoubtedly the "jewel in the crown" of Bangladesh's natural heritage.

Unfortunately, no similar efforts were made to conserve the country's freshwater wetlands in the 19th century, at a time when it might have been possible to protect sufficiently large tracts of wetland habitat to safeguard their unique fauna and flora. It is only within the last three decades that any interest has been shown in the conservation of the nation's wetland resources. The Wildlife Preservation Order (1973) included a list of 43 proposed protected areas, twelve of which were listed as "Wetland Game Reserves". These included five wetlands in the Northeast Region: Tangua Haor, Hakaluki Haor, Hail Haor, Kawadighi Haor and Dekhar Haor. It seems, however, that no further action was taken with these proposed protected areas. Hail Haor was, in fact, first proposed as a waterfowl sanctuary as long ago as 1960, and a part of it (1,427 ha) was declared a Wildlife Sanctuary in 1983. However, the sanctuary was never officially gazetted, and the proposal now seems to have been dropped, although as recently as 1990 (in a draft version of the National Conservation Strategy for Bangladesh), the sanctuary was still listed as being "in the process of notification".

To this day, there is not a single protected wetland in the country outside the coastal zone. Large components of the freshwater aquatic ecosystems have now been lost. Entire ecosystems have disappeared, many species of large mammal and bird have become extinct, and most systems have been so extensively modified by man's activities and introductions that little indication of their original condition now remains. Had even one reserve of reasonable size been established last century and maintained as well as the Sundarbans Reserved Forest, much of the natural fauna and flora of the wetlands might have survived to the present.

Unfortunately, it is now too late to repair much of the damage. Some elements of the fauna and flora of the Northeast Region such as the Pink-headed Duck have disappeared forever, while many others are now so rare elsewhere in the region and require such large tracts of undisturbed habitat (e.g. One-horned Rhinoceros and Greater Adjutant) that they are never likely to return. On the other hand, floodplain wetland ecosystems are remarkably resilient. Adapted to cope with seasonal extremes of deep flooding and severe drought, many of the animal and plant species typical of these systems are able to make remarkable recoveries when conditions are suitable. Many of the original plant and animal species still survive in the region or in neighbouring areas, and given the right conditions, would be able to re-

colonize the area very quickly. The excellent stands of *Pongamia* forest, scrub and tall grasses at Pasua Beel and the rich bird fauna which they support demonstrate that even a little protection over a relatively short period of time (less than nine years) can give excellent results.

8.2 Protection of critical areas

If any significant remnants of the once rich and diverse wetland ecosystems of the Northeast Region are to be preserved for posterity, it is essential that some form of protected area or special "wetland management zone" be established in as many of the critical areas as possible in the very near future. The guiding principle in the development of these areas should be the maintenance of biodiversity (at the ecosystem, species and genetic levels) through the implementation of sound management practices and rational utilization of natural wetland resources.

The most pressing need is for immediate steps to be taken to safeguard the unique stands of native vegetation at Pasua Beel. With the lease on this *beel* coming up for renewal in 1992, its future is uncertain, and there is a strong possibility that a new lease-holder would take a less sympathetic attitude to the protection of the vegetation around the *beel*. The Government of Bangladesh should be approached with a request to withhold the lease on the *beel* until such time as preliminary studies have been completed and a draft management plan can be prepared.

At the same time, the Government should be requested to proceed with the establishment of waterfowl sanctuaries in the Haor Basin, as recommended in the Wildlife Preservation Order of 1973 and reiterated on several occasions since then. The existing proposal to establish a sanctuary at Hail Haor should be revived, and new proposals put forward for the establishment of reserves at Tangua Haor and Hakaluki Haor. Emphasis in the management of these wetland reserves should be given to the maintenance of ecological character and wise use, in the true spirit of the Ramsar Convention.

The exploitation of fisheries resources and other valuable wetland products on a sustainable basis is by no means incompatible with the maintenance of ecological character and biodiversity. Indeed, some desirable management practices in the wetland reserves, such as the planting of *Barringtonia* and *Pongamia* forests and encouragement of marsh grasses, would not only enhance biodiversity, but could also provide a valuable sustainable harvest of timber, fuelwood, fodder and materials for thatching and weaving. A variety of possibilities for people's participation present themselves in this context. However, a strict ban should be imposed on hunting, conversion of wetland habitat to agricultural land and human settlement within the reserves, and special "sanctuary" areas should be established to create disturbance-free zones for nesting or roosting birds. In reserves in which fishing is an important activity, such sanctuaries could rotate from *beel* to *beel*, depending on which *beels* are not being fished in any given season. In most cases, these sanctuaries would only need to be maintained for a part of the year, e.g. during the breeding season or during the period when the wintering waterfowl are present.

The need for further study at the six critical areas has already been recognized. Wildlife biologists from NACOM will be conducting detailed faunal investigations at four of the six sites during the coming year (Tangua, Pasua, Hail and Hakaluki), while botanists will be carrying out rapid surveys at all six sites and detailed investigations at three (Pasua, Hail and Hakaluki). It is recommended that the information gathered during these studies be compiled in the standard format advocated by the Bureau of the Ramsar Convention, using copies of the Bureau's "Information Sheet on Ramsar Wetlands". These information sheets, if properly completed, would provide much of the background information required for the

development of management plans, as well as all the details required for listing of the sites under the Ramsar Convention.

8.3 Flood control, drainage, and irrigation

It is concluded that any proposed flood control, drainage and irrigation projects which are likely to affect the hydrology and hence ecology of any of the six critical areas in the Northeast Region should be subjected to extreme scrutiny. Any project in Tangua Haor would undoubtedly have an adverse effect on the important natural qualities of the *haor*, and should be discouraged. Similarly at Pasua Beel and Hail Haor, any new FCDI projects would be likely to affect the unique ecological character of these wetlands and would be undesirable. At Hakaluki Haor and Balai Haor, submersible embankments could have both positive and negative impacts, while the use of these sites for flood storage could have a beneficial effect on most wildlife species.

Elsewhere in the region, any irrevocable loss of water bodies as a result of future flood control, drainage and irrigation projects will have only a minor impact on wildlife as compared to that of the rapid growth in human population and the greatly increased pressure on all natural ecosystems which this imposes. Over most of the region, waterfowl populations and other wetland fauna are now limited more by human disturbance, hunting and the destruction of natural swamp forests, grasslands and marsh vegetation than by any overall loss in permanent water bodies. There is still a vast area of the Haor Basin under water even at the end of the dry season, mostly in the thousands of small *beels* and abandoned river channels. These remain highly productive systems, supporting abundant submerged and floating aquatic vegetation, a rich and diverse invertebrate fauna and a major fishery. There is thus no shortage of suitable feeding habitat for most species of waterfowl, many of which would now appear to be at levels far below the carrying capacity of these systems. Concentrations of 250,000 or more waterbirds would not seem out of place at wetlands as large and as obviously productive as Hail Haor and Hakaluki Haor.

It is understood that full environmental impact assessments (EIAs) will be carried out for all major FCDI projects in the Northeast Region. One component of these EIAs will presumably be an assessment of the likely impact of the proposed projects on the native fauna and flora. Such EIAs have often been flawed in the past, not because of an inability to predict the impact of the project on the fauna and flora at the site in question, but because of an inability to assess the conservation values of that fauna and flora in a national, regional and international context. This study and the continuing studies of NACOM on the wetlands of the Haor Basin provide some of the essential background information on which such assessments can be made in the future.

8.4 Critical issues for wildlife conservation

As far as nature conservation in the Northeast Region is concerned, the following critical issues have been identified:

Habitat Loss

As repeatedly stressed in this report, the large-scale conversion of natural wetland ecosystems into agricultural land has been the principal reason for the disappearance of much of the region's native wetland fauna and flora. Flood control, drainage and irrigation projects have been played a major role in this process, as have deforestation, over-grazing and expansion of human settlements. The rapid growth in human population has been the underlying cause, and this remains the principal problem today and for the foreseeable future. Absence of cover (tall marsh vegetation, shrubbery, undisturbed woodland with tall trees etc.) is clearly a serious limiting factor for many breeding species of waterfowl, and may be the

main reason for the disappearance of many colonially nesting and tree-nesting waterbirds. Although there remains ample feeding habitat for most waterfowl species, there is obviously a shortage of secure roosting and nesting sites. This problem could easily be solved at a local level for some species through the creation of small sanctuaries in the critical areas and provision of adequate nesting and roosting sites (e.g. establishment of plantations of *Barringtonia* and *Pongamia*).

Lack of protected areas

No protected areas have as yet been established in the wetlands of the Northeast Region. There is an urgent need for a network of wetland reserves to protect and conserve representative examples of the natural or near-natural wetland ecosystems which still survive in the region. Such a network could be achieved through the establishment of appropriate reserves in the six critical areas.

Hunting pressure

The illegal hunting of waterfowl and other wildlife is common throughout the region, and is undoubtedly having a detrimental effect on many wildlife species, both through direct hunting mortality and through the disturbance associated with it. In a region which supports 17 million people but only a few hundred thousand waterfowl, the economic significance of the annual "harvest" of waterfowl must be slight. Shooting is a major problem because of the disturbance which it causes, while flight-netting obviously accounts for a very large number of birds and affects a much wider range of species.

General disturbance

A critical factor affecting the distribution of many waterfowl in the Haor Basin is disturbance from humans. Large concentrations of ducks can only occur where there are several to many large *beels* in close proximity to one another, affording a range of possible escape routes from disturbance without the necessity of lengthy flight. The problem could be reduced in two ways:

- by creating disturbance-free zones, either relocated from year to year or enforced only seasonally (in winter or during the breeding season) with fishing and other activities permitted at other times;
- by eliminating all gun hunting and other hunting techniques which reinforce the birds' wariness of man. Where there is no shooting at all, birds rapidly become accustomed to man and are therefore much less affected by disturbance.

Fish-poisoning

The Second Aquaculture Development Project, supported by the Asian Development Bank, involves the use of the fish poison rotenone to kill predatory fishes in a number of *beels* throughout the Haor Basin prior to stocking with carp hatchlings. At least 23 *beels* covering about 400 ha were selected for poisoning during the 1991/92 dry season. The expressed aim of the project is to improve the floodplain fishery in general, rather than to improve the fishery in any particular *beel*. The project commenced in early 1992, and a number of *beels* have now been poisoned, including *beels* in Hakaluki Haor and Hail Haor. One of the *beels* selected for poisoning is also one of the sites selected for the Monthly Waterfowl Census Programme. This *beel*, Patachatal Beel near Balaganj, was poisoned during the first week of April and stocked with carp hatchlings on 26 April. According to local people (including the lease-holder of the *beel*, the Fisheries Officer in Balaganj and the fish-guard stationed at the *beel*), the poison killed not only the gill fishes, but also about 250 freshwater turtles along with large numbers of snakes, frogs and invertebrates. Obviously there was gross misapplication of the poison, since rotenone is generally regarded as being highly specific to gill fishes. It now appears that no proper environmental impact

assessment was carried out prior to the poisoning. Furthermore, there is some question as to whether or not the exercise is economically viable in a floodplain situation. Although there were no indications that the poisoning at Patachatal Beel had any adverse impact on bird populations, it was clearly catastrophic for other wildlife. Obviously, the whole question of poisoning *beels* with rotenone in the Haor Basin requires further investigation.

Lack of institutional collaboration

One of the major problems facing wetland conservation efforts in the Haor Basin (as elsewhere in Bangladesh) has been the sad lack of cooperation between the various government agencies and institutions involved with wetlands. No single agency has overall responsibility for wetlands and wetland resources in Bangladesh, the responsibility being shared between the Ministry of Land Administration and Land Reform, the Ministry of Fisheries and Livestock and the Ministry of Agriculture. In particular, the lack of cooperation between the Forest Department (in the Ministry of Agriculture), Fisheries Department (in the Ministry of Fisheries and Livestock) and Revenue Department (in the Ministry of Land Administration and Land Reform) has precluded the establishment of wetland reserves in the region. Now that the Government of Bangladesh has ratified the Ramsar Convention, it seems likely that a National Wetlands Working Group or Committee will be established in the near future in an attempt to resolve this important issue. It is to be hoped that this Working Group will include not only representatives of the relevant government agencies, but also representatives of interested academic institutions and non-governmental organizations. 8.6

8.5 Recommendations for follow-up studies

The present surveys have placed emphasis on the importance of wetlands in the Haor Basin for birds, mammals, reptiles and amphibians. Over the coming 12 months, NACOM personnel will be conducting further studies on these groups, and also carrying out botanical investigations at the six critical areas. However, there remains a possibility that there are other sites in the region of special importance for their general ecological or limnological interest. Thus, there is a need for a more general appraisal of the overall ecological significance of the wetlands of the Haor Basin. This would draw heavily on the results of the present surveys and the NACOM studies, and would benefit greatly from the information already being gathered by other NERP staff in the fields of hydrology, sedimentology, fisheries biology and social anthropology. However, there would probably still be a need for rapid field surveys in some areas.

As regards further waterfowl censuses, it is to be hoped that at a minimum, annual censuses will be carried out at all internationally and nationally important sites (the "A" sites and "B" sites in Table 11), either as part of the Northeast Regional Project or independently by NACOM and interested personnel in the Forest Department. These censuses would serve to monitor the status of waterfowl populations throughout the region as a whole, and would provide valuable information on the impact of future flood control, drainage and irrigation projects as they are implemented. The counts would also constitute an important component of the IWRB/AWB Asian Waterfowl Census.

There should also be annual monitoring of any major breeding colonies of large waterbirds which may be discovered during the course of the Monthly Waterfowl Census Programme and NACOM investigations.

At the end of the first twelve month period, the results of the Monthly Waterfowl Census Programme should be reviewed to determine if there is any value to be gained by continuing the censuses for one or more years.

It is essential that a study be carried out on the significance of waterfowl hunting in the Northeast Region, both with respect both to its importance in the local economy and with respect to its impact on waterfowl populations. An important aspect of this study should be to investigate ways in which hunting pressure might be reduced in the six critical areas (e.g. by enlisting the support of the hunters themselves in the protection of the birds).

In the longer term, consideration might be given to the establishment of a waterfowl banding programme. Little is known about the origins and destinations of waterfowl migrating through northeastern Bangladesh, although the situation is likely to complex, with some species belonging to a western flyway covering much of the eastern half of the Indian Subcontinent, and others belonging to an eastern flyway extending through Burma into Southeast Asia. The establishment of a banding programme might best be achieved through cooperation between the Asian Wetland Bureau and NACOM.

8.6 The Ramsar Convention in Bangladesh

The Government of Bangladesh has recently become a Party to the Convention on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar Convention). By so doing, it has demonstrated its commitment to ensuring the wise use of the important wetlands within its territory. The six critical areas in the Northeast Region identified by the present surveys are clearly of considerable importance for their nature conservation values both at national and international level. The Government of Bangladesh should be urged to designate as many as possible of these sites for inclusion in the List of Wetlands of International Importance maintained under the terms of the Convention, and to take whatever measures are necessary to ensure that their high values for the maintenance of biodiversity in the region are not compromised. The Convention Bureau exists to serve the Parties, and would undoubtedly be willing to assist the Government of Bangladesh in fulfilling its obligations under the Convention if and when the need arises.

9. PRINCIPAL REFERENCES

Baker, E.C.S. (1922-1930). Fauna of British India, Birds. Vols. I- VIII (2nd Ed.). London.

Forest Department (1976). National report for Bangladesh. *In*: Smart, M. (Ed.), Proc. Intl. Conf. Conservation Wetlands and Waterfowl, Heilgenhafen, Fed. Rep. Germany, 2-6 Dec 1974: 74-80. IWRB, Slimbridge, U.K.

Rashid, Haroun Er (1967). Systematic list of the birds of East Pakistan. Asiatic Soc. Pakistan, Pub. No. 20. Ramna, Dhaka.

Harvey, W.G. (1990). Birds in Bangladesh. Univ. Press Ltd., Dhaka.

Hume, A.O. (1888). The birds of Manipur, Assam, Sylhet and Cachar. Stray Feathers 11:1-353.

Husain, K.Z. & Sarker, M.S.U. (1984). Report on the status of some birds of Bangladesh. Presented at ICBP 10th Asian Continental Sect. Conf., Kandy, Sri Lanka, 21-26 Apr 1984.

IUCN (1990). The 1990 IUCN red list of threatened animals. IUCN, Gland, Switzerland/Cambridge, U.K.

Khan, M.A.R. (1987). Conservation of storks and other waterbirds in Bangladesh. Colonial Waterbirds 10(2): 229-235.

Mountfort, G. (1969). The Vanishing Jungle. Collins, London.

Sarker, M.S.U. & Hussain, K.Z. (1990). Conservation of wetland wildlife of Bangladesh. *In*: Atiq Rahman, A., Saleemul Huq & Conway, G.R. (Eds.), Environmental aspects of surface water systems of Bangladesh: 188-200. Univ. Press Ltd., Dhaka.

Savage, C.D.W. (1970). Status of the main wildfowl resorts in Pakistan. *In*: Isakov, Y.A. (Ed.), Proc. Intl. Reg. Meeting Conservation Wildfowl Resources, Leningrad, USSR, 25-30 Sep 1968: 333-334. Moscow.

Savage, C.D.W. & Abdulali, H. (1970). Status of wildfowl species in East Pakistan and West Bengal. *In*: Isakov, Y.A. (Ed.), Proc. Intl. Reg. Meeting Conservation Wildfowl Resources, Leningrad, USSR, 25-30 Sep 1968: 207-209. Moscow.

Scott, D.A. (1989). A directory of Asian wetlands. IUCN, Gland, Switzerland.

Scott, D.A. & Poole, C.M. (1989). A status overview of Asian wetlands. AWB Pub. No.53. Asian Wetland Bureau, Kuala Lumpur.

Syed Iqbal Ali (1990). Haor basin eco-System. *In*: Atiq Rahman, A., Saleemul Huq & Conway, G.R. (Eds.), Environmental aspects of surface water systems of Bangladesh: 79-92. Univ. Press Ltd., Dhaka.

Annex A

DIRECTORY OF ASIAN WETLANDS: BANGLADESH SITES

MEDA BEEL

Location: 25 deg.03'N, 90 deg.55'E; in Kaluma Kanda Upazilla, 25 km northeast of Netrakona, Netrakona District, Mymensingh.

Area: 122 ha.

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 3 m during the rainy season to a minimum of 1 m during the dry season.

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 *beel* 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 *beel* 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 hermaphroditus* and *Herpestes* spp; reptiles include monitor lizards *Varanus* spp and a variety of snakes, freshwater turtles and tortoises.

TANGUA HAOR

Location: 25 deg.06'-25 deg.11'N, 91 deg.01'-91 deg.06'E; 10 km northwest of the Headquarters of Tahirpur Upazilla and 30 km WNW of Sunamganj, Sunamganj District, Sylhet.

Area: 1,566 ha.

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 6-8 m during the rainy season to 2-8 m during the dry season.

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Principal vegetation: The aquatic vegetation includes species of *Hydrilla, Vallisneria, Potamogeton, Blyxa, Utricularia, Najas, Nitella, Nymphaea, Trapa, Ottelia, Polygonum* and *Phragmites*, along with *Hygrorhiza aristata, Eichhornia crassipes, Haemarthria 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: Tangua 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, Clarias 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* and *Enhydris,* monitor lizards *Varanus* spp, freshwater turtles and tortoises.

AILA BEEL

Location: 24 deg.52'-24 deg.54'N, 91 deg.12'-91 deg.13'E; in Jamalganj Upazilla, 25 km southwest of Sunamganj, Sunamganj District, Sylhet.

Area: 160 ha.

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 5 m during the rainy season to 1 m during the dry season.

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* app 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.

DEKHAR HAOR

Location: 25 deg.03'N, 91 deg.26'E; north of the Sylhet to Sunamganj road in Sunamganj Sadar Upazilla, east of Sunamganj Town, Sunamganj District, Sylhet.

Area: Over 325 ha.

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 flood water, 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 3.4 m during the rainy season.

Principal vegetation: The aquatic vegetation includes *Hygrothiza aristata, Eichhornia crassipes, Hemarthria protensa, Rumex polygonum, Ficus heterophyla* and *Ipomoea aquatica.* 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.* 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.

KURI BEEL

Location: 24 deg.56'N, 91 deg.31'E; to the north of the Sylhet to Sunamganj road, 35 km west of Sylhet Town, Sunamganj District, Sylhet.

Area: 73 ha.

Description of site: A small freshwater lake and marsh (*beel*) 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 3 m.

Principal vegetation: The relatively sparse aquatic vegetation includes *Eichhornia crassipes* and species of *Hydrilla, Vallisneria, Potamogeton* and *Nympaea.* Plant communities in adjacent areas include *Barringtonia acuatangula, Crataeva nurvala, Trewia polycarpa, Calamus* 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. *Calmus* 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, Mystus aor, 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.*

ERALI BEEL

Location: 24 deg.51'N, 92 deg.03'E; 6 km southeast of the Headquarters of Golapganj Upazilla and 18 km ESE of Sylhet, Sylhet District, Sylhet.

Area: 320 ha.

Description of site: A freshwater lake and marshes (*beel*) in undulating country, with villages on all sides. The lake is permanent and has a depth of about 5 m during the rainy season.

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 ruficollis, 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.

DUBRIAR HAOR

Location: 24 deg.44'N, 91 deg.54'E; to the west of the Sylhet to Fenchuganj road, 21 km south of Sylhet, Sylhet District.

Area: 156 ha.

Description of site: A group of freshwater lakes and marshes (*beels*) including one large *beel* in Balaganj Upazilla and two small *beels* to the east in Fenchuganj Upazilla. The eastern side of the wetland borders on several villages. During the rainy season, large areas are flooded to a depth of 3 m; during the dry season, about three-quarters of the wetland dries out and the maximum depth falls to about 1 m.

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, *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 *beels* 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.

HAKALUKI HAOR

Location: 24 deg.35'-24 deg.44'N, 92 deg.01'-92 deg.09'E; 30 km southeast of Sylhet, Moulvibazar District, Sylhet.

Area: 20,400 ha, including 4,440 ha of *beels*.

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, Pingla, Haor Khal, Foot, Tural, Puala, Juala, Kaiarkuna, Balijuri, Kukur Dubi, Katoa, Birai, 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 Kusiyara 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 5-6 m during the rainy season to about 1 m 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.

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, Pistia stratiotes, Hydrilla verticillata* and *Ipomoea acuatica*. In winter, as water levels start to fall, *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. exaltatus, Eleocharis fistulosa, E. plantagiuea, Fimbristylis dichotoma, Panicum* sp, *Hygrorhiza aristata, Paspalum* sp, *Sataria glauca, S. sagittifolia, Vallisneria spiralis, Ottelia alismoides, Nechamandra alternifolia, Lemna minor, Spirodela polyrhiza, Potamogeton crispus, Monochoria vaginalis, M. hostata, 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 Pingla 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 flood waters 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. *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.

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.

KAWADIGHI HAOR

Location: 24 deg.33'-24 deg.37'N, 91 deg.46'-91 deg.49'E; 12 km NNE of Moulvibazar, Moulvibazar District, Sylhet

Area: 414 ha.

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 3-4 m during the rainy season and about 1 m during the dry season.

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 waterbirds 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 *Anas acuta*). The wetland remains important for a wide variety of other waterfowl including *Tachybaptus ruficollis, Ardeola grayii, Bubulcus ibis, Egretta garzetta, Nettapus 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.

HAIL HAOR

Location: 24 deg.18'-24 deg.26'N, 91 deg.38'-91 deg.45'E; 3 km northwest of Srimangal and 14 km southwest of Moulvibazar, Moulvibazar District, Sylhet.

Area: From a minimum of 3,643 ha in the dry season to a maximum of 8,906 ha in the rainy season.

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 Kusiyara 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 3 m.

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, *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 Sylhet 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 *Nettapus 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 large numbers. Much the commonest migrant ducks are *Anas querquedula, A. acuta* and *A. clypeata*, although *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.

Hail Haor is also important for many other species of waterfowl such as *Tachybaptus ruficollis, Phalacrocorax niger, Ardola 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, 16 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 fulva, Charadrius dubius, C. alexandrinus, Tringa stagnatilis, T. glareola, Calidris temminckii* and *Philomachus pugnax*. The Open-bill Stork *Anastomus oscitans* is a regular visitor (e.g. 200 in April and May 1984), and the rare Blyth's Kingfisher *Alcedo hercules* has been recorded. Birds of prey include *Pandion haliaetus, Circus aeruginosus* and *C. melanoleucos*.

Annex B

IUCN RED LIST OF THREATENED ANIMALS (1990): GLOBALLY THREATENED WATERFOWL AND OTHER WETLAND BIRDS

Globally threatened waterfowl:

Spot-billed Pelican *Pelecanus philippensis*
Dalmatian Pelican *Pelecanus crispus*
White-bellied Heron *Ardea imperialis*
Oriental White Stork *Ciconia boyciana*
Lesser Adjutant *Leptoptilos javanicus*
Greater Adjutant *Leptoptilos dubius*
White-winged Wood-Duck *Cairina scutulata*
Marbled Teal *Marmaronetta angustirostris*
Pink-headed Duck *Rhodonessa caryophyllacea* (extinct)
Baer's Pochard *Aythya baeri*

Other globally threatened wetland birds:

Pallas's Fish-Eagle *Haliaeetus leucoryphus*
Swamp Francolin *Francolinus gularis*
Bengal Florican *Eupodotis bengalensis*
Blyth's Kingfisher *Alcedo hercules*
Swamp (long-tailed) Prinia *Prinia burnesii*
Marsh Babbler *Pellorneum palustre*
Jerdon's Moupinia *Moupinia altirostris*
Black-breasted Parrotbill *Paradoxornis flavirostris*

Annex C

LISTS OF NATIONALLY THREATENED WATERBIRDS IN BANGLADESH

From *Draft National Conservation Strategy for Bangladesh*, Wildlife and Protected Areas (version credited to K.Z. Husain):

Little Grebe *Tachybaptus ruficollis*
Oriental Darter *Anhinga melanogaster*
Grey Heron *Ardea cinerea*
Purple Heron *Ardea purpurea*
Asian Openbill *Anastomus oscitans*
White-necked Stork *Ciconia episcopus*
Glossy Ibis *Plegadis falcinellus*
White Spoonbill *Platalea leucorodia*
Fulvous Whistling-Duck *Dendrocygna bicolor*
Comb Duck *Sarkidiornis melanotos*
Pheasant-tailed Jacana *Hydrophasianus chirurgus*
Greater Paintedsnipe *Rostratula benghalensis*

From *Draft National Conservation Strategy for Bangladesh*, Wildlife and Protected Areas (version credited to Syed Abdur Rahman and Abdul Wahab Akonda):

White Stork *Ciconia ciconia*
White Spoonbill *Platalea leucorodia*
Comb Duck *Sarkidiornis melanotos*
Demoiselle Crane *Anthropoides virgo*

From Nature Conservation Movement (NACOM) (Dec 91):

Goliath Heron *Ardea goliath*
Black-crowned Night Heron *Nycticorax nycticorax*
Yellow Bittern *Ixobrychus sinensis*
Asian Openbill *Anastomus oscitans*
White Spoonbill *Platalea leucorodia*
Grey Lag Goose *Anser anser*
Bar-headed Goose *Anser indicus*
Comb Duck *Sarkidiornis melanotos*
Northern Shoveler *Anas clypeata*
Sarus Crane *Grus antigone*
Long-toed Stint *Calidris subminuta*
Spoon-billed Sandpiper *Eurynorhynchus pygmeus*
Asian Dowitcher *Limnodromus semipalmatus*
Nordmann's Greenshank *Tringa guttifer*
Indian Skimmer *Rhynchops albicollis*

Annex D

ITINERARY OF FIELD SURVEYS

February/March Survey

Feb 18: Depart Dhaka by vehicle at 1015 hrs for Maulvibazar; survey of fish ponds south of Hail Haor (1645-1720 hrs); arrive Maulvibazar 1900 hrs. Overnight at NERP Guest House in Maulvibazar.

Feb 19: Survey of south and central portions of Hakaluki Haor (Gharkuri, Chatla, Pingla, Tural, Dulla and Chakia Beels) (0645-1900 hrs). Overnight in Maulvibazar.

Feb 20: Survey of Chalnia Beel (near Fenchuganj) and northwest Hakaluki Haor (Lamba, Niral and Puala Beels) (0655-1840 hrs). Overnight in Maulvibazar.

Feb 21: Survey of West Banugach Reserved Forest (0650-0945 hrs), southeastern portion of Hail Haor (0945-1450 hrs) and West Banugach Reserved Forest again in evening (1535-1845 hrs). Overnight in Maulvibazar.

Feb 22: Survey of east side of Kawadighi Haor (Ulauli Beel and Majherbanda Beel) in morning (0755-1410 hrs). Survey of west side of Kawadighi Haor (Petangi Beel) in afternoon (1520-1910 hrs). Overnight in Maulvibazar.

Feb 23: Brief visit to West Banugach Reserved Forest in early morning (0720-0900 hrs), then survey of west side of Hail Haor (0900-1330 hrs). Depart Maulvibazar at 1505 hrs for Sylhet and flight to Dhaka at 1805, arriving Dhaka 1850 hrs.

Feb 25: Aerial survey in Cessna 182 over central Haor Basin from Netrakona area south along Baulai River to confluence with Kalni River. (Take-off from Dhaka 1125; landing in Dhaka 1345).

Feb 26: Aerial survey in Cessna 182 over eastern Haor Basin from Bajitpur to Sylhet, returning via Erali Beel, Dubriar Haor, Hakaluki Haor, Kawadighi Haor and Hail Haor. (Take-off from Dhaka at 1110; landing in Dhaka at 1400).

Feb 28: Depart Dhaka by vehicle at 0845 hrs for Sunamganj, arriving at 1900 hrs. Overnight at Water Development Board Guest House in Sunamganj.

Feb 29: Survey of Dekhar Haor (Dapha, Ruwa, Guinga, Ghazaria, Panchakauri and Goraduba Beels), Dabor Beel, Kuri Beel and Deochapra Beel on Sunamganj - Sylhet road. Overnight in Sunamganj.

Mar 01: Depart by "engine boat" from Sunamganj at 1110 hrs for Tangua area, travelling down the Surma River to its confluence with the Someswari River then up the Someswari River to Sanbari Bazar, arriving 1830 hrs. Overnight on the boat at Sanbari Bazar.

Mar 02: Survey by boat upstream from Sanbari Bazar, visiting Kanamaiya Haor, Pakertala Beel, Pana Beel, Biaskhali Beel, Banuar Beel, Bara Beel, Rauar Beel and the Tangua *beels* (0645-1815 hrs). Overnight on the boat at Jaypur (near Rauar Beel).

Mar 03: Survey by boat along the Patnai Gang to Bhuragat, visiting Rauar Beel, Ghaniakuri Beel, Arabiakona Beel, Samsar Beel and an un-named *beel* south of Samsar on the way up, and Palair Beel and Bara Beel on the way back down (0615-1900 hrs). Overnight on the boat at Potabuka (near Pana Beel).

Mar 04: Survey by boat downstream from Potabuka and back up the Surma River to Sunamganj, visiting Pakertala Beel, Kanamaiya Haor, Kecharia Beel and Pasua Beel (0645-1645 hrs). Overnight at the Water Development Board Guest House in Sunamganj.

Mar 05: Drive to Sylhet (0850-1100 hrs) and survey of Deodar Beels, Chalnia Beels, Dubriar Haor (Dubriar Beel and Biasha Beel) and Mehdi Beel, on the Sylhet - Fenchuganj road (1100-1805 hrs). Overnight in Sylhet.

Mar 06: Survey of Erali Beel, Chunnia Beel (near Charkai) and Balai Haor (Khakra Kuri Beel, Jugni Beel and Dubail Beel) east of Sylhet (0730-1925 hrs). Overnight in Sylhet.

Mar 07: Survey of northwest Hakaluki Haor (Kair Gang, adjacent *beel* and Haor Khal) by boat from Fenchuganj (0745-1710 hrs). Overnight in Sylhet.

Mar 08: Survey of Maijeil Haor (Patachatal and Borachatal Beel) east of Balaganj, and Petangi Beel in western part of Kawadighi Haor (0800-1850 hrs). Overnight at NERP Guest House in Maulvibazar.

Mar 09: Survey of small *beels* along Khowai River, Ratna Beel and Sankardanga Beel west of Habiganj (0745-1755 hrs). Overnight in Maulvibazar.

Mar 10: Drive from Maulvibazar via Bhairab Bazar, Kishorganj and Kendua to Netrakona (0720-1805 hrs), with brief stops in Shatchari Reserved Forest (0900-1000 hrs) and at a small wetland northwest of Kendua. Overnight at Circuit House in Netrakona.

Mar 11: Survey of wetlands along Netrakona - Kaluma Kanda road and Ubdakhali Haor (Meda Beel and Uglar Beel) (0755-1725 hrs), driving to Mymensingh in evening. Overnight at Water Development Board Guest House in Mymensingh.

Mar 12: Survey of Boraduba Beel west of Phulpur in morning (0825-1300 hrs); return to Dhaka arriving at 1535 hrs.

April/May Survey

Apr 19: Depart Dhaka at 2200 hrs by train for Sylhet. Overnight on train.

Apr 20: Arrive Sylhet at 0555 hrs. Depart Sylhet by vehicle at 0700 hrs for Sunamganj, surveying Deochapra Beel, Kuri Beel, Dabor Beel and southwest portion of Dekhar Haor on way, and arriving in Sunamganj at 1315 hrs. Arranging boat and supplies in afternoon. Overnight at Water Development Board Guest House in Sunamganj.

Apr 21: Depart Sunamganj by boat at 0700 hrs for Ghazaria (on Surma River), arriving at 1105 hrs. Survey of Karul Dhan Beel, Pangna Beel and Aila Beel on plains east of Ghazaria (1110-1640 hrs). Travel up Someswari River in evening to Joysree, arriving 1835 hrs. Overnight on boat at Joysree.

Apr 22: Surveying wetlands in Gurmar Haor - Matian Haor - Tangua Haor complex (0530-1815 hrs), visiting Pasua Beel, Kecharia Beel, Kanamaiya Haor, Pakertala Beel, Pana Beel, Bara Beel, Biaskhali Beel, Banuar Beel, Rauar Beel, Tangua Beel and adjacent *beels*. Overnight on boat at Jaypur (near Rauar Beel).

Apr 23: Surveying wetlands along Patnai Gang (Rauar Beel, Ghaniakuri Beel, Palair Beel, Arabiakona Beel and Samsar Beel), and returning downstream to Pasua Beel in evening (0630-1910 hrs). Overnight on boat at Pasua Beel.

Apr 25: Final survey of Pasua Beel in morning (0530-1020 hrs); return by boat via Baulai River and Surma River to Sunamganj, arriving 1615 hrs. Travel by vehicle to Sylhet, arriving 1745 hrs. Overnight in Sylhet.

Apr 26: Survey of Dubriar Haor (Dubriar and Baisha Beels), Chalnia beels, Deodar beels and Mehdi Beel along Sylhet - Fenchuganj road in morning (0650-1325 hrs). Meeting with Ron Livingston in Sylhet in afternoon. Overnight in Sylhet.

Apr 27: Survey of Erali Beel, Chunnia Beel and Balai Haor (Khakra Kuri Beel, Jugni Beel and Dubail Beel) (0650-1810 hrs). Overnight in Sylhet.

Apr 28: Survey of Maijeil Haor (Patachatal and Borachatal Beels) in morning (0735-1030 hrs), continuing on to Maulvibazar, arriving 1345 hrs. Overnight at NERP Guest House in Maulvibazar.

Apr 29: Survey of eastern part of Kawadighi Haor (Ulauli Beel and Majherbanda Beel) in morning (0645-1200 hrs). Survey of fish ponds south of Hail Haor in afternoon (1540-1900 hrs). Overnight in Maulvibazar.

Apr 30: Survey of southeastern portion of Hakaluki Haor (Chatla Beel, Pingla Beel, Tural Beel and Gharkuri Beel) (0640-1710 hrs). Overnight in Maulvibazar.

May 01: Survey of West Banugach Reserved Forest near Srimangal (0635-1945 hrs). Overnight in Maulvibazar.

May 02: Survey of southeast portion of Hail Haor by boat (0645-1140 hrs), then west side by vehicle (1140-1820 hrs). Overnight in Maulvibazar.

May 03: Survey of Petangi Beel in western part of Kawadighi Haor in morning (0640-1135 hrs). Afternoon visit to Balisera Tea Estate east of Srimangal (1435-1915 hrs). Overnight in Maulvibazar.

May 04: Depart Maulvibazar at 0715 hrs by vehicle for Dhaka, stopping briefly at Shatchari Reserved Forest (0850-0955 hrs) and arriving in Dhaka at 1430 hrs.

May 09: Aerial survey in Cessna 182 over central Haor Basin from Bajitpur via Azmiriganj and Baniachang to Sylhet, then along the Surma River to Sunamganj and the Aila Beel complex, then down the Baulai River to Bhairab Bazar. (Take-off from Dhaka 0955; landing in Dhaka 1210).

Annex E

ASIAN WATERFOWL CENSUS FORMS

[add form xx]

INTERNATIONAL WATERFOWL AND WETLANDS RESEARCH BUREAU (IWRB)

ASIAN WATERFOWL CENSUS SOUTH ASIA

ASIAN WETLAND BUREAU

Please return this form to your National Coordinator or IWRB, Slimbridge, Gloucester, GL2 7BX, U.K. before the end of March.

COUNTRY:

NAME OF SITE:

DATE OF COUNT:...../...../199..... (day / month / year)

PROVINCE/STATE/PREFECTURE:
NEAREST LARGE TOWN:

SITE CODE:

TYPE: A Aerial, F On foot, B By boat, M Mixed
COVERAGE: V Upto 25%, W 25-50%, X 50-75%, Y 75-99% Z 100%

HAS THE SITE BEEN COUNTED BEFORE? Yes ☐ No ☐

Waterfowl Counts

GREBES

_____ Little Grebe *Tachybaptus ruficollis*
_____ Red-necked Grebe *Podiceps grisegena*
_____ Great Crested Grebe *P. cristatus*
_____ Black-necked Grebe *P. nigricollis*
_____ Unidentified grebes

PELICANS

_____ Great White Pelican *Pelecanus onocrotalus*
_____ Spot-billed Pelican *P. philippensis*
_____ Dalmatian Pelican *P. crispus*
_____ Unidentified pelicans

CORMORANTS & DARTERS

_____ Great Cormorant *Phalacrocorax carbo*
_____ Indian Shag *P. fuscicollis*
_____ Little Cormorant *P. niger*
_____ Unidentified cormorants
_____ Oriental Darter *Anhinga melanogaster*

HERONS & EGRETS

_____ Great Bittern *Botaurus stellaris*
_____ Yellow Bittern *Ixobrychus sinensis*
_____ Cinnamon Bittern *I. cinnamomeus*
_____ Black Bittern *I. flavicollis*
_____ Malayan Night Heron (Tiger Bittern) *Gorsachius melanolophus*
_____ Black-crowned Night Heron *Nycticorax nycticorax*
_____ Indian Pond Heron *Ardeola grayii*
_____ Chinese Pond Heron *A. bacchus*
_____ Cattle Egret *Bubulcus ibis*
_____ Striated (Little Green) Heron *Butorides striatus*
_____ Western Reef Egret *Egretta gularis*
_____ Little Egret *E. garzetta*
_____ Intermediate (Smaller) Egret *E. intermedia*
_____ Great Egret *E. alba*
_____ Purple Heron *Ardea purpurea*
_____ Grey Heron *A. cinerea*
_____ Goliath Heron *A. goliath*
_____ White-bellied Heron *A. imperialis (insignis)*
_____ Unidentified herons and egrets

STORKS

_____ Painted Stork *Mycteria leucocephala*
_____ Asian Openbill *Anastomus oscitans*
_____ Black Stork *Ciconia nigra*
_____ Wooly-necked (White-necked) Stork *C. episcopus*
_____ White Stork *C. ciconia*
_____ Black-necked Stork *Ephippiorhynchus asiaticus*
_____ Lesser Adjutant *Leptoptilos javanicus*
_____ Greater Adjutant *L. dubius*
_____ Unidentified storks

IBISES & SPOONBILLS

_____ Black-headed (White) Ibis *Threskiornis (aethiopicus) melanocephalus*
_____ Black Ibis *Pseudibis papillosa*
_____ Glossy Ibis *Plegadis falcinellus*
_____ White Spoonbill *Platalea leucorodia*

FLAMINGOS

_____ Greater Flamingo *Phoenicopterus roseus*
_____ Lesser Flamingo *Phoeniconaias minor*
_____ Unidentified flamingos

GEESE & DUCKS

_____ Fulvous (Large) Whistling Duck *Dendrocygna bicolor*
_____ Lesser Whistling Duck (Lesser Tree Duck) *D. javanica*
_____ Greylag Goose *Anser anser*
_____ Bar-headed Goose *A. indicus*
_____ Unidentified geese
_____ Ruddy Shelduck *Tadorna ferruginea*
_____ Common Shelduck *T. tadorna*
_____ White-winged Wood Duck *Cairina scutulata*
_____ Comb Duck *Sarkidiornis melanotos*
_____ Indian Cotton Teal *Nettapus coromandelianus*
_____ Eurasian Wigeon *Anas penelope*
_____ Falcated Teal *A. falcata*
_____ Gadwall *A. strepera*
_____ Common (Green-winged) Teal *A. crecca*
_____ Mallard *A. platyrhynchos*
_____ Spot-billed Duck *A. poecilorhyncha*
_____ Northern Pintail *A. acuta*
_____ Garganey *A. querquedula*
_____ Northern Shoveler *A. clypeata*
_____ Marbled Teal *Marmaronetta angustirostris*
_____ Red-crested Pochard *Netta rufina*
_____ Common Pochard *Aythya ferina*
_____ Baer's Pochard *A. baeri*
_____ Ferruginous Duck *A. nyroca*
_____ Tufted Duck *A. fuligula*
_____ Common Goldeneye *Bucephala clangula*
_____ Goosander *Mergus merganser*
_____ White-headed Duck *Oxyura leucocephala*
_____ Unidentified ducks

CRANES

_____ Common Crane *Grus grus*
_____ Black-necked Crane *G. nigricollis*
_____ Sarus Crane *G. antigone*
_____ Siberian Crane *G. leucogeranus*
_____ Demoiselle Crane *Anthropoides virgo*
_____ Unidentified cranes

RAILS, GALLINULES & COOTS

_____ Water Rail *Rallus aquaticus*
_____ Slaty-breasted Rail *R. striatus*
_____ Slaty-legged Crake *R. eurizonoides*

COMPILER'S name and address:

_____ Baillon's Crake *P. pusilla*
_____ Ruddy Crake *P. fusca*
_____ Brown Crake *Amaurornis akool*
_____ White-breasted Waterhen *A. phoenicurus*
_____ Watercock *Gallicrex cinerea*
_____ Moorhen *Gallinula chloropus*
_____ Purple Swamphen *Porphyrio porphyrio*
_____ Common Coot *Fulica atra*

FINFOOT & JACANAS

_____ Masked Finfoot *Heliopais personata*
_____ Pheasant-tailed Jacana *Hydrophasianus chirurgus*
_____ Bronze-winged Jacana *Metopidius indicus*

SHOREBIRDS – WADERS

_____ Painted Snipe *Rostratula benghalensis*
_____ Crab Plover *Dromas ardeola*
_____ Oystercatcher *Haematopus ostralegus*
_____ Ibisbill *Ibidorhyncha struthersii*
_____ Black-winged Stilt *Himantopus himantopus*
_____ Avocet *Recurvirostra avosetta*
_____ Great Stone Plover *Esacus recurvirostris*
_____ Oriental Pratincole *Glareola maldivarum*
_____ Little Pratincole *G. lactea*
_____ Northern Lapwing *Vanellus vanellus*
_____ River Lapwing *V. duvaucelii*
_____ Yellow-wattled Lapwing *V. malabaricus*
_____ Sociable Plover *V. gregarius*
_____ White-tailed Plover *V. leucurus*
_____ Grey-headed Lapwing *V. cinereus*
_____ Red-wattled Lapwing *V. indicus*
_____ Asiatic (Pacific) Golden Plover *Pluvialis (dominica) fulva*
_____ Grey Plover *P. squatarola*
_____ Long-billed Plover *Charadrius placidus*
_____ Little Ringed Plover *C. dubius*
_____ Kentish Plover *C. alexandrinus*
_____ Mongolian Plover *C. mongolus*
_____ Greater Sand Plover *C. leschenaultii*
_____ Black-tailed Godwit *Limosa limosa*
_____ Bar-tailed Godwit *L. lapponica*
_____ Whimbrel *Numenius phaeopus*
_____ Eurasian Curlew *N. arquata*
_____ Spotted Redshank *Tringa erythropus*
_____ Redshank *T. totanus*
_____ Marsh Sandpiper *T. stagnatilis*
_____ Greenshank *T. nebularia*
_____ Nordmann's Greenshank *T. guttifer*
_____ Green Sandpiper *T. ochropus*
_____ Wood Sandpiper *T. glareola*
_____ Terek Sandpiper *Xenus cinereus*
_____ Common Sandpiper *Actitis hypoleucos*
_____ Ruddy Turnstone *Arenaria interpres*
_____ Red-necked Phalarope *Phalaropus lobatus*
_____ Eurasian Woodcock *Scolopax rusticola*
_____ Solitary Snipe *Gallinago solitaria*
_____ Pintail Snipe *G. stenura*
_____ Swinhoe's Snipe *G. megala*
_____ Common Snipe *G. gallinago*
_____ Jack Snipe *Lymnocryptes minimus*
_____ Asiatic Dowitcher *Limnodromus semipalmatus*
_____ Great Knot *Calidris tenuirostris*
_____ Sanderling *C. alba*
_____ Little Stint *C. minuta*
_____ Temminck's Stint *C. temminckii*
_____ Long-toed Stint *C. subminuta*
_____ Dunlin *C. alpina*
_____ Curlew Sandpiper *C. ferruginea*
_____ Spoon-billed Sandpiper *Eurynorhynchus pygmeus*
_____ Broad-billed Sandpiper *Limicola falcinellus*
_____ Ruff *Philomachus pugnax*
_____ Unidentified shorebirds

GULLS, TERNS & SKIMMERS

_____ Sooty Gull *Larus hemprichii*
_____ Herring Gull *L. argentatus*
_____ Lesser Black-backed Gull *L. fuscus*
_____ Great Black-headed Gull *L. ichthyaetus*
_____ Brown-headed Gull *L. brunnicephalus*
_____ Black-headed Gull *L. ridibundus*
_____ Slender-billed Gull *L. genei*
_____ Unidentified gulls
_____ Whiskered Tern *Chlidonias hybrida*
_____ White-winged Black Tern *C. leucoptera*
_____ Gull-billed Tern *Gelochelidon nilotica*
_____ Caspian Tern *Hydroprogne caspia*
_____ Indian River Tern *Sterna aurantia*
_____ Common Tern *S. hirundo*
_____ Black-bellied Tern *S. melanogaster*
_____ Little Tern *S. albifrons*
_____ Saunders' Little Tern *S. saundersii*
_____ Great Crested Tern *S. bergii*
_____ Lesser Crested Tern *S. bengalensis*
_____ Sandwich Tern *S. sandvicensis*
_____ Unidentified terns
_____ Indian Skimmer *Rynchops albicollis*

ADDITIONAL SPECIES

_____
_____
_____
_____
_____
_____
_____
_____
_____

USEFUL SITE INFORMATION: (please circle the relevant figures)

CONDITION OF WETLAND: 1 Wet (water present), 2 Totally dry, 3 Totally frozen

PROTECTION: 1 By Government, 2 By Tradition, 3 Private ownership, 4 Unprotected, 0 Unknown

THREATS AND USES: 0 Unknown, 1 None, 2 Sedimentation, 3 Excessive overgrowth of vegetation, 4 Cutting/clearance of vegetation, 5 Eutrophication, 6 Agriculture along drying margins, 7 Excessive cattle grazing, Pollution by: 8 domestic sewage, 9 solid waste, A industrial waste, B oil, C pesticides, D fertilizers, E Mining, F Hunting/trapping/poaching of birds, G Little fishing, H Large scale fishing, I Partial reclamation, J Complete reclamation, K Dam/barrage construction, L Tourism/recreation

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INTERNATIONAL WATERFOWL AND WETLANDS RESEARCH BUREAU (IWRB)

ASIAN WATERFOWL CENSUS COUNT UNIT FORM

ASIAN WETLAND BUREAU

Please return this form to your National Coordinator or IWRB, Slimbridge, Gloucester GL2 7BX, U.K. before the end of March.

COUNTRY:

NAME OF SITE:

PROVINCE / STATE / PREFECTURE:
NEAREST LARGE TOWN:

AREA:

COORDINATES: N E

SITE CODE:

WETLAND TYPE: (please circle the relevant figures)

0 Open seas, bays, straits
1 Estuaries, tidal mudflats, salt marshes
2 Brackish or saline lakes, lagoons, salt pans
3 Rivers, streams, canals
4 Freshwater marshes, flooded areas
5 Freshwater lakes, ponds
6 Reservoirs, barrages, tanks
7 Gravel pits, mineral workings
8 Fish ponds, shrimp ponds
9 Grassland, arable land
10 Mangrove, nipah
11 Freshwater swamp forest, peat swamp forest

DESCRIPTION OF SITE:

a season of maximum flooding:
b maximum depth of water:
c salinity/acidity:
d fluctuations/permanence:
e tidal variations:

COMMENTS:

Outline map of count unit (limit of the area covered by the count) with important geographical features (cities, roads, rivers, hills). A copy of a map would be appreciated.

COMPILER'S name and address:

Annex F

RAMSAR CRITERIA FOR IDENTIFYING WETLANDS OF INTERNATIONAL IMPORTANCE

As approved by the Fourth Conference of the Parties to the Ramsar Convention in Montreux, Switzerland, in June 1990:

[add text xx]

Annex G

MONTHLY WATERFOWL MONITORING PROGRAMME CENSUS FORMS

[add form xx]

Annex H

OUTLINE FOR FINAL REPORT OF MONTHLY MONITORING PROGRAMME

1. **INTRODUCTION**

Background to monthly waterfowl monitoring programme;
Note on two major surveys;
Main objectives of monthly censuses; and
Criteria for selection of sites for monthly census.

2. **STUDY AREA**

Brief description of all census sites, with coordinates, location, area, physical and ecological characteristics, special features and status with regard to FCDI projects.

Summary table of sites with following parameters: reference number, name of site, district, coordinates, area, wetland type, status with respect to FCDI projects

3. **METHODS**

Note on how and when counts were conducted.
Summary table of sites with following parameters: month of census, date of count, time of count, coverage, water level, total waterfowl, number of waterfowl species present, observers
Note on any problems encountered in counting.

4. **RESULTS**

Site accounts: discussion of seasonal changes at each site (water levels, vegetation, disturbance, fishing activities, rice cultivation, hunting activities etc).
Species accounts: 1-2 paragraphs per species summarizing status (breeding resident, winter visitor, passage migrant, breeding summer visitor, non-breeding monsoon visitor etc.), abundance and seasonal changes in population levels. Discussion of changes in populations in relation to migration patterns, changes in water level, feeding conditions, disturbance etc.
Summary table of counts by site: total count of waterfowl at each site each month for 12 months.
Summary table of counts by species: total count of each species each month for 12 months.

5. **DISCUSSION**

General discussion of factors affecting waterfowl populations (habitat degradation, disturbance, hunting, FCDI projects etc).
General discussion on (a) wintering populations; (b) spring and autumn migrations; (c) breeding populations.

6. **CONCLUSIONS AND RECOMMENDATIONS**

General discussion of implications of FCDI projects.
Discussion of main conservation issues.
Recommendations for establishment and management of reserves, with special reference to control of hunting and other disturbance.
Recommendations for follow-up activities.

7. APPENDICES

A. Copy of monthly data sheets for each site (12 per site).
B. Tables of counts by site (monthly totals for each species: one table per site).
C. Tables of counts by month (totals of each species at each site: one table per month).
D. Histograms for each of the commoner species, showing the total count in each of the 12 months.

8. FIGURES

1. General map of Sylhet showing location of all sites.
2. Outline map of each site showing major features, routes taken by observers, and principal count points.
3. Map showing location of sites in relation to FCDI projects.

9. ILLUSTRATIONS

Representative photographs of each of sites.
Photographs of main habitat types and plant communities.
Photographs of counters at work (on foot, by boat and by vehicle).
Photographs of waterfowl/other fauna as appropriate.

Annex I

WATERFOWL OF THE NORTHEAST REGION OF BANGLADESH

This annotated checklist of the waterfowl of the Northeast Region on Bangladesh includes all species of waterfowl known or thought to have occurred in the region. The sequence and nomenclature follow Harvey, W.G. (1990) *Birds in Bangladesh*, University Press, Dhaka. Each species account begins with a short statement of the current status of the species in the Northeast Region, as determined on the basis of the present surveys, recent literature and some unpublished material available to the authors. The status of each species as summarized by Harvey (1990) is given in parenthesis at the end of the species accounts.

Details of the main survey observations (dates 18 Feb to 12 Mar 92, 20 Apr to 4 May) have been included.

Little Grebe *Tachybaptus ruficollis*

Common resident and winter visitor.

353 were recorded during the Feb/Mar survey, with birds present at 20 sites. The largest concentrations were 51 at Arabiakona Beel, 51 at an un-named *beel* south of Samsar Beel, and 40 at Dekhar Haor. The great majority of birds were in parties of 5-15 individuals, and were still in non-breeding plumage, although there were a few solitary birds in breeding plumage.

534 were recorded during the Apr/May survey, with birds present at 17 sites. Approximately 350 of these were in a large flock of obvious non-breeders at Arabiakona Beel, but most of the others were paired and in breeding plumage. Much calling was heard, and it appeared that the birds were settling down to breed. The species favours shallow *beels* with large areas of floating vegetation, and was often found on very small *beels*, e.g. in Dekhar Haor, at Mehdi Beel and at Karul Dhan Beel.

(Locally common breeding resident).

Great Crested Grebe *Podiceps cristatus*

Fairly common winter visitor, frequenting the larger, deeper *beels*.

135 were recorded during the Feb/Mar survey, with birds present at 11 sites. The highest counts were 55 at Chatla Beel and 30 at Pana Beel. Most birds were in breeding plumage, but no courtship behaviour was observed. All had apparently left the area by the time of the second survey. These records suggest that the species is not as rare in northeastern Bangladesh as was formerly supposed.

(Uncommon winter visitor).

Great Cormorant *Phalacrocorax Carbo*

Winter visitor in small numbers to the deeper *beels* in the north.

54 were recorded during the Feb/Mar survey, with birds present at 11 sites. Apart from a flock of 11 at Kuri Beel on 29 Feb, all were in the Tangua, Matian and Pasua complex in the north, the highest count being 19 at Pana Beel. Only one individual was recorded during the Apr/May survey: a slightly injured bird in flight over the Someswari River on 21 Apr. The only other reports of this species in Bangladesh in recent years are of small numbers wintering in the coastal zone.

Many of the birds observed in February and March were in full breeding plumage, and it is possible that given suitable nesting sites (tall trees) and freedom from disturbance, the Great Cormorant would become re-established as a breeding species in the region. There would certainly appear to be no shortage of suitable feeding habitat.

(Former? resident).

Indian Shag *Phalacrocorax fuscicollis*

Status uncertain.

Not recorded during the present surveys. Apparently this species has never been recorded in the Northeast, although it is widespread throughout the Indian Subcontinent, and occurs in wetlands elsewhere in Bangladesh. Its absence is therefore surprising.

(Scarce? resident. Not recorded for the Northeast).

Little Cormorant *P. niger*

Common resident, particularly in the north.

5,277 were recorded during the Feb/Mar survey, with birds present at 37 sites. Over 4,560 (86%) were in the Tangua, Matian and Pasua complex in the north, with the largest concentrations being along the Someswari River (500), at Kanamaiya Haor (750), at Pasua Beel (450) and at Bara Beel (425). The only large numbers away from this area were 160 at Chatla Beel (Hakaluki Haor).

6,090 were recorded during the Apr/May survey, with birds present at 38 sites. As in Feb/Mar, much the largest numbers were in the Tangua, Matian and Pasua complex, with at least 2,500 roosting in the trees at Pasua Beel on 23 Apr. However, the species was rather more widespread throughout the region as a whole, with small numbers present in most of the major wetland areas. Most birds were in non-breeding plumage or immatures, and there was no evidence of breeding activity. According to Harvey (1990), the species has been found breeding in Bangladesh between June and February.

(Locally common breeding resident).

Oriental Darter *Anhinga melanogaster*

Local resident, almost confined to the Tangua/Pasua complex.

21 were recorded during the Feb/Mar survey, with birds present at six sites. All but one were in the Tangua, Matian and Pasua complex in the north, the highest counts being six along the Someswari River and 10 at Pasua Beel. One bird at Uglar Beel (Meda Haor) was the only other record.

21 were again recorded during the Apr/May survey. Sixteen of these were at Pasua Beel and the others at Pana Beel (3) and Tangua Beel (2). No evidence was found of breeding. According to Harvey (1990), the species breeds in Bangladesh between September and February.

(Local breeding resident).

Spot-billed Pelican *Pelecanus philippensis*

Extinct as a breeding species in Bangladesh, and now only a rare vagrant.

Not recorded during the present surveys. This species was once a common species almost throughout the Indian Subcontinent and in neighbouring Southeast Asia. However, populations have declined dramatically this century, and the species survives in substantial numbers only in southern India and Sri Lanka. It is now listed in the IUCN Red Data Book as a threatened species.

(Former? resident. Now rare vagrant).

Dalmatian Pelican *Pelecanus crispus*

Extinct in Bangladesh.

Formerly a winter visitor to Bangladesh from breeding areas in China, this species has not been recorded for many years. Once widespread in much of central and southern Asia, the species has disappeared from much of its former range, and is now listed in the IUCN Red Data Book as a threatened species.

(Former visitor).

Great Bittern *Botaurus stellaris*

Status uncertain; probably a scarce winter visitor.

One at Khakra Kuri Beel (Balai Haor) on 6 Mar.

(Rare passage migrant).

Yellow Bittern *Ixobrychus sinensis*

Probably a fairly common breeding summer visitor, but very secretive and easily overlooked.

None was recorded in the Feb/Mar survey. However, one was seen at Balai Haor on 27 Apr, and at least two were flushed from reed-beds at Hail Haor on 2 May.

(Local breeding resident).

Cinnamon Bittern *Ixobrychus cinnamomeus*

Probably a common breeding summer visitor.

None was recorded during the Feb/Mar survey. However, the species was fairly common in Apr/May, especially around small ponds in homestead forests. The species generally avoids open wetlands, and only eight were recorded at the study sites: five at Pasua Beel, two at Hail Haor and one at Balai Haor. At each of these sites, there is plenty of dense vegetation to provide suitable cover.

(Common breeding resident).

Black Bittern *Dupetor flavicollis*

Status uncertain.

Only one was recorded: a bird in flight over rice fields and homestead forest to the east of Hail Haor on 4 May. This is a secretive species, generally keeping to dense cover, and is easily overlooked.

(Local breeding resident).

Malayan Night-Heron *Gorsachius melanolophus*

Status uncertain.

Not recorded during the present surveys. This is a very secretive heron of damp forest and forest streams, avoiding open wetlands. There has been at least one recent record from West Banugach Reserved Forest (July 1988).

(Local visitor).

Black-crowned Night-Heron *Nycticorax nycticorax*

Fairly common winter visitor, and possibly also a passage migrant.

149 were recorded during the Feb/Mar survey, most observations being of birds at day roosts in homestead forests. These included five in a roost near the Khowai River west of Habiganj, at least 90 at a roost near Ruwa Beel (Dekhar Haor), and 39 flushed from a roost by the Surma River west of Sunamganj.

The only birds observed during the Apr/May survey were a flock of 33 flying out at dusk from the forest patch at Pasua Beel on 23 Apr.

(Local breeding resident).

Little Heron *Butorides striatus*

Scarce resident.

The only records of this secretive and largely crepuscular heron were: two along the Juri River on 20 Feb and two again on 25 Apr; five along the Someswari River on 1-2 Mar, and one there on 21 Apr; and three at Pasua Beel on 21-23 Apr.

(Local breeding resident).

Indian Pond Heron *Ardeola grayii*

Common and widespread resident.

977 were recorded during the Feb/Mar survey, with birds present at 44 sites. Much the largest concentration was 320 at Petangi Beel (Kawadighi Haor) on 22 Feb. This was the most widespread waterbird in the region, occurring in all types of wetland habitat with some cover, including wet rice fields, roadside ditches and small pools in homestead forest.

280 were recorded at the main wetlands during the Apr/May survey, with birds present at 30 sites. Much the largest counts were 68 at Hail Haor and 50 along the Someswari River. The species was even more widely distributed than in Feb/Mar, and many birds (which do not figure in the counts) were found scattered in rice fields, borrow pits and the small wetlands associated with homestead forests. Although no breeding colonies were located, many of the birds were in full breeding plumage, and it seemed likely that they were breeding somewhere, perhaps in small groups in homestead forests.

(Abundant breeding resident).

Chinese Pond Heron *Ardeola bacchus*

Possibly a regular winter visitor in small numbers, but status uncertain because of difficulties in identification when in non-breeding plumage.

None was recorded during the Feb/Mar survey, but the species could easily have been overlooked, as at this time of the year it closely resembles *A. greyii*. Two adults in breeding plumage were observed during the Apr/May survey: one at Pasua Beel on 22 Apr and one in rice fields west of Hail Haor on 3 May.

(Rare visitor).

Cattle Egret *Bubulcus ibis*

Common resident.

324 were recorded during the Feb/Mar survey, with birds present at 22 sites. No large flocks were observed in these areas. However, flocks of 255 and 70 were observed in rice fields between Bhairab Bazar and Srimangal on 18 Feb, bringing the total recorded during the survey to 649.

1,675 were recorded during the Apr/May survey, with birds present at 17 sites. Major concentrations included at least 300 at the egret roost at Pasua Beel, 150 at Balai Haor, 255 at Kawadighi Haor, and a flock of 500 in rice fields near Bhairab Bazar. No evidence was found of breeding, although most birds were in full summer plumage.

(Local breeding resident).

Little Egret *Egretta garzetta*

Common resident.

1,121 were recorded during the Feb/Mar survey, with birds present at 36 sites. The largest concentrations were 350 at Petangi Beel (Kawadighi Haor) and 125 at Pasua Beel.

970 were recorded during the Apr/May survey, with birds present at 24 sites. Much the largest concentrations were 500 at the egret roost at Pasua Beel and 225 at Petangi Beel (Kawadighi Haor). Many of the birds were in breeding plumage, but no evidence was found of nesting.

(Locally common breeding resident).

Intermediate Egret *E. intermedia*

Common resident.

498 were recorded during the Feb/Mar survey, with birds present at 34 sites. The largest concentrations were 160 at Petangi Beel, 50 at Hail Haor and 45 at Dekhar Haor.

866 were recorded during the Apr/May survey, with birds present at 32 sites. The largest concentrations were 300 at the egret roost at Pasua Beel, 140 at Hail Haor and 125 at Kawadighi Haor. No evidence was found of breeding, although some birds were in breeding plumage.

(Locally common breeding resident).

Great Egret *E. alba*

Abundant winter visitor, with many non-breeders remaining throughout the summer; possibly also a breeding species.

2,539 were recorded during the Feb/Mar survey, with birds present at 41 sites. The largest concentrations were 600 at Pasua Haor, 500 at Petangi Beel, 300 at Majherbanda Beel and 300 at Bara Beel.

1,855 were recorded during the Apr/May survey, with birds present at 37 sites. The largest concentrations were 900 at the egret roost at Pasua Beel, 355 at Kawadighi Haor, 154 at Hail Haor and 110 in the Rauar/Tangua Beel complex. Very few birds were in breeding plumage, and it seems likely that the majority were either late migrants or over-summering non-breeders (mostly immatures). There do not appear to have been any confirmed breeding records in Bangladesh in recent years.

(Locally common resident).

Grey Heron *Ardea cinerea*

Common winter visitor, with some non-breeders remaining throughout the summer.

606 were recorded during the Feb/Mar survey, with birds present at 31 sites. The largest concentrations were 135 at Hail Haor, 125 at Petangi Beel and 125 at Pasua Beel. Numbers had fallen considerably by Apr/May, and most of the remaining birds were immatures. Only 128 were recorded, with birds present at 20 sites. The largest concentrations were 45 at Pasua Beel and 34 at Petangi Beel (Kawadighi Haor). No evidence of breeding was observed, although Harvey (1990) gives the breeding period in Bangladesh as November to May.

(Local breeding resident).

Purple Heron *A. purpurea*

Perhaps mainly a rather scarce summer visitor and passage migrant, with a few birds over-wintering.

Only five were recorded during the Feb/Mar survey: four at Hail Haor on 21 Feb and one at Khakra Kuri Beel (Balai Haor) on 6 Mar. 35 were recorded during the Apr/May survey, with birds present at six sites. Much the highest count was 27 at the heron and egret roost at Pasua Beel on 23 Apr. This is a rather secretive heron of dense reed-beds, and is only likely to nest at sites such as Hail Haor, Pasua Beel, Tangua Haor and Matian Haor with tall stands of emergent marsh vegetation.

(Local breeding resident).

White-bellied Heron *A. imperialis*

Possibly a very rare straggler from forested areas in neighbouring India.

None was recorded during the present surveys. This very large heron is an extremely rare species of forested swamps and streams, formerly occurring from the Himalayan foothills in Nepal to southwest China and Burma. There have been few reliable records in recent years, and the species is now listed in the IUCN Red Data Book. There is, however, one recent record from the Northeast Region: two appeared at a small lake in a tea estate near Srimangal on 25 March 1988 (John Woolner, pers. comm.). It seems unlikely, however, that there is a sufficient area of suitable habitat remaining in Bangladesh to support a viable population.

(Rare visitor).

Painted Stork *Mycteria leucocephala*

Extinct in the region.

Formerly a widespread breeding species in Bangladesh (and still so over much of the Indian Subcontinent), the Painted Stork has almost completely disappeared from the country, and now occurs only as a rare straggler. There are no recent records in the Northeast.

(Rare visitor. Formerly resident).

Asian Openbill *Anastomus oscitans*

Locally common winter visitor and passage migrant.

A large flock was apparently resident at Pasua Beel from early March until at least the end of April. 128 were present on 4 Mar, about 400 on 23 Mar and at least 300 on 22-24 April. The birds were roosting in the *Pongamia* trees near the *beel*, and flying out to feed on nearby *haors*. The only other Openbills recorded during the surveys were one at Balai Haor on 6 Mar, six in flight over cultivated plains between

Netrakona and Kaluma Kanda on 11 Mar, one at Kecharia Beel on 22 Apr, 13 at Balai Haor on 27 Apr, and singles in flight over tea estates near Maulvibazar and Srimangal on 30 Apr and 2 May, respectively.

The Openbill is much the commonest stork in Bangladesh, but has not been known to breed in recent years. The large flocks which apparently appear with some regularity in the Northeast may belong to the large migratory population which breeds in south Thailand.

(Local wandering resident).

Woolly-necked Stork *Ciconia episcopus*

Probably now extinct in the Northeast Region.

Formerly a widespread resident in Bangladesh, this species is now very rare, and may only occur as a straggler from neighbouring countries. There do not appear to have been any records in the Northeast in recent years.

(Rare winter visitor).

White Stork *Ciconia ciconia*

Rare winter visitor.

None was recorded during the present surveys. There have, however, been at least two recent records of small groups in the Srimangal area; in November 1988 and April 1989 (John Woolner, pers. comm.).

(Rare winter visitor).

Oriental Stork *Ciconia boyciana*

Probably now extinct in Bangladesh.

Formerly a rare winter visitor to Bangladesh, this species, which breeds in northeast Asia, has not been recorded for many years. The species has shown a dramatic decline throughout its range this century, and is now listed in the IUCN Red Data Book.

(Formerly rare winter visitor).

Black-necked Stork *Ephippiorhynchus asiaticus*

Extinct in the Northeast Region.

Formerly a widespread resident in Bangladesh, this species has become extinct as a breeding species and now occurs only as a rare straggler from neighbouring countries. The species has shown a dramatic decline throughout its wide range in mainland Asia during the past few decades, and is now a rare bird almost everywhere except in New Guinea and northern Australia.

(Rare visitor. Former resident).

Lesser Adjutant *Leptoptilos javanicus*

Perhaps only a rare straggler from neighbouring India.

A pair was observed at Khakra Kuri Beel (Balai Haor) on 6 Mar. This species is now listed in the IUCN Bird Red Data Book in the category "Vulnerable". A small population survives in the Sundarbans, but elsewhere in Bangladesh, the species is now only a rare straggler.

(Locally breeding resident).

Greater Adjutant *L. dubius*

Extinct in the Northeast Region.

Formerly a widespread and fairly common breeding bird in much of the Indian Subcontinent and Southeast Asia, the Greater Adjutant has suffered a catastrophic decline throughout its range in recent decades, and is now one of the most seriously threatened waterbirds in Asia. The reasons for its decline are uncertain, but probably include large-scale destruction of forested wetlands suitable for breeding colonies, especially in central Burma where there were enormous colonies in the 19th century. One or two pairs may continue to survive in southeastern Bangladesh, but there have been no records in the Northeast Region in recent years.

(Rare resident or winter visitor. Formerly more common).

Glossy Ibis *Plegadis falcinellus*

Rare straggler in winter.

Formerly a regular winter visitor to Bangladesh and perhaps even a breeding species, the Glossy Ibis now occurs only as a rare winter visitor. None was recorded during the present surveys, but two were observed near Srimangal in December 1990 (John Woolner, pers. comm.).

(Former? winter visitor).

Red-naped Ibis *Pseudibis papillosa*

Extinct in the Northeast Region.

Perhaps formerly a widespread resident in Bangladesh, the Red-naped Ibis now occurs only as a rare straggler from neighbouring countries. There do not appear to have been any records from the Northeast Region in recent years.

(Rare visitor).

Black-headed Ibis *Threskiornis melanocephala*

Scarce winter visitor.

A flock of 11 was observed at Pasua Beel on 4 Mar, and three were present there on 23 Apr. Formerly a widespread resident in Bangladesh, this species has disappeared as a breeding species. Mid-winter waterfowl counts in the coastal zone in recent years have revealed that it remains a regular winter visitor in small numbers, but elsewhere in Bangladesh the species is now only a rare visitor.

(Rare visitor).

White Spoonbill *Platalea leucorodia*

Rare passage migrant.

One immature at Pasua Beel on 22 Apr.

(Rare winter visitor).

Fulvous Whistling Duck *Dendrocygna bicolor*

Abundant winter visitor, principally in the Tangua Haor area.

9,815 were recorded during the Feb/Mar survey, with birds present at 12 sites. Almost 9,000 (93%) were in the Tangua, Matian and Pasua complex in the north, with major concentrations at Pakertala Beel (3,850), Pana Beel (3,800), Arabiakona Beel (850) and Rauar Beel (650). Elsewhere, there were flocks of 500 at Chatla Beel (Hakaluki Haor), 60 at Chalnia Beel and 60 at Dekhar Haor.

1,263 were recorded during the Apr/May survey, with birds present at seven sites. The largest concentrations were 650 at Aila Beel and 550 at Chatla Beel. All of the birds were still in flocks, and there were no signs of breeding behaviour. Only 36 were present at Balai Haor on 27 Apr, although there had been 5,000 there on 27 Mar (during the Monthly Waterfowl Census).

These high counts of *D. bicolor* are unprecedented in the Subcontinent in recent years; indeed, the highest total for the whole of the Subcontinent in the first five years of the Asian Waterfowl Census (1986/87 to 1990/91) was 4,910 in 1989/90, with the highest count in Bangladesh being 275 in the same year. The wetlands of the Haor Basin, and especially the Tangua Haor complex, are clearly of outstanding importance as wintering habitat for this uncommon species.

(Local winter visitor).

Lesser Whistling Duck *D. javanica*

Abundant winter visitor and common resident.

9,016 were recorded during the Feb/Mar survey, with birds present at 15 sites. Much the largest concentration was a flock of 6,000 at Chatla Beel (Hakaluki Haor). Other high counts included 780 at Uglar Beel (Meda Haor) and 455 at Chalnia Beel. There were only 440 in the Tangua, Matian and Pasua complex, where the species was greatly outnumbered by *D. bicolor*.

1,791 were recorded during the Apr/May survey, with birds present at 14 sites. The largest concentrations were 550 at Chatla Beel (Hakaluki Haor), 400 at Tangua Beel, 200 at Aila Beel and 150 at Balai Haor. At the latter site, about 15,000 *D. javanica* were present on 27 Mar following recent flooding, but by the end of April, water levels had receded almost to their late February levels, and the large flocks had moved on. At several sites (e.g. Hail Haor and Tangua Haor), many birds were paired and showing some courtship behaviour, suggesting that they were preparing to breed.

(Common winter visitor and local breeding resident).

Greylag Goose *Anser anser*

Possibly still a rare winter visitor or passage migrant.

Formerly a common winter visitor to wetlands throughout Bangladesh, the Greylag Goose is now regular only at remote wetlands in the coastal zone. Harvey (1990) indicates that there have been some recent records in the Northeast Region, but none was recorded during the present surveys.

(Local winter visitor).

Bar-headed Goose *A. indicus*

Rare winter visitor or passage migrant.

The only record was of a party of four on a small island in Kuri Beel on 29 Feb. As with *A. anser, A. indicus* was formerly a common and widespread winter visitor to the wetlands of Bangladesh, but is now

regular only in the coastal zone. It is doubtful if there are any areas in the Haor Basin sufficiently free from human disturbance to support significant numbers of geese on a regular basis.

(Local winter visitor).

Ruddy Shelduck *Tadorna ferruginea*

Fairly common winter visitor, principally in the north.

337 were recorded during the Feb/Mar survey, with birds present at seven sites. Apart from four at Petangi Beel (Kawadighi Haor), all were in the Tangua, Matian and Pasua complex in the north, with flocks of 170 at Pakertala Beel and 132 at Pana Beel. Only 40 were recorded during the Apr/May survey: flocks of 19 at Pangna Beel and Pasua Beel, and singles at Kawadighi Haor and Balai Haor.

(Local winter visitor).

Common Shelduck *Tadorna tadorna*

Rare winter visitor or passage migrant.

One with a flock of Ruddy Shelducks at Pangna Beel on 21 Apr was the only record. This is primarily a species of coastal wetlands and brackish to saline lakes.

(Local winter visitor).

White-winged Wood-Duck *Cairina scutulata*

Extinct in the Northeast Region.

Formerly a resident of forested wetlands in much of Bangladesh, this globally endangered species has been reported in recent decades only from the Chittagong Hill Tracts, where a tiny population was still known to be surviving as recently as 1981.
A small population survives in neighbouring Assam, but it seems that no suitable habitat is now left for the species in the Northeast.

(Very rare breeding resident).

Comb Duck *Sarkidiornis melanotos*

Perhaps still a very rare resident or occasional visitor.

Formerly a widespread and fairly common resident of wetlands throughout Bangladesh, this species has become very rare. There have apparently been some records in the Northeast Region in recent years

(Harvey, 1990), but no birds were seen during the present surveys. Direct persecution and the loss of suitable nesting sites (holes in large trees) have doubtless been responsible for the species' decline.

(Rare breeding resident).

Cotton Pygmy Goose *Nettapus coromandelianus*

Fairly common resident, especially in the Tangua Haor and Matian Haor area.

111 were recorded during the Feb/Mar survey, with birds present at eight sites. Most were in the Tangua, Matian and Pasua complex, with 50 at Palair Beel, 30 at Banuar Beel and 11 at an un-named *beel* south of Tangua Beel. Elsewhere, there were eight at Petangi Beel, three at Dubail Beel (Balai Haor), one at Deochapra Beel and three at Uglar Beel (Meda Haor).

206 were recorded during the Apr/May survey, with birds present at 11 sites. Again, most were in the Tangua, Matian and Pasua complex, with concentrations of 65 at Biaskhali Beel, 52 at Banuar Beel, 24 at Palair Beel and 12 at Rauar Beel. However, smaller numbers were also recorded at Hail Haor (14), Hakaluki Haor (3), Balai Haor (20) and Mehdi Beel (4). Birds were paired and a great deal of courtship behaviour was observed, suggesting that breeding was about to take place.

(Local breeding resident).

Eurasian Wigeon *Anas penelope*

Scarce winter visitor.

101 were recorded during the Feb/Mar survey, with birds present at 9 sites. The highest counts were 60 at Pana Beel, 17 at Tangua Beel and 10 at Little Tangua Beel. In Apr/May, there were 91 at a total of six sites, the highest counts being 40 at Pasua Beel and 30 by the Someswari River.

(Scarce winter visitor).

Falcated Teal *A. falcata*

Rare winter visitor.

A male at Pana Beel on 2 Mar. This is a rare winter visitor to Bangladesh, occurring here near the extreme western edge of its range. Harvey (1990) mentions only one recent record.

(Rare winter visitor).

Gadwall *A. strepera*

Fairly common winter visitor.

507 were recorded during the Feb/Mar survey, with birds present at 10 sites. Much the largest concentration was 400 at Pana Beel. Two other sites held double figures: Chalnia Beel with 41, and Chatla Beel with 30.

Only 51 were recorded during the Apr/May survey, with birds present at six sites. The highest counts were 32 in the Aila/Pangna *beel* area and 15 at Pasua Beel.

(Scarce winter visitor).

Common Teal *A. crecca*

Scarce winter visitor.

73 were recorded during the Feb/Mar survey, with birds present at 10 sites. Much the largest concentration was 45 at Kuri Beel. While it is likely that many more *A. crecca* were overlooked in the large flocks of Garganey with which they were usually associated, it is clear that the species is a rather scarce winter visitor to northeastern Bangladesh. Most had departed by late April, and only four were observed during the Apr/May survey (last on 22 Apr).

(Locally common winter visitor).

Mallard *A. platyrhynchos*

Very scarce winter visitor.

Only 16 were recorded during the Feb/Mar survey, and all were in the Tangua and Matian complex as follows: one at Pana Beel, six at Biaskhali Beel and nine at Palair Beel. None was observed during the Apr/May survey.

(Rare winter visitor).

Spot-billed Duck *A. poecilorhyncha*

Fairly common resident, almost exclusively in the north.

243 were recorded during the Feb/Mar survey, with birds present at 16 sites. Except for 3 at Dekhar Haor, all were in the Tangua, Matian and Pasua complex, with much the highest count being 120 at Pasua Beel. 122 were recorded during the Apr/May survey, with birds present at 15 sites. Again, except for 10 in the Aila/Pangna Beel area, all were in the Tangua, Matian and Pasua complex, with the largest concentrations being 40 at Pasua Beel, 20 at Pana Beel and 12 at Rauar Beel. By Apr/May, most of the

birds were paired; some pairs appeared to be prospecting for nests sites, and the presence of single males in suitable breeding habitat suggested that a few females might already be incubating. Clearly, this is a commoner species in northeastern Bangladesh than Harvey (1990) suggests, and there are indications that the region supports a small breeding population.

(Rare winter visitor).

Northern Pintail *A. acuta*

Abundant winter visitor.

20,283 were recorded during the Feb/Mar survey, with birds present at 28 sites. The major concentrations were at Hakaluki Haor (15,310) and Kawadighi Haor (2,825), and there were only about 850 in the Tangua, Matian and Pasua Beel complex. Only 72 were recorded during the Apr/May survey, these including 20 at Chatla Beel, 15 at Aila Beel and 15 at Pasua Beel.

(Common winter visitor).

Garganey *A. querquedula*

Abundant winter visitor and probably also passage migrant.

15,487 were recorded during the Feb/Mar survey, with birds present at 30 sites. The largest concentration was in the Tangua, Matian and Pasua complex (10,207), with the highest counts at West Tangua Beel (2,000) and Bara Beel (1,600). Other concentrations included 1,495 at Hakaluki Haor, 1,430 at Kawadighi Haor, 1,150 at Maijeil Haor and 690 at Hail Haor.

8,658 were recorded during the Apr/May survey, with birds present at 15 sites. Much the largest concentration was a flock of 7,000 at Aila Beel on 21 Apr. Other high counts included 450 at Chatla Beel, 325 at Pasua Beel, 150 at Patachatal Beel and 120 at Haor Khal. This is typically the last of the wintering ducks to depart in spring and the first to return in autumn.

(Common winter visitor).

Northern Shoveler *A. clypeata*

Very common winter visitor.

12,913 were recorded during the Feb/Mar survey, with birds present at 20 sites. There were 9,379 at Hakaluki Haor, 2,850 at Maijeil Haor, 857 in the Tangua, Matian and Pasua complex and 750 at Kawadighi Haor, with the largest single concentration being 5,000 at Chatla Beel (Hakaluki Haor). Only

214 were recorded during the Apr/May survey, with birds present at 11 sites. The highest counts were 75 at Aila Beel, 50 at Chatla Beel and 35 at Pasua Beel. Clearly, this is a much commoner winter visitor than Harvey (1990) suggests.

(Scarce winter visitor).

Marbled Teal *Marmaronetta angustirostris*

Possibly a very rare vagrant.

Although there are some old specimen records of the Marbled Teal in the eastern half of the Indian Subcontinent, recent reports from Assam are open to some doubt. The species is known to breed no further east than Pakistan and extreme western China (Sinkiang), and is primarily a species of the Middle East and Mediterranean. Many populations have shown marked declines in recent decades, and the species is now listed in the IUCN Red Data Book. It is highly unlikely that it would occur in Bangladesh as anything other than a very rare vagrant.

(Winter vagrant).

Pink-headed Duck *Rhodonessa caryophyllacea*

Extinct.

The Pink-headed Duck was a bird of grassy swamps on the floodplains of the Ganges, Brahmaputra and Irrawaddy in eastern India, Bangladesh and northern Burma. Massive conversion of this habitat type to rice cultivation had already reduced populations to very low levels by the end of last century, and there have been no reliable records of the species since 1935. However, rumours of its continued existence in Assam and northern Burma persist, and there is a slight possibility that the species could survive in some of the extensive marshes in the upper Irrawaddy drainage in Burma. Its chances of survival in Bangladesh would, however, appear to be negligible.

(Almost certainly globally extinct since 1935 when last recorded in Bihar, India).

Red-crested Pochard *Netta rufina*

Scarce winter visitor to the north of the region.

This species, previously thought to be a rare visitor to Bangladesh, was recorded at four sites in the Tangua Haor complex during the Feb/Mar survey: 12 at Pana Beel, 22 at Rauar Beel, 13 at West Tangua Beel and 40 at a small un-named *beel* west of Tangua Beel, all on 2 Mar. A single male was observed by the Someswari River on 22 Apr, and two pairs were present at Pasua Beel on 24 Apr. There have been two other records of this species in Bangladesh since 1990.

(Winter vagrant. No recent records).

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Common Pochard *Aythya ferina*

Scarce winter visitor.

Only 119 were recorded during the Feb/Mar survey: 80 at Chatla Beel, 30 at Chalnia Beel, five at Gharkuri Beel and four at Pana Beel. None was recorded during the Apr/May survey.

(Scarce winter visitor).

Baer's Pochard *A. baeri*

Fairly common winter visitor, especially in the north.

No less than 697 were recorded during the Feb/Mar survey, with birds present at seven sites. Apart from five at Chatla Beel and five at Gharkuri Beel in Hakaluki Haor, all were in the Tangua, Matian and Pasua complex. Much the largest concentration was a single flock of 660 at Pana Beel (on 2 Mar), but there were also 20 at Palair Beel, four at Banuar Beel, two at Pasua Beel and one at West Tangua Beel. All had departed by the time of the Apr/May survey. This species is currently listed in the IUCN Bird Red Data Book in the category "Vulnerable". Although the species winters widely from south China through Vietnam, Thailand and Burma to northeastern India and occasionally even Nepal, it is everywhere rather scarce, and this concentration of almost 700 in the Haor Basin is thus of considerable international significance.

(Rare winter visitor).

Ferruginous Duck *A. nyroca*

Common winter visitor.

1,973 were recorded during the Feb/Mar survey, with birds present at 16 sites. The great majority (1,952) were recorded at 13 sites in the Tangua and Matian Haor complex, where the largest concentrations were 500 at Palair Beel, 420 at Rauar Beel and 275 at West Tangua Beel. Elsewhere, there were 15 at Chalnia Beel, four at Dubail Beel (Balai Haor) and two at Chatla Beel. Only one was recorded during the Apr/May survey: at Rauar Beel on 23 Apr.

(Locally common winter visitor).

Tufted Duck *A. fuligula*

Common winter visitor.

2,351 were recorded during the Feb/Mar survey, with birds present at nine sites. The largest concentrations were 1,200 at Chalnia Beel, 500 at Hakaluki Haor, 360 at Maijeil Haor and 280 at Pana

Beel. Only 54 were recorded during the Apr/May survey: 20 at Aila Beel, 14 at Pana Beel, 14 at Chatla Beel and six at Haor Khal.

(Locally common winter visitor, sometimes oversummering).

Greater Scaup *A. marila*

Rare winter visitor.

A party of three males and two females with a flock of *A. fuligula* at Pana Beel on 2 Mar. This constitutes the first record of *A. marila* in Bangladesh for many years. The species is a very scarce winter visitor to the Subcontinent, but may be commoner than the records suggest as it is easily overlooked in large flocks of *A. fuligula*. (One male was observed at Aila Beel on 22 Mar, during the Monthly Waterfowl Census).

(Rare winter visitor. No recent records.)

Common Merganser *Mergus merganser*

Possibly still a rare winter visitor.

Not recorded during the present surveys. Although the species is known to have occurred in the Northeast Region, it is primarily a bird of clear, fast-flowing rivers in hilly areas, and is thus unlikely to occur with any regularity.

(Former winter visitor).

Slaty-breasted Rail *Gallirallus striatus*

Scarce resident.

One feeding in a small rice field in a tea estate east of Srimangal on 1 May. This is a very secretive species, easily overlooked.

(Local resident).

Water Rail *Rallus aquaticus*

Possibly a scarce winter visitor and/or passage migrant.

Not recorded during the present surveys, but easily overlooked.

(Rare passage migrant).

Ruddy-breasted Crake *Porzana fusca*

Possibly a fairly common resident.

Not recorded during the present surveys, but extremely secretive and easily overlooked. The species has recently been found nesting in the Srimangal area (John Woolner, pers.comm.).

(Scarce winter visitor).

Brown Crake *Amaurornis akool*

Status uncertain.

Not recorded during the present surveys, but extremely secretive and easily overlooked.

(?Former resident. No recent records).

White-breasted Waterhen *A. phoenicurus*

Status uncertain; possibly an occasional visitor or scarce resident.

Not recorded during the present surveys. This was surprising, as the species is generally common throughout the Indian Subcontinent and Southeast Asia, and frequently lives around small ponds and tanks in close proximity to humans. It has a very loud and distinctive call, and is not easily overlooked. Harvey (1990) gives its distribution in Bangladesh as "throughout in wetlands including mangroves". The species has recently been recorded as an occasional visitor in tea estates near Srimangal (John Woolner, pers. comm.).

(Local breeding resident).

Common Moorhen *Gallinula chloropus*

Common breeding bird; perhaps mainly a summer visitor.

Only ten were recorded during the Feb/Mar survey: seven at Hail Haor on 23 Feb and three at the nearby fish ponds on 18 Feb. However, 120 were recorded during the Apr/May survey, with birds present at 10 sites. Much the largest concentration was 62 in the Rauar/Tangua Beel complex, but there were also at least 12 at Balai Haor, 11 at Pasua Beel, 10 at Hail Haor and smaller numbers at five other sites. The scarcity of records in Feb/Mar would suggest that the species is primarily a summer visitor to the Northeast Region.

(Local breeding resident).

Purple Swamphen *Porphyrio porphyrio*

Locally common resident.

Purple Swamphen were recorded at only four sites, but at all of these, the species appeared to be common. At Pasua Beel, there were 102 on 4 Mar and 420 on 22-24 Apr; at Rauar Beel, there were 31 on 2 Mar and 170 on 22-23 Apr; at Tangua Beel there were 75 on 22 Apr; and at Hail Haor there was one on 23 Feb and at least five on 2 May. The species would appear to be quite common wherever sufficient emergent marsh vegetation survives to provide the dense cover which it requires.

(Scarce breeding resident).

Watercock *Gallicrex cinerea*

Probably a fairly common summer visitor.

The only record during the Feb/Mar survey was two in *Ipomoea* scrub at Balai Haor on 6 Mar. Eleven were recorded during the Apr/May survey: six at Hail Haor, four at Mehdi Beel and one at Pasua Beel.

(Local breeding resident).

Eurasian Coot *Fulica atra*

Common winter visitor, mainly in the north.

5,320 were recorded during the Feb/Mar survey, with birds present at 11 sites. The great majority (5,100) were in the Tangua, Matian and Pasua complex, with concentrations of 3,040 at Rauar Beel, 1,120 at Tangua Beel and 500 at Pana Beel. The only large numbers elsewhere were 200 at Chatla Beel. Only 65 were recorded during the Apr/May survey, at a total of six sites. Again, the highest counts were at Rauar Beel (38) and Tangua Beel (16).

(Scarce breeding resident).

Common Crane *Grus grus*

Probably extinct in Bangladesh.

This species was formerly a winter visitor to the wetlands of Bangladesh, but there have been no confirmed records this century.

(Former winter resident).

Sarus Crane *G. antigone*

Extinct as a breeding bird in the Northeast.

The Sarus Crane probably once occurred as a resident throughout the larger wetland areas of Bangladesh, but disappeared from most of its range many years ago, and has been regular in recent years only in the extreme northwest. A specimen in the National Museum was reportedly shot in the Northeast Region in 1990, but this seems to have been the only record in recent years. The species has shown a dramatic decline almost throughout its range in the Indian Subcontinent and Southeast Asia in recent decades.

(?Former resident, now maybe all but extinct).

Demoiselle Crane *Anthropoides virgo*

Possibly a rare winter visitor.

Formerly a regular winter visitor to Bangladesh, the Demoiselle Crane is now apparently very rare. Although there have been two or three records from the Northeast in recent years, none was recorded during the present surveys.

(Rare winter visitor).

Pheasant-tailed Jacana *Hydrophasianus chirurgus*

Common breeding resident.

1,022 were recorded during the Feb/Mar survey, with birds present at 17 sites. Over 680 were observed in the Tangua and Matian complex, where the highest counts were 180 at West Tangua Beel, 140 at Tangua Beel, 120 at Rauar Beel and 120 at a small *beel* west of Tangua Beel. Elsewhere, there were 300 at Petangi Beel, 13 at Boraduba Beel, 10 at Deochapra Beel and smaller numbers at Hail Haor, Chalnia Beel, Balai Haor and Uglar Beel.

393 were recorded during the Apr/May survey, with birds present at 16 sites. The highest counts were 102 at Majherbanda Beel (Kawadighi Haor), 90 at Bara Beel, 53 at Hail Haor, 33 at Rauar Beel and 25 at Palair Beel. Many birds were in full breeding plumage and paired; a considerable amount of calling was heard, and it appeared that the birds were settling down to breed at many of the sites.

(Scarce breeding resident).

Bronze-winged Jacana *Metopidius indicus*

Fairly common breeding resident.

37 were recorded during the Feb/Mar survey. 25 were present at Deochapra Beel and much smaller numbers at Hail Haor, Ulauli Beel (Kawadighi Haor), Chalnia Beel, Meda Beel and Boraduba Beel.

35 were recorded during the Apr/May survey, with birds present at 13 sites. The highest counts were 11 at hail Haor, 10 at Deocahpra Beel and eight at Mehdi Beel. Birds were paired and displaying, and it appeared that they were settling down to breed.

(Local breeding resident).

Greater Paintedsnipe *Rostratula benghalensis*

Possibly a fairly common breeding resident.

One at Banuar Beel (Matian Haor) on 22 Apr, and a pair at Hail Haor on 2 May. This is a secretive species, easily overlooked and possibly much commoner than these records suggest.

(Local breeding resident).

Black-winged Stilt *Himantopus himantopus*

Common winter visitor and possibly a local breeding bird.

1,267 were recorded during the Feb/Mar survey, with birds present at 16 sites. The largest concentrations were 380 at Kanamaiya Haor, 315 at Bara Beel, 280 at Majherbanda Beel and 120 at Pakertala Beel. 376 were still present in Apr/May, with birds at a total of 13 sites. Much the largest concentrations were at Kawadighi Haor, where there were 165 at Majherbanda Beel on 29 Apr and 90 at Petangi Beel on 3 May. At both of these *beels*, small parties of stilts were indulging in aerial displays, and at Petangi Beel, several pairs were observed nest-building. Obviously this species is much commoner than Harvey (1990) suggests, and may nest in the region.

(Scarce winter visitor).

Pied Avocet *Recurvirostra avosetta*

Scarce winter visitor or passage migrant.

A party of four at Haor Khal (Hakaluki Haor) on 7 Mar. This is primarily a species of coastal wetlands and brackish to saline lakes.

(Scarce winter visitor).

Oriental Pratincole *Glareola maldivarum*

Status uncertain.

The species was observed only once: a single over the Surma River near Sunamganj on 1 Mar.

(Local breeding resident).

Small Pratincole *G. lactea*

Status uncertain. Possibly a resident in the west of the region.

Two were observed on the mudflats at Haor Khal (Hakaluki Haor) on 7 Mar. This is very much a bird of sand banks in large rivers, and might only be expected to be regular in the far west of the region.

(Local breeding resident. Not listed for northeast).

Little Ringed Plover *Charadrius dubius*

Common winter visitor.

357 were recorded during the Feb/Mar survey, with birds present at 25 sites. The largest concentrations were 175 at Haor Khal and 40 at Mehdi Beel. All had departed by late April.

(Common winter visitor and local breeder).

Long-billed Plover *C. placidus*

Status uncertain; probably a rare winter visitor.

Not recorded during the present surveys. There are only two recent records of this East Asian species in Bangladesh.

(Scarce winter visitor. ? Formerly more regular).

Kentish Plover *C. alexandrinus*

Locally common winter visitor.

752 were recorded during the Feb/Mar survey, with birds present at eight sites. Much the highest count was 650 at Haor Khal (Hakaluki Haor) on 7 Mar, where the extensive mudflats provided ideal feeding

conditions. Other concentrations included 40 at Majherbanda Beel (Kawadighi Haor) and 34 on mud banks in the Someswari River. All had departed by late April.

Mongolian Plover *C. mongolus*

Scarce winter visitor.

Five at Majherbanda Beel (Kawadighi Haor) on 22 Feb, and seven at Haor Khal (Hakaluki Haor) on 7 Mar. This is primarily a bird of coastal mudflats and sandy beaches.

(Abundant winter visitor, non-breeders oversummering. Not listed for the Northeast).

Asiatic Golden Plover *Pluvialis fulva*

Common winter visitor and passage migrant.

821 were recorded during the Feb/Mar survey, with birds present at 21 sites. The largest concentrations were at Hakaluki Haor (433), Balai Haor (150), Pakertala Beel (82) and Hail Haor (60).

Large numbers were still present in late April/early May, and probably far more than the total count (585 at 14 sites) would suggest, as the birds were making much more use of rice stubble, and were therefore far more scattered than in Feb/Mar. A number of flocks were seen passing overhead in a northeasterly direction. Much the largest concentration was 300 in the Balai Haor area on 27 Apr.

(Common winter visitor).

Grey Plover *P. squatarola*

Scarce winter visitor.

Two at Pakertala Beel on 2 Mar and three at Haor Khal (Hakaluki Haor) on 7 Mar. This is primarily a species of coastal mudflats and sandy beaches.

(Locally common winter visitor, nonbreeders oversummering. Not listed for northeast).

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River Lapwing *Vanellus duvaucelii*

Scarce resident along wide rivers with extensive sand banks.

Not recorded during the present surveys. This is a species of extensive sand banks in large rivers - a habitat type not visited during the surveys. It is known to occur along the Old Brahmaputra in the west of the region, but is apparently scarce.

(Rare? resident).

Grey-headed Lapwing *V. cinereus*

Common winter visitor.

685 were recorded during the Feb/Mar survey, with birds present at 24 sites. The largest concentrations were 210 at Majherbanda and Ulauli Beels, 82 at Ratna Beel, 61 at Hail Haor and 60 at Kair Gang (Hakaluki Haor). Most had left by late April, but there were still 15 at Kawadighi Haor, eight at Hail Haor and one at Haor Khal. Bangladesh appears to be one of the most important wintering areas for this rather scarce lapwing which breeds in Northeast Asia and winters in wetlands from northern India east to South China.

(Local winter visitor).

Red-Wattled Lapwing *V. indicus*

Scarce resident.

Only three individuals were recorded during the Feb/Mar survey: singles at Dubriar Haor, Pana Beel and Palair Beel; and only one was recorded during the Apr/May survey: at Bara Beel. The scarcity of this species in the Haor Basin is surprising, as it is a common resident over much of its range from the Middle East to Thailand and often occurs on agricultural land and waste ground around human habitation.

(Local breeding resident).

White-tailed Lapwing *V. leucurus*

Rare winter visitor.

Not recorded during the present surveys, but one was reported at Hail Haor by Anisuzzaman Khan and Mark Barter in early February, just before the first survey.

(Former winter visitor. No recent records).

Northern Lapwing *V. vanellus*

Vagrant in winter.

Not recorded during the present surveys. This is probably only a rare vagrant in winter, as Bangladesh lies to the south of the species' normal winter distribution.

(Former winter visitor. No recent records).

Little Stint *Calidris minuta*

Common winter visitor.

741 were recorded during the Feb/Mar survey, with birds present at 6 sites. The largest concentrations were 550 at Haor Khal, 100 at Majherbanda Beel and 60 in rice fields between Netrokona and Kaluma Kanada. Only four were recorded during the Apr/May survey, at Petangi Beel on 3 May. All birds examined closely appeared to be of this species rather than the very similar Rufous-necked Stint *C. ruficollis,* which is believed to be the commoner of the two in the coastal zone.

(Local winter visitor. Not listed for northeast).

Temminck's Stint *C. temminckii*

Common winter visitor.

132 were recorded during the Feb/Mar survey, with birds present at 22 sites. The largest concentrations were 20 at Hail Haor, 20 in rice fields between Netrokona and Kaluma Kanda, 15 at Mehdi Beel and 15 at Hail Haor. Only six were recorded during the Apr/May survey: three at Kuri Beel on 20 Apr and three at Pingla Beel on 30 Apr. The species typically occurs in ones and twos around small muddy pools, in shallow marshes and in rice fields, and is thus easily overlooked and very difficult to census. It is clear that the total population wintering in the Haor Basin could be very much larger than the counts might suggest.

(Scarce winter visitor).

Long-toed Stint *C. subminuta*

Scarce passage migrant.

Two were observed at Haor Khal on 25 Apr.

(Scarce winter visitor).

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Dunlin *C. alpina*

Scarce winter visitor.

One at Majherbanda Beel on 22 Feb, and two at Haor Khal (Hakaluki Haor) on 7 Mar. This is primarily a shorebird of coastal mudflats, near the southern limit of its winter distribution in Bangladesh.

(Rare winter visitor. Not listed for the Northeast).

Curlew Sandpiper *C. ferruginea*

Scarce winter visitor and passage migrant.

Two at Majherbanda Beel on 22 Feb, and 20 at Haor Khal (Hakaluki Haor) on 7 Mar. One at Haor Khal on 25 Apr, and three at Petangi Beel on 3 May. Like the Dunlin, this is primarily a shorebird of coastal mudflats .

(Common winter visitor, nonbreeders oversummering).

Broad-billed Sandpiper *Limicola falcinellus*

Scarce winter visitor.

One at Haor Khal (Hakaluki Haor) on 7 Mar. Primarily a bird of coastal mudflats.

(Local winter visitor. Not listed for northeast).

Ruff *Philomachus pugnax*

Common winter visitor and/or passage migrant.

912 were recorded during the Feb/Mar survey, with birds present at 16 sites. The largest concentrations were 300 at Tangua Beel, 150 at Petandi Beel, 130 at Banuar Beel and 100 at Bara Beel. *P. pugnax* is one of the earliest spring migrants, and it is possible that many of these birds were already on their return spring migration from wintering areas further south in the Subcontinent.

Only 51 were recorded during the Apr/May survey: a flock of 50 at Haor Khal on 25 Apr, and one at Balai Haor on 27 Apr.

(Passage migrant and rare winter visitor).

Jack Snipe *Gallinago minima*

Probably a winter visitor in small numbers.

Not recorded during the present surveys, but a very secretive species, easily overlooked. The species has been observed on a number of occasions in the Srimangal area in recent years (John Woolner, pers. comm.).

(?Former winter visitor).

Common Snipe *Gallinago gallinago*

Abundant winter visitor.

Snipe were recorded in a wide variety of wet habitats in Feb/Mar, and were frequently flushed from rice fields where they were probably the commonest shorebird. The species is notoriously difficult to census, and thus the total count of 553 (at 30 sites) gives little more than an indication of its general abundance. Unusually large concentrations included 150 at Haor Khal, 90 at Boraduba Beel and 80 at Dekhar Haor. Only 31 were observed during the Apr/May survey, at a total of six sites. The Haor basin is clearly a very important wintering area for this species.

(Abundant winter visitor).

Pintail Snipe *G. stenura*

Common winter visitor.

G. stenura is perhaps even more difficult to census than *G. gallinago* as it occurs not only in wetlands but also in drier habitats such as stubble fields and grassy areas with some herbaceous cover. The total count of 41 in Feb/Mar (at 13 sites) merely supports Harvey's statement that the species is common (Harvey, 1990). Only six were recorded in Apr/May, and five of these were at Balai Haor on 27 Apr.

(Common winter visitor).

Swinhoe's Snipe *G. megala*

Probably a scarce winter visitor.

Two with *G. gallingo* and *G. stenura* in rice fields on the west side of Hail Haor on 23 Feb. The birds were identified from *stenura* on a combination of their larger size, heavier flight, longer bills, more conspicuous white in the outer tail features and slightly different call. This apparently constitutes the first record of *G. megala* in Bangladesh, although Rashid (1967) assumed that it must occur as it winters widely in the subcontinent south to Kerala and Sri Lanka, and has been recorded in neighbouring Assam,

Manipur and West Bengal (Ali and Ripley, 1969). The species is, however, very difficult to separate from the much commoner *G. stenura* in the field, and is thus easily overlooked.

(Not listed).

Solitary Snipe *G. solitaria*

Possibly a rare winter visitor.

Not recorded during the present surveys. This is primarily a species of bogs and streams in hilly areas, and is thus unlikely to occur with any regularity in the Haor Basin.

(Rare winter visitor. No recent records).

Eurasian Woodcock *Scolopax rusticola*

Possibly a scarce winter visitor.

Not recorded during the present surveys. This is a nocturnal feeder, spending the day in thick cover, usually in damp forest. It is thus easily overlooked.

(Former winter visitor. No records this century).

Black-tailed Godwit *Limosa limosa*

Fairly common winter visitor.

420 were recorded during the Feb/Mar survey, with birds present at nine sites. The largest flocks were 165 at Majherbanda Beel, 140 at Pana Beel and 65 at Puala Beel (Kawadighi Haor). 93 were recorded during the Apr/May survey, with birds present at five sites. The highest counts were at Petangi Beel (31), Biaskhali Beel (25) and Pasua Beel (23). The species would appear to be commoner than Harvey (1990) suggests.

(Scarce winter visitor).

Eurasian Curlew *Numenius arquata*

Scarce passage migrant.

A flock was heard passing overhead at night at Rauar Beel on 22 Apr. At least three birds were calling. This is primarily a shorebird of coastal mudflats.

(Locally common winter visitor. Not listed for the Northeast).

Spotted Redshank *Tringa erythropus*

Fairly common winter visitor.

No less than 135 were recorded during the Feb/Mar survey, at a total of ten sites. The highest counts were 55 at Pasua Beel, 30 at Haor Khal and 30 at Majherbanda Beel. Smaller numbers (less than 10) were present at Kair Gang (Hakaluki Haor), Khakra Kuri Beel and Dubail Beel (Balai Haor), Kuri Beel, Someswari River, Kanamaiya Haor and Pakertala Beel. 18 were recorded during the Apr/May survey, at four sites, the largest flock being 13 at Pingla Beel on 30 Apr. Although listed by Rashid (1967) as a winter visitor to much of Bangladesh, the species was not listed by Harvey (1990). However, there have been several records in recent years (John Woolner, pers. com.), and it is now thought to be a scarce winter visitor. The present series of records would suggest that it is a fairly common winter visitor to the wetlands of the Haor Basin.

(Not listed).

Common Redshank *T. totanus*

Scarce winter visitor, but probably a fairly common passage migrant.

Only three were recorded during the Feb/Mar survey: one at Majherbanda Beel on 22 Feb, and two at Jugni Beel (Balai Haor) on 6 Mar. 20 were observed in Apr/May at a total of six sites, the highest count being five at Haor Khal on 25 Apr. This is primarily a bird of coastal mudflats in Bangladesh.

(Common winter visitor, nonbreeders oversummering).

Marsh Sandpiper *T. stagnatilis*

Common winter visitor.

434 were recorded during the Feb/Mar survey, with birds present at 16 sites. The largest concentrations were 145 at Haor Khal, 100 at Majherbanda Beel and 100 at Puala Beel. Only six were recorded during the Apr/May survey: at Petangi Beel on 3 May. This was one of the commonest shorebirds at *beels* with exposed mudflats in Feb/Mar, and would appear to be much commoner than Harvey (1990) suggests.

(Scarce winter visitor).

Common Greenshank *T. nebularia*

Fairly common winter visitor.

119 were recorded during the Feb/Mar survey, with birds present at 18 sites. The largest concentrations were 21 at Kuri Beel and 20 at Majherbanda Beel. Only seven were recorded in Apr/May, at five sites.

(Common winter visitor).

Green Sandpiper *T. ochropus*

Rather scarce winter visitor.

Singles were recorded at eight sites in Feb/Mar, and at four sites in Apr/May (last on 22 Apr). As this is a species of small pools, roadside ditches and muddy creeks, generally avoiding large open wetlands, it is often overlooked during waterfowl censuses. Nevertheless, a total count of only 12 suggests that the species is relatively uncommon.

(Common winter visitor, nonbreeders oversummering).

Wood Sandpiper *T. glareola*

Abundant winter visitor and passage migrant.

848 were recorded during the Feb/Mar survey, with birds present at 41 sites. The largest concentrations were 250 at Mehdi Beel, 90 at Haor Khal, 65 at small *beels* between Netrakona and Kaluma Kanda, and 60 in paddies by the Khowai River west of Habiganj. This was one of the commonest and most widespread shorebirds in the Haor Basin, frequenting a variety of wetland habitats and occurring commonly in wet rice fields. As only a tiny fraction of the suitable habitat was covered, the total count of about 850 must represent only a tiny fraction of the birds present.

Most had departed by late April, and only 133 were recorded during the Apr/May survey (at a total of 13 sites). The highest counts were 50 at Balai Haor and 24 at Haor Khal. On several occasions, small flocks were seen passing overhead in a northeasterly direction.

(Common winter visitor, and abundant passage migrant).

Common Sandpiper *Actitis hypoleucos*

Fairly common winter visitor.

26 were recorded during the Feb/Mar survey, with birds present at 16 sites. Most were recorded singly along river banks, and the only site to hold more than two was Kuri Beel with three. Only 12 were recorded in Apr/May, with one or two individuals present at eight sites.

(Common winter visitor).

Common Black-headed Gull *Larus ridibundus*

Scarce winter visitor.

Fourteen were recorded during the Feb/Mar survey: eight at Puala Beel (Hakaluki Haor) on 20 Feb, one over the Baulai River on 25 Feb, one at Pakertala Beel on 2 Mar and four at Baisha Beel (Dubriar Haor) on 5 Mar. Only one was observed in Apr/May: a slightly injured bird at Haor Khal on 25 Apr. This species is primarily a bird of the coastal zone in Bangladesh.

(Locally common winter visitor).

Brown-headed Gull *L. brunnicephalus*

Fairly common winter visitor and passage migrant.

185 were recorded during the Feb/Mar survey, with birds present at 19 sites. The largest concentration was 60 at Haor Khal (Hakaluki Haor) on 7 Mar. Numbers had increased considerably by late April, presumably because of an influx of migrants from the south. 408 were recorded during the second survey, with birds present at 18 sites. The largest concentration was 150 at the Tangua/Rauar *beels* on 22 Apr, but there were also 80 at Pasua Beel, 45 at Haor Khal, 35 at Aila Beel and 35 at Pakertala Beel. Many of the birds were in full breeding plumage, and probably on the point of departing for their breeding areas on the Tibetan Plateau.

(Common winter visitor).

Gull-billed Tern *Gelochelidon nilotica*

Probably a scarce passage migrant.

None was recorded during the two main surveys, but a party of seven was observed at Pasua Beel on 23 Mar during the Monthly Waterfowl Census. This appears to be primarily a coastal species in Bangladesh.

(Common winter visitor, non-breeders oversummering).

River Tern *Sterna aurantia*

Status uncertain; possibly a fairly common resident on large rivers in the west, but only an occasional visitor to the Haor Basin.

A party of five on the Kalni River on 26 Feb and five along the Someswari River on 1 Mar and 4 Mar were the only records during the two surveys, although three were observed at Pasua Beel on 23 Mar during the Monthly Waterfowl Census. This is very much a species of large rivers with extensive sand banks.

(Local breeding resident).

Common Tern *S. hirundo*

Passage migrant in small numbers.

Eight were recorded during the Mar/Apr survey: four over the Someswari River on 22 Apr, two at Majherbanda Beel on 29 Apr, and singles at Tural Beel on 30 Apr and Petangi Beel on 3 May.

(Scarce winter visitor, non-breeders oversummering. Not listed for the Northeast).

Black-bellied Tern *S. acuticauda*

Possibly a scarce resident on large rivers in the extreme west.

Not recorded during the present surveys. This is a species of sand banks in wide rivers (a habitat type not investigated during the present surveys), and may occur in small numbers along the Old Brahmaputra in the extreme west of the region.

(Very local breeding resident. Not listed for the Northeast).

Little Tern *S. albifrons*

Status uncertain; probably a scarce resident.

A single immature at Patachatal Beel (Maijeil Haor) on 8 Mar, and a pair at the same locality on 28 Apr were the only records.

(Scarce breeding resident. Not listed for northeast).

Whiskered Tern *Childonias hybrida*

Abundant winter visitor and possibly a breeding bird.

2,139 were recorded during the Feb/Mar survey, with birds present at 32 sites. The largest concentrations were 455 at Kawadighi Haor on 22 Feb, 435 along the Baulai River on 25 Feb and 350 at Pasua Beel on 4 Mar. Some individuals were beginning to show signs of their breeding plumage by early March.

1,597 were recorded during the Apr/May survey, with birds present at 37 sites. The highest counts were 440 along the Someswari River, 203 at Hail Haor, 150 at Haor Khal and 142 at Pingla Beel. The species was even more widespread than in Feb/Mar, and many birds were in full breeding plumage, but the only indication that breeding might be about to occur was at Petangi Beel, where a pair was observed showing courtship behaviour at a potential nest site on 3 May.

(Common winter visitor, nonbreeders oversummering).

White-winged Tern *C. leucopterus*

Rare passage migrant.

One was observed with a large flock of Whiskered Terns at Pingla Beel (Hakaluki Haor) on 30 Apr.

(Rare passage migrant. Not listed for the Northeast).

Indian Skimmer *Rhynchops albicollis*

Possibly a scarce passage migrant or winter visitor on large rivers in the west.

Not recorded during the present surveys. This is a species of sand banks in wide rivers (a habitat type not investigated during the present surveys), and may occur on passage and/or in winter along the Old Brahmaputra in the extreme west of the region.

(Local winter visitor. Listed for the East-central Region, but not for the Northeast).

CHECKLIST OF BIRDS RECORDED IN NORTHEASTERN BANGLADESH 18 FEB - 12 MAR AND 20 APR - 9 MAY 1992

The sequence and nomenclature follow Harvey (1990).

Little Grebe *Tachybaptus ruficollis*
Great Crested Grebe *Podiceps cristatus*
Great Cormorant *Phalacrocorax carbo*
Little Cormorant *P. niger*
Oriental Darter *Anhinga melanogaster*
Great Bittern *Botaurus stellaris*
Yellow Bittern *Ixobrychus sinensis*
Cinnamon Bittern *I. cinnamomeus*
Black Bittern *Dupetor flavicollis*
Black-crowned Night-Heron *Nycticorax nycticorax*
Little Heron *Butorides striatus*
Indian Pond Heron *Ardeola grayii*
Chinese Pond Heron *A. bacchus*
Cattle Egret *Bubulcus ibis*
Little Egret *Egretta garzetta*
Intermediate Egret *E. intermedia*
Great Egret *E. alba*
Grey Heron *Ardea cinerea*
Purple Heron *A. purpurea*
Asian Openbill *Anastomus oscitans*
Lesser Adjutant *Leptoptilos javanicus*
Black-headed Ibis *Threskiornis melanocephala*
White Spoonbill *Platalea leucorodia*
Fulvous Whistling Duck *Dendrocygna bicolor*
Lesser Whistling Duck *D. javanica*
Bar-headed Goose *Anser indicus*
Ruddy Shelduck *Tadorna ferruginea*
Common Shelduck *T. tadorna*
Cotton Pygmy Goose *Nettapus coromandelianus*
Eurasian Wigeon *Anas penelope*
Falcated Teal *A. falcata*
Gadwall *A. strepera*
Common Teal *A. crecca*
Mallard *A. platyrhynchos*
Spot-billed Duck *A. poecilorhyncha*
Northern Pintail *A. acuta*
Garganey *A. querquedula*
Northern Shoveler *A. clypeata*
Red-crested Pochard *Netta rufina*
Common Pochard *Aythya ferina*
Baer's Pochard *A. baeri*
Ferruginous Duck *A. nyroca*
Tufted Duck *A. fuligula*
Greater Scaup *A. marila*
Crested Honey-Buzzard *Pernis ptilorhynchus*
Black-shouldered Kite *Elanus caeruleus*
Black/Pariah Kite *Milvus migrans*
Brahminy Kite *Haliastur indus*
Pallas's Fish-Eagle *Halieetus leucoryphus*
Grey-headed Fish-Eagle *Ichthyophaga ichthyaetus*
Griffon Vulture *Gyps fulvus*
White-rumped Vulture *G. bengalensis*
Long-billed Vulture *G. indicus*
Crested Serpent-Eagle *Spilornis cheela*
Western Marsh Harrier *Circus aeruginosus*
Eastern Marsh Harrier *C. spilonotus*
Pied Harrier *C. melanoleucos*
Crested Goshawk *Accipiter trivirgatus*
Shikra *A. badius*
Lesser Spotted Eagle *Aquila pomarina*
Greater Spotted Eagle *A. clanga*
Steppe Eagle *A. nipalensis*
Changeable Hawk-Eagle *Spizaetus cirrhatus*
Osprey *Pandion haliaetus*
Eurasian Kestrel *Falco tinnunculus*
Northern Hobby *F. subbuteo*
Blue-breasted Quail *Coturnix chinensis*
Red Junglefowl *Gallus gallus*
Slaty-breasted Rail *Gallirallus striatus*
Common Moorhen *Gallinula chloropus*
Purple Swamphen *Porphyrio porphyrio*
Watercock *Gallicrex cinerea*
Eurasian Coot *Fulica atra*
Pheasant-tailed Jacana *Hydrophasianus chirurgus*
Bronze-winged Jacana *Metopidius indicus*
Greater Paintedsnipe *Rostratula benghalensis*
Black-winged Stilt *Himantopus himantopus*

Pied Avocet *Recurvirostra avosetta*
Oriental Pratincole *Glareola maldivarum*
Small Pratincole *G. lactea*
Little Ringed Plover *Charadrius dubius*
Kentish Plover *C. alexandrinus*
Mongolian Plover *C. mongolus*
Asiatic Golden Plover *Pluvialis fulva*
Grey Plover *P. squatarola*
Grey-headed Lapwing *Vanellus cinereus*
Red-wattled Lapwing *V. indicus*
Little Stint *Calidris minuta*
Temminck's Stint *C. temminckii*
Long-toed Stint *C. subminuta*
Dunlin *C. alpina*
Curlew Sandpiper *C. ferruginea*
Broad-billed Sandpiper *Limicola falcinellus*
Ruff *Philomachus pugnax*
Common Snipe *Gallinago gallinago*
Pintail Snipe *G. stenura*
Swinhoe's Snipe *G. megala*
Black-tailed Godwit *Limosa limosa*
Eurasian Curlew *Numenius arquata*
Spotted Redshank *Tringa erythropus*
Common Redshank *T. totanus*
Marsh Sandpiper *T. stagnatilis*
Common Greenshank *T. nebularia*
Green Sandpiper *T. ochropus*
Wood Sandpiper *T. glareola*
Common Sandpiper *Actitis hypoleucos*
Common Black-headed Gull *Larus ridibundus*
Brown-headed Gull *L. brunnicephalus*
River Tern *Sterna aurantia*
Common Tern *S. hirundo*
Little Tern *S. albifrons*
Whiskered Tern *Childonias hybrida*
White-winged Tern *C. leucopterus*
Rock Dove *Columba livia*
Collared Dove *Streptopelia decaocto*
Red Turtle Dove *S. tranquebarica*
Oriental Turtle Dove *S. orientalis*
Spotted Dove *S. chinensis*
Emerald Dove *Chalcophaps indica*
Pin-tailed Pigeon *Treron apicauda*
Wedge-tailed Pigeon *T. sphenura*
Yellow-footed Pigeon *T. phoenicoptera*
Vernal Hanging Parrot *Loriculus vernalis*
Rose-ringed Parakeet *Psittacula krameri*
Red-breasted Parakeet *P. alexandri*
Common Hawk-Cuckoo *Cuculus varius*
Indian Cuckoo *C. micropterus*
Common Cuckoo *C. canorus*
Grey-bellied Cuckoo *Cacomantis passerinus*
Plaintive Cuckoo *C. merulinus*
Violet Cuckoo *Chrysococcyx xanthorhynchus*
Drongo Cuckoo *Surniculus lugubris*
Common Koel *Eudynamys scolopacea*
Green-billed Malkoha *Rhopodytes tristis*
Greater Coucal *Centropus sinensis*
Lesser Coucal *C. bengalensis*
Brown Fish-Owl *Ketupa zeylonensis*
Asian Barred Owlet *Glaucidium cuculoides*
Spotted Owlet *Athene brama*
Large-tailed Nightjar *Caprimulgus macrurus*
House Swift *Apus affinis*
Asian Palm-Swift *Cypsiurus balasiensis*
Red-headed Trogon *Harpactes erythrocephalus*
White-throated Kingfisher *Halcyon smyrnensis*
Black-backed Kingfisher *Ceyx erithacus*
Common Kingfisher *Alcedo atthis*
Pied Kingfisher *Ceryle rudis*
Green Bee-eater *Merops orientalis*
Chestnut-headed Bee-eater *M. leschenaulti*
Blue-bearded Bee-eater *Nyctyomis athertoni*
Indian Roller *Coracias benghalensis*
Hoopoe *Upupa epops*
Lineated Barbet *Megalaima lineata*
Blue-throated Barbet *M. asiatica*
Coppersmith Barbet *M. haemacephala*
Speckled Piculet *Picumnus innominatus*
Lesser Yellownape *Picus chlorolophus*
Greater Yellownape *P. flavinucha*
Grey-headed Woodpecker *P. canus*
Greater Flameback *Chrysocolaptes lucidus*
Black-rumped Flameback *Dinopium benghalense*
Fulvous-breasted Woodpecker *Picoides macei*
Hooded Pitta *Pitta sordida*
Rufous-winged Bushlark *Mirafra assamica*
Short-toed Lark sp *Calandrella* sp
Oriental Skylark *Alauda gulgula*
Plain Martin *Riparia paludicola*
Sand Martin *R. riparia*
Barn Swallow *Hirundo rustica*
Red-rumped Swallow *H. daurica*

Paddyfield/Richard's Pipit *Anthus rufulus/richardi*
Olive Tree Pipit *A. hodgsoni*
Red-throated Pipit *A. cervinus*
Rosy Pipit *A. roseatus*
Forest Wagtail *Dendronanthus indicus*
Yellow Wagtail *Motacilla flava*
Yellow-hooded Wagtail *M. citreola*
Grey Wagtail *M. cinerea*
White Wagtail *M. alba*
Bar-winged Flycatcher-Shrike *Hemipus picatus*
Large Wood-shrike *Tephrodornis virgatus*
Black-faced Cuckoo-shrike *Coracina novaehollandiae*
Black-winged Cuckoo-shrike *C. melaschistos*
Scarlet Minivet *Pericrocotus flammeus*
Black-headed Bulbul *Pycnonotus atriceps*
Black-crested Bulbul *P. melanicterus*
Red-whiskered Bulbul *P. jocosus*
Red-vented Bulbul *P. cafer*
White-throated Bulbul *Criniger flaveolus*
Olive Bulbul *Hypsipetes viridescens*
Ashy Bulbul *H. flavala*
Common Iora *Aegithina tiphia*
Gold-fronted Leafbird *Chloropsis aurifrons*
Bluethroat *Erithacus svecicus*
Firethroat *E. pectardens*
Magpie Robin *Copsychus saularis*
White-rumped Shama *C. malabaricus*
Black Redstart *Phoenicurus ochruros*
Stonechat *Saxicola torquata*
Blue Whistling Thrush *Myiophonus caeruleus*
Orange-headed Thrush *Zoothera citrina*
Black-backed Forktail *Enicurus immaculatus*
Spotted Bush-Warbler *Bradypterus thoracicus*
Zitting Cisticola *Cisticola juncidis*
Rufescent Prinia *Prinia rufescens*
Common Tailorbird *Orthotomus sutorius*
Pallas's Warbler *Locustella certhiola*
Lanceolated Warbler *L. lanceolata*
Striated Warbler *Megalurus palustris*
Thick-billed Warbler *Acrocephalus aedon*
Blunt-winged/Paddyfield Warbler *A. concinens/agricola*
Blyth's Reed Warbler *A. dumetorum*
Black-browed Reed Warbler *A. bistrigiceps*
Clamorous Reed Warbler *A. stentoreus*
Golden-spectacled Warbler *Seicercus burkii*
Blyth's Leaf Warbler *Phylloscopus reguloides*
Greenish Warbler *P. trochiloides*
Inornate Warbler *P. inornatus*
Dusky Warbler *P. fuscatus*
Pale-chinned Flycatcher *Cyornis poliogenys*
Verditer Flycatcher *Muscicapa thalassina*
Dark-sided Flycatcher *M. sibirica*
Red-throated Flycatcher *Ficedula parva*
White-throated Fantail *Rhipidura albicollis*
Asian Paradise-Flycatcher *Tersiphone paradisi*
Black-naped Monarch *Hypothymis azurea*
Grey-headed Flycatcher *Culicicapa ceylonensis*
Puff-throated Babbler *Pellorneum ruficeps*
Abbott's Babbler *Trichastoma abbotti*
Buff-chested Babbler *Stachyris ambigua*
Grey-throated Babbler *S. nigriceps*
Striped Tit-Babbler *Macronous gularis*
Striated Babbler *Turdoides earlei*
Lesser Necklaced Laughingthrush *Garrulax monileger*
Greater Necklaced Laughingthrush *G. pectoralis*
Rufous-necked Laughingthrush *G. ruficollis*
Brown-cheeked Fulvetta *Alcippe poioicephala*
Nepal Fulvetta *A. nipalensis*
White-bellied Yuhina *Yuhina zantholeuca*
Great Tit *Parus major*
Velvet-fronted Nuthatch *Sitta frontalis*
Ruby-cheeked Sunbird *Anthreptes singalensis*
Purple-throated Sunbird *Nectarinia sperata*
Purple Sunbird *N. asiatica*
Crimson Sunbird *Aethopyga siparaja*
Little Spiderhunter *Arachnothera longirostris*
Pale-billed Flowerpecker *Dicaeum erythrorhynchos*
Plain Flowerpecker *D. concolor*
Scarlet-backed Flowerpecker *D. cruentatum*
Oriental White-eye *Zosterops palpebrosa*
Black-hooded Oriole *Oriolus xanthomus*
Asian Fairy Bluebird *Irena puella*
Brown Shrike *Lanius cristatus*
Long-tailed Shrike *L. schach*
Grey-backed Shrike *L. tephronotus*
Black Drongo *Dicrurus macrocercus*
Ashy Drongo *D. leucophaeus*
Bronzed Drongo *D. aeneus*
Lesser Racket-tailed Drongo *D. remifer*

Hair-crested Drongo *D. hottentottus*
Greater Racket-tailed Drongo *D. paradiseus*
Ashy Wood-Swallow *Artamus fuscus*
Green Magpie *Cissa chinensis*
Rufous Treepie *Dendrocitta vagabunda*
Grey Treepie *D. formosae*
House Crow *Corvus splendens*
Large-billed Crow *C. macrorynchos*
Chestnut-tailed Starling *Sturnus malabaricus*
Rosy Starling *S. roseus*
Asian Pied Starling *S. contra*
Common Myna *Acridotheres tristis*
Jungle Myna *A. fuscus*
Hill Myna *Gracula religiosa*
House Sparrow *Passer domesticus*
Eurasian Tree Sparrow *P. montanus*
Black-breasted Weaver *Ploceus benghalensis*
Streaked Weaver *P. manyar*
Baya Weaver *P. philippinus*
White-rumped Munia *Lonchura striata*
Scaly-breasted Munia *L. punctulata*
Chestnut Munia *L. malacca*
Black-faced Bunting *Emberiza spodocephala*
Chestnut-eared Bunting *E. fucata*
Yellow-breasted Bunting *E. aureola*

Annex K

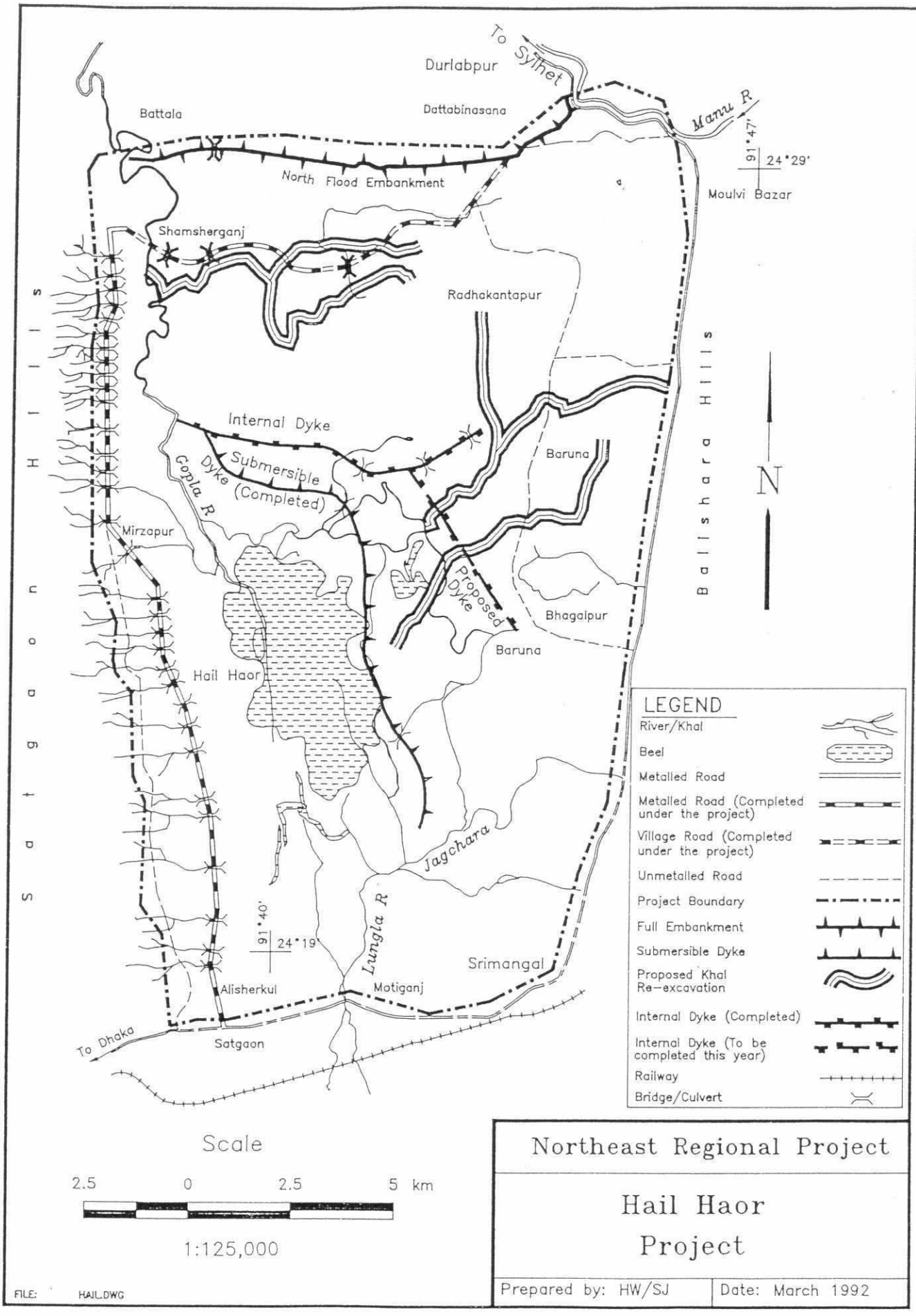
Other Wetland Birds of the Northeast Region of Bangladesh

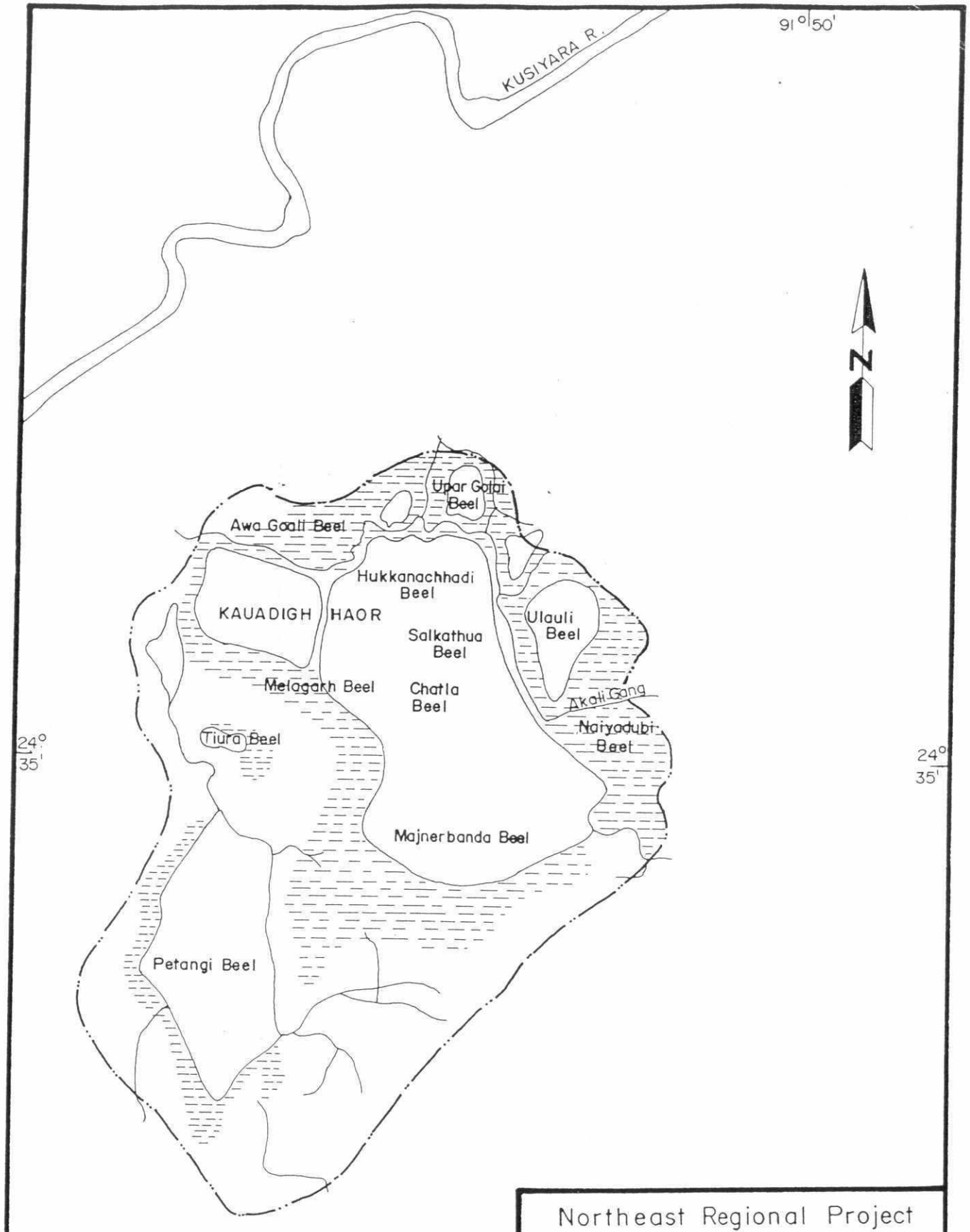
(IN PREP)

FIGURE 1: Key to sites visited during surveys

1. Old Brahmaputra River
2. Lower Baulai River
3. Lower Kalni River
4. Sankardanga Beel
5. Ratna Beel
6. Khowai River
7. Hail Haor
8. Hail Haor Fish Ponds
9. Petangi Beel
10. Majherbanda/Ulauli
11. Patachatal Beel
12. Borachatal Beel
13. Dubriar Beel
14. Baisha Beel
15. Chalnia Beels
16. Deodar Beels
17. Juri River
18. Kair Gang & *beel*
19. Haor Khal
20. Puala Beel
21. Pingla Beel
22. Chatla Beel
23. Tural Beel
24. Dulla Beel
25. Chakia Beel
26. Gharkuri Beel
27. Khakra Kuri Beel
28. Dubail Beel
29. Jugni Beel
30. Chunnia Beel
31. Erali Beel
32. Chapra, Singari etc.
33. Mehdi Beel
34. Deochapra Beel
35. Dabor Beel
36. Kuri Beel
37. Goraduba Beel
38. Dapha, Ruwa, Guinga
39. Jaor Beel
40. Surma River
41. Aila Beel
42. Pangna Beel
43. Karul Dhan Beel
44. Someswari River
45. Patnai Gang
46. Pasua Beel
47. Kecharia Beel
48. Kanamaiya Haor
49. Pakertala Beel
50. Bara Beel
51. Banuar Beel
52. Palair Beel
53. Pana Beel
54. Biaskhali Beel
55. Rauar Beel
56. Main Tangua Beel
57. West Tangua Beel
58. Two un-named *beels*
59. Ainna Beel
60. Ghaniakuri Beel
61. Arabiakona Beel
62. Un-named Beel
63. Samsar Beel
64. Uglar Beel
65. Meda Beel
66. Netrakona/Kaluma Kanda
67. Kendua area
68. Boraduba Beel

FIGURE 2
STATUS OF PROJECTS JUNE 1989


To Sylhet
Durlabpur
Battala
Dattabinasana
Manu R
91°47'
24°29'
Moulvi Bazar
North Flood Embankment
Shamsherganj
Radhakantapur
Internal Dyke
Submersible Dyke (Completed)
Gopla R
Baruna
Mirzapur
Proposed Dyke
Bhagalpur
Baruna
Hail Haor
Jagchara
91°40'
24°19'
Lungla R
Srimangal
Alisherkul
Motiganj
To Dhaka
Satgaon
Satgaon Hills
Ballishara Hills
N
LEGEND
River/Khal
Beel
Metalled Road
Metalled Road (Completed under the project)
Village Road (Completed under the project)
Unmetalled Road
Project Boundary
Full Embankment
Submersible Dyke
Proposed Khal Re-excavation
Internal Dyke (Completed)
Internal Dyke (To be completed this year)
Railway
Bridge/Culvert
Scale
2.5 0 2.5 5 km
1:125,000
FILE: HAIL.DWG
Northeast Regional Project
Hail Haor Project
Prepared by: HW/SJ
Date: March 1992



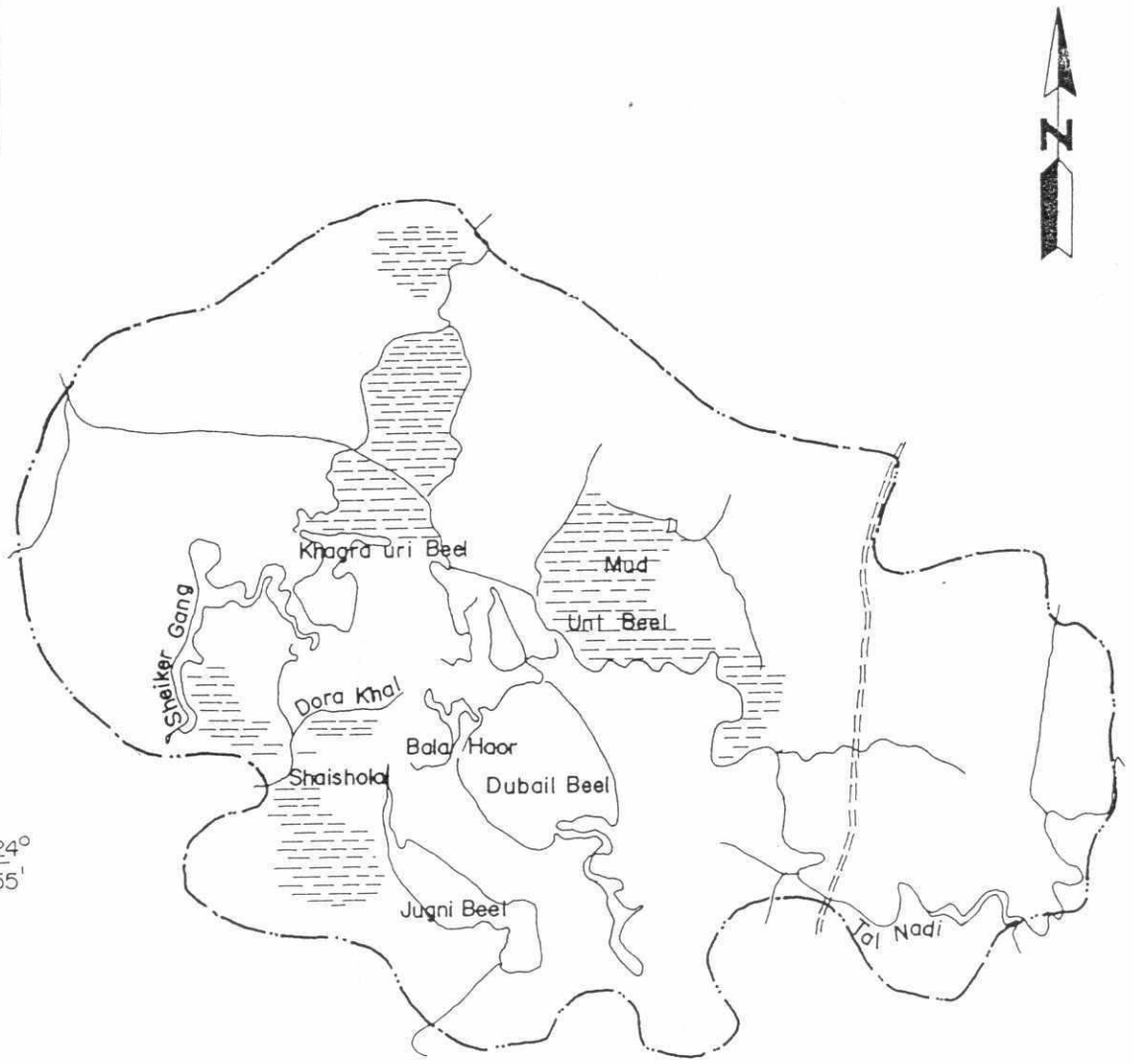
Northeast Regional Project

Kawadighi Haor

Prepared by:	Date : May 1992


92°05'
24°40'
24°40'
N
Kalikrishnapur Lamba Beel
Niral Beel
Nayabasti
Puala Beel
Dudhal Beel
Mayajuri Beel
Sonai R.
Kair R.
Pulubhanga Beel
Tekoni Beel
Mud
Gabha Beel
Mud
Baghakuri Beel
Balijuri Beel
Barajala Beel
Parjala Beel
Charua Beel
Kukurdubi Beel
Katue Beel
Bahiya Beel
Charua Beel
Galua Beel
Bhitar Beel
Digha Beel
Mada Beel
Ranthi Beel
Aramdinga Beel
Pinglarkona Beel
Kalapani Beel
Turat Beel
Chinaura Beel
Prani Beel
Dulla Beel
Abanya Beel
Chatal Beel
Chakia Beel
Tural Beel
Mud
Mud
Gharkuri Beel
Northeast Regional Project
Hakaluki Haor
Prepared by:
Date : May 1992

92° 20'



24° 55'

24° 55'

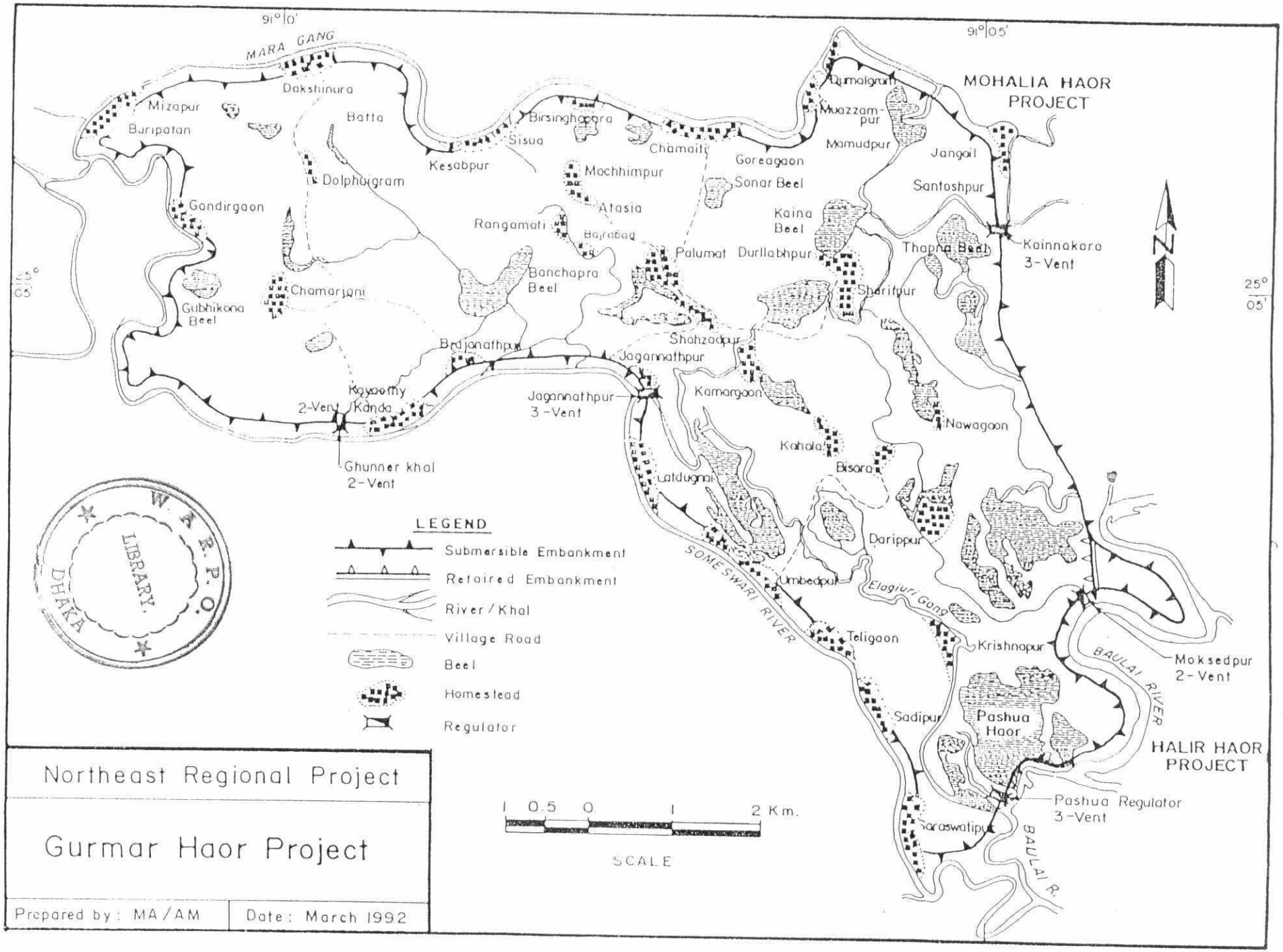
92° 20'

Northeast Regional Project

Balai Haor

Prepared by:

Date : May 1992


91°10'
91°05'
MARA GANG
MOHALIA HAOR PROJECT
Dakshinura
Mizapur
Buripatan
Batta
Birsinghapara
Sisua
Chamaili
Kesabpur
Mochhimpur
Dolphuigram
Gandirgaon
Atasia
Rangamati
Bajrabag
Goreagaon
Sonar Beel
Kaina Beel
Durllabhpur
Palumat
Banchapra Beel
Chamarjani
Gubhikona Beel
Brajanathpur
Shahzadpur
Jagannathpur
Kamargaon
Jagannathpur 3-Vent
Kayaorthy Kanda 2-Vent
Ghunner khal 2-Vent
Kahalia
Bisara
Latdugnai
Nawagaon
Sharifpur
Thapna Beel
Kainnakara 3-Vent
Santoshpur
Jangail
Mamudpur
Muazzampur
Durmalgram
25° 05'
SOMESWARI RIVER
Darippur
Umbedpur
Elagiuri Gong
Teligaon
Krishnapur
BAULAI RIVER
Moksedpur 2-Vent
Sadipur
Pashua Haor
HALIR HAOR PROJECT
Pashua Regulator 3-Vent
Saraswatipur
BAULAI R.
LEGEND
Submersible Embankment
Retained Embankment
River / Khal
Village Road
Beel
Homestead
Regulator
1 0.5 0 1 2 Km.
SCALE
Northeast Regional Project
Gurmar Haor Project
Prepared by : MA / AM
Date : March 1992
W A R P O
LIBRARY
DHAKA