
FLOOD ACTION PLAN
NORTHEAST REGIONAL WATER MANAGEMENT PROJECT
(FAP 6)

WETLAND RESOURCES
SPECIALIST STUDY

DRAFT FINAL

April 1993

Shawinigan Lavalin (1991) Inc.
Northwest Hydraulic Consultants

in association with

Engineering and Planning Consultants Ltd.
Bangladesh Engineering and Technological Services
Institute For Development Education and Action
Nature Conservation Movement

Canadian International Development Agency

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ACRONYMS AND ABBREVIATIONS

AWB	Asian Wetland Bureau
BCAS	Bangladesh Centre for Advanced Studies
CIDA	Canadian International Development Agency
IUCN	International Union for the Conservation of Nature
IWRB	International Waterfowl and Wetland Research Bureau
MMP	NERP Monthly Wetland Monitoring Programme
NACOM	Nature Conservation Movement
NCS	National Conservation Strategy
NEMAP	National Environment Management Action Plan
NERP	Northeast Regional Water Management Project
NGO	Non-governmental organization
WWF	Worldwide Fund for Nature (formerly World Wildlife Fund)

GLOSSARY OF TERMS

English Terms

Biodiversity	Variability among living organisms from all sources including <i>inter alia</i> terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are a part; diversity within species, between species and of ecosystems (Convention on Biodiversity, 1992).
Ecosystem	Dynamic complex in which plant, animal and microorganism communities and their non-living environment interact as a functional unit (Convention on Biodiversity, 1992).
Emergent vegetation	Rooted aquatic plants standing in water with vegetation above the water surface.
Law	Main tools by which policies are implemented.
Legislation	The aggregation of laws enacted by legislative authorities of a country over time, plus common and customary laws that have accumulated respectively through judicial or traditional practice.
Policy	Principles that govern action toward given ends. A statement of agreed upon courses to be adopted and followed.
Wildlife	Most generally, organisms living in a natural state. The legal definition in Bangladesh restricts it to (<u>Bangladesh Wildlife (Preservation) (Amendment) Act 1974</u>) vertebrate species, other than humans, fish, and usually domesticated animal species, and including the eggs of birds and reptiles.
Wetland	An area of land saturated with or submerged under water. Legal definitions can vary from country to country. The term is not defined in any domestic legislation in Bangladesh. Rec. C.4.7 of the Conference of the Contracting Parties to the Ramsar Convention identifies 36 broad types, 26 of which are natural or semi-natural and 10 man-made.
Wetland values	All valued products and services derived from wetlands, such as food, fodder, fuel, medicines, flood storage, water purification, and so on.

Bangla Terms

<i>Beel</i>	Permanent shallow lake.
<i>Haor</i>	River backswamp.
<i>Kanda</i>	Ridges that are higher than the <u>haor</u> basin but lower than homestead land.
<i>Khal</i>	Small drainage channel.

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1. INTRODUCTION

1.1 Purpose

The overall goal with respect to wetlands of North East Regional Water Management Project (NERP), Item 6 of the Flood Action Plan (FAP-6), is to support improved wetland management in the Northeast Region of Bangladesh, focusing particularly on links with water resources planning and development. In support of this goal, the NERP Wetland Resources Subteam prepared this report:

- to characterize the region's wetlands and their values;
- to identify driving forces, issues, strengths, weaknesses, opportunities, and threats to the region's wetlands;
- to establish wetland management objectives, so that these can be incorporated, as far as is appropriate, into overall regional development objectives; and
- to identify key wetland management initiatives for further pre-feasibility study and possible inclusion in the Regional Plan.

1.2 Organization and Relationship to Regional Plan

This report is organized into a main section of eight chapters and four annexes. The organization of the main section parallels the regional planning process and Regional Plan main volume outline, to allow straightforward incorporation of wetland driving forces, issues, and so forth into their regional analogues. The annexes provide more detailed information that is oriented toward readers with specific technical interests. A companion data report is to be released later, to a limited circulation.

1.3 Relationship to Previous Reports

This report (main report plus annexes) plus the data report incorporates the findings of and supersedes all previous reports of the NERP wetland subteam.

NOTE: This status of this version of this report is DRAFT FINAL. The FINAL version will be issued by Sep/Oct 93. COMMENTS APPRECIATED.

1.4 Scope of Study and Related Studies

The description, analysis, and proposals presented here are based largely on a study of the wetlands of the Northeast Region that was undertaken during the period December 1991 to May 1993, as part of the North East Regional Water Management Project (NERP). The study focused on

- wetland appraisal and identification of key sites,
- wild wetland plants, including trees,
- waterfowl and wetland-dependent birds,

- wetland wild life, and
- wetland seasonal changes.

Observations of wetland utilization and management were integrated into each of these areas.

Other NERP Subteams in Fisheries, Agriculture, Sedimentation, Hydrology/Geohydrology, Social Anthropology, Water Resources, and Economics covered these other aspects of the region and, in cooperation with the Wetland Subteam, its wetlands. Most of these groups are reporting their findings in their own Specialist Studies.

Relevant information from these disciplines has been incorporated here where appropriate. The focus in this report remains on wild animals and plants and their utilization and management. This bias does not imply a purely conservationist perspective, as these wetland elements do have value to human society both directly and indirectly as indicators of ecological functioning in a wider sense.

1.5 NERP Wetland Subteam

The NERP Wetland Subteam consists of:

Field Research Team, Nature Conservation Movement

Anisuzzaman Khan	<i>Project Coordinator/Wildlife Study Leader</i>
Dr. Salar Khan	<i>Flora Advisor</i>
Dr. Ansar Karim	<i>Flora Study Leader</i>
S.M.A. Rashid	<i>Ornithology Study Leader/Wildlife Biologist</i>
Istiak Sobhan	<i>Flora Researcher</i>
Abu Saeed	<i>Ornithologist</i>

Wetland Appraisal and Main Ornithology Surveys

Dr. Derek Scott, International Waterfowl and Wetlands Research Bureau

Environment Specialist

Dr. Sara Bennett, SLI/NHC Joint Venture

2. STUDY OVERVIEW

2.1 Rationale

The focus of these wetland studies is on wild wetland plants, waterfowl, wetland-dependent birds, wild animals (wild life), and on wetland seasonal changes at the most important ("key") wetland sites in the region. Utilization and management of these wetland resources is an area of especial interest. The rationale for this approach was:

- There are severe constraints - financial, institutional, social, demographic - to improved wetland management. Under these circumstances, we felt that a strategic approach (focusing on the most important wetlands) would have a greater likelihood of success than a comprehensive approach (preparing basic inventory and baseline data of "all" the region's wetlands).
- Other NERP Subteams in Fisheries, Agriculture, Sedimentation, Hydrology/Geohydrology, Social Anthropology, Water Resources, and Economics covered these other aspects of the region. Given this organizational setting, the Wetland Subteam chose to focus its field research efforts on those wetland values (wild wetland plants, waterfowl, wetland-dependent birds, wild life, and wetland seasonal changes) not being studied by any other NERP subteam, using the wetland system as the reference frame.

2.2 Limitations

This approach has, in the main, served us well. The limitations during the preparation of the draft final Specialist Study (Aug 91 to Apr 93) were:

- Contact with other NERP subteams to exchange information on wetland values was limited. *Comment:* During this timeframe (Aug 91 to Apr 93), some contact between subteams did occur within the NERP FCDI project monitoring activity (one of the monitored projects, Manu River Project, also contains a key wetland site, Kawadighi Haor), as well as informally in the field and in the office; more would have been desirable. During the period Jan 93 to Jun 93, prefeasibility studies of all proposed initiatives are being prepared by multi-disciplinary teams; this should afford opportunities for inter-disciplinary exchange on the most important issues.
- Limited investigation of water quality considerations during the main wetland field work. *Comment:* Water quality has been independently identified as a concern by the hydrology/geohydrology, social anthropology, fisheries, and wetland subteams. As a result, a potential initiative to address water quality monitoring and management was identified, and a Canadian Water Quality Specialist mobilized in Apr 93. The results of this mission will be reported elsewhere.
- Limited investigation of gender aspects of wetland resource management and utilization. *Comment:* It is reasonably clear that common-property wetlands, absent distorting interventions, exhibit progressive socioeconomic distribution of benefits (benefits go mainly to the rural poor), and our impression is that poor women and children are at

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least equitably represented among the beneficiaries. The study did not quantify benefits nor their distribution, however. This remains for future studies.

2.3 Objectives of Field Studies

The objectives of the field studies were:

- ***Wetland appraisal and identification of key sites.*** Make a regional overview of wetlands based on available information and field visits, noting the overall condition and status of wetland values. Identify those wetlands of greatest value, using extent, type, and quality of habitat and waterfowl as indicators, and paying particular attention to habitat for threatened or internationally-migrating animal and plant species, and examples of unique or threatened habitat types.
- ***Characterization of key sites.*** At the identified key sites and at other selected sites, produce basic assessments of biological resources (specifically, amphibians, reptiles, birds, mammals, and macrophytes) and of the utilization of natural products (food, fodder, building material, and so on). Outputs to include species checklists, classification of habitats, and so on, cross-referenced to sites.
- ***Identification of areas of concern.*** In the course of field studies, identify areas of concern as a preliminary basis for the regional analysis (driving forces, issues, strengths, weaknesses, opportunities, threats, and objectives). Formulate, on a preliminary basis, ideas for potential initiatives.

2.4 Methodology

The field studies had five components:

1. ***Wetland appraisal and major ornithology surveys.*** Two regional surveys, including ground surveys of 63 sites and three aerial surveys.
2. ***Floral studies.*** Five field visits, once every two months for ten months to 19 sites.
3. ***Wild life studies.*** Three field visits (pre-monsoon, monsoon, and post-monsoon) to the six key wetland sites.
4. ***Monthly surveys of seasonal ornithological and other changes.*** Twelve field visits, once a month for twelve months to 15 sites. Visits one and three were combined with the two wetland appraisal surveys.

2.4.1 Wetland appraisal and main ornithology surveys

Rationale

Prior information on all but the two best known sites, Hail Haor and Hakaluki Haor, was very fragmentary, and good quantitative data on the basin's waterfowl populations was almost completely lacking. Thus it was felt that the most urgent need initially was for rapid field surveys of the region, covering as many wetlands as possible.

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This reconnaissance focused on the importance of the wetlands as habitat for waterfowl, for two reasons. First, the waterfowl of the Northeast Region are of interest in their own right, due to their large numbers and the fact that the basin is part of a major international flyway. Second, 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 biodiversity conservation. Absence of large numbers of waterfowl does not however mean that a site has little value. Sites may exist in the haor basin that are of negligible importance for birds but of outstanding limnological or botanical interest (for example, sites with endemic aquatic invertebrates or threatened species of aquatic plants). Detailed limnological and botanical surveys throughout the region would be required to identify such sites.

Site evaluation

The evaluation of sites was based on criteria developed in relation to the Ramsar Convention (Tables 2.1a and 2.1b; information taken from the *Explanatory Note and Guidelines* that accompany the official *Ramsar Information Sheet*). These criteria, which are now widely recognized as a sound basis for the identification of "wetlands of international importance", are appropriate for use in Bangladesh which became a Contracting Party to the Convention in 1992.

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".

Timing of surveys

Two surveys were carried out, one during late winter (dry season) between 18 Feb and 12 Mar 1992 and one during late spring (pre-monsoon period) between 19 Apr and 9 May 1992. 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. 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.

Two surveys is the minimum number needed to assess the importance of wetlands for resident and migratory waterbirds: one during the mid-winter period to assess sites used as wintering areas by migratory species that breed at more northerly latitudes; and another during the main breeding season to assess sites used by resident breeding birds and any breeding summer visitors that spend the winter further south. Also, one of these surveys should be when water levels are at their lowest, to allow critical dry season refuges for waterfowl to be identified, given that water levels fluctuate widely and extensive desiccation occurs during the annual dry season. Finally, it was also clearly important for NERP to conduct a survey during the pre-monsoon period, since many existing and 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.

A survey at the time of maximum flooding is usually less important, as at that time there is an abundance of wetland habitat available, the birds themselves are widely scattered, and it is often difficult to pinpoint the important areas.

Table 2.1a: Ramsar Convention Criteria for Wetlands
of International Importance

Ramsar Convention

The Ramsar Convention states that:

"Each Contracting Party shall designate suitable wetlands within its territory for inclusion in a 'List of Wetlands of International Importance.' - Article 2.1

"In the first instance, wetlands of international importance to waterfowl at any season should be included. . . [and also wetlands of] international significance in terms of ecology, botany, zoology, limnology, or hydrology." - Article 2.2

Montreux Conference of the Contracting Parties

Criteria for identifying wetlands of international importance were subsequently formulated and approved at the Montreux Conference of the Contracting Parties (Montreux Proceedings, Vol.1, Annex I, Rec. C.4.2 (Rev.)).

Criteria

A wetland is identified as being of international importance if it meets at least one of the criteria set out below:

1. *Criteria for representative or unique wetlands.* A wetland should be considered internationally important if:
 - a. It is a particularly good representative example of a natural or near-natural wetland, characteristic of the appropriate biogeographical region; or
 - b. It is a particularly good representative example of a natural or near-natural wetland, common to more than one biogeographical region; or
 - c. It is particularly good representative example of a wetland which plays a substantial hydrological, biological or ecological role in the natural functioning of a major river basin or coastal system, especially where it is located in a trans-border position; or
 - d. It is an example of a specific type of wetland, rare or unusual in the appropriate biogeographical region.
2. *General criteria based on plants or animals.* A wetland should be considered internationally important if:
 - a. It supports an appreciable assemblage of rare, vulnerable or endangered species or subspecies of plant or animal, or an appreciable number of individuals of any one or more of these species; or
 - b. It is of special value for maintaining the genetic and ecological diversity of a region because of the quality and peculiarities of its flora and fauna; or
 - c. It is of special value as the habitat of plants or animals at a critical stage of their biological cycle; or
 - d. It is of special value for one or more endemic plant or animal species or communities.
3. *Specific criteria based on waterfowl.* A wetland should be considered internationally important if:
 - a. It regularly supports 20,000 waterfowl; or
 - b. It regularly supports substantial numbers of individuals from particular groups of waterfowl, indicative of wetland values, productivity or diversity; or
 - c. Where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl.

Table 2.1b: Ramsar Criteria (continued)

Guidelines for Application of the Criteria

To assist Contracting Parties in assessing the suitability of wetlands for inclusion on the List of Wetlands of International Importance, the Conference of the Contracting Parties has formulated the following guidelines for application of the Criteria:

- a. A wetland could be considered of international importance under Criterion 1 if, because of its outstanding role in natural, biological, ecological or hydrological systems, it is of substantial value in supporting human communities dependent on the wetland. In this context, such support would include:
 - provision of food, fibre or fuel;
 - or maintenance of cultural values;
 - or support of food chains, water quality, flood control or climatic stability. The support, in all its aspects, should remain within the framework of sustainable use and habitat conservation, and should not change the ecological character of the wetland.
- b. A wetland could be considered of international importance under Criterion 1, 2 or 3 if it conforms to additional guidelines developed at regional (e.g. Scandinavian or West African) or national level. Elaboration of such regional or national guidelines may be especially appropriate:
 - Where particular groups of animals (other than waterfowl) or plants are considered more suitable as a basis for evaluation; or
 - Where waterfowl and other animals do not occur in large concentrations (particularly in northern latitudes);
 - or where collection of data is difficult (particularly in very large countries).
- c. The "particular groups of waterfowl, indicative of wetland values, productivity or diversity" in Criterion 3(b) include any of the following:
 - loons or divers: **Gaviidae**;
 - grebes: **Prodicipedidae**;
 - cormorants: **Phalacrocoracidae**
 - pelicans: **Pelicanidae**
 - herons, bitterns, storks, ibises and spoonbills: **Ciconiiformes**;
 - swans, geese and ducks (wildfowl): **Anatidae**;
 - wetland related raptors: **Accipitriformes** and **Falconiformes**
 - cranes: **Gruidae**
 - shorebirds or waders: **Charadrii**; and
 - terns: **Sternidae**.
- d. The specific criteria based on waterfowl numbers will apply to wetlands of varying size in different Contracting Parties. While it is impossible to give precise guidance on the size of an area in which these numbers may occur, wetlands identified as being of international importance under Criterion 3 should form an ecological unit, and may thus be made up of one big area or a group of smaller wetlands. Consideration may also be given to turnover of waterfowl at migration periods, so that a cumulative total is reached, if such data are available.

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Fortunately, the two surveys undertaken by NERP met most of these requirements. 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. 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.

Surveys at the height of the spring and autumn migration seasons to assess sites used as staging areas for migratory waterfowl, on their way between southern wintering and northern breeding areas, are also highly desirable. These were carried out later, as part of the Monthly Ornithology Surveys (see below).

Ground surveys

Most wetlands in peripheral areas of the basin were visited by ground transport. 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 Feb/Mar 92 survey and 51 during the Apr/May 92 survey (48 sites were visited during both surveys). Most of the 12 sites visited in Feb/Mar 92 but not in Apr/May 92 were rather small, isolated and relatively unimportant beels in the Habiganj, Netrokona and Mymensingh areas. Together, these sites held less than 6% of the waterfowl recorded during the Feb/Mar 92 survey.

Aerial surveys

The aerial surveys focused on the large areas in the deeper, central portion of the haor basin, particularly along the lower Baulai and Kalni Rivers and 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), which are far from the nearest vehicular access and, by the end of the dry season, inaccessible by boat. These were surveyed by air on 25 and 26 February and again on 9 May in a Cessna 182 on hire from Dhaka Flying Club. Many of the 63 sites visited on the ground were also surveyed from the air. The first day of aerial survey covered the central portion of the haor basin along the lower Baulai River; 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); and the third, in early May, covered the same areas along the lower Baulai and Kalni rivers, plus the Surma River between Sylhet and Sunamganj, and the important Aila Beel complex.

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.

A list of the sites visited and survey itineraries are given in Annex A.

Coverage and limitations

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 of Asian Wetlands* (Scott, 1989): eight of these were visited during both surveys, and the other two once each (Meda Beel during the Feb/Mar 92 survey and Aila Beel during the Apr/May 92 survey).

Only a tiny fraction of the 6,300 or so beels in the Northeast Region could be visited, but it soon became apparent that the great majority of these 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. Karchar, Joalbangha, Angurali or Shanir Haors, west of Sunamganj, were not visited during this part of the study; all but Joalbangha were however visited on a casual basis during the Monthly Monitoring Programme surveys, and Kaluma Kanda was visited during the Oct 92 wild life 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 give only a general impression of abundance for hard-to-count inconspicuous, secretive, or widely dispersed species. 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.

Other habitat types

Although these surveys 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 Moulvibazar and Srimangal.

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, and so on). 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 B. The counts made during the late winter survey have been submitted to IWRB for inclusion in the 1992 Asian Waterfowl Census Report and in the Asian Waterfowl Database maintained at IWRB Headquarters in the U.K. Copies of the original count data also remain on file at the NERP offices in Dhaka.

Investigators

The two principal investigators were Dr. Derek Scott (IWRB/AWB) and S.M.A. Rashid (NACOM). Dr. Scott is primarily an ornithologist with extensive experience in wetland assessment; he is the editor of the *Directory of Asian Wetlands*, and designer of the Ramsar data sheet. Mr. Rashid (M.Sc. Ecology, University of Kent 1991) has extensive experience in Bangladesh wetlands as both an ornithologist and wildlife biologist with particular interest in herpetology.

2.4.2 Floral studies

Rationale

The *Directory of Asian Wetlands* (Scott, 1989) and *Aquatic Angiosperms of Bangladesh* (Khan, 1987) provide preliminary lists of plants for some of the wetlands of the Northeast Region, but a full account of the region's plants with proper taxonomic identification is lacking.

The objective of the study was to provide a general assessment of wetland plant diversity of the Northeast Region, by studying a variety of sites representative of the complex ecological systems in the region; recognizing in particular the range and importance of human interventions.

Timing of surveys

Five field visits were made every other month from May 1992 to February 1993. During each visit, a set of 19 beel sites in nine different haor systems were visited (Annex A). Staff resources for each visit were 21 person-days or approximately one day per site.

Sample identification and preservation

Most of the plants were identified in the field. Samples of all plants, both those that could and could not be identified in the field, were collected. Two sets of samples were dried, pressed, identified, and preserved in the National Herbarium. Another set of aquatic macrophytes were preserved in formaldehyde, acetic acid, propionic acid, and glycerin mixed with water in various proportions and stored in the NERP field station in Moulvibazar.

Data collection and analysis

In each beel at each visit, the occurrence, abundance and phenology (relations between environmental and biological cycles) of plant species were recorded based on visual estimation.

Interviews were conducted with local people regarding utilization of plants. Abundance assessment was subjective, into four abundance rankings:

- *Abundant*: species appeared to be dominant
- *Common*: species appeared to be common throughout but not dominant
- *Rare*: species found but not common
- *Absent*: species not found

Structural characteristics of plant communities were analyzed on the basis of qualitative data of species abundance in each site. The relative ecological complexity of each site was estimated from this data, in conjunction with data on resource utilization.

Limitations

Quantitative techniques were not used, nor were relationships between vegetation and environmental variables explored. Diversity index and productivity, highly desirable parameters for resource management, were not determined; this would require more rigorously defined quantitative field surveys, and repeated field studies would be required for a high degree of confidence to be achieved.

Investigators

The two principal investigators were Dr. Ansar Karim (Associate Professor of Botany/Plant Ecology, Chittagong University) and Istiak Sobhan (M.Sc. Botany, Dhaka University). Dr. Salar Khan, founder-director of and honorary advisor to the National Herbarium, provided crucial support in the area of plant identification.

2.4.3 Monthly Monitoring Programme (MMP)

Rationale

In the wetlands, water levels and patterns of human activity are changing throughout the year. At the same time, each species/community of plant, waterbird, and wildlife has its own requirements for reproduction, migration, and so on. If we want to improve the management of wetland biological resources, we need an understanding of the relationships between external conditions and species requirements throughout the year.

Clearly, this is an ambitious undertaking. Intuitively, one would start with the readily observable parameters first. With the resources available to us, we chose to focus particularly on waterfowl distributions and related data such as water level, disturbance events such as fishing and hunting. Other data (on for example, wild life) was also collected on an opportunistic basis.

Timing of surveys and data collected

Visits were made to 15 wetlands during the last ten days of each month for one full year. As far as possible, the same individuals visited each month, covering the same area. All waterbirds were counted, and all evidence of breeding and migration was recorded. Information was also

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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 was recorded on standardized data sheets (Annex B).

Site selection

The fifteen sites selected for the monthly ornithology/ecology study are listed in Annex A. An indication is given of the nature of each wetland and its status with respect to flood control, drainage and irrigation projects. The criteria for site selection were:

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

The fifteen sites selected 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. The fifteenth site is a totally artificial group of fish ponds within a privately-constructed full-flood embankment.

Coverage

An indication of the effectiveness of the Monthly Monitoring Programme 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. During the Feb/Mar 92 survey, the 15 Monthly Monitoring Programme sites held 66% of the waterfowl recorded during the entire survey, while in Apr/May 92, 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.

Data analysis

Monthly variation in waterfowl population by number of species and number of individuals, in the aggregate, and at each site, was plotted against time. Water level was also plotted as a function of time. Timing of disturbance events (fishing, hunting) was noted and compared to fluctuations in waterfowl numbers.

Waterfowl migration through the region was analyzed — the arrival and departure of winter visitors, the occurrence of passage migrants in spring and autumn, and the arrival and departure of summer visitors. Breeding seasons of waterbirds in the region were also analyzed. 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.

Interesting observations (threatened species and so on) were noted and logged separately.

2.4.4 Wildlife studies

Rationale

A better understanding of wildlife was required to assess the contribution of this resource to society and to determine the effect of development interventions. There was little information on the wetland wildlife of the region.

Data Gathering

Field surveys were undertaken at each of the six key sites during the pre-monsoon, monsoon, and post-monsoon periods. During the field work, information was collected and recorded through observations as well as discussions with local people. In addition, specimens were collected and preserved for later submission to the National Museum. The field information was supplemented with a literature review.

Data included:

- a check list of amphibians, reptiles, and mammals of the region; and,
- information on the exploitation and dependence of people on wetland animals.

Investigators

The two principal investigators were Mr. Anis-uz-zaman Khan and S.M.A. Rashid. Mr. Khan is a wildlife biologist who is also President of the NGO — Nature Conservation Movement. Mr. Rashid is a wildlife biologist specializing in animal ecology. Both have extensive field experience in Bangladesh.

2.5 Related and Ongoing Investigations

There are several related and on-going investigations. These are summarized in Table 2.2.

2.2: Ongoing Activities and Programs

Study Title	Institution	Status
Study on Wetland Biodiversity at Hail Haor	Wildlife Society of Bangladesh with support from WWF (USA)	Started in May 1992. Scheduled for completion May 1993. Has been extended through Apr 1994.
Hakaluki Haor of International Importance	IUCN — Part of the program related to the National Conservation Strategy (NCS)	A proposal has been prepared to develop a management plan.
Asian Waterfowl Census	AWB, IWRB, and NACOM	Annual event — carried out each January since 1987.

3. INTERPRETIVE DESCRIPTION OF THE REGION'S WETLANDS

3.1 Overview

3.1.1 The 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 (Figure 1). 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, Kushiya, 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.

A large number of water resources development projects have been constructed and still more are proposed for the region (Figure 2). Existing projects are described in the NERP Water Resources Thematic Study.

3.1.2 The wetlands of the Northeast Region

Physical configuration

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.

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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, Ganeshar, Tolar, Anganer, Bara, and Humaipur Haors, in the south of the basin.
- Etna and Sania Haors, Kishorganj district.
- Khaliaghuri Haor, east Mymensingh.

Current conditions

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 to 150,000 ducks, and provide a refuge for many other species of wildlife which are becoming increasingly rare elsewhere in Bangladesh.

Natural history

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. Swamp forest, dominated by *Barringtonia*, *Pongamia*, and other flood-tolerant tree species, would have covered the river levees, and provided a secure refuge for terrestrial wildlife during the monsoon floods. On higher ground, this would have given way to scrub jungle and dense stands of bamboo.

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

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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 almost completely disappeared. Vast areas of the seasonally flooded plains have been converted to rice monoculture, 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, 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 swamp forests, scrub jungle, bamboo thickets and dense stands of reeds 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 would once have appeared by visiting comparable areas in neighbouring countries where these ecosystems 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 Rhinoceros *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.

Recent events

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. Petersburg (at that time Leningrad) in Sep 1968. 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 1974 (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

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ongoing studies in the region be expanded with a view to the development of a regional wetland management plan.

Directory of Asian Wetlands

Two years prior to the NERP study, the wetlands of the haor basin were described in the *Directory of Asian Wetlands* (Scott, 1989). The *Directory's* information on the wetlands of Bangladesh 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 *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 Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat.

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. 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 *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.

Other literature

Most of the published literature on the region, especially the earlier material, consists mainly of anecdotal information and descriptions of specimens collected in the area. These materials are discussed below under the appropriate resource subsystem (flora, water fowl, wild life). A more recent and detailed account of the wetland ecosystems of the haor basin is given by Syed Iqbal Ali (1990).

3.2 Wetland Appraisal

3.2.1 Classification

The wetlands of the Northeast can be classified as follows:

- A *Wetlands of international importance.* These are large sites comprised of either a single large beel (Hail Haor) or a group of beels that are of outstanding importance for wildlife and retain 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 (Tables 2.1a and 2.1b) for identifying wetlands of international importance. These give prominence to overall importance for wildlife, especially waterfowl, and characteristics such as representativeness, uniqueness, high ecological diversity, and presence of threatened species.

- B** *Wetlands of national importance.* 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. Sites which narrowly fail to qualify as internationally important under the Ramsar criteria would appear in this category. Official criteria to define wetlands of national importance do not exist in Bangladesh.
- C** *Other wetlands.* 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.

The major haor systems and the individual sites within them are ranked into one of these three categories in Table 3.1. Note that the ranking is never absolute: a site would *increase* in rank if additional information documenting its value becomes available, and would *decrease* in rank if its ecological character were significantly compromised.

3.2.2 Wetlands of international importance (A sites)

Six systems were identified as of outstanding national and international importance for their nature conservation values. They are:

1. Tangua Haor.
2. Pashua Beel, Gurmar Haor.
3. Hakaluki Haor.
4. Hail Haor.
5. Balai Haor.
6. Kawadighi Haor.

Annex C presents full information on each of these sites, in the format agreed to by the Contracting Parties to the Ramsar Convention for documenting Ramsar sites. Should the Government so choose, once approved these information sheets can be submitted to the Ramsar Secretariat.

Brief descriptions of each key site are provided below.

1. Tangua Haor

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

Table 3.1: Importance of sites

SITE	RANK
A/a = outstanding (international) B/b = considerable (national) C/c = limited	
TANGUA HAOR	A
Pana Beel	a
Biaskhali Beel	b
Rauar Beel	a
Main Tangua Beel	a
West Tangua Beel	b
Two un-named <i>beels</i>	b
Ainna Beel	b
Ghaniakuri Beel	b
Arabiakona Beel	b
Un-named <i>beel</i>	b
Samsar Beel	b
PASUA BEEL, GURMAR HAOR	A
HAKALUKI HAOR	A
Kair Gang & <i>beel</i>	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
HAIL HAOR	A
BALAI HAOR	A
Khakra Kuri Beel	b
Dubail Beel	b
Jugni Beel	b

SITE	RANK
A/a = outstanding (international) B/b = considerable (national) C/c = limited	
KAWADIGHI HAOR	A
Petangi Beel	a
Majherbanda/Ulauli	a
HAIL HAOR FISH PONDS	B
MAIJEIL HAOR	B
Patachatal Beelb	b
Borachatal Beelb	b
DAMRIR HAOR	B
Chalnia Beels	b
Deodar Beels	c
KANAMAIYA HAOR	B
Kanamaiya Haor	b
Pakertala Beel	b
MATIAN HAOR	B
Bara Beel	b
Banuar Beel	b
Palair Beel	b
UBDAKHALI HAOR	B
Uglar Beel	b
Meda Beel	b
Netrakona/Kaluma Kanda	c
ERALI BEEL	B
DEKHAR HAOR	B
Kuri Beel	b
Goraduba Beel	b
Dapha, Ruwa, Guinga	b
Jaor Beel	c

Table 3.1: Importance of sites (continued)

SITE	RANK
A/a = outstanding (international) B/b = considerable (national) C/c = limited	
PANGER HAOR	B
Aila Beel	b
Pangna Beel	b
Karul Dhan Beel	c
JURI RIVER	C
CHUNNIA BEEL	C
BARA HAOR	C
Chapra, Singari etc.	c
MEHDI BEEL	C
KHAI HAOR	C
Deochapra Beel	c
Dabor Beel	c
SURMA RIVER	C
SOMESWARI RIVER	C
PATNAI GANG	C
HALIR HAOR	C
Kecharia Beel	c
DUBRIAR HAOR	C
Dubriar Beel	c
Baisha Beel	c
KENDUA AREA	C

SITE	RANK
A/a = outstanding (international) B/b = considerable (national) C/c = limited	
BORADUBA BEEL	C
OLD BRAHMAPUTRA RIVER	C
LOWER BAULAI RIVER	C
LOWER KALNI RIVER	C
KHOWAI RIVER	C
Sankardanga Beel	c
Ratna Beel	c
Khowai River	c

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.

This haor forms the core area of the northern haor system, which includes several other haors also of importance for waterfowl (such as Gurmar Haor, Kanamaiya Haor and Matian Haor). The Tangua Haor site itself consists of a group of large beels to the west of the Patnai Gang, close to the Indian border; its principal beels are Pana, Rauar, Tangua, Ainna, Arabiakona, and Samsar. Tangua Haor as a whole is unprotected from flash-flooding, although Arabiakona Beel and one or two small beels are surrounded by submersible embankments.

The presence of a complex of large and relatively undisturbed beels still in a near-natural condition at Tangua Haor is undoubtedly a key reason for the major concentrations of waterfowl found in the northern system as a whole. The northern haors mentioned above together held 40% of all the waterfowl recorded during the Feb/Mar 92 survey and 36% of those during the Apr/May 92 survey. The corresponding figures for Tangua Haor itself were 24% and 11%, respectively.

Largely confined to the northern system of haors are many species of waterfowl, especially the cormorants, Oriental Darter, several species of ducks and Eurasian Coot, undoubtedly because the system provides the largest contiguous area of permanent water in the region and remains relatively thinly populated. The outstanding importance of this system for some waterfowl species is demonstrated by the results of the Feb/Mar 92 survey (Table 3.2). The northern system is also very important for herons and egrets. It held 49% of all herons and egrets recorded during the Feb/Mar 92 survey and 68% of those during the Apr/May 92 survey.

Tangua Haor was identified as a key site in the *Directory* and is described there in some detail. Three of the main beels, Pana, Rauar and Tangua, were included in the NERP monthly ornithology/ecology monitoring programme.

2. Pashua Beel, Gurmar Haor

The main value of Pashua 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 pinnata* (koroch) 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

Table 3.2: Northern haor system,
proportion of individuals
Feb/Mar 92

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

Northern haor system consists of Tangua Haor (core area), Gurmar Haor, Kanamaiya Haor, and Matian Haor.

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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.

The Pashua Beel site consists of 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, completed in 1991).

The importance of Pashua 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 Apr 92), 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 Mar 92 until late Apr 92, and numbered about 400 at the end of Mar 92. 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 Mar 92 and 28 in late Mar 92 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. Many passerines were observed in the surrounding forest and shrubbery.

Pashua 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 were stationed at the beel to prevent illegal fishing, but it is apparent that these guards, and perhaps also a respect for the Minister, were effective in preventing other forms of exploitation as well. The lease came up for renewal in 1992 and was given out to a Member of Parliament on a three-year basis. So far this new lessee is maintaining the same level of protection as under the previous lease.

Pashua Beel was not mentioned in the *Directory*, as its importance had not been recognized at that time. The site was included in the Monthly Monitoring Programme.

3. *Hakaluki Haor*

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 92 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 92 survey, the

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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).

The Hakaluki Haor site consists of a large group of *beels* surrounded by heavily grazed grassland and rice fields.

Hakaluki Haor was identified as a key site in the *Directory*, and is described in some detail. Three of the main *beels*, Haor Khal, Chatla Beel, and Pingla Beel, were included in the Monthly Monitoring Programme.

4. Hail Haor

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.

The Hail Haor site 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). The project seems to have had little effect on the hydrologic regime within the basin, however.

Hail Haor was identified as a key site in the *Directory*, and is described in some detail. Parts of the *haor* were included in the Monthly Monitoring Programme.

5. Balai Haor

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 Mar 92 and late Apr 92, when water levels were very low, but over 32,000 were present in late Mar 92 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.

The Balai Haor site is an isolated *haor* between the Surma and Kushiyara rivers in the extreme east of the project area. It includes three principal *beels* (Dubail, Jugni, and Khakra Kuri) surrounded by heavily grazed pasture land 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* (*kalmi*) and this is now spreading out into the cultivable areas.

Balai Haor was not mentioned in the *Directory*. The site was included in the Monthly Monitoring Programme.

6. Kawadighi Haor

Kawadighi Haor remains very important for a wide variety of waterfowl, despite the changes which must have occurred to these wetlands since the construction of the Manu River Project in 1976-83. The haor held 8.5% of the waterfowl recorded during the Feb/Mar 92 survey, and 5.3% of those during the Apr/May 92 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.

Kawadighi Haor comprises two large, shallow beels, Petangi and Majherbanda, and a third, smaller beel, Ulauli, adjacent to the latter. The Manu River Project, within which the haor lies, consists of a full flood control embankment, water control structures, and a pump house for pumped drainage. The project has caused some reduction in wet season water levels, but not as much as anticipated due to public cuts and overland flow from the adjacent Bhatara Hills. It is not clear how nor to what extent the project has actually affected waterfowl, positively or negatively. It seems clear however that if full flood protection were achieved as intended, further changes would occur.

Kawadighi Haor was identified as a key site in the *Directory*, and is described there in some detail. The haor was included in the Monthly Monitoring Programme. Also, Manu River Project was selected as a NERP project monitoring site.

3.2.3 Wetlands of national importance (B sites)

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. Monthly Monitoring Programme site.

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 Mar 9. Patachatal Beel was poisoned with rotenone during the first week of Apr 92 and stocked with carp hatchlings on 26 Apr 92, as part of the Second Aquaculture Development Project supported by the Asian Development Bank. A large numbers of turtles, snakes, and frogs were killed along with the gill fishes, possibly due to misapplication of the poison. Monthly Monitoring Programme sites.

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. Monthly Monitoring Programme site.

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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*. Monthly Monitoring Programme site.

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*. Monthly Monitoring Programme site.

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). Apparently an important wintering area for ducks, gulls and terns. No survey was possible in late Feb 92 or early Mar 92, but a survey on 22 Mar 92 revealed 9,600 birds including 3,600 ducks, almost 400 Brown-headed Gulls, and 5,000 Whiskered Terns. On 21 Apr 92, the beels held over 8,000 ducks, the most recorded at any site during the Apr/May 92 survey. Aila Beel was described as a key site in the *Directory*.

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 Mar 92 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 kilometres to the north and Pashua Beel a few kilometres to the south.

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), 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 92 and 725 in Apr/May 92. The dense aquatic vegetation provides nesting habitat for a variety of species. Monthly Monitoring Programme site.

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). Probably of some importance for wintering ducks, although only 1,130 were recorded in Feb/Mar 92. No survey was carried out in Apr/May 92. Meda Beel was described as a key site in the *Directory*.

3.2.4 Other sites (C sites)

All the other sites listed in Table 3.1 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 pasture land. 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.

3.3 Flora and Forest Resources

3.3.1 General ecology of wetland vegetation

Physical environmental factors

Compared with other major natural forms of landscape, wetlands are young and dynamic. Many are physically unstable, changing in a season or even in a single storm. They change as vegetation changes, sediments are laid down, or land sinks. Due to continuous submergence, wetland habitat is characterized by anaerobic conditions which inhibits normal plant growth. A group of plants known as hydrophytes are adapted to withstand these extreme conditions, and these plants colonize wetland habitats.

Within a particular climatic setting (insolation, temperature, precipitation), the geographical and temporal extent of wetlands and the development of particular types of wetland vegetation is governed by the timing and duration of inundation or soil saturation events (hydroperiod), the flow regime, chemical and particulate concentrations (water quality), and soil characteristics. Wetland conditions range from virtually perennial aquatic lowlands to seasonally dry uplands.

Hydroperiod is key to vegetation development and community dynamics. Hydroperiod is affected by topography, flooding and flood type (backwater, overbank), precipitation, and water table fluctuations.

Interannual variability in the timing and nature of the flood regime is important in determining the composition of plant communities and can be responsible for large variations in community distributions. The full extent of its influence is not yet well understood in relation to the germination of plant species.

The nature of the soil also has an important effect on the wetness of an area. Heavy clays drain most slowly and the effects of saturation therefore persist longer in such soils. Soil within the same haor system can vary in texture, drainage class, fertility, and other parameters. This variation can occur in an apparently random pattern, reflecting depositional or other processes

that are no longer discernible, or there may be a definite pattern. The transition from the wettest to the driest areas in the floodplains occurs over distances varying from several miles to several meters.

Flood tolerance

The most flood-tolerant species can live and thrive in swampy conditions. These species can also grow on moist, well-drained sites, but they cannot compete successfully with species that normally inhabit and are specifically adapted to such sites. The least flood-tolerant species cannot tolerate flooding or waterlogging even for a short period. Between these extremes lies a large group of species that can tolerate varying degrees of flooding or waterlogging. Moreover, flood tolerance can vary with life stage. While many plants can withstand flooding for several days during the growing season, only a few plants can survive more than a few days of partial inundation at the seedling stage.

Human modification

In a heavily populated and extensively cultivated area such as Bangladesh, human activity is also a key factor in determining the extent and composition of wetland plant communities. A general overview of the region's natural history and the impact of human settlement has already been given (Section 3.1); the details of this interaction are presented in the literature review and in the discussion of each vegetation type below.

3.3.2 Previous studies

Botanical exploration in the Northeast Region began with Roxburgh (*Hortus Bengalensis*, 1814; *Flora Indica*, 1932) and William Griffith, whose 1835 collecting trip by boat began in Calcutta, passing through Pabna, Jamalpur, Mymensingh, and Habiganj, then along the Surma to Chhatak. During a second trip in 1838 he again travelled along the Surma. During these journeys, he recorded the marsh vegetation and aquatic flora of the jheels and haors. Somewhat later, in 1850, the author of *Flora of British India* (Hooker, 1872-1897) travelled along the Surma and visited the wetlands of Sylhet.

The first detailed collection of plant specimens from these wetlands was undertaken by Gibson in 1836. He travelled by boat from Calcutta to Dhaka, along the Ganges, and then on to the Surma to Chhatak, returning in 1837 to Calcutta with a full boat load of magnificent specimens. The next major collecting expedition was in 1869, when more than 14,000 specimens were collected by Clarke from Sylhet, Madhupur, and Comilla.

In 1903, the names and drawings of many aquatic plants from the haors of Sylhet appeared in *Bengal Plants* (Prain, 1903).

Three habitat types in the Sylhet region were identified on the basis of a collation of systematic botanical records (Kanjilal, 1934):

1. ***Upland vegetation.*** This types includes plants at the beel fringe and at all higher levels. We found all the genres reported by Kanjilal that would be expected at the levels we studied (homestead and below): *Crataeva*, *Terminalia*, *Lagerstroemia*, *Ardisia*, *Trewia*, *Ficus*, *Clinogyne*, and so on. His list also includes genres we did not find that are characteristic of higher elevations. These would be *Litsaea*, *Duabanga*, *Eugenia*,

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Hypotianthera, *Symplocos*, *Pealii*, *Rhabdia*, *Homonoia*, *Antidesma*, *Bunius*, *Cunia*, *Engelherdia*, *Draeaena*, and so on.)

2. **Grassland.** Emergent vegetation. Of Kanjilal's genres, we observed *Hygroryza*, *Panicum*, *Phragmites*, and *Arundo*. We did not observe *Vossia*, *Myurus*, *Crusgali*, *Arundonella*, or *Thysanolana*; the situation is a bit confusing however as some genus names have changed.
3. **Aquatic vegetation.** Kanjilal lists the families **Nymphaeaceae**, **Araceae**, **Lemnaceae**, **Alismataceae**, **Najadaceae**, **Eriocaulaceae** and **Cyperaceae**. All were observed.

Schematic haor zonation showing the location of these communities is shown in Figures 3.3(a) through 3.3(d)

Between the publication of *Bengal Plants* in 1903 and the creation of independent Bangladesh in 1971, very little systematic botanical fieldwork was undertaken. (The biological science departments of Dhaka University date only to the late 1930s.)

In the 1970s, the Bangladesh Agriculture Research Council took up a 'Botanical Survey of Bangladesh', and in 1975 the Bangladesh National Herbarium was established. Since then, field activities have intensified. A professional journal, *Flora of Bangladesh*, was established in 1972 and 36 issues were published through 1988.

Microphytes of the haors have also received some attention (for example Islam and Paul, 1978, which presented a hydrobiological study of Hakaluki Haor).

3.3.3 Plant communities (zonation) of the Northeast Region's wetlands

Wetland vegetation can be broken down into a number of communities or types. Each type is an aggregated assemblage of particular plant species, and is characteristic of a particular set of environmental conditions (hydroperiod, flow regime, water quality, soil).

The schematic of haor zonation shown in Figures 3.3(a) through 3.3(d) illustrates how geomorphologically defined areas are influenced by the fluctuating hydrological regime. Different plant communities occupy different habitats along the gradient of flooding and moisture.

Elements of the sequence of plant communities, or sometimes the entire sequence, may be absent from particular landscapes due to disruption from human activities. In the present study, we have identified eight communities (estimated number of species in parentheses):

1. *Submerged plants* (20)
2. *Free floating plants* (15)
3. *Rooted floating plants* (15)
4. *Sedges and meadows* (35)
5. *Reed swamp* (7)
6. *Fresh water swamp forest* (7)
7. *Crop field vegetation* (60)
8. *Homestead vegetation* (63)

These are described in detail below. Upland communities above the homestead level were not included in this study.

The last two communities listed differ from the others in that their composition is strongly affected by human management and disturbance plays; many plants appearing in the other six communities appear in these two as well.

A checklist of the plants (systematic name, Bangla name, and habit) observed in each community is provided in Table D.1. Bangla names of trees and heavily utilized plants are widely known by local residents, and tend not to vary from place to place. Bangla names of smaller and less utilized plants are known now to only a few local people and tend to vary from haor to haor. For these plants, the Bangla names provided were obtained from the literature (Huq, 1986).

The list includes about 210 species of macrophytic plants from at least 60 families. These include 65 obligate hydrophytes: plants that survive only when submerged in or floating on freshwater, or when on saturated soil. The most abundant of these plants belong to the families **Graminae** (9 species), **Nymphaeaceae** (4), **Hydrocharitaceae** (5) and **Lemnaceae** (4). The list also includes about a dozen species of amphibian trees, shrubs, and climbers that prefer seasonally flooded areas.

Kanjilal's upland vegetation no longer exists in community form at the levels we studied. At our swamp forest level, only isolated forest patches remain, and at our crop field and homestead levels it has been completely displaced by synthetic communities. All Kanjilal's tree genuses survive in the homestead groves, however, except for those that one would expect to find only at higher elevations.

1. Submerged plants

The submerged plant community is one of the most prevalent in the haor area. It is comprised of about 20 plant species (Table D.1). Submerged plants remain fully submerged for their entire life cycle, except for the flower which occurs above the water surface. Some are rooted to the bottom and some are freely suspended. All of these plants are monocotyledons, from ten pretty closely related families including **Aponogetonaceae**, **Hydrocharitaceae**, and **Potamogetonaceae**.

These plants are, for obvious reasons, highly susceptible to seasonal water level fluctuations. The community expands in area during the monsoon and contracts with the coming of the dry season. The plants start growing when water levels start rising at the very beginning of the monsoon, persisting throughout the wet season for as long as ample water is present. (In some haors, at the peak of the monsoon when wave amplitude and water depth are greatest, these plants can be very difficult to find.) When the water starts receding, most of these plants flower and fruit very quickly, thereby assuring offspring in the next year; though most of these species have rhizomes and can also reproduce vegetatively. Where the water recedes further, the plants become desiccated and decompose; in permanent water bodies, they can survive for a much longer period.

The composition and prevalence of this community differs from one haor to the next. For example: in Tangua Haor, we found that *Hydrilla* (kureli, jhangi) and *Potamogeton* (keorali) were the most abundant species, whereas in Balai Haor *Hydrilla*, *Najas* (goisa), *Ottelia* (panikola, kaorali), *Sagittaria* (chhotokul) and *Aponogeton* (ghechu) were the most abundant species.

(*Hydrilla* is common in both haors but much more abundant in Tangua than in Balai.) Still different compositions are found in Hail Haor and Kawadighi Haor.

Community composition also varies between beels within a particular haor system: for example, in Hail Haor, beels such as Chanda situated on the eastern side have dense vegetation while the beels on the western side do not. Kawadighi Haor, Hakaluki Haor, and Murir Haor, also exhibit variation from beel to beel. In other haors, such as Tangua Haor, Balai Haor, and Maijeil Haor, the submerged plant communities of the various beels do not differ significantly.

Community composition also reflects species' water depth and chemical preferences. Most species prefer depths of 0.2 to 2 meters, but some prefer deeper (> 2 m) water. Some also have chemical preferences (*Utricularia* prefers lower pH, for example, rendering it useful as an indicator species).

2. Free floating plants

Free floating vegetation consists of plants that are most commonly found floating freely on and collecting nutrients from the water; most of them can also survive for a certain period with their roots on or in moist soil. This community is common but not dominant in the haors. It is comprised of about 20 plant species (Table D.1) from the classes Angiosperm and Pteridophytes. The most dominant family in this community is **Lemnaceae**. Other common families are **Salviniaceae**, **Lentibulariaceae** and **Pontederiaceae**. At the species level *Eichhornia* (kochuripana), *Utricularia* (chhotojhang) and *Salvinia* (kuripana, indurkan, tetulapana) are the most abundant and can be found in almost all the beels.

This community is also affected by water level fluctuations, though they are in general less dependent on water and more adaptable than the submerged plants. Before the monsoon begins, they are found growing luxuriantly in the stagnant water within individual beels. They persist as the water rises, but as flooding becomes general and the beels fill up, they tend to be advected out from the haors into the rivers. Their main mode of propagation is vegetative, though many members of this community can produce seed.

Community composition differs sharply from one haor to another, but differences among beels within a single haor are not very significant. The highest concentrations of floating vegetation are found in Hail Haor and Balai Haor, followed by Kawadighi Haor. These haors are shallower and more enclosed than Tangua Haor, Gurmar Haor, and Hakaluki Haor where lower concentrations are found. The reason for this may be the relative shallowness and moreover the closed surroundings of the high-concentration haors, which restrict advection of the plants away from these systems.

3. Rooted floating

These plants root deeply in the soil and float leaves and flower on the water surface. To accomplish this, most plants have very long stalks for both leaf and flower, and a stem that remains under water, sometimes beneath the soil; a few plants have long stems rather than long stalks. This community is one of the most dominant in the haors. It is comprised of about 15 plant species (Table D.1). The most dominant families in this community are **Nymphaeaceae** and **Menyanthaceae**. At the species level *Nymphaea stellata*, (nilshapla), *N. nouchali* (sada, raktoshapla), *Nymphoides cristatum* (chandmala), *N. indicum* (panchuli), and *Trapa maximowiczii* (singra, paniphal) are the most abundant and common in all the beels.

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Like the other wetland plant communities, these plants are also susceptible to seasonal water level fluctuations. In the permanent beels they can survive and regenerate for the whole year. But in seasonally flooded areas, the rhizomes or seeds remain buried under the soil during the dry season and then start sprouting with the arrival of water. As water levels increase, they then elongate their stems or leaf and floral stalks. They typically start flowering on a large scale when the water starts receding just after the peak flood. Almost all the plants of this community can propagate vegetatively as well as sexually.

Community composition also differs from haor to haor and even among beels within an individual haor system. Hail Haor has the most unique vegetation pattern of this type: *Nelumbo nucifera* (padma) and another unidentified *Limnophila* species are found there and are totally absent from the other sites. Moreover, *Euryale ferox* (makhna) which is abundant in this haor is very rare in all the other systems. Balai Haor also has extensive rooted floating vegetation coverage, mostly *Nymphaea* and *Nymphoides*. Murir Haor has a community similar in composition but less extensive. Kawadighi Haor's community is mainly composed of a grass, *Echinochloa colonum* (parua). Hakaluki Haor has abundant vegetation of this type near the haor but little in the haor itself. Tangua, Gurmar Haor, and Maijeil Haor have this community but it is less prevalent.

In Hail Haor and somewhat in Hakaluki Haor, differences between beels within a single haor system are very prominent. In the other haors, it is not very significant.

4. Sedges and meadows

This is an ecotonal type (transition area between two communities, such as forest and grass land, and as such usually exhibiting competition between species common to both) consisting of amphibian plants (plants that can tolerate wet or dry conditions). Usually, the leaves of these plants are exposed to the air and the roots remain under water, though inundation and desiccation are tolerated to some degree. This community has the highest species diversity of all the haor types, with at least 35 different species present (Table D.1). In this sense, it is one of the most important plant communities in the haor area.

The most dominant families in this community are **Cyperaceae** and **Polygonaceae**, followed by **Gramineae** and others. At the species level *Polygonum* (kukra, bishkatakali, and others), *Fimbristylis* (joina and others), and various species of *Cyperus* (mutha) are most abundant and are more or less common in all the beels. Some other species like *Ipomoea fistulosa* (dhol kalmi), *Monochoria hastata* (baranukha, kechur), and *Hemarthria protensa* (chailla) are highly abundant in Balai Haor, Hail Haor and Gurmar Haor respectively. Most of the plants of this type are rhizomatous and can propagate vegetatively, but all of them produce seed as well.

Generally this vegetation type occupies the water margin. At the end of the dry season, this is the margin of the beels. As water levels increase during the wet season, the community in a particular spot is gradually submerged; new growth 'follows' the shallow water margin, and at the peak of flooding the community is found at the margin of the haor. Submerged individual's shoot parts die out and slowly decompose into the water, enriching it with organic matter.

Community composition varies from haor to haor, but differences among beels within a haor are not prominent; community composition seems to be particularly sensitive to the rate at which water levels increase. Hail Haor has the best community of this type, composed mostly of *Cyperus* and other grasses. Balai, Kawadighi, and Tangua also have good coverage but with

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different composition. In Tangua and Kawadighi, the community is dominated by grasses, whereas at Balai the dominant species are *Polygonum* and *Ipomoea*. Murir and Dubriar have the same composition as Kawadighi but lower concentrations. Gurmar Haor displays co-dominance of grasses and *Polygonum*. Erali has very little vegetation of this type.

5. *Reed swamp*

This community is adapted to lands intermediate in height between the haor basin and homestead lands (kanda), typically on ridges out in the haors. These areas are fairly deeply flooded during the flood season and dry out during the dry season. The community is known locally as pajuban. It consists of the grasses *Phragmites karka* (khagra, nol) and *Saccharum spontaneum* (khag, aisha). Some sedge/meadow grasses are also found here, in lesser amounts, such as *Vetiveria zizanioides* (binna, gandhabena, *Sclerostachya fusca* (khuri), and *Arundo donax* (baranal, gobanal). Other than the grasses, woody shrubs like *Ficus heterophylla* (bonolat, baladumur), *Asparagus racemosus* (satamuli, hilum), and *Lippia javanica* (bhuiokra) are the more common species. *Rosa involucrata* (gunja kata) is a threatened plant in Bangladesh which finds natural sanctuary in pristine reed lands. Another prominent species is *Asclepias*, a climber from *Asclepidiaceae* family. Mature reeds attain heights of six to seven meters, in earlier times affording important habitat for Single-Horned Rhinoceros, Barashinga, Bengal Tiger, and Asian Elephant.

The community is composed principally of perennials, making it particularly vulnerable to utilization pressure. Sustainable harvesting is possible if a rotation of at least three years is allowed, but reclamation of land for agriculture, indiscriminate reed cutting for building material, industrial raw material, and fuel, in particular for lime-burning, has all but eliminated the once vast reed lands of the region.

6. *Fresh water swamp forest*

This community consists of evergreen trees; a fully developed stand exhibits a closed canopy. Mature trees are ten to twelve meters tall. *Barringtonia acutangula* (hijal) and *Pongamia pinnata* (koroch) occur in varying proportions to form this vegetation type. *Crataeva nurvala* (barun), *Trewia nudiflora* (gotagamar, panidumur) and *Salix tetrasperma* (bias, panihijal) are frequently also present. These trees mostly produce their seeds in the monsoon period and they disperse them through water. In addition, woody shrubs such as *Phyllanthus disticha* (chitki), *Ficus heterophylla*, *Rosa involucrata*, and *Asclepias* climbers are found.

Swamp forest is adapted to monsoon flooding for three to four months, to depths of 0.5 to 2.5 m; thus, much of the area now under monsoon rice would once have been occupied by swamp forest. Remnant forest patches are now restricted to areas sloping away from village highland down towards the haor, helping to shelter homesteads from wave erosion; to elevated ridges between beels; and to stream levees. These patches currently vary from a few plants to several hectares of more than a thousand trees. Depending on local conditions, particularly the extent of human disturbance, the luxuriance of the vegetation varies, from sparse low trees with undergrowth grasses, as at Rangsi and Rupnagar in Tangua Haor, to dense closed canopy with poor undergrowth, as at Pashua Beel in Gurmar Haor.

Rangsi within Tangua Haor has an area of about 3 ha. The density is 300 trees per hectare and average breast girth is 110 cm. At Pashua Beel in Gurmar Haor and at Nurpur in Jolbhangra

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Haor, the density is nearly 600 trees per hectare, and average girth is 30 cm. The principal trees of these forests are *Barringtonia* and *Pongamia*.

A detailed account of the status and distribution of these forest patches type does not exist. Some larger patches are listed with the revenue officers of the districts; these are leased out, mostly to jalmohal owners who use the branches for fish entrenchment.

Traditionally, forests were managed communally to provide protection of village highland from wave erosion; coppices were harvested in three years' rotation for fuel wood, housing posts, and fish entrenchment (katha). One or two branches per year can be taken on a sustainable basis. In recent years, however, outsiders (typically a jalmohal lessee) have taken control, increasing the frequency of the coppicing and the number of branches. In 1992 at Rangsi this reached tragic levels: virtually all the branches were taken from all the trees. Some of the trees may survive, if they are allowed to recover for several years.

Under sustainable management, yields of Tk 40,000 per year are possible; coppicing can begin when trees are five to seven years old, and natural regeneration is good. The upper limit of population density in mature stands is about 400 trees per hectare and the market value is Tk 30 to 50 per branch.

7. Crop field vegetation

This is a disturbed community, composed of both wetland plants and smaller dryland herbs found in other communities also. Community composition depends on the degree of waterlogging in each particular field. **Cyperaceae** is the dominant family in this community; a large number of other, unrelated plant families, ranging from **Amaranthaceae**, **Euphorbiaceae**, and **Compositae** to **Gramineae** are also present.

In this setting, these plants are weeds and are destroyed by farmers. These plants survive in this hostile setting by surviving unfavourable periods and multiplying rapidly.

8. Homestead vegetation

Homestead vegetation is a very important plant community, though a synthetic one. The community includes two types of plant: those cultivated for their economic value, and those that are self-propagating. Plants of the first category can be found all over the country, and composition within this type is more or less uniform. The composition within the second type is more interesting, in that it reflects the composition of nearby natural communities, including communities and species that have otherwise vanished locally, and contains some strong clues as to local vegetation composition in times past. Homesteads around Hakaluki Haor, the study site closest to the hilly rain forest, has the largest number of trees of this type. Sunamganj homesteads contain more *Barringtonia*, *Pongamia*, and *Trewia* trees than Moulvibazar homesteads, which suggests that the swamp forest was much more prominent in Sunamganj than in Moulvibazar.

3.3.4 Plant utilization

Currently utilized wetland plant products and services are grouped as follows (after AWB, pers. comm.):

- Starch (energy) foods (grains and starchy roots),
- Other foods (vegetables)
- Fodder and forage
- Medicine
- Thatching and mat-making
- Fuel
- Erosion protection
- Fisheries habitat
- Industrial raw material
- Fertilizer

In addition, the wetlands of the region are potential providers of:

- Pollution abatement
- Biogas production

Table 3.3 shows the known uses in the Northeast Region for each species.

Reliable quantitative information is not available for most of these products and services. In the few instances where order of magnitude estimates are possible and useful, these are presented below. This would include amounts currently harvested per unit area, extent of utilized area, unit price, and unit cost of collection and processing, and so on. Additional study is clearly required, focusing on the items of greatest current and potential importance.

Starch (energy) foods (FS)

During times of scarcity, local people eat grains of *Oryza rufipogon* (jhara dhan), *Echinochloa colonum* (parua), *Eleocharis dulchis* (panichaise), and *Hygroryza aristata* (phutki). Rhizomes of *Aponogeton* (ghechu) and *Nymphaea* (nilshapla, sada, raktoshapla) are also eaten. Seeds of *Euryale ferox* (makhna) and *Nelumbo nucifera* (padma) are eaten raw or roasted. The seeds of *Ottelia alismoides* (panikola, kaorali), *Nymphaea stellata* (nilshapla) and *Nymphaea nouchali* (sada, raktoshapla) are made into puffed grain by frying, and may be eaten in this form or prepared into confectionery.

Trapa maximowiczii (shingra, paniphal) produces a nut which is commercially sold in both local and urban (Dhaka) markets.

Table 3.3: Wetland plant utilization (see text for codes)

Species	fs	fv	fp	m	fb	fu	ft	bf	pa	bg	c	ff	b	vo	sf	eo	sm	dt	or	ts	ex	ot
SUBMERGED																						
<i>Aponogeton natans</i>	X	X																				
<i>Aponogeton undulatus</i>	X	X		X																		
<i>Aponogeton appendiculatus</i>	X	X		X																		
<i>Blyxa</i> sp.																						
<i>Ceratophyllum desmersum</i>			X			X																
<i>Hydrilla verticillata</i>			X	X				X														
<i>Lagarosiphon roxburghii</i>								X														
<i>Myriophyllum tuberculatum</i>			X	X																		
<i>Myriophyllum tetrandrum</i>			X	X																		
<i>Najas</i> sp.																						
<i>Ottelia alismoides</i>	X	X	X																			
<i>Potamogeton crispus</i>			X	X																		
<i>Potamogeton mucronatus</i>			X	X																		
<i>Rotala rutundifolia</i>																						
<i>Sagittaria guayanensis</i>				X																		
spp. <i>lappula</i>																						
<i>Sagittaria sagittifolia</i>				X																		
<i>Vallisneria spiralis</i>								X											X			
<i>Azolla pinnata</i>								X														
<i>Eichhornia crassipes</i>			X					X		X									X			
<i>Lemna perpusilla</i>								X														
<i>Pistia stratiotes</i>								X		X												
<i>Salvinia cucullata</i>								X														
<i>Salvinia natans</i>								X														
<i>Spirodela punctata</i>																						
<i>Spirodela polyrrhiza</i>																						
<i>Utricularia exoleata</i>				X																		
<i>Utricularia aurea</i>				X																		

Species	fs	fv	fp	m	fb	fu	ft	bf	pa	bg	c	ff	b	vo	sf	co	sm	dt	or	ts	ex	ot
ROOTED FLOATING																						
<i>Utricularia stellaris</i>				X						X												
<i>Wolffia arrhiza</i>								X														
<i>Wolffia microscopica</i>								X														
SEDGES & MEADOWS																						
<i>Aeschynomene aspera</i>								X											X			
<i>Aeschynomene indica</i>								X											X			
<i>Alternanthera philoxeroides</i>		X	X																			
<i>Arundo donax</i>			X		X																	
<i>Cleome hasslerana</i>				X															X			
<i>Clinogyne dichotoma</i>																						
<i>Colocasia esculenta</i>	X			X																		
<i>Cyperus</i>			X		X																	
<i>Eclipta alba</i>				X																		
<i>Eleocharis dulcis</i>			X																			

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Species	fs	fv	fp	m	fb	fu	ft	bf	pa	bg	c	ff	b	vo	sf	co	sm	dt	or	ts	ex	ot
<i>Enhydra fluctuans</i>		X		X																		
<i>Fimbristylis dichotoma</i>																						
<i>Fimbristylis miliacea</i>																						
<i>Fimbristylis squarrosa</i>																						
<i>Hemarthria protensa</i>			X		X																	
<i>Ipomoea aquatica</i>		X	X			X													X			X
<i>Ipomoea fistulosa</i>																			X			
<i>Ludwigia abscondens</i>			X																			
<i>Ludwigia repens</i>																						
<i>Monochoria hastata</i>				X																		X
<i>Oryza rufipogon</i>	X		X																			
<i>Polygonum glabrum</i>				X																		
<i>Polygonum stagninum</i>				X																		
<i>Polygonum lanatum</i>				X																		
<i>Polygonum pedunculare</i>				X																		
<i>Polygonum barbatum</i>				X																		
<i>Rumex maritimus</i>				X																		
<i>Setaria glauca</i>			X																			
<i>Setaria fusca</i>			X																			
<i>Schoenoplectus articulatus</i>			X		X																	
<i>Scirpus juncoides</i>			X																			
<i>Sclerostachya fusca</i>			X		X																	
<i>Sesbania roxburghii</i>						X		X														
<i>Vetiveria zizanioides</i>						X																
<i>Xanthium indicum</i>		X		X																		
Reeds																						
<i>Asclepias</i> sp.				X																		
<i>Asparagus racemosus</i>				X																		
<i>Ficus heterophylla</i> var. <i>heterophylla</i>						X																
<i>Lippia javanica</i>				X		X														X		
<i>Phragmites karka</i>					X																X	X

Species	fs	fv	fp	m	fb	fu	ft	bf	pa	bg	c	ff	b	vo	sf	eo	sm	dt	or	ts	ex	ot
<i>Rosa involucreta</i>						X																X
<i>Saccharum spontaneum</i>					X	X														X		X
Swamp Forest																						
<i>Barringtonia acutangula</i>				X		X	X													X		
<i>Crataeva nurvala</i>						X														X		
<i>Phyllanthus disticha</i>				X		X																
<i>Pongamia pinnata</i>				X		X														X		X
<i>Salix tetrasperma</i>						X														X		
<i>Trewia nudiflora</i>				X		X														X		
CROP FIELD																						
<i>Alternanthera sessilis</i>		X	X																			
<i>Amaranthus spinosus</i>		X		X																		
<i>Ceratopteris thalictroides</i>		X	X																			
<i>Chenopodium ambrosioides</i>																						
<i>Cotula hemispherica</i>				X																		
<i>Croton bonplandianum</i>			X																X			
<i>Cynodon dactylon</i>			X																			
<i>Cyperus cephalotes</i>					X																	
<i>Centipeda orbicularis</i>				X																		
<i>Dentella repens</i>																						
<i>Digitaria longiflora</i>			X																			
<i>Eleocharis atropurpurea</i>			X																			
<i>Eleusina indica</i>			X																			
<i>Heliotropium indicum</i>				X																		
<i>Leucas lavendulifolia</i>				X																		
<i>Lindernia crustacea</i>																						
<i>Paspalum conjugatum</i>			X																			
<i>Rottboellia protensa</i>																						
<i>Rorippa indica</i>																						
<i>Solanum khasianum</i>		X		X																		
<i>Solanum flicifolium</i>				X																		

Species	fs	fv	fp	m	fb	fu	ft	bf	pa	bg	c	ff	b	vo	sf	co	sm	dt	or	ts	ex	ot
<i>Solanum nigrum</i>				X																		
<i>Spilanthes acmella</i>				X																		
HOMESTEAD																						
<i>Aegle marmelos</i>				X							X	X								X		
<i>Alstonia scholaris</i>				X		X														X		
<i>Albizia sp.</i>																				X		
<i>Albizia procera</i>																				X		
<i>Alpinia sp.</i>				X														X				
<i>Anthocephalus chinensis</i>						X														X		
<i>Areca catechu</i>				X								X								X		
<i>Artocarpus heterophyllus</i>												X								X		
<i>Bombax ceiba</i>				X	X	X														X		
<i>Bambusa sp.</i>			X		X	X														X		X
<i>Calamus tenuis</i>					X																	
<i>Cassia siamea</i>						X														X		
<i>Caryota urens</i>														X					X	X		
<i>Centella asiatica</i>		X		X																		
<i>Cleorodendrum siphonanthus</i>						X													X			
<i>Cocos nucifera</i>					X							X								X		
<i>Datura suaveolens</i>				X																		
<i>Diospyros perigrina</i>				X								X						X			X	
<i>Erythrina variegata</i>				X		X													X			
<i>Erythrina ovalifolia</i>				X		X												X				
<i>Ficus bengalensis</i>				X		X					X											X
<i>Ficus rumphii</i>						X														X		
<i>Ficus religiosa</i>				X		X					X									X		X
<i>Ficus hispida</i>		X																		X		
<i>Ficus</i>				X		X																
<i>Lagerstromia speciosa</i>						X													X	X		
<i>Mangifera indica</i>				X		X						X								X		
<i>Mikania scandens</i>			X	X																		

Species	fs	fv	fp	m	fb	fu	ft	bf	pa	bg	c	ff	b	vo	sf	eo	sm	dt	or	ts	ex	ot
<i>Mikania cordata</i>			X	X																		
<i>Musa paradisiaca</i> var. <i>sapientum</i>		X										X										
<i>Ocimum americanum</i>				X							X											
<i>Pandanus</i>					X																	
<i>Samanea saman</i>						X														X		
<i>Syzygium fruticosum</i>						X						X								X		
<i>Syzygium cumini</i>				X								X								X	X	
<i>Tamarindus indica</i>				X		X						X										
<i>Terminalia catappa</i>				X								X								X		
<i>Zizyphus mauritiana</i>						X						X										

Other foods (vegetables) (FV)

The stems and leaves of various plants are eaten as vegetables: this would include *Alternanthera sessilis* (haicha, sachishak), *A. philoxeroides* (helencha), *Ipomoea aquatica* (kalmi shak), *Colocasia esculenta* (kachu), *Xanthium indicum* (ghagra, khagra), *Centella asiatica* (thankuni), *Amaranthus spinosus* (kata note), *Chenopodium ambrosoides* (chapali ghash), *Enhydra fluctuans* (helencha, harhach), *Mersilea quadrifoliata* (sushnisak), and *Aponogeton* (ghechu).

Nymphaea and *Ottelia alismoides* floral stocks are also eaten as vegetables.

Eichhornia crassipes, *Monochoria hastata*, *Nelumbo nucifera*, *Sagittaria sagittifolia* and *Limnophila* are used as vegetables in many other countries, but not much in Bangladesh.

Fodder and forage (FP)

Most wetland plants can be used as food for livestock. Most of the grasses such as *Hygroryza aristata*, *Oryza rufipogon*, *Panicum paludosum*, *Echinochloa colonum*, *Setaria glauca*, *Cynodon dactylon*, *Pseudoraphis*, *Arundo donax*, *Eleusina indica*, *Paspalum* are extensively used as fodder. The members of *Cyperaceae* family are also used.

In the monsoon, when grass is less abundant, the major source of cattle food becomes *Eichhornia crassipes*, *Nymphaea*, and *Nymphoides*; other smaller herbs are also used.

Medicine (M)

Local people use many wetland plants as medicine. *Polygonum* is well-known for its antibacterial effect.

Another well-known species is *Eclipta alba*, which is used as a hair tonic.

Limnophila indica is used as an antiseptic; is mixed with coconut oil to make a liniment for treatment of elephantiasis; and is used in the treatment of certain types of fever, when the plant's juice is rubbed on the body of the patient.

Nymphoides indicum is used to treat fever and jaundice.

Nelumbo nucifera is used as a cardiac tonic, diuretic, scyptic, and antipyretic; the seeds are used as a cooling balm in skin disease; and seeds are also given for piles and ringworm.

Monochoria hastata is used against diarrhoea and dysentery, and as an aphrodisiac.

The flowers of *Nymphaea nouchali* are used to treat bloody dysentery and in gynaecological complaints; the powdered rhizome is used to treat piles, dysentery, and dyspepsia.

The flowers of *Nymphaea stellata* are used in preparing a cardiac tonic.

Cyperus tubers are regarded as tonic and stimulant.

Pistia stratiotes are used to treat diarrhoea, skin disease, gonorrhoea, syphilis, and others.

Ottelia alismoides and *Ipomoea aquatica* are used against haemorrhoids.

Phyllanthus is utilized as an abortifacient and diuretic.

Alternanthera sessilis, *Scirpus* and *Rorippa indica* have antidiarrhoeal activity.

Spilanthes acmella is used against toothache.

The juice of *Heliotropium indicum* is used in leprosy.

Cynodon dactylon, *Utricularia*, *Sagittaria*, and others are also used.

Thatching and mat-making (FB)

The grasses which are used in the Northeast Region as thatching material and to make protective screens around homesteads are *Selerostachya fusca* and *Vetiveria zizanioides*. The latter species is also a very good soil binder.

An highly-prized mat known as sithal pati is made from *Clinigyne dichotoma*. A 1.5 m x 2 m mat sells at times for Tk 15,000 (about US\$400). This is the basis of an important cottage industry.

Fuel (FU)

Barringtonia and *Pongamia* are exploited for homestead construction and for fuel wood.

All the grasses are dried and used as cooking fuel.

Other plants such as *Ficus heterophylla*, *Ipomoea fistulosa*, *Lippia javanica* and reeds are also used extensively as fuel.

Erosion protection

Barringtonia and *Pongamia* forest is considered very effective in protecting homesteads from wave erosion and storm damage, which are common problems around the haors and larger beels during the monsoon. A number of the remaining forest areas are managed by local community management groups for this purpose.

Fisheries (FT)

Wetland vegetation makes a number of key contributions to the openwater fishery: providing shelter for the juvenile and adult fish; providing food in the form of periphyton on the stems and leaves of submerged vegetation; and supporting the base of the food chain through decomposition of plant material in the water.

The branches of *Barringtonia* are considered by local fishing folk and fisheries lease holders alike to be essential to fish production, indeed vital for the sustainability of the openwater fishery as a whole.

Industrial raw materials

Reeds (*Phragmites karka*, *Saccharum spontaneum*) locally known as pajuban, were intended to be an important constituent of the raw material for the Sylhet Pulp and Paper Mill (SPPM). In 1977, an estimate of the reed area available for commercial exploitation was estimated to be more than 30,000 ha, with a biomass production of 4.5 MT ha⁻¹ (air dry basis). The present official Forest Department estimate of reed area is about 27,000 ha, but in fact there is no trace of reeds on most of it. Productivity of the remaining reeds has also decreased to an estimated 2 MT ha⁻¹. SPPM took 22000 ha of land from the Revenue Department for reed cultivation a number of years ago, but this was unsuccessful (propagation was limited to 2000 ha only in the Chhatak, Companiganj, and Jaintiapur areas) and now the land is being returned to Forest Department management.

More than 90% of the lime requirement of the country comes from the Northeast region, and the region's lime-burning industry made extensive use of reeds as fuel, which resulted in extensive destruction. The industry now uses natural gas.

Rosa involucrata is an threatened plant in Bangladesh which finds natural sanctuary in the pristine reed lands. Conversion of reed land to agricultural use and over-exploitation of reeds for lime-burning are the main threats to the conservation of this vegetation.

Fertilizer (BF)

Eichhornia crassipes, once considered to be a pest, is now being used as compost fertilizer in the Northeast Region (it is also used in parts of India). The ash of the plant, which contains 30% potash, 7% phosphoric acid and 13% lime, makes an excellent fertilizer; in Sudan, it increased peanut production by over 30% (Maltby, 1986).

Other soft aquatic herbs can also be used in compost: for example, *Azolla* is used as an important bio-fertilizer all over the world.

Pollution abatement (PA)

Aquatic plants are proving an asset in the treatment of sewage and polluted water. *Lemna* can remove 50% of nitrogen, 67% of phosphorous, and nearly all the heavy metals from the water. Calcutta's sewage has undergone natural purification in the complex of wetlands east of the city for at least 50 years; the facility also supports a rich fishery.

In Madras, *Eichhornia crassipes* is being used to clean tannery effluents that would otherwise contaminate groundwater.

In Malaysia, the aquatic plant *Azolla* is being used to treat wastewater both from sugar refineries and from a rubber processing plant.

In the U.S. (Maltby, 1986), *Phragmites*, *Arundo donax* and *Salix* sp. have been shown to filter sediment load from dredged material.

Biogas (BG)

Another possible use of *Eichhornia crassipes*, *Lemna*, *Nymphaea* and so on is to production of biogas. Up to 40 litres of gas can be produced from 100 kg fresh weight of plants. By-products of biogas production can be used as fish feed.

3.3.5 Threatened communities and species

The freshwater swamp forest (*Barringtonia acutangula*, *Pongamia pinnata*, and *Crataeva nurvala*) is the native vegetation of much of the region and indeed of much of Bangladesh. It has disappeared from the country except for the small patches remaining in the Northeast Region, plus individuals surviving on homestead lands throughout the country.

The reed lands have also been reduced to remnant areas, and will likely disappear unless action is taken. In particular, *Rosa involucrata* gunja kata, a wild relative of the garden roses, was abundant in the reed lands of Bangladesh. It was abundant in the northern districts a century ago. This plant is now rare as a result of the destruction of reed land habitat. It is now restricted to the undisturbed haors of Sunamganj.

Euryale ferox makhna and *Nelumbo nucifera* padma, both rooted floating plants, are also threatened. They are found only in Hail Haor now.

The major causes of decline of these plants are conversion of wetlands for paddy cultivation, increasing cropping intensity, and the increasingly intensive tillage required by HYVs which disturbs the seed banks of wild vegetation.

3.4 Wetland Birds

3.4.1 Introduction

The ornithology surveys (main and monthly) were undertaken to determine the current status and abundance of waterfowl and wetland-dependent birds occurring in the wetlands of the haor basin, and to understand seasonal changes and events. Wetland-dependent birds are those that depend ecologically on wetlands; this category would include the two fish-eagles, the Osprey, several kingfishers, and a number of marsh-dwelling passerines. Of less interest were the many other bird species that frequent the wetlands but are not dependent upon them; this category would include various birds of prey and many of the small birds typical of homestead forests and gardens.

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 a summary of the observations of the 89 species that were recorded during the present surveys, is presented in Annex xx. (Eighty-seven species were

48
recorded in the 68 wetlands, and two others, Black Bittern and Slaty-breasted Rail, were observed in rice fields).

3.4.2 Previous studies

Hume (1888) is one of the most useful early accounts of the birds of Sylhet: 178 species are listed, including Pink-headed Duck *Rhodonessa caryophyllacea* which is now globally extinct. Stuart Baker (1922-1930) did some work on the birds of the Northeast, which include several references to "plains of reeds", a habitat type now all but disappeared from the region. More recently, Mountfort (1969) summarized the observations of the 1966 World Wildlife Fund Expedition to West and East Pakistan. Haroun Er Rashid (1967) reviews bird species status in Bangladesh by region, one of which is the haor basin (his North-East Lowlands), but by his own admission status information is based on assumptions more than positive records, largely due to imprecise locality information in earlier accounts.

Harvey (1990), in a recent comprehensive listing of the birds of Bangladesh takes a cautious approach and includes only those species and records for which there is full documentation. The list provides a status indication for each species in each of six regions, one of which is the Northeast, plus useful information on habitat preferences and breeding seasons. The status summaries relate almost entirely to the last twenty years. The former status of species that are now rare or locally extinct is little mentioned, even though many would once have been widespread and common here. Another recent list, S.U. Sarker and K.Z. Husain (1990) included 174 bird species that occur in the wetlands and mangrove areas of Bangladesh, with a discussion of conservation implications.

There have been a few studies relating specifically to the waterbirds of the Northeast. Some preliminary investigations were carried out by Forest Department, University of Dhaka, and Bangladesh Zoological Society personnel; most of this work focused on Hakaluki Haor and Hail Haor. Annually since 1987, excepting 1989, mid-winter waterfowl censuses were undertaken in the Northeast by Forest Department and NACOM personnel in the years, as part of the IWRB/AWB Asian Waterfowl Census (see Section xx.xx). These censuses covered only four sites (Hakaluki, Hail, Kawadighi, and Tangua Haors), and the counts give only a rough indication of species present and relative abundance.

The ten site accounts in the *Directory* give preliminary lists of waterfowl known to occur at each site. Other useful sources of information on the birds of the wetlands of the region include D.J. Millin (1984-88, unpublished list of bird sightings at Hail Haor) and J.D. Woolner (1986-91, unpublished notes on 108 species), and Altamash Kabir (unpublished notes on scarce waterfowl in the region). Khan (1987) summarizes the status of the storks and other large waterbirds in Bangladesh and refers to the importance of the haor wetlands but few specifics. Similarly, many other recent authors refer to the importance of the haors for waterbirds, especially migratory species and several rare and endangered species, but without any useful quantitative information.

A review of this literature, when combined with the current data set, identifies a total of 125 species of waterfowl that are known or thought to have occurred in the haor basin:

- 53 are or were resident breeding species or breeding summer visitors, of which
 - 1 species: globally extinct

- 9 species: extinct in the Northeast Region
 - 6 species: extinct in the Northeast Region as breeding birds, though they still occur as non-breeding visitors
 - Many other species: populations greatly reduced (notably Oriental Darter and Cotton Pygmy Goose).
- 42 are or were regular winter visitors or passage migrants from more northerly breeding grounds. Of these,
 - 2 species: extinct in Bangladesh
 - 6 species: almost extinct in the Northeast Region
 - Many other species: populations well below former levels, especially wintering ducks and geese.
 - 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.

3.4.3 Species observed and species groups

Two hundred and eighty-four species of birds were recorded in the Northeast Region during the NERP field program. A master checklist is provided in Annex D. These 284 are grouped as follows:

- *True waterfowl*: 89 species. These are species in the families.

Thus, of the 125 waterfowl species known or thought to have occurred in the wetlands of the Northeast Region, 36 species were not observed. These can be grouped as follows:

- 17 species: extinct or almost so in the region.
 - 8 species: scarce visitors to the region.
 - 6 species: extremely secretive and easily overlooked. Mostly rails and crakes.
 - 3 species: birds mainly associated with large rivers with extensive sand banks (River Lapwing, Black-bellied Tern and Indian Skimmer). In the Northeast Region, this habitat type appears to be restricted to the Old Brahmaputra River in the extreme west, which was surveyed by air only.
 - Indian Shag: not uncommon in the wetlands of central Bangladesh. Lack of observation is surprising.
 - White-breasted Waterhen: reported to occur at wetlands throughout the country, and is a noisy and conspicuous bird, often living in close proximity to human dwellings. Lack of observation surprising.
- *Other birds*:
 - Wetland-dependent birds: 30 species. These are species which are largely or wholly dependent on wetland ecosystems. Of these, 11 species are birds of prey.
 - Other birds observed in wetlands or adjacent floodplains: 42 species. Of these, 11 species are birds of prey.

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- Dry-land birds: 123 species. About half of these species are mainly confined to the West Banugach and Shatchari Reserved Forests; the rest were observed in the reserved forests and in other dry-land habitats (tea estates, homestead forests, secondary scrub, and so on). Of these, 11 species are birds of prey.

3.4.4 True Waterfowl

The two NERP main ornithology surveys (18 Feb 92 to 12 Mar 92 and 19 Apr 92 and 9 May 92) were the most comprehensive waterfowl surveys ever undertaken in the wetlands of the haor basin. The results of the waterfowl counts are summarized by site in Table 3.4, by species group in Table 3.5, and by individual species in Table 3.6.

These surveys show that despite the massive habitat losses, the haor basin remains an internationally important wintering area for migratory waterfowl, principally ducks and shorebirds. It 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, at least for two shorebird species, Ruff (an early migrant) which was observed in early March and Asiatic Golden Plover (a late migrant) which was observed in late April and early May.

Waterfowl populations, main ornithology surveys

Geographical distribution

Nearly all the waterfowl were found in the fourteen principal wetland systems listed in Table 3.6: 95% in Feb/Mar 92 and 90% in Apr/May 92. The northern haor system (Tangua Haor, Matian Haor, and Gurmar Haor complex) and Hakaluki Haor together held much the largest concentrations: about 71% (76,500) in Feb/Mar 92 and 44% (13,480) in Apr/May 92. Aila Beel also held a large concentration of ducks in late Apr 92; it was not included in the Feb/Mar 92 survey.

Feb/Mar 92 survey

A total of 108,000 waterfowl of 77 species were counted during the Feb/Mar 92 survey. This is a substantial population, but, given the vast extent of the wetlands of the haor basin, very low in comparison to other wetland systems at about the same latitude in southern Asia. 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. No reliable information is available on the numbers of waterfowl wintering in the Northeast Region in the past, but there can be little doubt that there has been a drastic decline in numbers, perhaps to only a few percent of former levels. The Feb/Mar 92 survey occurred a few weeks before the spring migration, which would have peaked sometime between mid-Mar 92 and mid-Apr 92.

Table 3.4a: Summary of waterfowl by sites

* aerial survey only

Site name	Feb/Mar 92 survey			Apr/May 92 survey		
	Date(s)	Spp.	Count	Date(s)	Spp.	Count
Old Brahmaputra River	25/2*	5	145			
Lower Baulai River	25/2*	10	1668	9/5*	5	597
Lower Kalni River	26/2*	9	1017	9/5*	3	123
Sankardanga Beel	9/3	13	126			
Ratna Beel	9/3	11	146			
Khowai River	9/3	15	335			
Hail Haor	21/2 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	4844	3/5	19	519
Majherbanda/Ulauli	22/2	32	4352	29/4	19	1080
Patachatal Beel	8/3	19	3073	28/4	12	234
Borachatal Beel	8/3	4	1180	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	1892	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 and beel	7/3	17	857	25/4	1	40
Haor Khal	7/3	27	7385	25/4	26	505
Puala Beel	20/2	15	1380			
Pingla Beel	19/2	6	51	30/4	8	192
Chatla Beel	19/2	26	17841	30/4	15	1680
Tural Beel	19/2	11	98	30/4	3	20
Dulla Beel	19/2	4	2021			
Chakia Beel	19/2	3	120			
Gharkuri Beel	19/2	22	7378	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			
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			

Table 3.4b: Summary of Waterfowl by Sites

Site name	Feb/Mar 92 survey			Apr/May 92 survey		
	Date(s)	Spp.	Count	Date(s)	Spp.	Count
Dapha, Ruwa, Guinga	29/2	23	1018	20/4	10	102
Jaor Beel				9/5*	3	15
Surma River	1/3 4/3	8	181	21/4 24/4	25	
Aila Beel				21/4	21	8327
Pangna Beel				21/4	12	153
Karul Dhan Beel				21/4	13	59
Someswari River	1/3 2/3 4/3	30	1718	21/4 23/4	24	2023
Patnai Gang	3/3	9	110	23/4	8	624
Pasua Beel	4/3	31	3696	22/2 4/4	40	6334
Kecharia Beel	4/3	7	62	22/4	7	29
Kanamaiya Haor	2/3 4/3	30	1875	22/4 23/4	8	183
Pakertala Beel	2/3 4/3	30	5079	22/4 23/4	10	330
Bara Beel	2/3 3/3	29	3389	22/4	17	335
Banuar Beel	2/3	14	1252	22/4	10	298
Palair Beel	3/3	19	1746	23/4	12	92
Pana Beel	2/3	29	9220	22/4	14	515
Biaskhali Beel	2/3	20	426	22/4	10	132
Rauar Beel	2/3 3/3	29	6054	22/4 23/4	24	1059
Main Tangua Beel	2/3	20	2306	22/4	15	1055
West Tangua Beel	2/3	11	2922	22/4	part of above	
Two unnamed beels	2/3	11	1317	22/4	part of above	
Ainna Beel	2/3	5	294	22/4	part of above	
Ghaniakuri Beel	3/3	9	348	23/4	5	20
Arabiakona Beel	3/3	13	1062	23/4	6	431
Unnamed Beel	3/3	17	1789	23/4	9	118
Samsar Beel	3/3	10	264	23/4	11	86
Uglar Beel	11/3	15	1083			
Meda Beel	11/3	11	248			
Netrokona/Kaluma Kanda	11/3	16	301			
Kendua area	10/3	5	33			
Boraduba Beel	12/3	8	172			

Table 3.5: Summary of waterfowl counts by group

FAMILY SUB-FAMILY	TOTAL SPECIES	FEB/MAR		APR/MAY	
		SPECIES	COUNT	SPECIES	COUNT
Grebes	2	2	488	1	534
Cormorants	2	2	5,331	2	6,091
Darters	1	1	21	1	21
Bitterns, herons and egrets	13	10	8,334	12	6,062
Storks	2	2	137	1	315
Ibises and spoonbills	2	1	11	2	4
Whistling Ducks	2	2	18,831	2	3,054
Geese	1	1	4	0	0
Ducks	18	17	56,954	13	9,519
Rails, moorhens, coots etc	4	4	5,466	4	866
Jacanas	2	2	1,059	2	428
Painted snipes	1	0	0	1	3
Stilts and avocets	2	2	1,271	1	376
Pratincoles	2	2	3	0	0
Plovers	7	7	2,635	3	610
Sandpipers, snipes, godwits	19	17	4,942	16	400
Gulls	2	2	199	2	409
Terns	5	3	2,150	4	1,608
TOTAL	87	77	107,836	67	30,300

Table 3.6: Summary of waterfowl counts by species

Species	Feb/Mar 92	Apr/May 92
<i>Tachybaptus ruficollis</i> Little Grebe	353	534
<i>Podiceps cristatus</i> Great Crested Grebe	135	0
<i>Phalacrocorax carbo</i> Great Cormorant	54	1
<i>P. niger</i> Little Cormorant	5,277	6,090
<i>Anhinga melanogaster</i> Oriental Darter	21	21
<i>Botaurus stellaris</i> Great Bittern	1	0
<i>Ixobrychus sinensis</i> Yellow Bittern	0	3
<i>I. cinnamomeus</i> Cinnamon Bittern	0	8
<i>Nycticorax</i> Black-crowned Night-Heron	136	33
<i>Ardeola grayii</i> Indian Pond Heron	977	280
<i>A. bacchus</i> Chinese Pond Heron	0	2
<i>Bubulcus ibis</i> Cattle Egret	324	1,675
<i>Butorides striatus</i> Little Heron	7	6
<i>Egretta garzetta</i> Little Egret	1,121	970
<i>E. intermedia</i> Intermediate Egret	498	866
<i>E. alba</i> Great Egret	2,539	1,855
Unidentified egrets	2,120	201
<i>Ardea purpurea</i> Purple Heron	5	35
<i>A. cinerea</i> Grey Heron 606		128
<i>Anastomus oscitans</i> Asian Openbill	135	315
<i>Leptoptilos javanicus</i> Lesser Adjutant	2	0
<i>Threskiornis melanocephalus</i> Black-headed Ibis	11	3
<i>Platalea leucorodia</i> White Spoonbill	0	1
<i>Dendrocygna bicolor</i> Fulvous Whistling-Duck	9,815	1,263
<i>D. javanica</i> Lesser Whistling-Duck	9,016	1,791
<i>A. indicus</i> Bar-headed Goose	4	0
<i>Tadorna ferruginea</i> Ruddy Shelduck	337	40
<i>T. tadorna</i> Common Shelduck	0	1
<i>Nettapus coromandelianus</i> Cotton Pygmy Goose	111	206
<i>Anas penelope</i> Eurasian Wigeon	101	91
<i>A. falcata</i> Falcated Teal	1	0
<i>A. strepera</i> Gadwall	507	51
<i>A. crecca</i> Common Teal	73	4
<i>A. platyrhynchos</i> Mallard	16	0
<i>A. poecilorhyncha</i> Spot-billed Duck	243	122
<i>A. acuta</i> Northern Pintail	20,283	72
<i>A. querquedula</i> Garganey	15,457	8,658
<i>A. clypeata</i> Northern Shoveler	12,913	214
<i>Netta rufina</i> Red-crested Pochard	87	5
<i>Aythya ferina</i> Common Pochard	119	0
<i>A. baeri</i> Baer's Pochard	697	0

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Species	Feb/Mar 92	Apr/May 92
<i>Tachybaptus ruficollis</i> Little Grebe	353	534
<i>A. nyroca</i> Ferruginous Duck	1,973	1
<i>A. fuligula</i> Tufted Duck	2,351	54
<i>A. marila</i> Greater Scaup	5	0
Unidentified ducks	1,680	0
<i>Gallicrex cinerea</i> Watercock	2	11
<i>Gallinula chloropus</i> Common Moorhen	10	120
<i>Porphyrio</i> Purple Swampphen	134	670
<i>Fulica atra</i> Eurasian Coot	5,320	65
<i>Hydrophasianus chirurgus</i> Pheasant-tailed Jacana	1,022	393
<i>Metopidius indicus</i> Bronze-winged Jacana	37	35
<i>Rostratula benghalensis</i> Greater Paintedsnipe	0	3
<i>Himantopus</i> Black-winged Stilt	1,267	376
<i>Recurvirostra avosetta</i> Avocet	4	0
<i>Glareola maldivarum</i> Oriental Pratincole	1	0
<i>G. lactea</i> Little Pratincole	2	0
<i>Vanellus cinereus</i> Grey-headed Lapwing	685	24
<i>V. indicus</i> Red-wattled Lapwing	3	1
<i>Pluvialis fulva</i> Asiatic Golden Plover	821	585
<i>P. squatarola</i> Grey Plover	5	0
<i>Charadrius dubius</i> Little Ringed Plover	357	0
<i>C. alexandrinus</i> Kentish Plover	752	0
<i>C. mongolus</i> Mongolian Plover	12	0
<i>Limosa</i> Black-tailed Godwit	402	93
<i>Numenius arquata</i> Eurasian Curlew	0	3
<i>Tringa erythropus</i> Spotted Redshank	135	18
<i>T. totanus</i> Common Redshank	3	20
<i>T. stagnatilis</i> Marsh Sandpiper	434	6
<i>T. nebularia</i> Common Greenshank	119	7
<i>T. ochropus</i> Green Sandpiper	8	4
<i>T. glareola</i> Wood Sandpiper	848	133
<i>Actitis hypoleucos</i> Common Sandpiper	26	12
<i>Gallinago stenura</i> Pintail Snipe	41	6
<i>G. gallinago</i> Common Snipe	553	31
<i>G. megala</i> Swinhoe's Snipe	2	0
<i>Calidris minuta</i> Little Stint	741	4
<i>C. temminckii</i> Temminck's Stint	132	6
<i>C. subminuta</i> Long-toed Stint	0	2
<i>C. alpina</i> Dunlin	3	0
<i>C. ferruginea</i> Curlew Sandpiper	22	4
<i>Limicola falcinellus</i> Broad-billed Sandpiper	1	0
<i>Philomachus pugnax</i> Ruff	912	51
Unidentified shorebirds	560	0

Species	Feb/Mar 92	Apr/May 92
<i>Tachybaptus ruficollis</i> Little Grebe	353	534
<i>Larus brunnicephalus</i> Brown-headed Gull	185	408
<i>L. ridibundus</i> Black-headed Gull	14	1
<i>Chlidonias hybrida</i> Whiskered Tern	2,139	1,597
<i>C. leucopterus</i> White-winged Tern	0	1
<i>Sterna aurantia</i> River Tern	10	0
<i>S. hirundo</i> Common Tern	0	8
<i>S. albifrons</i> Little Tern	1	2
TOTAL WATERFOWL	107,836	30,300

A total of 76,000 ducks were counted in Feb/Mar 92. If it overall coverage is assumed to be on the order of 50-75% (see Section 2.4.1), then the total number of ducks present would be about 100,000-150,000.

Most or all of the waterfowl recorded during the Feb/Mar 92 survey were birds that had overwintered in the haor basin, as little evidence for the start of spring migration was found through early March. Even so, the Feb/Mar 92 count was probably much lower than a count in December or January would have been, given the heavy hunting pressure throughout the region which would have reduced population levels.

Apr/May 92 survey

Far fewer birds (only 30,300 of 67 species) were observed during the Apr/May 92 survey, as by this time the great majority of winter visitors had departed, and the spring migration of waterfowl was almost over. At the 48 sites covered during both surveys, the total number of waterfowl had fallen from 98,850 to 21,000.

Very little breeding-related activity (showing courtship behaviour, calling, prospecting for nests sites or nest-building) was observed, though many of the resident birds had assumed breeding plumage. The only species of waterfowl which appeared to be breeding or about to breed 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, however, known to be complex. Some species begin breeding in the pre-monsoon period; others (mainly the herons and egrets) breed during the monsoon, while yet others (for example, Little Cormorant and Oriental Darter) breed during the dry season. 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, ten in May, four in June, four in July, one in August, one in September and one in November.

Only about 20,000 of the 30,300 waterfowl recorded were resident birds and hence potential breeding birds. This is a remarkably low figure again in view of the extent of the haor basin wetlands and their obviously high productivity (illustrated by fisheries production). The other

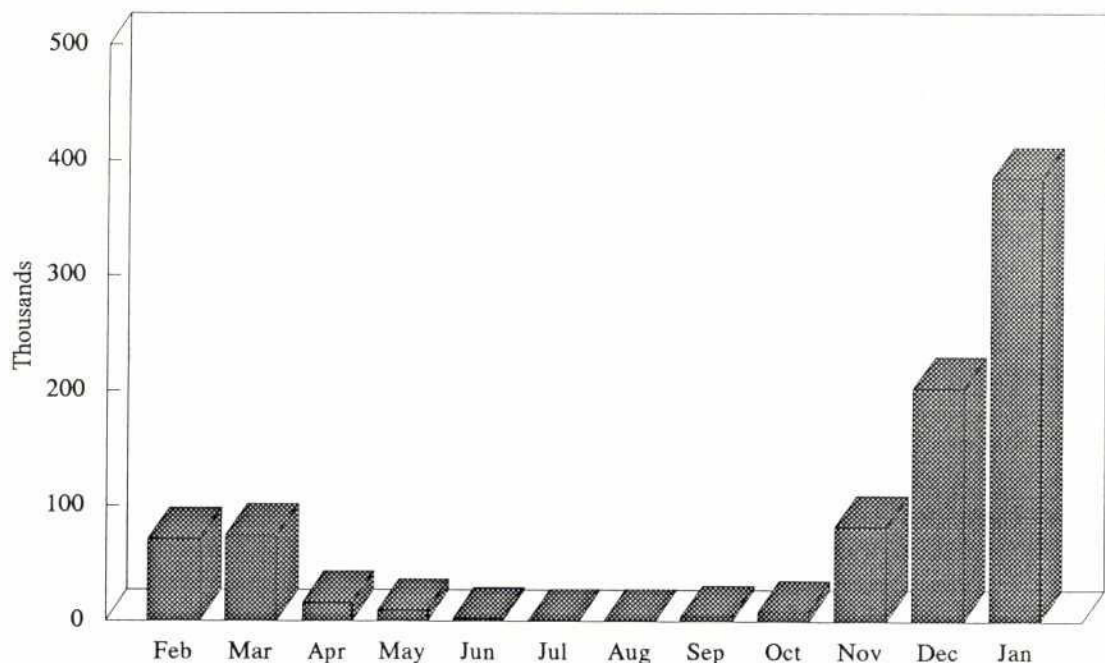
10,000 birds recorded were winter visitors or passage migrants (for example, the flock of 7,000 Garganey at Aila Beel) not yet departed for more northerly breeding grounds.

Waterfowl populations, monthly surveys

The studies were initiated in February 1992. At this time, water levels were decreasing. Unprecedented early rains (late-March and early-April) provided water to the wetlands at Balai and raised water levels at some of the other sites (Patachatal and Erali). This probably resulted in an increase in waterfowl population which may have skewed the counts. It was subsequently established that the peak population occurs in January and that the February 1992 population was, in fact, post-peak. It was also concluded that during May and June, there was an increase in the number of species which coincided with the beginning of the southward migration of waders and other birds. The total number of waterfowl for the monitored sites in January 1993 totalled 386,003 individuals which is more than double the waterfowl thought to be supported by the region's wetlands. Monthly variations are illustrated in the Figure below.

Waterfowl Count Summary

Individuals



In all the monthly monitoring sites the waterfowl population varied inversely with water level. The year-round monthly monitoring studies confirmed this variation. During the full monsoon, almost all the wetlands are under water. Since no habitat was available to the waterfowl, they

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were absent in most sites except for some at Kawadighi, Hail and Balai Haors. At these two sites, because of either embankments or drainage congestion and a reduced water discharge, the physical features appear to be changing. As a result, more vegetative cover and micro-habitat were available to both resident and migratory species.

The observations led to the conclusion that availability of cover, supported by shelter and protection increase the waterfowl population both in number of individuals and species. The number of individuals, however, was independent of the number of species. For example, some species were represented by a single individual while some numbered in the tens of thousands.

The presence of birds was also affected by human activities in the wetlands. This was well illustrated by the monthly surveys. During November and December, 1992 intensive fishing were carried out at Kuri, Erali, Kawadighi haor which involved more than one hundred people at a time. This resulted in the sharp decline in the waterfowl population, when actually the population was supposed to be reaching its peak. Again, disturbances at Tangua beel and other adjacent areas compelled the birds to move to Pashua beel and other nearby wetlands. As a result, Pashua, which is not being fished this year, had the largest aggregation of waterfowl in January 1993 of any area in the region. The numbers estimated (239,827 individuals) surpassed the total regional figures for the northeast mentioned by Scott (1989) and Scott & Rashid (1992). Similarly, because of some protection at Haorkhal, the numbers were higher but did not reach the estimated peak. This may be attributed to illegal hunting and other human activities which caused disturbances.

The monthly observations are provided in Annex E (Waterfowl Count Data). Key observations are summarized as follows:

- January is the peak month for the major influx of migratory waterfowl, particularly ducks and most ducks leave by May. From April the waders start their migratory journey southwards, with the highest numbers staging in the northeastern wetlands during May/June. Waders wintering in the northeastern region start arriving as early as late-July. The water levels were at the peak during that time which forced the waders to stay at the available higher grounds.
- Some of migratory birds, both ducks and waders overstayed in the northeastern region. These might be either young ones or old and sick ones but their numbers were few. Among them were Garganeys, Gadwalls, Golden Plovers and Black-tailed Godwits.
- Some water-dependent waterfowls (Cormorants, Herons, Bitterns, Jacanas, Watercocks, Whiskered Terns) breed in and around the wetlands. The breeding period for Bitterns extended from April to June; Jacanas from May to August; Whiskered Terns from June to August; Cormorants from June/July to September; Herons from May/June to August/September.
- Whiskered Terns were earlier thought to be winter visitors but recent studies in the region showed that they are resident birds and breed in the wetlands of the region. This is the first record of the species breeding in Bangladesh. NERP/NACOM has detailed photographic evidence of this.

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- Even the endangered Pallas's Fish Eagle has managed to reproduce on the limited habitat available in the northeastern region. The nests were built on old nest sites at very low heights since big and high trees are scarce. These nests measured as much as 3-4 m. Fortunately for the birds, local people were not hostile to them although there were complaints that the eagle picks up domestic chicken and ducklings. This is an adapted behaviour owing to the fact that its natural food is scarce and that since it is at the top of the food chain, it is a predator by habit.
 - Resident waterfowl are also affected by increases in water levels. During the monsoon period, the resident population moves to higher ground, the whereabouts of which are not yet known. This suggests that because of environmental factors, resident birds migrate locally.
 - Those wetlands supporting vegetation even during the peak monsoon, retained some bird population. This was supported by observations at Kawadighi, Hail, Pashua and Tangua haors. Despite physical changes in the wetlands, if birds (not all) find cover, they tend to stay for either food, shelter or nesting (eg. jacana, watercock, whiskered tern).
 - Human activities such as fishing and cultivation, affects the waterfowl population in the wetlands. The disturbance caused by either human presence or activities distracts the birds. As a result, they had to increase their flight time in search of food or roosting areas. This is accomplished at the expense of energy stored in the body as fat. If the energy loss exceeds the gain the birds move to other places where the energy costs are low. This also happens during unfavourable environmental conditions such as flooding.

Threatened waterfowl species

Ten waterfowl species attributable to the Northeast Region appear on the IUCN *Red List of Threatened Animals* (1990; the IUCN status categories are shown in Table 3.8). For these ten species, Table 3.7 gives the the IUCN (global) status, the presumed (pre-NERP) status in Bangladesh, the NERP observations, and relevant remarks. Only two of these species were observed during the NERP field studies. Table 3.7 also documents 'interesting observations', mainly observations indicating a new (regional or national) status for a species, and observations of rare and unusual species.

Several lists of bird species considered to be nationally "threatened" or "endangered" 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). All of the lists exhibit poor species choices. Some species known to be on the verge of extinction in Bangladesh are omitted, for example Black-necked Stork and Red-naped Ibis; and other very common and widespread species are included, for example Little Grebe, Northern Shoveler, and Brahminy Kite.

A national list of endangered species, consistent with reasonable criteria and developed by a committee of national experts, would be a useful tool. This is discussed elsewhere.

Table 3.7: Threatened bird species and other interesting observations

Species	Status/observations (prior to NERP studies)	NERP observations			Remarks
		Date	Number observed	Location	
Pink-headed Duck	<i>Extinct</i>				Globally extinct.
Spot-billed Pelican	<i>Indeterminate</i> Extinct in Bangladesh				
Dalmatian Pelican	<i>Endangered</i> Extinct in Bangladesh				Formerly winter visitor.
Oriental White Stork	<i>Rare</i> Extinct in Bangladesh				
Marbled Teal	<i>Vulnerable</i> Extinct in Bangladesh				
Swamp Francolin	<i>Vulnerable</i> Extinct in Bangladesh				
Bengal Florican	<i>Endangered</i> Extinct in Bangladesh				
Common Crane	Extinct in Bangladesh				Formerly winter visitor.
Black-necked Stork	Extinct in Bangladesh				Formerly breeding species.
Black Ibis	Extinct in Bangladesh				Formerly breeding species.
Painted Stork	Extinct in the NE region				
Woolly-necked Stork	Extinct in the NE region				
Greater Adjutant	<i>Endangered</i> Extinct in the NE region				
White-winged Wood-Duck	<i>Vulnerable</i> Extinct in the NE region				
Comb Duck	Extinct in the NE region				
Sarus Crane	Extinct in the NE region				
Lesser Adjutant	<i>Vulnerable</i> ?Extinct as breeding bird in Northeast Region	6 Mar 92	pair	Khakra Kuri Beel Balai Haor	Rare visitor outside of Sundarban.
White-bellied Heron	<i>Endangered</i> ?Extinct as breeding bird in the NE region				Still occurs as winter visitor.
Great Cormorant	?Extinct as breeding bird in the NE region				Still occurs as winter visitor.
Black-crowned Night-Heron	?Extinct as breeding bird in the NE region				Still occurs as winter visitor.

Species	Status/observations (prior to NERP studies)	NERP observations			Remarks
		Date	Number observed	Location	
Grey Heron	?Extinct as breeding bird in the NE region				Still occurs as winter visitor.
Black-headed Ibis	?Extinct as breeding bird in the NE region				Still occurs as winter visitor.
White Stork	Very rare				Winter visitor.
Glossy Ibis	Very rare				Winter visitor.
White Spoonbill	Very rare				Winter visitor.
Grey Lag Goose	Very rare				Winter visitor.
Bar-headed Goose	Very rare				Winter visitor.
Demoiselle Crane	Very rare				Winter visitor.
Great Crested Grebes	Scarce winter visitor	Feb/Mar 92	135	11 sites	
Great Cormorants	Small numbers confined to coastal zone	Feb/Mar 92	54	11 sites	First observation of this species outside coastal zone in recent years.
Chinese Pond Heron	Rare visitor	Apr/May 92	1 1	Pashua Beel Hail Haor	
Asian Openbill		Feb/Mar 92 Apr/May 92	135 315	mostly Pashua Beel	
Fulvous Whistling Ducks		Feb/Mar 92	9815	mainly Tangua Haor	Largest concentration of this species recorded in the subcontinent in recent years.
Falcated Teal		?	drake	Pana Beel, Tangua Haor	Only the second record of this species in Bangladesh in recent years.
Spot-billed Ducks	Rare winter visitor	Feb/Mar 92 Apr/May 92	230 112	Tangua Haor complex	Many birds showing signs of breeding.
Red-crested Pochards	Vagrant	Feb/Mar 92	87	4 sites, Tangua Haor complex	Only two other recent records.
Ferruginous Duck		Feb/Mar 92	1970	nearly all in Tangua Haor & adjacent sites	
Greater Scaup	Not seen in Bangladesh for many years	22 Mar 92	3 female 2 male	Pana Beel, Tangua Haor	Very rare winter visitor to Indian subcontinent.
Grey-headed Lapwing		Feb/Mar 92	685	24 sites	

Species	Status/observations (prior to NERP studies)	NERP observations			Remarks
		Date	Number observed	Location	
Swinhoe's Snipe	Never observed in Bangladesh; assumed to be regular winter visitor	23 Feb	2	rice fields, Hail Haor	
Spotted Redshanks	Scarce winter visitor	Feb/Mar 92 Apr/May 92	135 18	10 sites 4 sites	First recorded in Bangladesh in 1990.
Baer's Pochards	<i>Vulnerable</i>	Feb/Mar 92	660 37	Pana Beel, Tangua Haor 6 sites	This concentration of almost 700 in the haor basin is of considerable international significance: species is scarce throughout its winter range (south China, Vietnam, Thailand, Burma, northeastern India, occasionally Nepal)
Pallas's Fish-Eagle	<i>Rare</i> Endangered in Bangladesh	Feb/Mar 92 Apr/May 92	30 adults 26 immat 17 adults 8 immat	27 sites	This may be one of the largest remaining populations in the world. Birds appear to be residents. Most adults paired and much display noted. Three occupied nests found. Major concentrations at Pashua Haor (2 adults + 17 immature), Tangua Haor (8 adults + 5 immature). Likely endangered in the rest of Bangladesh. Occurs from Kazakhstan and Pakistan east to China and Burma, but populations appear to be declining everywhere.
Jerdon's Moupinia	<i>Vulnerable</i>				Has not been observed in the NE region in many years. Small bird of floodplain grasslands and scrub; can be overlooked. May still survive in small pockets of near natural vegetation.
Black-breasted Parrotbill	<i>Indeterminate</i>				Has not been observed in the NE region in many years. Small bird of floodplain grasslands and scrub; can be overlooked. May still survive in small pockets of near natural vegetation.
Swamp (Long-tailed) Prinia	<i>Rare</i>				Has not been observed in the NE region in many years. Small bird of floodplain grasslands and scrub; can be overlooked. May still survive in small pockets of near natural vegetation.
Blyth's Kingfisher	<i>Indeterminate</i>				Has been observed in recent years in the NE region.
March Babbler	<i>Insufficiently Known</i>				Has been observed in recent years in the NE region.

Table 3.8a: IUCN Threatened species categories

Code	Category	Definition
Ex	Extinct	Species not definitely located in the wild during the past 50 years (criterion as used by CITES). On a few occasions, the category Ex? has been assigned. This denotes that it is virtually certain that the taxon has recently become extinct.
E	Endangered	Species in danger of extinction and whose survival is unlikely if the causal factors continues operating. Included are species whose numbers have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be a immediate danger of extinction. Also included are species that may be extinct but have definitely been seen in the wild in the past 50 years.
V	Vulnerable	Species believed likely to move into the Endangered category in the near future if the causal factors continue operating. Included are species of which most or all the populations are decreasing because of over-exploitation, extensive destruction of habitat or other environmental disturbance; species with populations that have been seriously depleted and whose ultimate security has not yet been assured; and species with populations that are still abundant but are under threat from severe adverse factors throughout their range. In practice, Endangered and Vulnerable categories may include, temporarily, species whose populations are beginning to recover as a result of remedial action, but whose recovery is insufficient to justify their transfer to another category.
R	Rare	Species with small world populations that are not at present Endangered or Vulnerable , but are at risk. These species are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range.
I	Indeterminate	Species <i>known</i> to be Endangered , Vulnerable or Rare but where there is not enough information to say which of the three categories is appropriate.

Source: 1986 IUCN Red List of Threatened Animals.

Cont'd on following page

3.4.5 Birds other than waterfowl

Birds of prey were found to be surviving extremely well in the region. 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 92 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 92 survey, and 72 raptors of ten species during the Apr/May 92 survey.

Four species were observed during the Feb/Mar 92 and Apr/May 92 surveys 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.

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Table 3.8b: IUCN Threatened Species Categories (cont'd)

Code	Category	Definition
K	Insufficiently known	Taxa that are <i>suspected</i> but not definitely known to belong to any of the above categories, because of lack of information.
T	Threatened	Threatened is a general term to denote species which are Endangered , Vulnerable , Rare , Indeterminate , or Insufficiently Known , used to identify species comprised of several sub-species which have differing status categories. The U.S. Office of Endangered Species also uses the term Threatened , but to mean ...
CT	Commercially threatened	Species not currently threatened with extinction, but most or all of whose populations are threatened as a sustainable commercial resource, or will become so, unless their exploitation is regulated. This category applies only to species whose populations are assumed to be relatively large. In practise, this category has only been used for marine species of commercial importance that are being overfished in several parts of their ranges.

Source: IUCN Red List of Threatened Animals

Threatened species (other than waterfowl)

Eight non-waterfowl species attributable to the Northeast Region appear on the IUCN *Red List of Threatened Animals* (1990; see Table 3.6). For these species, Table 3.7 indicates the IUCN (global) status, the presumed (pre-NERP) status in Bangladesh, the NERP observations, and any relevant remarks. Only one of the IUCN threatened species was observed during the NERP field studies.

Table 3.7 also documents 'interesting observations', mainly observations indicating a new (regional or national) status for a species, and observations of rare and unusual species.

3.4.6 Discussion

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, 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 Swampphen, and some of the other Rallidae, are now confined to those few large permanent wetlands or less intensively cultivated areas where such vegetation persists (such as Hail Haor, Balai Haor, Pashua 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 (such as 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 be 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 which relies on 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 twelve 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

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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 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 are the birds of prey. 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 bio-accumulative 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. In the future, populations of these species could be monitored as indicators of pesticide contamination levels.

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 92 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, for example at 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 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).

As a basic tool for conservation management, 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 relevant Government departments, academic institutions and NGOs.

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3.5 Wildlife

3.5.1 Introduction

No precise definition of wildlife is readily available. In a literal sense, it means all organisms "living in the natural state". According to Giles (1978), wildlife usually refers to wild or semidomesticated terrestrial vertebrates. The species most often mentioned are those that impact (positively or negatively) on human society, most notably game animals. Recently, vertebrate pests have been included as major wildlife forms. Butterflies could also be included but it is to be hoped that applied entomologists will assume responsibility for their management. Wildlife is what some individuals or group with a purpose decides it to be. In other words the definition of wildlife is a decision. McGraw-Hill Encyclopedia of Science and Technology (vol.14,p.490,1960) states that, wildlife, in a restricted sense, refers to undomesticated, warm-blooded vertebrates, or wild mammals and birds. Khan (1982) modified these definitions to refer to all undomesticated animals, including Amphibia, Reptilia, Aves and Mammalia but excluding pisces and all invertebrates. The Bangladesh Wildlife (Preservation) (Amendment) Act, 1974 defines wildlife in the Article 2 that wildlife means any vertebrate creature, other than human beings and animals of usually domesticated species or fish, and includes the eggs of birds and reptiles. A very recent consideration is that wildlife both in the wilderness and in captivity includes life in all its forms, levels and combinations (ecosystem diversity, species diversity, and genetic diversity).

3.5.2 Previous Studies

Most of the old documents, of which the District Gazeteers are most noteworthy, described some part of the Greater Sylhet district as an important fishing and hunting ground. Mitra (1957), Mountfort and Poore (1967 & 1968), Kanjilal (1934), Savage (1970), as well as Savage and Ali (1970) have described various aspects of the biological resources and their habitat in the North Eastern part of the country. From the wetlands viewpoint Khan (1982), Scott (1989) and Ali (1990) described the freshwater wetland system in more detail.

In the 4th century, Ibne Batuta travelled through Meghna River and its distributaries while moving from Sonargaon to Sylhet. During his journey by boat, he described that most river banks and marshes were dominated by densely populated cluster Villages, huts and Bazars.

From other old documents it was also found that the human population was dense and the nature of the village in the high land (Kundas) were clustered and primitive. That the human habitation was very old is also indicated by the Behli family in Shanir Haor at Tahirpur Police Station which goes back 1500 years or so. The conflict between the larger wildlife and human beings was very acute because of the limited terrestrial habitat in the haor system during the monsoon. The hypothesis in terms of the habitat is "In the past the haor system had a close resemblance to the present day Phumdi (floating mat) systems that exist in the Assam and Manipur states of India".

Publications in the eighties (Shingh,1980; Annon,1982; Das,1985; and others.) described the Keibul Lamjao National Park. This park which is situated about 50 km south of Imphal, the capital city of Manipur state and about 40 km from the Bangladesh border with India has remarkably retained the natural features of the region's ecosystem. It is unique in its configuration in that it covers a vast stretch of low-lying swamps — locally called Phumdi. These swamps cover a third of the entire area. Phumdi is a mat of organic matter formed from dead or decaying wetland vegetation which actually floats on Loktak lake in a partially submerged

condition. About one-fifth of the organic matter is above the surface of the water (Phumdi Ataoba) and four-fifths of it is submerged (Phumdi Aruppa). The Phumdi varies in thickness from 15 cm to about 1.8 m and is capable of supporting the weight of animals which thrive there. In places where Phumdi atoba is absent a tall reed (up to 5 m) grows on the bed of the lake in sinking phumdi and covers approximately 5% of the area of the National park. The main reeds and grasses growing on phumdi are identified as:

<i>Phragmites karka</i>	45%
<i>Erianthus ravennae</i>	25%
<i>Saccharum bengalensi</i>	15%
<i>Zizania latifolia</i>	5%
<i>Alpinia allughas</i>	5%
<i>Saccharum procerum</i>	2%
Miscellaneous	3%

The reeds are eaten by Brow-Antlered Deer (Sangai) (*Cervus eldi eldi*) and other domestic cattle. The publications (mentioned above) noted that a 1975 aerial survey revealed that the last 14 head of this Brow-antlered deer were waiting for their final extinction in this area. The Brow-antlered deer have shared this unique ecosystem with other animals and birds such as Hog deer, Common otter, Large civet, Small Indian civet, Indian wild boar, etc., for many centuries. Since 1975 an annual animal census has been carried out from the air using an Air Force helicopter. The use of helicopters for the census has been imperative because of the nature of the habitat (it is risky to walk on the Phumdi).

In Pashua Haor of the Gurmar Haor System and in Hail Haor, the remnants of the phumdi system still exists. With the loss of this phumdi system from the region's haors and large scale destruction of swamp forests, the natural habitat of most of the larger wildlife was lost. The corridors in terms of vegetative cover, continuity of Reeds and Grass land, and free flow of Hill streams in most places was discontinuous or destroyed.

3.5.3 Species Observed and Species Groups

The present study on the wildlife of the region revealed that the wetlands support only 48 species of wildlife ranging from Amphibia to Mammalia. Details are provided in Annex D.2 and are summarized as:

Amphibia	9
Reptilia	22
Mammalia	17

3.5.4 Endangered Species

Of the forty eight (48) species found in the region's wetlands, seven species were found to be highly endangered. The endangered species are: Black Pond Turtle (*Geoclemys hamiltoni*), Black Monitor Lizard (*Varanus bengalensis*), Rock Python (*Python molurus*), Monocellate Cobra (*Naja naja kaouthia*), Common Otter (*Lutra lutra*), Smooth-coated Otter (*Lutra perspicillata*), and Fishing Cat (*Felis viverrina*).

3.5.5 Wildlife Utilization

There were six major uses of wildlife and their by-products identified as follows:

- Food
- Medicine
- Trade
- Pet
- Bait
- Recreation

Food

Freshwater turtle meat is widely used as source of protein in the study area. In most of the wetlands, the temporary dry season fishing camps (*khola*) are built near the water bodies. Most of the fishermen living in these camps regularly consume turtle meat which they catch from the water bodies. In addition, lease holder of some of the water bodies enter into a contract with the turtle collectors to provide them with the live turtles. Resident fishermen also trap turtles throughout the year — either for their own consumption or to sell in the market. In total, about 35 turtle markets operating twice a week were identified in the area. The *Shantals*, *Khasias* and *Hindu* communities consume turtles as food, for medicine and for other religious occasions. The species consumed are Common Roof Turtle (*Kachuga tecta*), Brahminy Turtle (*Hardella thurjii*), Peacock Soft Shell Turtle (*Aspideretes hurum*), Spotted Pond Turtle (*Geochlemys hamiltoni*), and Spotted Flapshell Turtle (*Lissemys punctata*).

The remains of turtles found near human habitations indicate that the group was part of man's diet for centuries (Das, 1985). Today turtle flesh is consumed by a great many communities throughout the world. Sometimes as a source of protein and sometimes as a luxury food. A survey of restaurants in various countries indicates that freshwater turtles top the list of the 10 most popular meats.

Other wildlife consumed as food includes snakes and porcupines. All snake species and porcupine available in the wetlands are consumed by ethnic minority people.

Medicine

A total of eleven species of reptiles and mammals are used to treat diseases of both humans and their domestic animals. The most common uses are extracts of oil from turtles, dolphins, lizards, snakes and even from the jackal. The oil is used to treat rheumatic fever, respiratory diseases, asthma, skin diseases, and as a preventive against colds. Some of the by products from Porcupine quills, extract from lizards and turtles are also believed to have aphrodisiac values.

In India, the flesh of the flapshell turtle is prescribed as a cure for tuberculosis. Charaka, the ancient Hindu physician, recommended turtle meat in case of indigestion, weakness of body and they have been used by the Chinese since at least 2737 B.C. It is in China where the greatest number of turtles are used for medicinal purposes.

In Manikganj and in some part of Chittagong, the turtle's carapace is burned to ash and this ash is commonly used to treat the skin diseases of cows and buffalo as well as burns to humans. Venom from the krait and cobra are used by gypsies (*Bede*) in the region to cure various chronic diseases.

Trade

Frogs and turtles from the wetlands were a most important non-traditional export commodity for Bangladesh. Between 1974 and 1987, the country earned Tk 315,170,000 by exporting live turtles (*Source: Export Promotion Bureau*). In today's commercial world, most parts of the turtle have some value. The flesh is consumed, the neck and tail bones and the viscera are used in soup, the fat is needed for soups and creams, the oil forms a cosmetic base, the flipper and neck skins of the larger varieties are tanned and used to manufacture leather articles such as handbags and shoes, the shell is used for making jewellery and ornament cases. Juveniles, as well as adult turtles are sold as stuffed curios to tourists in various countries, to be hung on walls for decoration. The tortoise-shell is one of the most expensive animal products — weight for weight, it is more valuable than ivory. In 1977 alone, India exported more than 82,000 kgs of raw tortoise-shell.

A review of Japanese Customs's Statistics indicate that Bangladesh (then East Pakistan) first exported monitor lizard skins to Japan in 1958. In that first year, 4000 kgs of skins were exported and in the next two successive years, 40,000 kg and 65,000 kg of skins were exported. During the period from 1971 to 1987 Bangladesh exported 445,946 kg of monitor lizard skins to Japan (Khan, 1988). Despite the ban on export of lizard skins, a large quantity are smuggled out of the country. In 1988, Traffic Japan reported that Japan imported the skins of 730,000 endangered lizards from Bangladesh (Khaleej Times, Sept, 2, 1988).

Between 1972 and 1987, bull frogs were one of the major export commodities of Bangladesh. A considerable numbers of frogleg processing plants were established in the Chittagong and Khulna areas. It has been reported that on an average, Bangladesh exports the legs of 70 million frogs per year (Choudhury 1986). It was also noted (Ali 1985) that 3-4000 tons of frog legs were exported from India annually.

Skins of snakes, cats, mongoose, and otters are also used in trade. Venom extracted from poisonous snakes is a very valuable raw material in the preparation of antivenom serum and is also widely used in antirheumatic diseases.

Pets

Otters, mongoose, and turtles are used as pets and as captive animals for various purposes. Trained otters in southwestern Bangladesh are widely used by fishermen for herding fish into their nets. Raising and training these otters is also a profitable business.

Bait

Frogs and toads are used by people dwelling in and around the wetlands of the region for bait. They used frog baited hooks which attracts carnivorous fish. Each of these individually baited hooks are tied in a line which is 200-300 meters in length. Usually there are 200 hooks on the line. The frogs are hung vertically, hooked through the vertebral column with strong nylon string, usually 0.5 m in length, just at the surface of water. The limited movement which these frogs can make causes splashing and attracts the fish.

Recreation

Most of the wetland wildlife have recreational value both locally and at Zoos and Museums. There are myths, ritual beliefs, and historic religious and cultural values which exist among the people of wetlands. These are based on snakes, turtles, lizards, frogs, otters, and mongoose.

3.6 Seasonal Changes, Relationships, and Events

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.

3.7 Impacts of Water Resources Development Projects

It should be clear at this point that the wetlands of the Northeast Region are complicated, dynamic resource systems. It is also clear from the project monitoring, evaluation, and planning work done by NERP so far that the actual (as opposed to planned) impacts of water resources projects are complex.

Conceptually, the interaction between projects and wetlands can be represented by (at an absolute minimum) an $n \times m$ matrix (an impact matrix, one of the tools used in environmental impact assessment). Here n is the number of project types or better still, types of project activities and m is the number of wetland resource subsystems. Project types would include submersible flood protection, full flood protection, and drainage improvement. Project activities, both normal and abnormal, would include: preconstruction activities such as surveys; construction activities such as site preparation, channel excavation, and spoil disposal; operation and maintenance activities such as agricultural changes, structure operation, breaches, and public cuts; and abandonment activities (such as reclamation of infrastructure areas for other uses). Wetland resources subsystems would include the beel fishery, floodplain fishery, submerged vegetation, reed community vegetation, migratory water fowl, and resident water fowl. Not infrequently impacts on specific species would be of interest.

The value of n is at least 25 and the value of m is at least 30 (two fisheries systems, seven plant communities, roughly ten threatened animal species, and roughly ten bird species). Even supposing that 90% of the $n \times m$ potential interactions are trivial still leaves about 70 potentially significant interactions between projects and wetlands.

Thus it is with some caution, and the awareness that we are only scratching the surface, that we advance our ideas on how these kinds of projects affect wetland resource systems. The following paragraphs present the very few preliminary models that we have developed so far. These may well be seriously flawed, but if they stimulate further discussion and model development, they will have served their purpose.

3.7.1 Impacts of Cropping Changes on Floodplain Wetland Vegetation [In preparation]

3.7.2 Impacts of Reduced Monsoon Flood Levels on Waterfowl and Wildlife

[In preparation]

3.8 Key Institutional Aspects

3.8.1 Introduction

Institutional aspects affecting wetlands, like wetland resources themselves, cut across sectoral boundaries, and are bound up in the whole web of sectoral resource management policies, legislation, and organizations. The information in this section reflects that reality.

Institutional aspects consist of:

- *National Policies:* national policies, including national sectoral policies
- *Key international agreements*
- *Legislation and standards*
- *Organizational structure*
 - central government agencies;
 - local government agencies;
 - NGOs (international, regional, local); and
 - government/NGO links
 - Donor agencies
- *Public participation:* community management and education; role of elected officials; community/NGO links
- *Projects and programmes:* ongoing projects and programmes of relevance to wetlands

Land tenure, resource management, research, and human resources development aspects are an integral part of the above areas, and are documented within relevant sections.

Our main observations on institutional arrangements are summarized at the conclusion of this section.

3.8.2 National Policies

The Government of Bangladesh has clearly committed itself to:

- environmentally sound management in general,
- environmentally sound management of ecologically valuable areas such as wetlands, and
- environmentally sound management of specific wetland values.

For the most part, these commitments have yet to be invoked at the sectoral level. Relevant international agreements and national policies are catalogued in Table 3.9 and described below.

National and Sectoral Policy Statements

Memorandum for the Bangladesh Aid Group 1992-93. This document summarizes the 'New Development Perspective', the Government's "vision for the future development of the country consistent with participatory democracy." Overall goals are identified, and among nine strategies specified to meet these goals is:

- "ix. integration of national conservation strategy to prevent the degradation of the environment and improve its capacity of sustainable development with multi-level economic planning." - p. 2

Eight 'selected development issues' are identified and discussed in the document. One of these is "Environmental Protection and Management"; part of the discussion of it reads,

"For protection and conservation of natural resources and to link all developmental activities with the environment for ensuring sustainable development, the following objectives will be pursued during the FFYP period -

- "(a) control and prevention of environmental pollution and degradation related to soil, water, and air;
- "(b) promotion of environment friendly activities in the field of development;
- "(c) preservation, protection, and development of natural resource bases;
- "(d) strengthening the capabilities of public and private sectors to manage environment concern as a basic requisite for sustainable development; and
- "(e) creation of people's awareness for participation in environment protection activities.

"For attainment of the above objectives, the Ministry of Environment and Forest has already initiated a number of actions in different areas. . . . draft national environmental policy . . . draft National Conservation Strategy . . . provision for reflecting Environmental Impact Assessment (EIA) in all public sector projects. Similar measure is underway for the private sector projects. The Pollution Control Office set up in 1977 has been thoroughly reorganised, expanded and elevated as the Department of Environment. The existing

Table 3.9: International Agreements and National Policies Affecting Wetlands

POLICY DOCUMENT	STATUS & DATE
<i>Memorandum for the Bangladesh Aid Group 1992-93</i>	April 1992.
<i>Fourth Five Year Plan 1990-5</i>	Revised Draft, March 1991.
<i>National Environment Policy</i>	Approved April 1992.
<i>National Conservation Strategy (NCS)</i>	Reviewed by concerned Ministries. Submission to Cabinet imminent.
<i>National Environment Management Action Plan (NEMAP)</i>	In preparation.
<i>Forestry Master Plan</i>	In preparation.

INTERNATIONAL AGREEMENT	STATUS & DATE
<i>Ramsar Convention on Wetlands of Importance Especially as Waterfowl Habitat</i>	Ratified 30 April 1992. Sundarban declared as country's first Ramsar site
<i>Convention on International Trade in Endangered Species (CITES)</i>	Ratified 20 Nov 1991.
<i>Rio Convention on Biological Diversity</i>	Signed June 1992. MOEF is preparing instrument of accession.
<i>World Heritage Convention</i>	Accepted as member 3 August 1983. Instrument of accession deposited 1983. Ratification incomplete. Two cultural heritage sites have been inscribed in the World Heritage list. [but see Cida, 1898 p. 20; 'signatory 1987, part of Sundarban East sanctuary declared']
<i>UNESCO Man and the Biosphere Programme</i>	Accepted as member xx. National Committee exists.

Environmental Legislation is begin revised in order to re-orient it to the requirement of the present time. . . . [MOEF] has also prepared a draft National Management Action Plan to address major environmental issues and concerns . . . Environmentally vulnerable areas have been identified for priority action taking into consideration the developmental needs." - p. 76.

National Environment Policy. This is the Government's most comprehensive statement of overall environmental policy. It consists of an introductory statement; six objectives; policies in each of 15 sectoral and issue areas; and a short section on institutional arrangements. Points of particular relevance to wetlands are (page numbers refer to the English translation in typescript):

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Objectives:

"Maintenance of the ecological balance and over all progress and development of the country through protection and improvement of the environment. . . ." - p. 2

"Ensuring sustainable, long-term, and environmentally congenial utilisation of all national resources" - p. 2

Policies:

"Conserve and develop wet lands and protect migratory birds. . . ." [(6), Forest, Wildlife, and Bio-diversity] - p. 4

"Prevent activities which diminish the wetlands/natural habitats of fish and encourage promotional measures in this regard. . . ." [(2), Fisheries and Livestock] - p. 4

"Ratify all environment-related International Laws/Conventions/Protocols that Bangladesh considers ratifiable and amend/modify existing laws/regulations in line with the ratified laws/conventions/protocols." [(4), Legal Framework] - p. 7

Institutional Arrangements

"MOEF would coordinate the implementation of this policy. A National Environment Committee with the Head of Government as the Chairperson be constituted to give overall direction for implementation of the environment policy." - p. 7

Fourth Five Year Plan 1990-5. "Since Bangladesh is a small country with very large population, extra care is required to ensure that economic development does not lead to increased deterioration of its ecology and environment." (From Chapter I, Framework for the Perspective Plan, p. I.3.)

The Plan does not, however, dedicate a Chapter or Section to environmental concerns as such. These are dealt with sectorally; some of the relevant aspects are noted below.

In agriculture (Chapter V, Section B), flood-prone wetland areas are recognized as marginal for agriculture, and expansion or improvement of cropping in these areas is not sought:

"Floods are a fact of life and a part of the ecosystems of Bangladesh affecting land use pattern and the agricultural system of the country. While effective flood protection measures will form an integral part of development efforts during the Fourth Plan period, production plans in the crop sub-sector would focus attention on low-risk areas with less reliance on summer crops particularly in flood-prone areas." - p.V.A-13

In flood control and water resources (Chapter V, Section B), the need for integrated planning, which could include consideration of wetland values, is noted:

"The FFYP would focus attention on these aspects [agriculture, fishery, land use, and other environmental and socioeconomic considerations] in planning and implementation of future . . . programmes through integrated planning by involving all concerned agencies of the Government as well as the local people." - p. V.B-10

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In fisheries (Chapter V, Section C):

"Protection and conservation measures will include: . . . imposition of penalty on the industrial dumping of untreated and harmful industrial wastes into any open water system." -p. V.C-5

"The yearly leasing of inland open waters will be replaced with the licensing system under the New Fisheries Management Policy. On the other hand an investment and management-oriented leasing system covering at least four years or more would be adopted to ensure higher production and resource conservation." - p. V.C-11

(In fact, almost no water bodies have been transferred from leasing to NFMP since the original ~300 transfers during 1986-90.)

In forestry (Chapter V, Section E),

"To preserve the national heritage, a network of protected areas characterising different types of terrestrial life and ecosystems will be established to help maintain biodiversity, and preserve gene pools and critical habitats of rare and endemic plants and animals. The national botanical gardens will be further developed. Measures will be taken to preserve and protect the national parks system in its existing form. Particular emphasis will be given to wildlife protection and preservation through strict enforcement of existing laws and establishment of game sanctuaries." - p. V.E-11

National Conservation Strategy. The NCS is "the blueprint for the integration of both environmental and economic concerns" (p. i). It has been reviewed by the relevant ministries and its submission for Cabinet approval is thought to be imminent. It states that:

"A national policy should be formulated for preservation of wildlife. The proposed policy will include an objective statement specifying areas protected for preservation and regeneration of wildlife . . . [It] should be linked with the national forest policy to avoid conflict." (p. 119).

It also says that

"The Protected Areas System of National Parks, Wildlife Sanctuaries, and Game Reserves should be expanded and maintained since they are the areas of unique richness in biodiversity." (p. 155)

National Environment Management Action Plan. NEMAP is [need general description]. Currently, a set of sectoral discussion papers prepared by the NEMAP consultants are being circulated to Government for review. Each paper identifies sectoral policy, key environmental issues, intersectoral linkages, relevant GOB environmental policy, an environmental action plan (long list of desirable actions), and key areas of intervention (short list).

Papers are currently available in the areas of agriculture, fisheries, water resources, forestry, and coastal and marine sources management [need titles and copies of any others].

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Forestry Master Plan. A Forestry Master Plan is currently being developed. The policy results of this exercise are of potentially great significance to wetland management, given that the Forest Department is responsible for protected area administration; wildlife conservation, including floral research and conservation; and the country's overall forest resources, which would include swamp forest trees on public or private land.

3.8.3 International Agreements

Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat. The Ramsar Convention is an inter-governmental treaty which provides the framework for international cooperation for the conservation of wetland habitats. Wetlands are recognized as being of international importance because local human impacts such as exploitation and pollution can affect wetlands in other countries; many wetland animals migrate through several countries; and many countries required advice and support from others in order to conserve their own wetlands. The Contracting Parties to the Convention (SFOEFL, undated):

- Accept the obligation to include wetland conservation within their national land-use planning;
- Have to promote the wise use of wetlands in their territory and maintain the ecological character of these wetlands (characteristics such as quality of soil, water, plants, and animals);
- Must establish nature reserves in areas of special ecological value;
- Undertake to train personnel in wetland research, management, and wardening;
- Designate the world's most significant sites for inclusion in a "List of Wetlands of International Importance"; and
- Undertake to cooperate for the management of shared water systems and the conservation of shared migratory species.

The Convention is the only inter-governmental agreement to deal with wetland conservation. It was drawn up in 1971 at an international meeting in Ramsar, Iran, and entered into force in 1975. More than 55 countries are party to the Convention; 11 are in Asia (Iran, Pakistan, Russia, Jordan, Japan, India, Nepal, Vietnam, Sri Lanka, China, and Bangladesh). Several hundred sites, covering 34 million hectares, have been designated in the list of wetlands of international importance. A key role in the creation of the Convention, and continuing technical support, is provided by the International Waterfowl and Wetlands Research Bureau (IWRB) in Slimbridge, England.

Periodically, conferences are held (Italy, 1981; Netherlands, 1984; Canada, 1987; Switzerland, 1990; Japan, 1993); these provide the Contracting Parties the opportunity to carry out some of their commitments under the Convention (accept new members and sites; review site status and pledge assistance, and so on).

The Sundarban is so far the country's only Ramsar site. It is 40,000 ha in size, making it the third largest in Asia and sixteenth largest in the world.

Convention on International Trade in Endangered Species (CITES). "Illegal trade in wildlife, including ivory and skins but excluding fish and timber, is probably the world's second largest illegitimate business (only narcotics are worth more) . . . CITES aims to eradicate illegal trade in wildlife and its products, and to ensure that future transactions are held at sustainable levels by the use of mandatory permits." (UNEP, undated).

Two Appendices attached to the Convention, periodically updated, list species that are threatened or potentially threatened by international trade. Mandated activities under the convention are coordinated by the CITES Secretariat on behalf of the contracting parties, and include administration of the mandatory permit system, plus external projects such as wildlife studies and support for realization of economic potential of properly regulated trade in wildlife.

The CITES programme in Bangladesh is implemented and monitored by the Forest Department. There is no National Committee for the country. A number of wildlife species found in Bangladesh are currently listed in the CITES Appendices (Table 3.10).

Table 3.10: CITES and Bangladesh wetland species

Group	Number of species, Appendix I	Number of species, Appendix II	Wetland species, status in Bangladesh
Mammals	20	12	5
Reptiles	16	1	10
Birds	10	1	6
Amphibians	0	2	1

Rio Convention on Biological Diversity.

The Rio Convention on Biological Diversity is a Global Convention which was adopted and signed by 157 nations in the United Nations Conference on Environment and Development (UNCED) on its concluding day on 14th June 1992. The convention was held at Rio de Janeiro, Brazil.

Biological Diversity, often called "biodiversity" for short, refers to the total variety of genetic strains, species and ecosystems. Biological diversity should be conserved as a matter of principle, because all species deserve respect regardless of their use to humanity and because they are all components of our life support system. Biological diversity also provides us with economic benefits and adds greatly to the quality of our lives.

Pursuant to Convention arrangements, UNEP has established a number of "expert panels" to look at how to implement various parts of the Convention. The panels have now met twice in Nairobi, in December 1992 and February 1993. Another round of panel meeting was held at Montreal, Canada for preparing the final report. The reports will be discussed at another meeting hosted by Norway in May 1993. The Norway meeting is intended as a de-facto preparatory meeting of the signatories to the Convention set for September 1993 in Nairobi.

MOEF is preparing the instrument of accession.

World Heritage Convention. The Convention is designed to protect cultural and natural heritage areas of outstanding universal value. Over 90 countries are parties to this agreement. Two cultural heritage sites in Bangladesh have been inscribed in the World Heritage list, Paharpur Budhaya Bihar, Rajshahi, and Bagerhat Mosque, Khulna.

UNESCO Man and the Biosphere Programme.

UNESCO's Man and Biosphere programme (MAB) is decentralized and operates through a framework of National Committees which coordinate its activities. So far established in 120 countries, MAB cooperates closely with FAO, UNEP, WHO, WMO, ICSU, and IUCN. The major programme is the Human Environment and Terrestrial and Marine Resources.

Since 1983 Bangladesh has been a participant in the MAB programme and has organised a number of important activities. Major activities included:

- The formation of a MAB - National Committee.
- Organizing seminars and workshops.
- Publishing a Bangladesh MAB Newsletter
- A study on Public Health and Urban Development - Mosquito menace of Dhaka City.
- A school-based tree planting programme.

At present no active role is being played by the MAB Bangladesh Committee.

3.8.4 Legislation

The term 'wetland' is not used in any existing legislation. Existing legislation covers only a few areas:

- *Wetland ownership.* Permanent settlement of land dates to the 1790s for purposes of collection of revenue. Under this settlement, landed estates including forests, wetlands, and water bodies were settled on landlords (*zamindari*), and actual occupants of the land became tenants-at-will. Various reforms were introduced to curb abuses, but the system persisted until passage of the State Acquisition and Tenancy Act of 1950. With this act, the *zamindari* system was ended, and all types of rent-receiving interests in land were to be acquired by the State on payment of compensation to *zamindari* and tenants. The Act also abolished private ownership of forests, wetlands, and water bodies. In 1956, a policy decision was taken for the Government to acquire all remaining rent-receiving interests in the country, popularly known as "wholesale acquisition of *zamindaries*". Inadequate and fraudulent land settlement records dating or dated to this period continue to hinder resource management (particularly forest management) in some areas (Appendix 6, pp. 4-6, FMP, 1992a).
- *Hunting and protected areas.* The Bangladesh Wildlife (Preservation) Order, 1973 "provides for the preservation, conservation, and management of wildlife in Bangladesh." The law indicates if, when, how, and under what permits "game" and "protected" animals may be hunted. It makes provision for declaration of wild life sanctuaries and national parks, and indicates activities prohibited from such areas (pp. 56-58, Huq/MOEF, 1991).

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- *Pollution.* The Environment Pollution Control Ordinance 1977 provides for the "control, prevention, and abatement of pollution of the environment of Bangladesh." (p. 73, Huq/MOEF, 1991)
 - *Forests.* The Forest Act 1927 is the basic law governing public forests in Bangladesh. Wildlife exploitation within these areas are regulated by the Rules to Regulate Hunting, Shooting, and Fishing within the Controlled and Vested Forests 1959. No swamp forests are included in the government reserved and other forests, so this type of legislation has little direct linkage to wetlands. There is, however, an indirect linkage: to prevent illegal removal of public forest products, the Transit Rules made under the Forest Act prescribe *inter alia* controls on removal of timber and other products from non-Forest Department lands, including wetland swamp forests, and "it is the general impression that the Transit Rules have become an instrument of harassment" (Appendix 6, p. 9, FMP, 1992).
 - *Fisheries.* The East Bengal Protection and Conservation of Fish Act 1950 provides for the protection and conservation of fish in the inland waters of Bangladesh.

3.8.5 Organizational Structures

Regional Governmental Associations

The South Asian Association for Regional Cooperation (SAARC), which has as members Bangladesh, Bhutan, India, Nepal, Maldives, Pakistan, and Sri Lanka, is in the process of setting up a Technical Committee on Environment.

In addition to this, formation of a specialist Regional Wetlands Committee and a SAARC Environmental NGO Network were suggested in the Recommendations on a [Regional] Environmental Action Plan - for Consideration by SAARC Summit (the Summit was originally scheduled for December 1992 and is now planned for April 1993). This document was prepared at a November 1992 meeting of the Bangladesh, India, Nepal, and Pakistan members of the Global 500 Forum (which was established in Rio di Janeiro in 1992 to "link the members of UNEP's Roll of Honour").

Central Government Agencies

Wetland Ownership: Ministry of Land and Forest Department

The large freshwater wetlands of the Northeast are owned almost entirely by the Ministry of Land. This agency is mandated to raise revenue from its land assets, and this is mainly accomplished through renting or leasing use rights of various types, such as fishing rights. MOL has no mandate for or expertise in resource management, and no history of contact with donor agencies or donor-funded technical assistance.

MOL can assign this function to other government agencies. The best known example is the assignment of small fisheries (< 8 ha) lease sales to local government. MOL receives a nominal fee in recognition of its ownership.

MOL has on previous occasions entered into management agreements with resource management agencies. The best known example is an agreement with the Forest Department to afforest coastal *char* lands.

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The Forest Department owns about 50,000 ha of land nominally under reed forest. In 1973, this area was given to the Sylhet Pulp and Paper Mill to provide raw materials, but this was unsuccessful and the area was returned in early 1993.

Wildlife Conservation and Protected Areas Management: Forest Department

In 1973, a Wildlife Circle was established in 1973 in support of the wildlife preservation legislation passed in that year. In 1976, a Wildlife Advisory Board was established under that legislation. The Wildlife Circle "operated until 1983, when it was disbanded due to budgetary constraints following a review by the Enam Committee. The majority of the 112 staff of the Circle were merged into other operations within the Forest Department." In 1985, in response to a request from the Wildlife Advisory Board, "the Government appointed a Task Force [composed of members from inside and outside Government] to examine the current status of wildlife, identify causes for its depletion, and suggest appropriate arrangements to improve conservation." The Task Force recommended *inter alia* that the existing protected area system be consolidated and augmented, and that a wildlife and protected areas management organization be created within the Forest Department. No action has been taken on any of the significant Task Force recommendations (p. 13-14, AWB, 1991).

Of the numerous nominally protected areas in the country, staff with roles defined to include protected area management are on station only in the Sundarban and in Bhawal National Park 40 km north of Dhaka.

As was mentioned above, the CITES programme in Bangladesh is implemented and monitored by the Forest Department, which participates in meetings of the parties to the Convention, provides documentation to animal traders, and imposes bans on prohibited items.

Fisheries Management: Department of Fisheries

The Department of Fisheries is responsible for biological management of the open water fishery. Its structure and activities are documented in the *Fisheries Specialist Study*.

Wild Floral Research and Conservation: National Herbarium and National Botanic Gardens

The Bangladesh National Herbarium is "a component of the Bangladesh Agriculture Research Council, Forestry Division. It is engaged in "(i) exploration and collection plant resources; (ii) providing identification services to various institutes, agencies, and individuals; (iii) publication of the flora of Bangladesh and other floristic reports, and (iv) international exchange of herbarium specimens and publications. BNH is headed by a Director with a sanctioned strength of 13 professional and 10 support staff. It is planned to develop BNH as an autonomous research institution under the MOEF" (p. 21, Appendix 8, Forestry Master Plan, 1992a).

BNH facilities and those of the National Botanic Gardens are being consolidated and upgraded under an ODA-funded project.

Irrigation, Water Development, and Flood Control: MOI and Bangladesh Water Development Board

Water Quality Monitoring and Pollution Control: Department of Environment, BWDB, DPHE
Major pollution in the rivers of Bangladesh are by sewage pollution. Infectious agents contaminate surface water from excreta, domestic and hospital waste. Water becomes the media for carrying micro-organisms that cause typhoid, paratyphoid, dysentery, cholera, polio, infectious hepatitis, etc. The river banks are so densely populated in Bangladesh that testing coliform and faecal bacteria along river banks and ponds yield alarmingly high result. Good quality drinking water should not have more than 0-4 colony counts of coliform bacteria per 100 ml of water. But surface water in Bangladesh yield counts often tens of thousands of coliform per 100 ml of water.

Industrial pollution in Bangladesh is still limited to small areas. Most industries do not use the effluents for treatment. Pollution in these pocket areas can be highly concentrated.

Increasing use of agro-chemicals and heavy metals in industry is likely to contaminate ground water. Organic and chemical pollution sources are of great concern to fisheries and other beneficial uses of surface water.

A small project called the "Water Pollution Control Project" was established in 1973 by the "Water Pollution Control, 1973" ordinance under the Department of Public Health Engineering.

In 1977, the Ordinance of 1973 was abolished and a new Ordinance "Environment Pollution Control Order No. 13, 1977" was enacted. Subsequently, it lead to the establishment of the Environment Pollution Control Board and Environment Pollution Control Cell for future control over resource use and degradation, but responsibilities were limited to pollution control aspects.

Environment Pollution Control Projects were initiated in 1978 by appointing five divisional officers with a working force of 118 personnel. The offices were: Dhaka Division, Dhaka; Research Laboratory, Dhaka; Chittagong Division, Chittagong; Khulna Division, Khulna; and, Rajshahi Division, Bogra.

The main objectives were:

- Surveying industrial units and identifying the industries creating pollution.
- Reducing air and sound pollution.
- Collecting water samples from rivers, lakes, and samples of ground water for testing their quality.
- Testing the water supplied to major towns and implementing pollution control rules and laws.
- Acting upon public complaints.
- Surveying river water and coastal area water for taking pollution control measures.
- Taking necessary action against waste dumping.
- Surveying and researching bio-gas production.

Between 1978 and 1985, the Environment Cell was funded under the development budget. In 1985 the Department of Pollution Control was established under the GOB Revenue Budget. There are 4 Divisional Officers excluding 26 people at the Head Office in Dhaka. There are 11 each at Chittagong, Khulna and Rajshahi divisions. Each of the divisions had a laboratory to undertake necessary tests and analysis.

Major achievements of the programme are:

- Replacement of tannery factories from the bank of the Buriganga River to other places.
- Imposed ban on toxic waste imports.
- Prepared national environmental quality standards.
- Banned the registration of eight harmful pesticides.
- Identified 2072 industries causing pollution through a survey of 5967 industries (The nine key industries identified as top pollutants are listed in Table 3.11).
- Collected water samples from 27 rivers, analyzed these and established a data bank.
- Collected and analyzed 434 ground water samples.
- Established 379 bio-gas plants.

Table 3.11: Major Pollutants

- | |
|-----------------------------------|
| 1. Fenchuganj Fertilizer Factory* |
| 2. Sylhet Paper and Pulp Mill* |
| 3. TSP Complex |
| 4. Chittagong Steel Mill |
| 5. Karnaphuli Paper Mill |
| 6. Karnaphuli Rayon and Chemicals |
| 7. Chittagong Chemical Complex |
| 8. Amin Carpet Mills |
| 9. Chhatak Cement Company* |

* Located in the Northeast Region

Non-Governmental Organizations

The NGOs of greatest direct and current relevance to the wetlands of the Northeast Region so far have been IUCN (international), IWRB and AWB (regional), and NACOM and BCAS (national). These are discussed briefly below.

It should be noted that many other NGOs are active in the region, mainly working with credit, community organization, and vulnerable groups. Current and potential linkages with wetland resources do exist: for example, Mennonite Central Committee is involved in extending a cottage industry based on water hyacinth paper and furniture.

International Union for the Conservation of Nature. IUCN, founded in 1948 with the sponsorship of France, UNESCO, and the Swiss League for the Protection of Nature, is an umbrella organization whose members include 61 state, 128 government agencies (more than half are developing countries), and most of the major non-governmental conservation organizations such as the national branches of the World Wide Fund for Nature (formerly World Wildlife Fund). It is the largest international group concerned with natural resource management. Asia regional office in Bangkok 1991.

Regionally, IUCN activities have been publication in 1990 of the Directory of Asian Wetlands; and sponsorship in December 1991 of the International Conference on Waterfowl and Wetlands in Karachi.

IUCN has been active in Bangladesh since 1985, and established a country office here in 1989. IUCN has been involved in the preparation of the National Conservation Strategy for a number of years; and co-sponsored a National Workshop on Sustainable Management of Freshwater Wetlands in Bangladesh (December, 1992).

International Waterfowl and Wetland Research Bureau. IWRB, founded in 1954, has a small staff which stimulates and coordinates waterfowl and wetland activities worldwide. By acting in a

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catalytic fashion, IWRB can achieve goals otherwise beyond the means of its modest staff and financial resources. It played a key role in the creation of the Ramsar Convention, to which it continues to provide technical support. Funding is provided by member countries and private contributions.

IWRB's Waterfowl Division coordinates the monitoring of waterfowl populations in over 90 countries (including Bangladesh) through the International Waterfowl Census (IWC). The results of these, and of other studies coordinated through the research group, are used to formulate management plans for waterfowl populations and recovery plans for threatened species.

IWRB's Wetland Division coordinates activities through a wetland management group. Activities include the compilation of regional wetland inventories, the preparation and implementation of management plans, the publication of wetland management handbooks, and the organization of waterfowl and wetland workshops and training courses.

In Bangladesh, IWRB initiated the annual waterfowl count program (responsibility for the count in Asian countries was shifted to AWB in 1992).

Asian Wetland Bureau. AWB, founded in 1983, is an independent non-profit organization dedicated to promoting the protection and sustainable utilization of wetland resources in Asia. The headquarters office is located in Kuala Lumpur, Malaysia; Indonesia, the Philippines, and India have national offices. Funding sources for conservation activities include contributions from international environmental NGOs, revenues from environmental consulting, and private contributions.

AWB works in four specific areas: biological diversity; water resources; institutional strengthening and public awareness; and environmental management and policy. Its activities include organizing wetland study and management courses and scientific symposia, and publishing reports and a twice-yearly newsletter (*Asian Wetland News*).

In Bangladesh, AWB has (since 1992) responsibility for the annual International Waterfowl Count, in cooperation with IWRB. AWB has provided consultants to some development projects (Forestry III project appraisal/World Bank, NERP), and has participated in the annual Flood Action Plan conferences. [Directory of Asian Wetlands conferences]

It appears likely that AWB will merge with IWRB soon.

Nature Conservation Movement. NACOM, formally established in 1987, concerns itself with nature conservation and field research, focusing mainly on wetland ecosystems, with special emphasis on herpetology. The organization has been involved in a variety of projects across the country, including :

- Preparation of a management plan for the Teknaf peninsula wild elephant population (WWF);
- Surveys of Hispid Hare and Pygmy Hog (IUCN/SSC), Monitor Lizard (IUCN/WTMC), Sarus Crane (ICF) Otter (WWF), Estuarine River Terrapin (WWF), Freshwater turtle trade monitoring ("Care for the Wild" and University of Kent DICE), Gharials in the Padma river;

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- Marine turtle nesting beach surveys and experiments to hatch turtle eggs artificially with involvement of local people to protect nests and eggs (NACOM/Forest Department Joint Venture);
 - Coastal and inland wetland assessment as part of Forestry III project appraisal with AWB (World Bank) and as part of NERP (CIDA); and
 - Three Nature Conservation Centres at rural sites (at Whykeong, Cox's Bazaar District; Kapasia, Gazipur District; and Sardarpara, Munshiganj District) (Nagao Environmental Foundation, Japan; BRAC), with local people fully involved in operation and management, with an emphasis on non-formal education.

Public participation in environmental management is an increasingly important theme.

Bangladesh Centre for Advanced Studies. BCAS, established in 1984, addresses a broad range of environmental policy and research issues. Projects of relevance to the wetlands of the Northeast Region have included: environmental research projects in the surface water sector, in particular on environmental case studies of haor and pond ecosystems, and public consultations on for a *People's State of the Environment Report* (in prep.).

Government/NGO Links

One of the recommendations of the 1991 Karachi meeting (see IUCN activities above) was that the Government should designate a Wetland Committee that would include representatives of a wide range of interested parties from inside and outside government. Since that time, a group of environmental NGOs met with the Secretary, MOEF, for discussions, but this has not yet been institutionalized.

It is now usual at national (FAP), regional (SAARC), and international (Rio) meetings for NGOs to convene parallel meetings and forward their recommendations to the governmental sessions. Also, Audubon (U.S. non-profit conservation organization) has been designated by a group of international environmental NGOs, to monitor and disseminate information about the Flood Action Plan, with the aim of influencing donor governments, particularly in Europe.

Donor Agencies

Numerous donor agency environmental reviews were prepared in the late 1980s and 1990s. The more recent ones each note the special significance of the wetlands of the Northeast Region (p. 39, Dean and Treygo for CIDA, 1989; p. 25, USAID, 1990; and pp. ix and 34-35, World Bank, 1991), whereas the older ones do not (ADB, 1987; Barker for UNDP, 1988; DANIDA, 1988). Table 3.11 indicates which donors are supporting projects and programmes of relevance to the region's wetlands.

3.8.6 Public Participation

The region's wetlands contribute to the livelihood of a high percentage of the local community through floodplain agriculture, open water capture fisheries, swamp forest plant products, domestic water supply, and provides a means of transportation and communication. In addition, these wetlands support a great variety of plant and animal species.

People, in and around these wetlands, have evolved indigenous management systems. Although in principle, the land tenureship lies with the Land and Revenue Department of the Government, in practice the resources at a subsistence level are being manipulated by the people of the locality. The involvement of local people in wetland management is of prime importance since they are an active part of the ecosystem.

There are various systems used in the region to guide the exploitation of the resources. Jalmohals are leased out under the guiding principles of the "Nitimala". This approach is based on a peoples-participatory approach to fisheries resource management. Mosque-based Hijal forest management involves local participation in management of community forests and reflects the concept of sustainable resource utilization. Garubala is a term used in the region to describe the system of community management of livestock. These indigenous community management systems within the wetlands are under threat because of shifts in the social power structure and because of conflicts at the political level.

The United Nations has suggested that it is more useful to conceive of community participation as taking place in small communities comprising individuals "at the lowest level of aggregation at which people organize for common effort" (Popular Participation in Decision Making for Development, 1975). Accordingly, participation is considered to entail the voluntary and democratic of people in "(a) contributing to the development effort, (b) sharing equitably in the benefits derived thereof, and (c) decision-making in respect of setting goals, formulating policies, and planning and implementing economic and social development programmes" (Midgley 1986).

People's participation involves community action and, particularly in the context of the wetlands, needs to ensure that the poorest of the poor have an effective role — in choosing social actions, in implementing decisions, and in deriving equitable benefits from the programmes. Specific areas in which there is an urgent requirement for public participation needs to be engendered are:

- Lowland floodplain /haor forest management.
- Sustainable utilization and protection of wetland weeds and wildlife.
- Integrated management of wetland ecosystems.

3.8.7 Projects and Programmes

Current, future, and proposed projects and programmes in and affecting the wetlands of the Northeast Region other than water resources projects are listed briefly in Table 3.12. Additional information is given on [selected activities below].

Existing water resources projects are shown in Figure 2. Existing projects are documented in the NERP Water Resources Thematic Study (NERP, 1992). The water resources projects to be proposed in the NERP regional plan will be documented in a series of pre-feasibility studies and in the Regional Plan itself.

Annual Waterfowl Count. An international waterfowl count has been organized by IWRB in January every year since 1987. Count data has been submitted by Bangladesh every year since that time. Sites in the Northeast Region have been included for the last two years. Count sites are fixed, and include 6 sites in the Northeast Region.

Table 3.12: Projects and programmes of relevance to wetlands of the northeast

Name	Department	Time	Cost	Donor	Relevance
Development of Cane, Bamboo, and Murta Plantation	Forest	1992-5	Tk 54 million	ADB, UNDP	Wetland plantation of murta
Development of Conservation and Management of Wildlife	Forest	1992-5	Tk 100 million	ADB, UNDP	Major wetland wildlife component
Survey of Endangered Wildlife of Bangladesh	Forest	proposed Feb 1991	USD 0.44 M	proposed to Japan, USA, IUCN	Wetland wildlife component
Strengthening of Bangladesh National Herbarium	Forest	??	??	ODA	Upgrade floral research and conservation facilities
Management of Wetlands and Conservation of Biodiversity in Bangladesh	Environment	project concept paper Mar 1992	USD 2.48 million (first two years only)	proposed for GEF funding	Develop and implement management plan for important inland wetlands, conserving their biodiversity
Environment Study, Flood Action Plan 16	Flood Plan Coordination Office	1991-1993	USD xx million	USAID	Take wetland values into account in EIA guidelines for water projects; special studies of selected wetland values
Forest Resources Management Project	Forest	1992-1999	USD 63 million	World Bank	Wildlife management
Forestry Master Plan	Forest	1991-3	USD 1.9 million	ADB UNDP FAO	Fundamental sectoral policy and organizational changes
Second Aquaculture Development Project	Fisheries	1992-5	Tk 990 million	ADB	Floodplain stocking; wetland wildlife impacts

4. DRIVING FORCES AND ISSUES IN WETLAND RESOURCES MANAGEMENT

4.1 Introduction

4.2 Driving Forces

1. Increasing rural-urban and rural-government links ('monetization').

As links between rural and urban areas, and between rural areas and government agencies increase, the balance of power between local people and powerful individuals within and outside the local community is changing. The development of improved transportation and communications infrastructure is increasing outside entrepreneurs' access to rural resources. New sources of income, information, and influence are increasing local elites' power within their communities. And within local communities as a whole, from the top of the power structure on down, shifts from traditional cultural to modern consumer 'money-economy' values are gradually taking place.

As a result, powerful individuals are increasingly taking management control of wetland resources away from traditional community management groups, and denying traditional resource users their customary access rights. As managers and users change, so management objectives and practices change, from longer-term sustained community benefits to short-term one-time cash profits.

Examples of this are the changes in swamp forest management and in restriction to wetland access.

Rural-urban links can also have positive effects. In particular, they provide opportunities for alliances between local resource user groups and urban-based conservation activists and resource scientists. These have been limited so far, however.

2. Continued dependence on local resources for biomass and other necessities.

For most of the region's residents, local resources are the only source of biomass for fuel, building materials, and to a certain extent fodder; soil nutrients (fertilizer/compost); medicines; and other necessities. As a result, there is continued strong local demand for wetland products, and market values for them exist and remain relatively high. This heavy demand pressure coupled with weak resource management, sets the stage for localized over-exploitation (yields decreasing even as exploitation effort is increasing).

3. Rural impoverishment.

Wetland resource gathering is attractive to those for whom it provides better economic returns than the alternative activities open to them. Of all households, 50% are functionally landless, rural unemployment and underemployment is very high, and rural population is increasing faster than rural employment creation. As other economic options disappear, increasing numbers of rural residents will likely engage in wetland resource gathering.

The increased harvesting pressure already has or will push systems beyond sustainable levels; the result is declining total production. The large numbers of resource gatherers involved and their lack of alternative survival strategies implies that improved resource management — even for

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improvements that maintain current yields — will not be easy, and will depend on working in partnership with the resource gatherers themselves.

Rural impoverishment can also occur as the result of specific 'development' activities: oustees from sites adjacent to wetlands can also contribute to wetland exploitation. For example, BFIDC's planned conversion of ~ 400 ha yr⁻¹ of upland forest to tea and rubber plantations will displace biomass gatherers and settlers, who may then become dependent on resources from nearby Hail and Hakaluki Haors.

4. Expansion of new technologies ('modernization').

Many of the new technologies that have been introduced to the region are accompanied by adverse impacts on the wetland values. Examples:

- High yielding variety (HYV) technology packages (HYV seeds, irrigation, fertilizer, pesticides) can boost encroachment rates and consume and pollute water.
- Diesel pumps are used to pump out marginal wetland areas for conversion to agricultural use.
- Improved fishing implements such as boat mechanization and ice plants can boost fishing effort and increase overall fishing efficiency.
- Mechanized boats contribute to water pollution and increase the scope and efficiency of transport access to wetland areas.

Not every technological change affects wetlands adversely, however, and some changes can have definite benefits:

- Rural electrification and LPG extension can lessen pressure on species used as biomass fuel.
- Technology-induced increases in employment and income in other sectors can lessen overall pressure on wetland resources.

5. Widening markets and increasing local, urban, and international demand for certain wetland products.

Demand for wetland products is increasing broadly, with increasing local rural population, increasing urban population and wealth nationally, and increasing penetration and intensity of international demand. This demand can be species-specific or more general (for fuel, for example). Over the last century or so, worldwide, many species have been wiped out or brought to the brink of extinction as the result of intense species-specific demand. This type of demand — often reflecting a new fashion (locally or internationally) in food, clothing, or medicine, or the entry of new entrepreneurs into a trading circuit — can intensify rapidly and is hard to predict. Examples of species of the Northeast Region known to be vulnerable are:

- Turtles. Demand as table food.
- Frogs. International demand as table food.
- Snakes. HongKong, Singapore demand for skins
- Lizards. Japanese demand for skins to be used for shoes, bags, and so on.

6. Traditional cultural emphasis on rice and rice cultivation.

Management decisions are influenced by factors other than economic return. In Bengali society, there is an extremely strong preference for rice. Rice connotes pleasure and plenty: rice cultivators have considerably higher status than those dependent on other wetland resources (such as fish, wild plants, waterfowl), and many feel that a meal lacking rice cannot nourish or satisfy hunger.

This leads to wetland management practices such as induced silting up of wetlands to create areas suitable for rice cultivation and pumping out marginal areas to facilitate early planting - even when rice cultivation may not be the most economically attractive use of these areas.

7. Increasing concern for environment and wetlands.

Both nationally and internationally, interest in environmental matters, including concern for wetland values, is increasing dramatically. There are many signs of this, among them the signing of the Ramsar Convention and other international agreements by Bangladesh, the increasing numbers of environmental NGOs, donor country environmental reports and guidelines, and so on. Overall, interest in and institutional resources for wetland management improvements is much higher than even a few years ago, and will likely continue to increase.

8. National political changes.

The change to a democratically-elected government in 1990 has opened up public discourse and policy in a variety of areas, among them environmental management. This affords an opportunity to re-examine entrenched policies and attitudes towards wetlands, and established wetland management practices. The democratic government also has a less ambivalent stance with regard to public participation, a key element of any realistic improvement to wetland management systems.

9. GOB ownership of wetland areas, bureaucratic inertia, and the practice of 'compromise'.

By definition, the Government owns all areas submerged to greater than a designated depth. Tenure over wetlands and other government-owned lands is vested in an agency (Ministry of Land) with a revenue collection mandate and no interest or expertise in resource management. MOL generally leases out its holdings — be they fisheries, quarries, grazing lands, swamp forests.

The system is essentially a remnant of the British colonial period, held in place not by current economic or policy interests of the central government but by bureaucratic inertia and the practice of 'compromise' (A.S. Huque, 1989) wherein a bureaucrat and a prospective lessee agree on a lease fee well below the market price.

The lease fees appear under the heading 'Land Revenue Tax' in the government budget. Land Revenue Tax is a negligible proportion of government revenues. In 1986-7, gross Land Revenue tax was Tk 649 million or 1.7% of Tk 37,253 million total gross revenues. Even of this small amount, well over 80% is retained at the district level for collection costs, reducing the proportion of total gross revenue to 0.24%.

The beneficiaries of the current leasing system are the money lenders and lessees who derive high profits from land leases; those paid to collect the tax; and specific government agencies

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holding accounts to which the tax is credited. These vested interests are so powerful and so weakly opposed that the system looks likely to stay in place indefinitely, despite the many ways in which it opposes stated national interests:

- Tax theorists generally view rents and taxes as stimulative of resource depletion and degradation. This runs counter to stated Government policy to promote sustainable resource management.
- Rents and taxes on wetlands transfer wealth from rural areas to the centre, and from poor resource gatherers to members of the elite; again, Government policy is to focus development efforts on (to direct government resources towards) rural areas and socioeconomically disadvantaged groups, which would include most families dependent on fishing and other wetland resources.
- The land revenue system subsidizes concentration of control over resources in the hands of a few individuals (lessees and their government counterparts) also counter to Government policy prohibiting large landholdings and encouraging control of resources by *bona fide* users.

10. Regional infrastructure development.

Regional infrastructure development can clearly have major impacts on wetlands. Roads and highways can alter drainage patterns and stimulate economic activity. Water resources development for agriculture — flood control, drainage, irrigation — can change inundation timing and levels, alter low flows, and affect water quality, to name but a few potential direct impacts.

11. Development in upstream areas.

Development in upstream areas — changes in agriculture, land use, water resources use, and so on — can affect wetlands by changing water quantity and quality. An important example is the proposed dam at Tipaimukh.

12. Climate change.

Climate change as a driving force for the wetlands of the Northeast Region pales beside the pressures of human exploitation, at least in the near term. Over longer periods, a century and more, climate change will likely be an important factor. Current models of anthropogenic climate change are not yet accurate enough to provide useful information on the scales of interest (current models do not agree on whether or how much the monsoon circulation will intensify, for example).

4.3 Issues

Introduction

A number of issues in the area of wetland management are identified below.

1. Improved wetland management is highly congruent with the national development strategy, despite the perception that 'conservation' is an 'anti-development luxury'.

Table 4.1 illustrates the congruence between national strategy and the wetland management improvements.

Key wetland values (benefits) include:

- of direct benefit to local residents ...
 - primary production of economically valuable wetland plant and animal products (including openwater fishery)
 - employment related to wetland products, both in primary activities such as gathering and secondary activities such as manufacturing)
 - hydrologic services such flood peak reduction through diversion and storage
 - ecosystem services such as water purification, contributions to soil quality
 - erosion control by lowland trees and other plants
- of indirect benefit to local residents; of national and international interest ...
 - biodiversity, broadly defined (see Glossary); in particular, preservation of threatened species
 - representative ecosystems and habitats (reed land, mature swamp forest community)
 - integrity of flyway for internationally-migrating waterfowl
- of direct benefit to the rural poor ...
 - progressive equity distribution of wetland benefits mentioned above (benefits go overwhelmingly to the poorest). This characteristic has been nullified in the area of openwater fishery, by the fishery leasing/land revenue system.

The last wetland value listed is key. Government policy targets the hard-core poor. Wetlands, which provide vital benefits to this group, should be explicitly incorporated as an element of strategy to reach this target, for rural poor with access to wetland areas.

There is a need for wetland education for development policy-makers, planners, project teams, local communities, and other interested parties wetlands, to counter the perception that initiatives related to wetlands are by definition 'conservation-oriented' with the meaning 'anti-development'. Until wetlands are understood to be valuable and important, and lines of communication are open between interested parties, it will be difficult to address the rest of the issues discussed here.

A start has been made in this area with a MOEF, CIDA, and IUCN co-sponsored a national-level workshop on *Conservation and Sustainable Management of Freshwater Wetlands in Bangladesh* in December 1992.

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Table 4.1: Correspondence between Government development strategies and desirable wetland management improvements

GOB strategy	Wetland management improvement
<i>Decentralized participatory planning</i>	<p>Improve understanding of and dialogue about wetlands among development policy-makers, project teams, and local community-based user groups.</p> <p>Shift from centralized to local community-based wetland management.</p>
<i>Development of rural economy; involvement of and benefits for the poor</i>	<p>Enhance wetland benefits.</p> <p>Increase wetland value-added, especially for items with export potential.</p> <p>Shift from centralized to local community-based wetland management.</p>
<i>Appropriate transfer and adaptation of technology, targeted toward supporting employment in the agricultural and manufacturing sectors</i>	<p>Transfer and adaptation of technology to: enhance wetland benefits, increase wetland value-added, mitigate adverse wetland impacts of other activities.</p>
<i>Promote competitive private enterprises, thrust on export-oriented business</i>	<p>Seek maximum sustainable yields of wetland products, especially those with export potential.</p> <p>Increase wetland value-added, especially for items with export value.</p>
<i>Integrate national conservation strategy to prevent degradation of the environment</i>	<p>Stabilize, preserve, and enhance wetland values.</p> <p>Improve the information base for wetland management decision-makers.</p>

2. Wetland values need to be incorporated into development planning.

Wetland benefits need to be recognized and factored into development planning, to reduce environmental damage through appropriate mitigation, and to prevent falsely optimistic estimates of project returns by including losses of wetland value due to projects in project economic assessments. Both economic and other indicators (for example equity, quality of life) should be used as appropriate. The result should be the best use of each wetland site.

3. Wetland benefits need to be stabilized, preserved, and enhanced.

Almost every wetland value listed represents an area where management improvements could induce additional benefits. The potential for management improvement in each area needs to be examined critically. Additional benefits, and the efforts required to achieve them, need to be assessed in the same way that other development alternatives are assessed, and prioritized alongside them on the basis of appropriate indicators.

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Both traditional and creative approaches to improved wetland management should be examined: wildlife sanctuaries, semi-protected areas under local management, rotating preserves, zoning (for example, to limit water resource infrastructure development in certain areas), and so on.

4. The responsibility for and rewards of day-to-day wetland resource management belong in the hands of local communities and user groups.

Improved wetland management to optimize wetland benefits, and sustainable manufacturing based on wetland products will be possible only if resource use (benefits) and management control (responsibility) rest, in the long term, with the same entity.

As noted above, one of the most attractive characteristics of wetland production is its progressive equity distribution (in the absence of distorting policies): the benefits go mostly to poor rural residents. A logical corollary is that resource management responsibility should be devolved to this group ('community-based management'). Private corporations, local and other government agencies, and similar entities will have other appropriate roles, but overall stewardship should rest with local communities/user groups.

5. The information base for wetland management decision-makers needs to be improved.

Informed decision-making will require better information about wetlands: what they are, how they are changing, who exploits them, for what goods and services, and how much these goods and services are worth. The need for information runs from original research to routine monitoring; study programs should carefully focused to meet the needs of resource managers and users. Establishing alliances between Bangladeshi investigators and institutions and the international scientific community will be key.

6. The value added to wetland products needs to be increased, especially for items with export potential.

Currently little value is added to the bulk of wetland products: plants and animals are gathered, undergo basic processing (drying, bundling), and are then sold. There is a need to develop regional industries (cottage or larger-scale) to produce more finished, higher-value wetland goods, such as water hyacinth paper and furniture.

Boosting the value added to wetland products would increase demand for and market value of wetland raw materials; increase wetland-based employment and wages; and increase the value of wetlands relative to other land uses, thereby providing additional incentive to manage wetlands more wisely.

7. Critical wetland areas need to be protected.

Had one or more protected freshwater wetland areas been established (say in the 1870s at the time that the Sundarban Reserve Forest was established), many extinctions could have been avoided and a number of unique ecosystems preserved. This is still the case. The six key wetland sites documented in this study should receive immediate attention to establish viable protection and management.

8. A relentless focus on strategic interventions will be key.

Pressures on the remaining wetlands are heavy and resources (both financial and institutional) to address wetland issues are severely limited. There is a need to narrow the focus to a few key interventions and follow through.

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5. ANALYSIS OF STRENGTHS, WEAKNESSES, OPPORTUNITIES, AND THREATS TO WETLANDS

5.1 Introduction

The wetland management strategy must take into account:

- the current strengths and weakness of the wetlands and wetland management systems,
- the threats that will be impinging upon wetlands and improved wetland management in the future, and
- opportunities to achieve improvements in wetlands and wetland management systems.

In general (but not always), strengths and weaknesses are linked to issues; and threats and opportunities are linked to driving forces.

5.2 Strengths

Much of the prehistoric wetland system of the Northeast Region is gone, and what remains is under heavy pressure. Despite this, the system itself, and the human and institutional setting, has some key strengths:

- *Remaining wetlands have substantial value.* Several key wetlands of outstanding international and national value still exist; a large number of wetlands of significant national or regional value exist; and there are many sites of significant local value. Local residents, particularly the poor, derive significant benefit from these sites. The key sites support most of what remains of the international flyway and biodiversity at all scales (communities, species, and within species), and harbour several internationally threatened species.
- *Important representative habitats still exist,* some only as remnants, though all have been extensively modified relative to prehistoric conditions (in particular, virtually all of the larger animal species have disappeared).
- *The tenure situation is uncomplicated.* Ownership of the core areas of the key sites, including all perennial water bodies and much adjacent land, rests almost entirely with a single entity — the Government. Implementation of changes in national wetland management policy, once fully committed to, could be relatively quick and straightforward. There would not be a need for funds to compensate private landowners directly (though other types of compensation could be necessary).
- *Government development strategies and desirable improvements to wetland management are highly compatible.* See Table 4.1.
- *Some wetland education is already taking place,* at various levels within and outside Government. Tentative lines of communication for dialogue on wetlands among various government agencies, national and international non-governmental organizations, donors, and to a much lesser degree local communities, have evolved. Recent policy moves have

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been in the right direction with the signing of the Ramsar Convention and the other policy statements that are being developed.

- *Some wetland research and monitoring is already taking place, and some key alliances with the international scientific community are already in place.*
- *Some alliances between national and international NGOs are already in place.* National and international NGOs with an interest in wetlands have been active within the country for several years, and have influenced Government, donor, and project planners activities.

5.3 Weaknesses

The wetlands of the Northeast are vulnerable in many ways. The most important of these are:

- *Lack of viable protected freshwater wetland areas.* Had one or more protected freshwater wetland areas been established (say in the 1870s at the time that the Sundarban Reserve Forest was established), many extinctions could have been avoided and a number of unique ecosystems preserved. This is still the case. Establishment of protected areas now could prevent many future extinctions and ecosystem losses.
- *Some of the remaining wetland species and habitats are threatened.* A number of species and habitats are at critical levels.
- *Wetland values are not adequately recognized.* Also, the current and potential contributions of wetlands to national development objectives, are not understood. Both statements are true at all levels, both inside and outside government.
- *Information about wetlands is inadequate* for good decision-making.
- *Current institutional arrangements for wetland management are inappropriate.* MOL has no interest or expertise in resource management, yet it controls the key wetland core areas. It has been strong enough to retain this control despite the fact that it runs counter to various aspects of the national interest. Agencies (MOEF, MIWDFC, MOFL) who have interest and expertise (if in need of strengthening) in wetland resource management have little power, statutory or real, to influence what happens in the wetlands. These agencies are relatively weak and historically have been reluctant to form alliances due to other conflicts.
- *Wetland benefits are well below potential levels; little value is added to wetland products.* Benefits are less than what they might be because resource management is inappropriate or poorly organized, and does not focus on adding value to wetland products.
- *The equity distribution of wetland benefits is less progressive than it could be,* as a result of inappropriate resource management, specifically, the Land Revenue Tax system.

5.4 Threats

- *Over-exploitation.* Certain species are being harvested at levels or in ways that are unsustainable (yields are declining even though exploitation effort stays constant or is increasing).
- *Habitat destruction.* Certain habitat types and species dependent on them are gradually being eliminated.
- *Water pollution.*
- *Disturbance (including hunting).* Disturbance (including hunting) is reducing usable habitat significantly.
- *Felling of mature lowland forest trees.* Removal of mature trees is replacing coppicing as the harvesting method of choice. Immediate returns are higher, but in longer term returns are lower.
- *Suppression of natural regeneration of swamp forest trees.* Few saplings of swamp forest trees survive due to grazing and fuel collection.
- *Drainage improvements, flood control works, induced siltation.* All of these flood plain manipulations tend to reduce the extent and duration of wetlands.
- *Traditional management systems are being challenged by powerful interests.* Powerful interests threaten to reverse wetland benefits historic equity distribution profile, and appropriate resources traditionally under the control of local communities.

5.5 Opportunities

- *Foster beneficial rural-urban links.* Foster linkages between rural user groups and urban/government-based resource scientists and NGOs concerned with wetlands.
- *Transform and empower poor user groups to become resource managers.* Train community-based user groups in basic resource management techniques. Provide legal aid and other support to help them maintain or regain their traditional access and other rights.
- *Displace demand for heavily exploited and threatened species.* Accelerate provision of alternative energy sources to rural areas to reduce pressure on biomass fuel species.
- *Create employment in wetland primary production enhancement.* Develop semi-domesticated farming of high-valued species, especially those with export potential.
- *Develop enterprises based on value-added wetland products.*

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6. WETLAND MANAGEMENT OBJECTIVES

6.1 Introduction

Objectives by definition are quantified targets within a set time frame. They should be achievable, within the framework of available professional, financial, and other resources.

If new methodologies or institutions (for community-based management, for example) need to be developed in order to achieve a particular objective, estimates of the amount of time and resources required may be difficult. In this case, a series of phased objectives leading up to the main objective is indicated, to assist in understanding what is realistic and achievable; as the phases are executed, downstream objectives may need to be reviewed and revised.

The objectives presented here will be considered for incorporation in the regional development objectives or in the water management objectives of the North East Regional Plan.

[DRAFT FINAL VERSION:] The objectives statements presented here are preliminary and incomplete.

6.1 Main Objectives

1. To maintain the major part of the region's remaining biodiversity for future generations.

Comments: This objective includes wetland biodiversity, but extends well beyond this to include the biodiversity residing in wild upland species and in local varieties of domestic plant and animal species as well. To monitor and evaluate achievement of this objective, 'maintenance of remaining biodiversity', baseline data (appropriately defined and focused) and ongoing monitoring of the remaining regional biodiversity is needed.

2. To maintain or enhance the ecological character of the six key wetland sites [list] for future generations.

Comments: These sites are the main repositories of wild wetland species' biodiversity. This implies that major development activities (FCDI, floodplain fish stocking, roads and highways, industrial development) in these areas, and within their upstream basin areas, need to be planned, implemented, operated, and maintained with a high degree of sensitivity to wetland values; or foregone. This also implies improved local wetland resource management. To monitor and evaluate achievement of this objective, baseline data (appropriately defined and focused) on the ecological character of the six key wetland sites is needed.

3. During the period 19__ to 20__, afforest ____ ha per year with swamp forest tree species.

Comments: [In preparation. See FAP 19 report.]

6.1 Subsidiary Objectives

These objectives relate to specific targets that must be met in order to achieve the main objectives.

- 1.a By 2000, to develop a baseline data set (appropriately defined and focused) on the remaining biodiversity in the region. From 2000, to continue assimilating and analysing a monitoring data set.
- 2.a By 1995, complete the baseline data set (appropriately defined and focused) that begun under NERP on the ecological character of the six key wetland sites. From 1995, to continue assimilating and analysing a monitoring data set.
- 2.b By 2000, institutionalize a regional capability to review major development plans for impacts on regional biodiversity and the six key wetland sites.

Comments: EIAs are or will soon be required for most types of major development. DOE is or will be responsible for reviewing these. To support EIA preparers and DOE in this effort as it relates to regional biodiversity and key wetlands, a network of interested parties should be institutionalized. The network should include persons residing in or near each of the key sites, representing the full range of socio-economic classes and occupations, men and women; local and regional technical experts; national technical experts; and international experts as needed. 'Institutionalization' of this network needs to be defined, but would include locating and identifying interested persons, meetings to exchange information, and some form of regular contact (such as a newsletter or meetings).

- 2.c By 2000, institutionalize sustainable community-based management of wetland resources at the six key sites.

Comments: Serious thought is required to define this objective further. How do the terms 'institutionalize', 'sustainable', and 'community-based' apply to these wetlands? To specific subsystems (such as migratory waterfowl)? Should these areas (or subunits of them) have official status (Ramsar site, protected area, rotating refuges)? Each key site would likely require a period of intensive input (say two years, with year one for research and local consultation, and year two for design and implementation of new management systems), followed by follow-up of intermittent outside input on a steadily decreasing basis (over say three years), after which management would be under purely local control with supportive linkages to Government and non-government institutions as appropriate. To complete the intensive input at all the sites in the six year period before 2000, input would have to be provided to two sites during 1994-95, two during 1996-7, and two during 1998-9. Also, there is clearly an opportunity for synergy with the regional wetland network; this needs to be explored.

7. KEY WETLAND MANAGEMENT INITIATIVES

7.1 Introduction

Several key initiatives have been identified to address the challenges facing the wetlands of the Northeast Region and the human inhabitants and natural ecosystems that depend on them. These initiatives are introduced very briefly here. Each will be developed further within NERP, and will be considered for inclusion in the Regional Plan. The list is still open to additional entries.

7.2 Environment Management, Research, and Education Centre

This project would involve providing the necessary technical assistance, equipment, and funding:

- (i) to set up a not-for-profit non-governmental regional centre for environmental management, research, and education, and
- (ii) to carry out a initial programme of activities, including, for example,
 - Establishment of rotating waterfowl sanctuaries
 - Community-based management of internationally-valuable wetland sites
 - Breeding/farming of selected threatened animal species
 - Conservation of threatened plant species
 - Formal and non-formal wetland management education for the range of interested parties: government staff, resource lessees, local communities, and others

The Centre would gradually assume responsibility for fund-raising and management, eventually becoming an autonomous entity.

7.3 Lowland Forestry

Lowland forest tree species, in particular *hijal Barringtonia racemosa*, *koroch pongamia pinnata*, and *barun crataeva nurvala* provide several highly valued services: protection of homestead and embankment highlands from wave erosion; shelter and feeding areas for fish, both directly and indirectly when coppiced branches are placed in fishery areas; wildlife roosting and nesting habitat; and a sustainable (if correctly managed) harvest of branches and leaves for use or sale as fodder, fuel, and so on. Vast areas of the region were historically occupied by these trees and remnants are still common, but stocks are declining. Natural regeneration is rapid and plantation is technically feasible, however.

The aim of the programme would be to develop methodologies to stabilize existing lowland forest remnants, to encourage natural regeneration of these species, and to support private-sector afforestation efforts - taking fully into account both technical, social, and economic factors - with the ultimate objective of rapid reforest/afforestation of the remaining suitable sites.

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7.4 Environmental Quality Monitoring and Water Quality Management

This project would involve providing technical assistance and funding:

- (i) to set up an integrated environmental (including water quality) monitoring programme, appropriately linked to the Department of Environment;
- (ii) to carry out feasibility studies of water quality management for important present and future pollution sources (household, urban, industrial), looking in particular at appropriate/alternative technologies such as wetland waste water treatment
- (iii) to provide - through necessary means such as construction, financial or technical assistance to local communities - water treatment or water quality management facilities for priority pollution sources.

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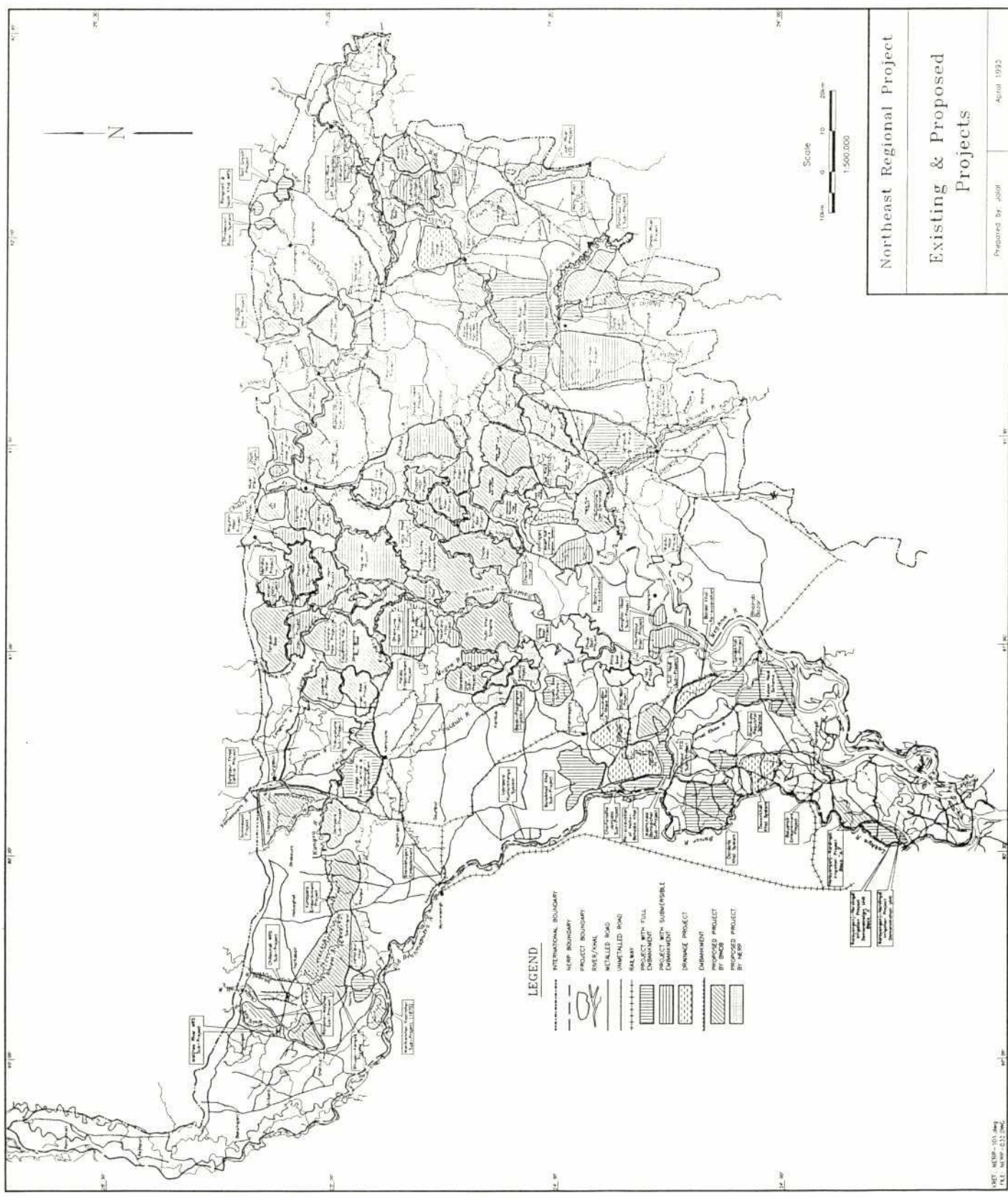
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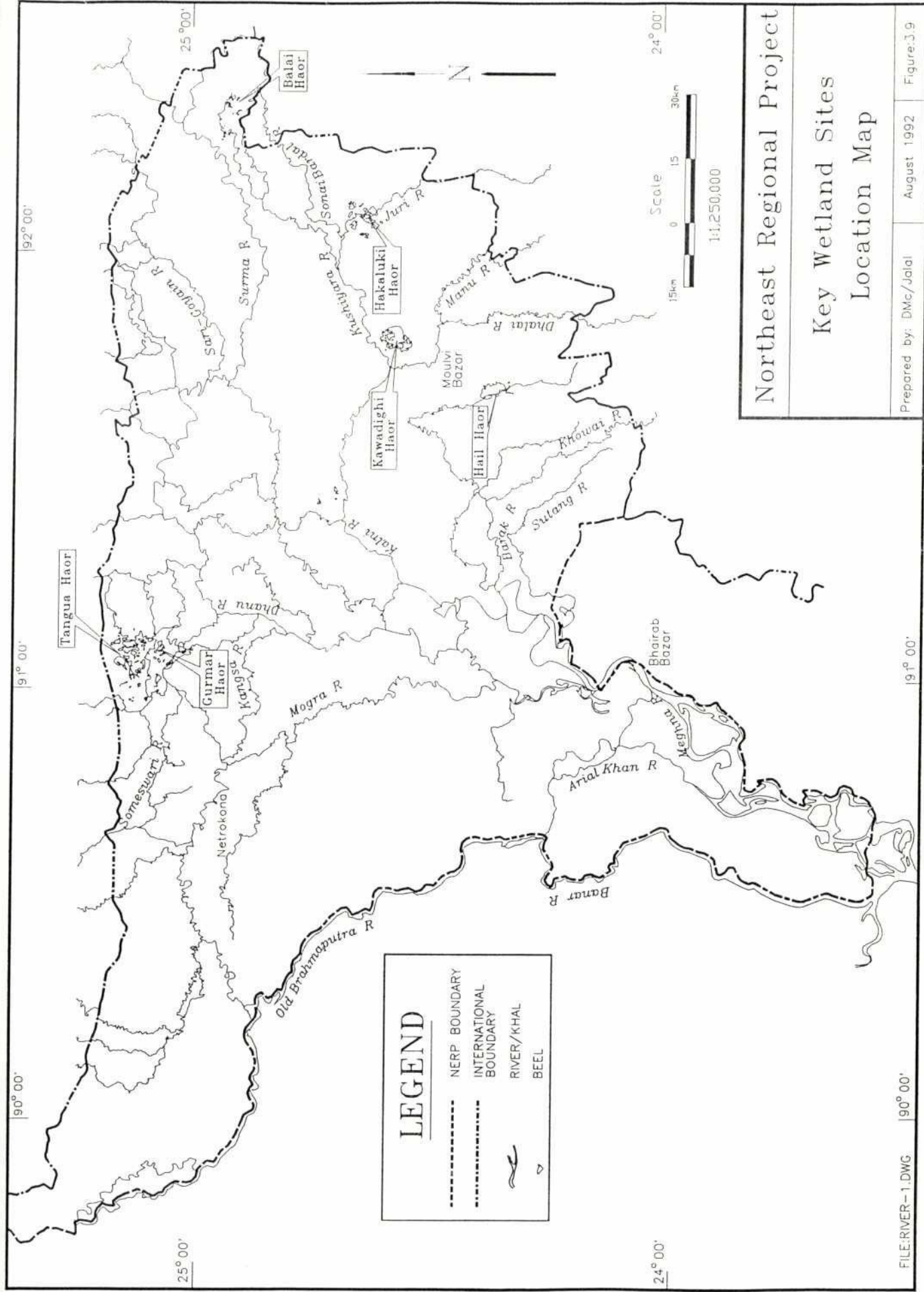
FIGURES



Northeast Regional Project

Existing & Proposed Projects

Prepared by J801 / April 1993



Northeast Regional Project

Key Wetland Sites Location Map

Prepared by: DMc/Jalal August 1992 Figure 3.9

FILE:RIVER-1.DWG 90° 00'

ANNEX A
STUDY SITES

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ANNEX A: STUDY SITES

A.1 Sites Visited During Wetland Appraisal and Main Ornithology Surveys

Wetland Types

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

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SITE NAME	HAOR SYSTEM	DISTRICT	COORDINATES	AREA (HA)	TME
Old Brahmaputra River	-	Mymensingh	24.27-24.45N 90.33-90.26E	(30 km)	1
Lower Baulai River	-	Netrakona	24.11-24.50N	?	1
		Kishorganj	91.00-91.09E		
Lower Kalni River	-	Kishorganj	24.11-24.45N	?	1
		Sunamganj	91.00-91.41E		
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	Moulvibazar	24.22N, 91.41E	2,800	3
Hail Haor Fish Ponds	Hail	Moulvibazar	24.19N, 91.41E	50	7
Petangi Beel	Kawadighi	Moulvibazar	24.34N, 91.47E	350	3
Majherbanda/Ulauli	Kawadighi	Moulvibazar	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	Moulvibazar	24.39N, 92.06E	100	4
Chatla Beel	Hakaluki	Moulvibazar	24.38N, 92.06E	300	2
Tural Beel	Hakaluki	Moulvibazar	24.38N, 92.05E	150	4
Dulla Beel	Hakaluki	Moulvibazar	24.38N, 92.04E	300	2
Chakia Beel	Hakaluki	Moulvibazar	24.37N, 92.03E	200	4
Gharkuri Beel	Hakaluki	Moulvibazar	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
Chunna 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

SITE NAME	HAOR SYSTEM	DISTRICT	COORDINATES	AREA (HA)	TYPE
Dapha, Ruwa, Guinga	Dekhhar	Sunamganj	24.59N, 91.25E	200	4,5
Jaor Beel	Dekhhar	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
Pashua 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

A.2 Itineraries of Wetland Appraisal and Main Ornithology Surveys

February/March 1992

- Feb 18:* Depart Dhaka by vehicle at 1015 hrs for Moulvibazar; survey of fish ponds south of Hail Haor (1645-1720 hrs); arrive Moulvibazar 1900 hrs. Overnight at NERP Guest House in Moulvibazar.
- Feb 19:* Survey of south and central portions of Hakaluki Haor (Gharkuri, Chatla, Pingla, Tural, Dulla and Chakia Beels) (0645-1900 hrs). Overnight in Moulvibazar.
- Feb 20:* Survey of Chalna Beel (near Fenchuganj) and northwest Hakaluki Haor (Lamba, Nirai and Puala Beels) (0655-1840 hrs). Overnight in Moulvibazar.
- 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 Moulvibazar.
- 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 Moulvibazar.
- 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 Moulvibazar 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 Pashua 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, Chalna 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 Moulvibazar.
- Mar 09:* Survey of small beels along Khowai River, Ratna Beel and Sankardanga Beel west of Habiganj (0745-1755 hrs). Overnight in Moulvibazar.
- Mar 10:* Drive from Moulvibazar 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 1992

- 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).

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- 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 Pashua 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 Pashua Beel in evening (0630-1910 hrs). Overnight on boat at Pashua Beel.
- Apr 25:* Final survey of Pashua 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), Chalna 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 Moulvibazar, arriving 1345 hrs. Overnight at NERP Guest House in Moulvibazar.
- 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 Moulvibazar.
- Apr 30:* Survey of southeastern portion of Hakaluki Haor (Chatla Beel, Pingla Beel, Tural Beel and Gharkuri Beel) (0640-1710 hrs). Overnight in Moulvibazar.
- May 01:* Survey of West Banugach Reserved Forest near Srimangal (0635-1945 hrs). Overnight in Moulvibazar.
- May 02:* Survey of southeast portion of Hail Haor by boat (0645-1140 hrs), then west side by vehicle (1140-1820 hrs). Overnight in Moulvibazar.
- 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 Moulvibazar.
- May 04:* Depart Moulvibazar 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 Ajmiriganj and Baniachong 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).

A.3 Floral Study Sites

Site name	Haor system	District	Coordinates
Tangua <u>beel</u>	Tangua	Sunamganj	25°08N,91°05E
Rauar <u>beel</u>	Tangua	Sunamganj	25°08n,91°06E
Ainna <u>beel</u>	Tangua	Sunamganj	25°10n,91°03E
Pana <u>beel</u>	Tangua	Sunamganj	25°06n,91°06E
Pashua <u>beel</u>	Gurmar	Sunamganj	25°02N,91°05E
Erali <u>beel</u>	Erali	Sylhet	24°52N,92°03E
Jugni <u>beel</u>	Balai	Sylhet	24°55N,92°21E
Dubail <u>beel</u>	Balai	Sylhet	24°56N,92°21E
Atli <u>beel</u>	Murir	Sylhet	24°51N,92°14E
Magura <u>beel</u>	Murir	Sylhet	24°50N,92°14E
Pata/Bora chatal	Maijeil	Sylhet	24°40N,91°50E
Chanda <u>beel</u>	Hail	Moulvibazar	24°22N,91°41E
West Hail Haor	Hail	Moulvibazar	24°22N,91°40E
N.E. Hail Haor	Hail	Moulvibazar	24°23N,91°43E
Majerbanda <u>beel</u>	Kawadighi	Moulvibazar	24°35N,91°48E
Ulauli <u>beel</u>	Kawadighi	Moulvibazar	24°36N,91°48E
Chatla <u>beel</u>	Hakaluki	Moulvibazar	24°38N,92°06E
Haor khal <u>beel</u>	Hakaluki	Sylhet	24°41N,92°04E
Chinaura <u>beel</u>	Hakaluki	Moulvibazar	24°38N,92°07E

A.4 Monthly Monitoring Programme

Site name	Wetland Type	Proposed Existing Ongoing	FCDI project
Tangua/Rauar Beel Tangua Haor	Large, permanent <u>beels</u> , emergent/floating vegetation	P	Submersible
Pana Beel Tangua Haor	Medium-sized permanent <u>beel</u> , little emergent vegetation	P	Submersible
Banuar Beel Matian Haor	Large shallow <u>beel</u> , rich emergent/floating vegetation	E	Submersible
Pashua Beel Gurmar Haor	Large <u>beel</u> , good natural vegetation + swamp forest	E	Submersible
Kuri Beel Dekhar Haor	Isolated deep <u>beel</u> with little vegetation	P	Submersible
Deochapra Beel Khai Haor	Small, shallow <u>beel</u> with extensive floating vegetation	P	Submersible
Erali Beel	Isolated deep <u>beel</u> in hilly terrain; little vegetation	P	Submersible
Balai Haor	Group of large <u>beels</u> with rich aquatic vegetation	P	Submersible
Deodar/Chalnia Beels Damrir Haor	Group of small to large <u>beels</u> with little vegetation	O	Drainage
Haor Khal Hakaluki Haor	Very large, shallow <u>beel</u> with mud flats, little vegetation	P	Submersible
Chatla/Pingla Beels Hakaluki Haor	Two large <u>beels</u> in much larger complex	P	Submersible
Patachatal/Borachatal Meijeil Haor	Two large <u>beels</u> , little vegetation	P	Submersible
Three large unnamed <u>beels</u> Kawadighi Haor	Three large <u>beels</u> with good vegetation and mud flats	E	Full flood
One large unnamed <u>beel</u> Hail Haor	Very large <u>beel</u> , extensive floating and emergent vegetation	E	Full flood
Fish ponds Hail Haor	Artificial ponds, little vegetation, protectedEFull flood (private)		

ANNEX B
CENSUS FORMS

NORTHEAST REGIONAL PROJECT : MONTHLY WATERFOWL COUNTS			
NAME OF SITE:			REF:
DATE OF COUNT:		OBSERVERS:	
WEATHER:		ACCESS:	
<p>Waterfowl Counts</p> <p>GREBES</p> <p>_____ Little Grebe</p> <p>_____ Great Crested Grebe</p> <p>_____ Unidentified Grebes</p> <p>CORMORANTS & DARTERS</p> <p>_____ Great Cormorant</p> <p>_____ Indian Shag</p> <p>_____ Little Cormorant</p> <p>_____ Uniden. Cormorants</p> <p>_____ Oriental Darter</p> <p>HERONS & EGRETS</p> <p>_____ Great Bittern</p> <p>_____ Yellow Bittern</p> <p>_____ Cinnamon Bittern</p> <p>_____ Black Bittern</p> <p>_____ Night Heron</p> <p>_____ Little Heron</p> <p>_____ Indian Pond Heron</p> <p>_____ Chinese Pond Heron</p> <p>_____ Cattle Egret</p> <p>_____ Little Egret</p> <p>_____ Intermediate Egret</p> <p>_____ Great Egret</p> <p>_____ Unidentified Egrets</p> <p>_____ Purple Heron</p> <p>_____ Grey Heron</p> <p>STORKS</p> <p>_____ Asian Openbill</p> <p>_____ Black Stork</p> <p>_____ Woolly-necked Stork</p> <p>_____ Black-necked Stork</p> <p>_____ Lesser Adjutant</p> <p>_____ Greater Adjutant</p> <p>_____ Unidentified Storks</p>		<p>IBISES & SPOONBILLS</p> <p>_____ Black-headed Ibis</p> <p>_____ Black Ibis</p> <p>_____ Glossy Ibis</p> <p>_____ White Spoonbill</p> <p>GEESE & DUCKS</p> <p>_____ Fulvous Whistling Duck</p> <p>_____ Lesser Whistling Duck</p> <p>_____ Greylag Goose</p> <p>_____ Bar-headed Goose</p> <p>_____ Unidentified Geese</p> <p>_____ Ruddy Shelduck</p> <p>_____ Common Shelduck</p> <p>_____ Comb Duck</p> <p>_____ Cotton Pygmy Goose</p> <p>_____ Eurasian Wigeon</p> <p>_____ Falcated Teal</p> <p>_____ Gadwall</p> <p>_____ Common Teal</p> <p>_____ Mallard</p> <p>_____ Spotbill Duck</p> <p>_____ Northern Pintail</p> <p>_____ Garganey</p> <p>_____ Northern Shoveler</p> <p>_____ Red-crested Pochard</p> <p>_____ Common Pochard</p> <p>_____ Baer's Pochard</p> <p>_____ Ferruginous Duck</p> <p>_____ Tufted Duck</p> <p>_____ Greater Scaup</p> <p>_____ Unidentified Ducks</p> <p>CRANES</p> <p>_____ Sarus Crane</p> <p>_____ Demoiselle Crane</p> <p>_____ Unidentified Cranes</p> <p>RAILS, GALLINULES & COOTS</p> <p>_____ Water Rail</p>	

[illegible]

[illegible][illegible][illegible]

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There is no handwriting or other markings on the paper.

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NORTHEAST REGIONAL PROJECT (FAP 6)	
MONTHLY WATERFOWL COUNTS IN HAOR BASIN	
1. SITE :	2. REF :
3. DATE :	4. COUNT No :
5. TIME :	
6. ACCESS :	
7. COVERAGE : A. upto 25 %; B. 25 - 50 %; C. 50 - 75 %; D. 75 - 99 %; E. 100 %	
8. WEATHER / VISIBILITY :	
9. COUNTERS :	
10. WETLAND CONDITION : a. WATER LEVEL : b. VEGETATION : c. RICE CULTIVATION :	
11. DISTURBANCE : a. FISHING : b. AGRICULTURAL ACTIVITY : c. OTHERS :	
12. HUNTING ACTIVITY : a. GUNS : b. NETS : c. OTHERS :	

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13. SUMMARY OF WATERFOWL COUNTS :

GREBES	_____	DUCKS	_____
CORMORANTS/DARTERS	_____	MOORHENS/COOTS	_____
HERONS/EGRETS	_____	JACANAS	_____
STORKS	_____	SHOREBIRDS	_____
IBISES	_____	GULLS	_____
WHISTLING DUCKS	_____	TERNS	_____
GEESE	_____	TOTAL :	_____

14. EVIDENCE OF BREEDING :

15. EVIDENCE OF MIGRATION :

16. OTHER FAUNA :

a. AMPHIBIANS :

b. REPTILES :

c. MAMMALS :

17. SUMMARY OF CHANGES SINCE PREVIOUS COUNT/COMMENTS :

~~PRELIMINARY~~ SURVEY : LIST OF WETLAND PLANT SPECIES

Alph :
Date :
Name :
Sh. No :

SPECIES	FAMILY	HABIT	DISTRIBUTION	HABITAT	USES	SOURCE
						HABITAT: T-treelet S-Shrub SC-Scrambler E-Epiphyte A-aquatic
						USES: M-medicinal/narcotic/poison C-Ceremonial FF-food: fruit & nuts FS-food: starch/sugar/cereals FV-food: Vegetable VO-Vegetable oils SF-Spices/flavours B-Beverages EO-Essential oils SM-smoking/chewing FP-feed plants/forage OR-ornament/hedge TS-timber/structures DI-dyes/tannins EX-exudates/resins FU-fuel FB-fibre/thatching/wickery OT-Other uses
						HABITAT: FS-freshwater swamps PS-peat swamps L-lakes FP-floodplains RS-River system M-open marshes
						DISTRIBUTION: W-widely distributed J-Johor M-Melaka Kd-Kedah N-N. Sembilan Kt-Kelantan Ph-Pahang Pk-Perak Pg-Perlis S-Selangor T-Terengganu

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VEGETATION QUESTIONNAIRE

Village

Upazila

Zila

Name:

Profession:

Number of Family Members:

Area of Homestead:

Male:

Female:

1. What do you use for fuel?

	Quantity	Source	
		Market	Homestead Common Field
Cowdung			
Jute Stick			
Rice bucks			
Crop residue			
Grasses			
Branches			
Bamboo			
Commercial fuel			

2. What plant do you use for roofing

Bamboo _____
 Saccharum _____
 Crop husks (Nara) _____
 Tin _____

3. What plant do you use for frame:

4. Do you use any plant for medicine?

Name of Plant _____ Name of Disease _____

Source of Supply

Wetland	_____
Homestead	_____
Local Market	_____
Forest	_____

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5. Do you use any plant for furniture?

Name _____ Quantity _____

Source of Supply Wetland _____
 Homestead _____
 Local Market _____
 Forest _____

6. What plants did you find in the early days but do not find now in the

Name of Plants

Wetland
Homestead
Forest

7. What is the reason for decline

Over cutting
Changing climatic conditions
Changing local environment (habitat)

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WETLAND RESOURCES ASSESSMENT
NERP/NACOM

Date:

Bot.Name:

Local Name:

Locality:

Notes:

[illegible]

WETLAND WORKSHEET

Project name:

Type	Identifying information		Current area		FWO area		FW area	
Cultivated Floodplain	F1 + F2 + F3 areas		ha		ha		ha	
Beels In order of decreasing size; lump smallest beels together if desired Indicate haor system for each, if applicable Show permanently flooded (beel proper) and seasonally-flooded wetland (fallow) area for each Use correct spellings	Beel name	Haor name	Beel	Wetland	Beel	Wetland	Beel	Wetland
TOTALS								
Rivers and Channels Within the project area. Indicate: _____ % perennial _____ % seasonal	Length and width				FWO area		FW area	
	FWO	FW						
	km	km						
Ponds and ditches If more detailed breakdown is used, attach separate table and enter summary here	Number and unit area				FWO area		FW area	
	FWO	FW						
	# ponds	# ponds						
	# ditches	# ditches						
	ponds: @	ha	ponds: @	ha	ha	ha	ha	ha

- Notes:
1. Change in cultivated floodplain area must match changes in agronomy analysis.
 2. Total wetland area should match F4 area, less any F4 not associated with beels.
 3. FWO means future without-project. FW means future with-project scenario.

Sign off:

Water Resources Engineer

Wetland Resources Specialist

Agronomist

Fisheries Specialist

ANNEX C

**RAMSAR INFORMATION SHEETS
FOR KEY SITES**

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INFORMATION SHEET FOR KEY WETLAND SITE

As approved by Rec.C.4.7 of the Conference of the Contracting Parties, Montreux, Switzerland - July 1990.

1. Country: Bangladesh

2. Date: 01-03-93

3. Ref: office use only

4. Name and address of compilers:

S. M. A. Rashid
NACOM
7/7, Kalabagan, N. Dhanmondi
Dhaka 1205
BANGLADESH

Dr. Sara L. Bennett
Northwest Hydraulic Consultants
#2-40 Gostick Place
N. Vancouver BC
CANADA V7M 3G2

5. Name of wetland:

TANGUA HAOR

6. Date of Ramsar designation:

not yet proposed for designation

7. Geographical coordinates:

25°06' - 25°11' N, 91°01' - 91°06' E

8. General location: (e.g. administrative region and nearest large town)

10 km northwest of the headquarters of Tahirpur *thana* and 30 km west-northwest of Sunamganj district town.

9. Area: (in hectares)

1789.93 during dry season, but in monsoon virtually the whole basin is under water.

10. Wetland type: (see attached classification, also approved by Montreux Rec.C.4.7)

M (permanent, rivers);
O (permanent, freshwater lake);
X (seasonally inundated forest and cultivable and grassland)

11. Altitude: (average and/or maximum & minimum)

Lowest elevation (deepest):	2.5 m (PWD)
Highest water level mark during dry season:	5.5 m (PWD)



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12. Overview: (general summary, in two or three sentences, of the wetland's principal characteristics)

A complex of over 46 beels, the most important of which are Rauar beel, Tangua beel, Arabiakona beel, Bherberia beel, Rupaboi beel, Ainna beel and Kalma beel. 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 - 10 m during the rainy season and 2 - 8 m during the dry season.

13. Physical features: (e.g. geology; geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth; water permanence; fluctuations in water level; tidal variations catchment area; downstream area; climate)

Tangua Haor is one of the largest, natural haor systems in the northeast region. The haor system is mainly rendered with the backflow of river waters from Baulai, and Someswari. Due to this backflow the water is relatively clean, free from suspending materials and with less residual matter. As a result the water is transparent and sunlight can penetrate to quite a considerable depth. This increases the lotic area of the water body facilitating the photosynthesis and making it the most productive area (with high biomass) within the northeastern haor basin. It is because of these important physical features that this wetland is still capable of maintaining the ecosystem to its near-natural state resulting in high biomass production.

Apart from these features, the location of the haor is another factor for its high biomass production. The wetland is located right at the foothills of the Meghalaya Hills. Few hill streams flow into the haor system but the major water thrust comes from the south because of the back flow. The hill streams do bring in some sediment but considering the volume of water held in the haor and the area of the haor itself, it is insignificant. Because of the low quantity of silt plus its dissemination during flooding season this haor is still deep enough compared to the other haors where the rate of sedimentation is very high.

The haor system has a number of several beels which retain water almost throughout the year. In between the beels are higher grounds - levees or kanda. These levees support the major plant communities during drier months. At the onset of monsoon or floods all these levees go under water transforming the whole wetland into a single sheet of water changing the whole scenario. The only plant communities to be found then are the rooted-floating, submerged and floating vegetation.

The climatic features of the region are subtropical-monsoon in nature with three prominent seasons, viz. summer, monsoon and winter. Summer begins in April through to June. During this period the average mean temperature ranges from 30.9 to 33.4 °C. The monsoon is the rainy season, extending from June to September with 80 % of the annual rainfall during this period. The average mean temperatures fluctuate between 25.8 to 29 °C. Winter is the following season with the peak cold weather in December and January. Prior to these during October/November and at the later part during February/March the weather is intermittently cold. The temperatures during this period range between 8.5 to 16.6 °C. The mean relative humidity varies between 83 % in the wet season and 64 % in the dry season.

14. Ecological features: (main habitats and vegetation types)

The ecological features of Tangua Haor vary distinctly because of the two different natural conditions namely dry season and monsoon (= rainy) season, of which the later is in extreme condition. As a result the plant communities have to be highly adaptive particularly in the monsoon season when much of the basin is under water. The plants have to modify themselves to survive this anaerobic condition.

The habitat and vegetation type are conditional to the environmental parameters (hydrology, soil, flood tolerance, and zonation) that regulate the development of vegetation. The vegetation consists of a large number of plant species which form aggregated assemblages into specific vegetation types based on physiognomy and environmental factors. They are in fact part of a larger water related ecosystem that includes a diversity of plant, animals and man himself. Different plant communities occupy different habitat along the increasing gradient of flooding and moisture regime.

The identified plant communities are as follows:

- A. **Submerged:** This type of vegetation remains fully under water for their whole life cycle. This includes *Hydrilla verticillata*, *Potamogeton crispus*, *Najas Sp.*, *Aponogeton appendiculatus* and *Ottelia alisoides*.
- B. **Free Floating:** This type of vegetation prefer to float freely in the water and collect their nutrient from it. This includes *Eichhornia crassipes*, *Utricularia* and *Sylvannia*.
- C. **Rooted Floating:** This type of plant although rooted deeply in the soil but their leaves and flower float on the surface of water. It includes *Trapa maximowiczii*, *Echinochloa colonum*, *Hygrorhiza aristata*, *Limnophila indica*, *Mersilea quadrifoliata*, *Nymphoides indicum*, and *Pseudoraphis sp.*
- D. **Sedges & Meadows:** This is an ecotonal community consisting of mostly amphibious plants or geophytes of emergent plants. This includes *Alternanthera philoxeroides*, *Clinogyne dichotoma*, *Eclipta alba*, *Enhydra fluctuans*, *Fimbristilis dichotoma*, *Ipomoea aquatica*, *I. fistulosa*, *Ludwizia sp.*, *Polygonum sp.*, *Scirpus juncoides*, *Vetiveria zizanioides*, and *Xanthium indicum*.
- E. **Reeds:** The elevated areas with gentle slope are occupied by tall grasses or reeds. This includes *Asclepias sp.*, *Asparagus racemosus*, *Ficus heterophylla*, *Lippia javanica*, *Phragmites karka*, *Rosa involucrata*, and *Saccharum spontaneum*.
- F. **Freshwater Swamp Forest:** This type of vegetation consists of evergreen trees forming closed canopy. These trees are 8-12 m in top height. The common species are *Barringtonia acutangula*, *Pongamia pinnata*. Some other species are *Crataeva nurvala*, *Phyllanthus disticha*, *Trewia nudiflora*, and *Salix tetrasperma*.
- G. **Crop Field Vegetation:** It is a synthetic plant community because it contains plant species which is also common in other types. This community comprises both wetland

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as well as open dry land smaller herbs. The composition, however, depends on the situation of water logging in the respective field. It includes *Alternanthera sessilis*, *Cotula hemispherica*, *Cynodon dactylon*, *Cyperus cephalotes*, *Eleocharis atropurpurea*, *Heliotropium indicum*, and *Leucas lavendulifolia*.

H. **Homestead Vegetation:** A synthetic vegetation community and very important for rich species diversity. Some of the common species within Tangua Haor are *Barringtonia acutangula*, *Bambusa* sp., *Calamus tenuis*, *Caryota urens*, *Cocos nucifera*, *Crataeva nurvala*, *Ficus bengalensis*, *Lagerstromia speciosa*, *Mangifera indica*, *Pongamia pinnata*, *Syzygium cumini*, *Trewia nudiflora*, and *Zizyphus mauritiana*. Among other species are *Albizzia procera*, *Alpinia* sp., *Anthocephalus chinensis*, *Areca catechu*, *Artocarpus heterophyllus*, *Bombax ceiba*, *Diospyros perigrina*, *Erythrina variegata*, *Mikania scandens*, and *Samanea saman*.

15. Land tenure/ownership of:

(a) *site*

The wetland is owned by the Government (*khas* land), and is under the control of a local government agency - Additional Deputy Commissioner (Revenue).

(b) *surrounding area*

The surrounding areas are privately owned.

16. Conservation measures taken: (national category and legal status of protected areas - including any boundary changes which have been made; management practices; whether an officially approved management plan exists and whether it has been implemented)

The wetland was earmarked by the Forest Department for the establishment of a Wildlife (Bird) Sanctuary. Recent information from the Forest Department does not indicate any tangibility of such plans. But recent work undertaken by NACOM/NERP has attracted many GOB officials including the Secretary, Ministry of Environment and Forest to take-up some conservation programmes. At present the wetland is leased out by the Ministry of Land through the local Government agency under a fishery development scheme.

17. Conservation measures proposed but not yet implemented: (e.g. management plan in preparation; officially proposed as a protected area etc.)

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18. Current land use - principal human activities in:

(a) site

The wetland is leased out for fishing for nine year period time frame. Fishing was supposed to be carried out every three years but now fishing is done every two years. Apart from fishing, passenger transportation is another major activity during the monsoon period. Some duckery is also being raised in the wetland. Local people also collect reeds (*Phragmites*, *Vetiveria*) and grasses (*Hemarthria protensa*, *chaila*) either for thatching or using them to protect their homesteads from erosion during monsoon. These are also used as a substitute for fuel along with *Lippia*, *Ficus heterophylla*, *Rosa involucra* and some *Phyllanthus*. *Hygrophiza*, *parua* grass are collected for fodder. *Trapa* fruits are also collected and serve as an important supplementary food.

(b) surroundings/catchment

The surrounding areas are mostly cultivated for HYV rice during the drier months.

19. Disturbances/threats, including changes in land use and major development projects: (factors which may have a negative impact on the ecological character of the wetland)

(a) site

Sedimentation due to the increase in erosion in adjacent areas and due to the greater volume of silt coming in from the hill streams.

(b) surroundings/catchment

Intensive rice cultivation and wherever possible transforming the wetland for cultivation (< 5 %), deforestation of freshwater swamp forest in adjoining areas (eg. Rangchi).

20. Hydrological and physical values: (groundwater recharge, flood control, sediment trapping, shoreline stabilisation etc.)

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21. Social and cultural values: (e.g. fisheries production, forestry, religious importance, archaeological site etc.)

The wetland is of great importance for fish production as well as for "mother fisheries". This is because many of the fish species migrate to this wetland for spawning and breeding. The floral richness and diversity and the water quality for high biomass production has already been discussed in different sections.

The adjoining area of Tangua support some freshwater swamp forest and reedlands. The forest provides protection to the adjacent villages from the onslaught of wave action and winds during monsoon. These forests provide some fire wood, building or thatching material, fish entrenchments (branches of *Barringtonia*) and wood for making boats.

Some wetland plants are of special importance for the local people since they provide food substitutes (already mentioned in one of the sections).

22. Noteworthy fauna: (e.g. unique, rare endangered, abundant or biogeographically important species; include count data etc.)

Amphibians: *Bufo melanostictus*, *Rana tigrina*, *R. cyanophlyctis*, *R. limnocharis*.

Reptiles: *Varanus bengalensis*, *Cerberus rhynchops*, *Xenochrophis piscator*, *Enhydria*, *Python molurus* (rare), *Kachuga tecta*, *Hardella thurjii*, *Geoclemys hamiltonii* (rare), *Aspideretes hurum*, *Lissemys punctata*.

Aves: Great Crested Grebe, Great Cormorant, Herons, Egrets, Fulvous Whistling Duck, Falcated Teal, Mallard, Spotbill, Red-crested Pochard, Common Pochard, Bear's Pochard, Ferruginous, Tufted Duck, Watercock, Swampphen, Oriental Pratincole, River Lapwing, Blacktailed Godwit, Curlew, Spotted Red Shank, Ruff, Great Blackheaded Gull, Whiskered Tern, Common Tern, Greyheaded Fish Eagle, Pallas's Fish Eagle (classified as Endangered in the IUCN Red Data Book), Shikra, Marsh Harriers, Pied Harrier.

Mammals: Musk Shrew, Fishing Cat, Large Indian Civet, Small Indian Mongoose, Jackal, and sometimes Leopard, Elephants, Wild Boar, Barking Deer, Gaur come in from the Meghalaya Hills, Flying Fox and Fruit Bats.

23. Noteworthy flora: (e.g. unique, rare endangered, or biogeographically important species/communities etc.)

Unique, Rare, & Endangered: Bengal Rose (*Rosa involucrata*)

Biogeographically Important Communities:

Freshwater Swamp Forest

Barringtonia acutangula, *Pongamia pinnata*, *Crataeva nurvala*, *Trewia nudiflora*, *Salix tetrasperma*, *Ficus* sp.

Reedland

Phragmites karka, *Vetiveria zizanioides*, *Saccharum spontaneum*, *Ficus heterophylla*, *Lippia javanica*.

24. Current scientific research and facilities: (e.g. details of current projects; existence of field station etc.)

Under the umbrella of NERP (FAP-6) various scientific studies are going on since early 1992. These include studies on Agriculture, Hydrology, Sedimentation, Sociology, Fisheries, Environment (flora, fauna) which are directly related to the wetland, the people residing around it and the developmental activities to be undertaken.

25. Current conservation education: (e.g. visitors centre, hides, information booklet, facilities for school visits etc.)

None existing but CIDA sponsored NERP/NACOM are planning to initiate an experimental Environment Management, Research and Education Centre.

26. Current recreation and tourism: (state if wetland used for recreation/tourism; indicate type & frequency/intensity)

The trend of eco-tourism, particularly in the wetlands have not developed yet. It will take some time before the people grasp the idea of eco-tourism. Presently few people visit the wetlands, among them most of the people have either some business interest in fishing or duck shooting. Few scientists also visit. The frequency of visitors in the wetlands is negligible.

27. Management authority: (name and address of body responsible for managing the wetland)

The wetland is managed by the Additional Deputy Commissioner (Revenue), Sunamganj District under the Ministry of Land.

28. Jurisdiction: (territorial e.g. state/region and functional e.g. Dept of Agriculture. Dept of Environment etc.)

Sunamganj; Tahirpur and Ministry of Land; Additional Deputy Commissioner (Revenue).

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29. Bibliographical references: (scientific/technical only)

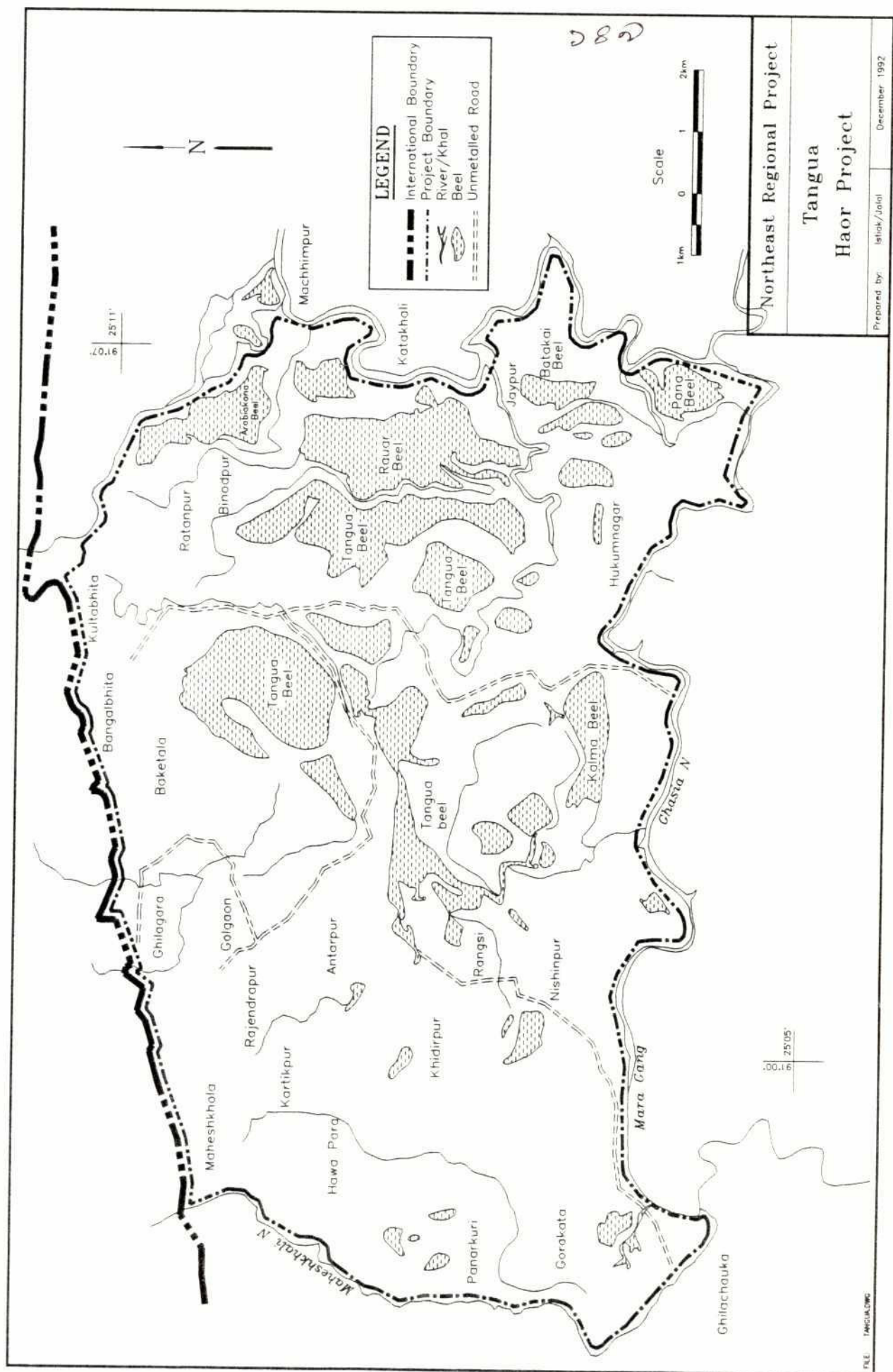
Scott, D.A. (1989). Directory of Asian Wetlands. IUCN.

Scott, D.A. & Rashid, S.M.A. 1992. Ornithological Main Surveys and Wetland Assessment. AWB/NACOM.

Karim, A. (1992). Wetlands plant diversity and conservation in Bangladesh. Paper presented at the Conference on Wetland Conservation in Bangladesh, held in Dhaka, November 1992. Jointly sponsored by IUCN, Ministry of Environment & Forest and CIDA.

30. Reasons for inclusion: (state which Ramsar Criteria - as adopted by Rec.C.515 of the Montreux Conference - are applicable)

31. Map of site (please enclose the most detailed and up-to-date map available - preferably at least 1:25,000 or 1:50,000)



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INFORMATION SHEET FOR KEY WETLAND SITE

As approved by Rec.C.4.7 of the Conference of the Contracting Parties, Montreux, Switzerland - July 1990.

1. Country: Bangladesh

2. Date: 07-03-93

3. Ref: office use only

4. Name and address of compilers:

S. M. A. Rashid
Co-Founder
NACOM, 7/7, Kalabagan, N. Dhanmondi
Dhaka 1205
BANGLADESH

5. Name of wetland:

PASHUA BEEL, GURMAR HAOR

6. Date of Ramsar designation:

7. Geographical coordinates:

25°02' N and 91°05' E

8. General location: (e.g. administrative region and nearest large town)

± 8 km west-southwest of the headquarters of Tahirpur

9. Area: (in hectares)

400

10. Wetland type: (see attached classification, also approved by Montreux Rec.C.4.7)

O (permanent freshwater lake), T (seasonal intermittent freshwater marshes) and X (swamp forest dominated wetland).

11. Altitude: (average and/or maximum & minimum)

Lowest elevation:

3.0 m (PWD)

Highest water level mark
during dry season:

3.5 m (PWD)

12. **Overview:** (general summary, in two or three sentences, of the wetland's principal characteristics)

Pashua 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 mixed forest of *Pongamia*, *Barringtonia* with the former species dominating. Seasonally intermittent marshes with reeds (*Phragmites karka*) abundant within and in the peripheries of the beel. Gurmar Haor has recently (in 1991) been surrounded by a submersible embankment to protect against flash-flooding (Gurmar Haor Project No: 49, 1991)

13. **Physical features:** (e.g. geology; geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth; water permanence; fluctuations in water level; tidal variations catchment area; downstream area; climate)

The main value of Pashua 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. These include a dense stand of *Pongamia pinnata*, few *Barringtonia acutangula* and rarely *Crataeva nurvala*, large areas of dense tall grasses and patches of dense shrubbery. Although the main beel is intensively fished every two years and there are few small rice fields near the river embankment, there has obviously been little other exploitation in the area in recent years.

Pashua 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 of the then Government of Bangladesh. 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 well. The lease came up for renewal in 1992 and is apparently given out by open auction on a three year basis. Fortunately the next man is also a Member of Parliament, with lot of goodwill and power to offer almost the same level of protection which has been afforded to the habitats around the beel over the past nine years.

The importance of Pashua 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 of Bangladesh. It provides a secure roosting site for huge numbers of cormorants, herons, and egrets (more than 10,000 in January 1993) and supports a number of species which are scarce or local elsewhere (eg. Purple Heron, Black-headed Ibis, Spotbilled Duck, and Purple Swamphen). A large flock of Asian Openbills frequented most part of the year excepting the peak monsoon months (June - September). They numbered + 700 in January 1993. Concentration of Pallas's Fish Eagle, nesting in adjoining areas, 19 in early-March, 28 in late-March, 3 active nests in adjoining areas are of great significance, as this is a globally threatened species. The area also supports a much higher diversity of waterfowl and other wetland birds than any other site studied in the northeast region. More than fifty species were recorded in the beel including Mandarin Duck, Comb Duck, Falcated Teal, Greater Scaup Duck, Red-crested Pochard and Baer's Pochard. The January, 1993 counts numbered 239,810 individuals.

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The climatic features of the region are subtropical-monsoon in nature with three prominent seasons, viz. summer, monsoon and winter. Summer begins in April through to June. During this period the average mean temperature ranges from 30.9 to 33.4° C. The monsoon is the rainy season, extending from June to September with 80 % of the annual rainfall during this period. The average mean temperatures fluctuate between 25.8 to 29° C. Winter is the following season with the peak cold weather in December and January. Prior to these during October/November and at the later part during February/March the weather is intermittently cold. The temperatures during this period range between 8.5° to 16.6° C. The mean relative humidity varies between 83 % in the wet season and 64 % in the dry season.

The changes in the water level during the dry months and peak monsoon is quite contrasting. During peak monsoon (July/August) the water level is so high that 0.5 to 1 m of the tallest *Pongamia* trees are visible and the rest under water which brings the difference in water level to between 6 m and 8 m between the dry and monsoon months. The submersible embankment is also under ± 2 m water during peak monsoon. During the monsoon the bird population is almost nil.

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14. Ecological features: (main habitats and vegetation types)

This wetland supports one of the last remaining natural stands of freshwater swamp forest and reedlands in the northeastern region of Bangladesh. Several distinct habitat types and plant communities, though subject to environmental parameters, can be identified during dry season:

- i. **Open water:** This is the open water area consisting of submerged, rooted floating and free floating vegetation.
 - A. **Submerged:** This type of vegetation remains fully under water for their whole life cycle. This includes *Hydrilla verticillata*, *Vallisneria spiralis*, *Najas sp.*, *Aponogeton natans* and *Ottelia alismoides*.
 - B. **Free Floating:** This type of vegetation prefer to float freely in the water and collect their nutrient from it. This includes *Eichhornia crassipes*, *Sylvannia natans*, *S. cucullata* and rarely *Pistia sp.*
 - C. **Rooted Floating:** This type of plant although rooted deeply in the soil but their leaves and flower float on the surface of water. It includes *Trapa maximowiczii*, *Hygorhyza aristata*, and *Nymphoides indicum*.
 - D. **Sedges & Meadows:** This is an ecotonal community consisting of mostly amphibious plants or geophytes of emergent plants. This includes *Eleocharis dulcis*, *Polygonum barbatum*, *P. glabrum*, *Hemarthria protensa*, *Scirpus juncoides*, *Xanthium indicum*, *Alternanthera philoxeroides* and *Eclipta alba*.
 - E. **Reeds:** Elevated areas, usually at the periphery and adjacent to the forest, with gentle slope are occupied by tall grasses or reeds. It includes *Asclepias sp.*, *Asparagus racemosus*, *Ficus heterophylla*, *Lippia javanica*, *Hemarthria protensa*, *Saccharum spontaneum*, and *Phragmites karka*.
 - F. **Freshwater Swamp Forest:** This type of vegetation consists of evergreen trees forming a dense closed canopy with very little cover underneath. These trees are 6 - 8 m in height. The species usually met with are *Pongamia pinnata*, *Barringtonia acutangula*, and *Crataeva nurvala*.

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15. Land tenure/ownership of:

(a) *site*

The wetland is owned by the Government and is under the control of the local government agency - Additional Deputy Commissioner (Revenue), who leases it out for fisheries projects.

(b) *surrounding area*

The surrounding areas are privately owned excepting the rivers which are on the east, west and south of the wetland. On the opposite bank are little cultivable land owned privately.

16. Conservation measures taken: (national category and legal status of protected areas - including any boundary changes which have been made; management practices; whether an officially approved management plan exists and whether it has been implemented)

No conservation plans exist excepting the fishing management practice which allows to fish every two or three years (it should be noted that this practice is followed by the fishermen themselves; there is no hard & fast government rule).

Recent studies undertaken by NERP/NACOM designate it as a high priority area for conservation. IUCN Wetland Programme officials have recently visited this wetland and have recognized its importance and value both for fish production and as a waterfowl refuge. Of utmost importance is the natural stand of freshwater swamp forest and the existence diverse habitat types.

17. Conservation measures proposed but not yet implemented: (e.g. management plan in preparation; officially proposed as a protected area etc.)

18. Current land use - principal human activities in:

(a) *site*

Principal activities include fishing in the beel waters with some boro rice cultivation on the peripheries during drier period. The beel is usually leased out for three years but in most instances it is effective for nine years. Presently fishing is done every two years instead of three years. During monsoon, when the whole basin is under water some lumber poaching takes place. Branches of *Pongamia* and *Barringtonia* are also used for fish entrenchment and trunks are used in house building. During drier months extraction of grass, *Hemarthria protensa* is carried on either for fodder or to store it for future use as homestead binder - to protect the homestead from wave action during monsoon.

(b) *surroundings/catchment*

The surrounding cultivable areas are planted with rice. Some higher grounds grow potatoes. Some areas, adjacent to homesteads, are planted with some vegetables.

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19. Disturbances/threats, including changes in land use and major development projects: (factors which may have a negative impact on the ecological character of the wetland)

(a) *site*

Sedimentation due to the increase in erosion in adjacent areas and due to the greater volume of silt coming in from the hill streams.

(b) *surroundings/catchment*

Intensive rice cultivation and wherever possible transforming the wetland for cultivation (< 5 %), deforestation of freshwater swamp forest in adjoining areas (eg. Rangchi).

20. Hydrological and physical values: (groundwater recharge, flood control, sediment trapping, shoreline stabilisation etc.)

21. Social and cultural values: (e.g. fisheries production, forestry, religious importance, archaeological site etc.)

The wetland is of great importance for fish production as well as for "mother fisheries". This is because many of the fish species migrate to this wetland for spawning and breeding. The floral richness and diversity and the water quality for high biomass production has already been discussed in different sections.

The adjoining area of Tangua support some freshwater swamp forest and reedlands. The forest provides protection to the adjacent villages from the onslaught of wave action and winds during monsoon. These forests provide some fire wood, building or thatching material, fish entrenchments (branches of *Barringtonia*) and wood for making boats.

Some wetland plants are of special importance for the local people since they provide food substitutes (already mentioned in one of the sections).

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22. Noteworthy fauna: (e.g. unique, rare endangered, abundant or biogeographically important species; include count data etc.)

Amphibians: *Bufo melanostictus*, *Rana tigrina*, *R. cyanophlyctis*..

Reptiles: *Mabuya* sp., *Xenochrophis piscator*, *Enhydrys enhydrys*, *Kachuga tecta*, *Hardella thurjii*, *Geoclemys hamiltonii*, *Aspideretes hurum*, *Lissemys punctata*.

Aves: Great Crested Grebes, Great Cormorants, Oriental Darters, Night Heron, Grey Heron, Purple Heron, Openbill Storks, Blackheaded Ibis, Fulvous Whistling Teals, Spotbills, Comb Ducks, Mandarin Duck, Red Crested Pochard, Falcated Teal, and Mallard.

An endangered Red Data Book raptor species, Pallas's Fish Eagle (*Haliaeetus leucoryphus*) uses this beel as its feeding and roosting area. Several avian species are found here which are either rare or not seen in other places. During winter months the bird population reaches its peak. In January, 1993 the waterfowl count came to 239,810 individuals, the highest so far and has even surpassed the estimates for the whole northeast region by almost double. A vagrant Mandarin Duck, probably the first in Bangladesh, has been recorded from this beel. Apart from these a forest bird, Fire-throat (*Erithacus pectardens*) has also been recorded from the swamp forest which apparently seems to be the second record in the Indian sub-continent..

Mammals: Musk Shrew, Fishing Cat, Smooth Indian Otter, Long-tailed Tree Rat, Bandicoot Rat, Flying Fox, Fruit Bats, False Vampires.

23. Noteworthy flora: (e.g. unique, rare endangered, or biogeographically important species/communities etc.)

Submerged: *Vallisneria spiralis*, *Najas* sp., *Aponogeton natans*, *Ottelia alismoides*.

Rooted Floating: *Hydrorhyza aristata*, *Trapa maximowiczii*.

Sedges and Meadows: *Eleocharis dulcis*, *Polygonum barbatum*, *P. glabrum*, *Hemarthria protensa*.

Reeds: *Phragmites karka*, *Ficus heterophylla*, *Lippia javanica*.

Swamp Forest: *Pongamia pinnata*, *Phyllanthus disticha*, *Asclepias* sp., *Barringtonia acutangula*, *Clorodendron* sp., *Crataeva nurvala*, *Salix tetrasperma*, *Trewia nudiflora*.

24. Current scientific research and facilities: (e.g. details of current projects; existence of field station etc.)

A year long scientific study through NERP/NACOM Wetland Assessment Studies were recently undertaken monitoring the waterfowl population and seasonal changes in the flora at Pashua Beel. Other studies on fisheries, hydrology, sedimentology, sociology are being going on in adjoining areas/beels through NERP/FAP-6. A field station, located at Beheli is available for researchers/scientists with limited facilities. It is located about 5 km east of Pashua Beel.

25. **Current conservation education:** (e.g. visitors centre, hides, information booklet, facilities for school visits etc.)

No environment and conservation education facilities exist but within the NERP (FAP-6) planning is an initiative to give an experimental start to environment and conservation education in the northeastern region of Bangladesh which will accommodate this beel.

26. **Current recreation and tourism:** (state if wetland used for recreation/tourism; indicate type & frequency/intensity)

Eco-tourism has not yet set its pace in Bangladesh. It has to be appreciated and encouraged. Some visitors do visit the wetland from time to time but most of them come with a gun rather than a conservation message. Few scientists have recently started visiting the wetlands for scientific exploration.

27. **Management authority:** (name and address of body responsible for managing the wetland)

The wetland is managed by the Additional Deputy Commissioner (Revenue), Sunamganj District under the Ministry of Land.

28. **Jurisdiction:** (territorial e.g. state/region and functional e.g. Dept of Agriculture. Dept of Environment etc.)

Territorial: Tahirpur, Sunamganj.

Functional: Additional Deputy Commissioner (Revenue).

29. **Bibliographical references:** (scientific/technical only)

Scott, D. A. & Rashid, S. M. A. (1992). Ornithological Main Surveys and Wetland Assessment. SLI/NHC/AWB/NACOM.

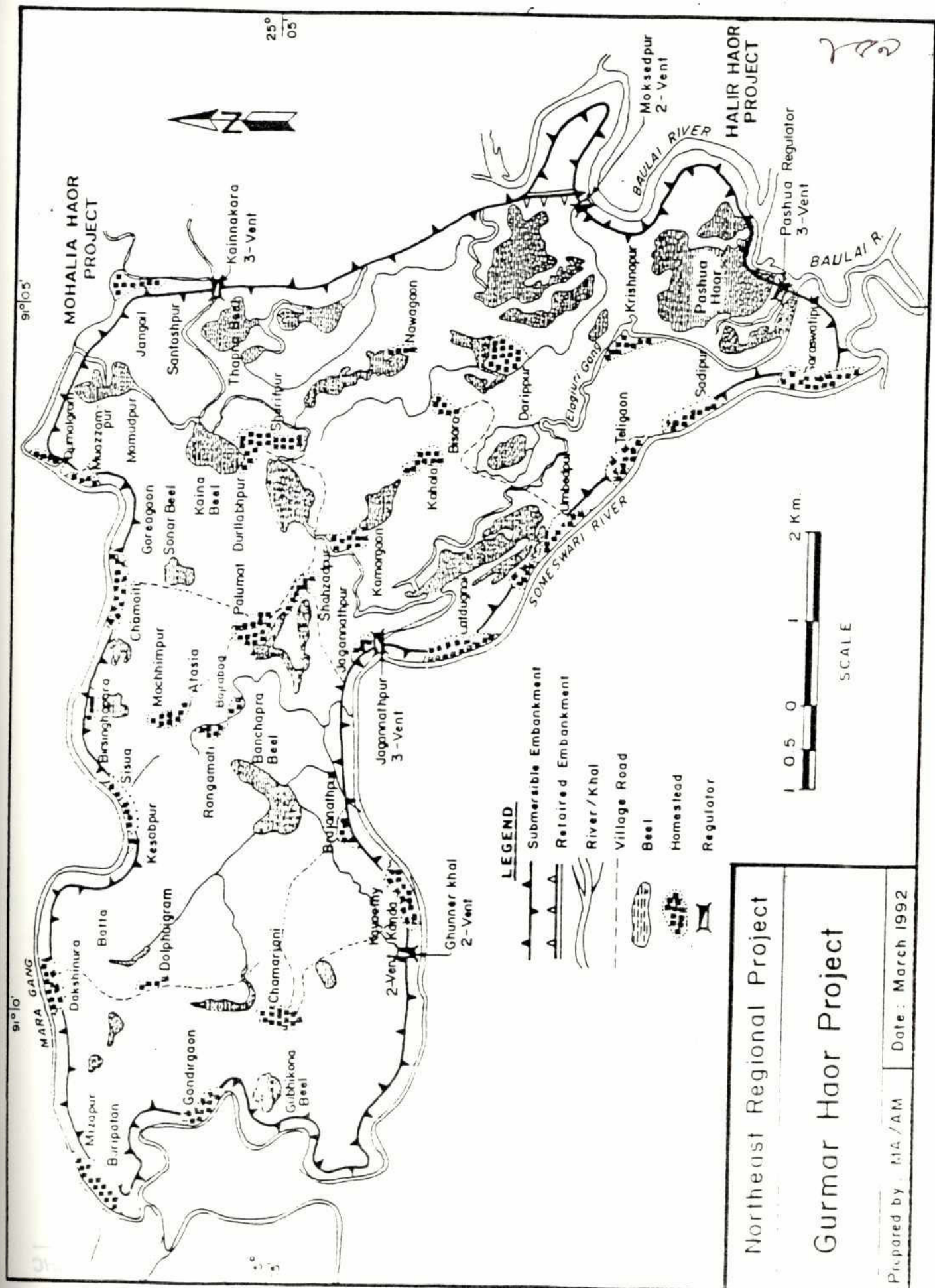
Karim, A. (1992). Wetlands plant diversity and conservation in Bangladesh. Paper presented at the Conference in Bangladesh, held in Dhaka, November 1992. Jointly sponsored by CIDA, Ministry of Environment and Forests and CIDA.

Karim, A.; Khan, S.; Sobhan, I.; Rashid, S.M.A. & Khan, A.Z. (1992). Interim Report on the Wetland Assessment Studies. SLI/NHC/NERP/NACOM.

30. **Reasons for inclusion:** (state which Ramsar Criteria - as adopted by Rec.C.515 of the Montreux Conference - are applicable)

1 (c), 1 (d), 2 (b), 3 (b)

31. **Map of site** (please enclose the most detailed and up-to-date map available - preferably at least 1:25,000 or 1:50,000)



Northeast Regional Project

Gurmar Haor Project

Prepared by: MA/AM Date: March 1992

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INFORMATION SHEET FOR KEY WETLAND SITE

As approved by Rec.C.4.7 of the Conference of the Contracting Parties, Montreux, Switzerland - July 1990.

1. Country: Bangladesh

2. Date: 11-03-93

3. Ref: office use only

4. Name and address of compilers:

S. M. A. Rashid
NACOM

5. Name of wetland:

HAKALUKI HAOR

6. Date of Ramsar designation:

not yet designated

7. Geographical coordinates:

24°35' - 24°44' N and 92°01' - 92°09' E

8. General location: (e.g. administrative region and nearest large town)

30 km southeast of Sylhet District town and \pm 40 km northeast of Moulvibazar District town.
Parts of the Haor lie within both Sylhet and Moulvibazar districts. 5 km north of Juri township.

9. Area: (in hectares)

20,400 h, including 4,400 h of beels.

10. Wetland type: (see attached classification, also approved by Montreux Rec.C.4.7)

O (Permanent, Freshwater Lakes), T (seasonal intermittent freshwater marshes), W (shrub dominated wetland).

11. Altitude: (average and/or maximum & minimum)

Minimum elevation:

4.5 m (PWD)

Maximum elevation:

9 m (PWD)

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12. Overview: (general summary, in two or three sentences, of the wetland's principal characteristics)

A complex of more than 80 interconnecting freshwater 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, Haorkhal, Foot, Tural, Paula, Juala, Kaiarkona, Balijuri, Kukurdubi, Katoa, Birai, Baia, and Chinaura. The beels are permanent, but as water level falls during the dry season, they become isolated from one another. Some of the land between the beels are cultivated while most of the land remain fallow and serve as pasture lands. Some of the beels are drained and fished in rotation.

13. Physical features: (e.g. geology; geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth; water permanence; fluctuations in water level; tidal variations catchment area; downstream area; climate)

The Meghna River Valley in the northeast part of Bangladesh, which includes the Hakaluki Haor, has been formed by sediments deposited over the centuries by the many rivers entering the valley from the adjoining hills in India. The area is very flat with a gentle slope in a westerly direction for the upper half of the area and then in a southerly direction towards the Bay of Bengal. Considerable faulting has taken place in the floor of the valley and adjoining areas with definable movement activity. The upper part of the valley, comprising the Hakaluki Haor is probably the most active part of the seismic Meghna Valley area. The very noticeable depression area extends up the Meghna-Surma Rivers above Bhairab Bazar to the Jadukata river area and up the Kushiya to the Hakaluki Haor.

Most of the inflow to the Hakaluki haor is contributed by the Kushiya river, Sonai Bardhal river and the Juri river. During monsoon heavy rainfall flood the whole area and the outflow is slow, the Hakaluki Haor acts as a natural reservoir and the water level remains high till the end of monsoon.

The climatic features of the region are subtropical-monsoon in nature with three prominent seasons, viz. summer, monsoon and winter. Summer begins in April through to June. During this period the average mean temperature ranges from 30.9 to 33.4° C. The monsoon is the rainy season, extending from June to September with 80 % of the annual rain during this period. The average mean temperatures fluctuate between 25 to 29° C. Winter is the following season with the peak cold weather in December and January. Prior to this during October/November and at the later part during February/march the weather is intermittently cold. The temperatures during this period range between 8.5° to 16.6° C. The mean relative humidity varies between 83 % in the wet season and 64 % in the dry season.

14. Ecological features: (main habitats and vegetation types)

15. Land tenure/ownership of:

(a) site

The beels and the levees between the beels are government owned (**khas land**) as well as the low lying areas other than the beels which are seasonally flooded. These **beels** are leased out for fishing by the government through auction at the office of the Additional Deputy Commissioners at Moulvibazar and Sylhet.

(b) surrounding area

The surrounding areas are privately owned while some of them are government **khas land** leased out to either landless local people or other local villagers for cultivation.

16. Conservation measures taken: (national category and legal status of protected areas - including any boundary changes which have been made; management practices; whether an officially approved management plan exists and whether it has been implemented)

No legal status of protection has been extended to this wetland site nor the area has been categorised of any national importance. The importance of this area as a natural reservoir and as a waterfowl refuge has long been known. Based on these facts this area has been identified as a key wetland area of the northeast region by NERP/NACOM. Future plans include to designate this area as a protected site and preserve its natural systems.

18. Current land use - principal human activities in:

(a) site

Mostly fishing. During the winter season when the water level is lower, marginal land of the **beels** are cultivated with paddy. Apart from it the levees and the fallow land are used for cattle grazing.

(b) surroundings/catchment

Most of the surrounding area are used for rice cultivation with some vegetable growing. Other than this the waterways are used for local riverine transportation and for carrying bamboo rafts from the Juri river to the Kushiya river. Motor pumps are also installed to pump water from the rivers to the paddy fields.

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19. Disturbances/threats, including changes in land use and major development projects: (factors which may have a negative impact on the ecological character of the wetland)

(a) site

Intensive fishing by draining water out of the wetlands; creating embankments restricting the water flow which causes low currents thus favouring sedimentation in the Juri river.

(b) surroundings/catchment

The Bangladesh Water Development Board has proposed to build full-flood embankments at some lengths of the Kushiara river and also some submersible embankments to protect the crops from flash floods in the upper catchment of the Haor.

20. Hydrological and physical values: (groundwater recharge, flood control, sediment trapping, shoreline stabilisation etc.)

21. Social and cultural values: (e.g. fisheries production, forestry, religious importance, archaeological site etc.)

The wetland holds an important position in the life line and life style of the local people. The beels are leased out to the lease holders who employ a lot of people to do fishing. Apart from that some poor fishermen are also involved in fishing to earn their bread from fishing in the wetlands. People collect *Lippia*, *Ficus heterophylla* for use as fuel. Grasses are also collected for use as fodder from the higher grounds. Fruits of several wetland plants are collected and consumed as supplementary food.

22. **Noteworthy fauna:** (e.g. unique, rare endangered, abundant or biogeographically important species; include count data etc.)

Amphibia: *Bufo melanostictus*, *Rana cyanophlyctis*, *Rana tigerina*, *Rana tyleri*.

Reptilia: *Varanus bengalensis*, *Hemidactylus brookii*, *Calotes versicolor*, *Hardella thurjii*, *Aspideretes hurum*, *Lissemys punctata*.

Aves: Great Crested Grebe, Great Bittern, Purple Heron, Openbill Stork, Adjutant Stork, Barheaded Geese, Bear's Pochard, Falcated Teal, Common Pochard, Spotted Redshank, Temminck's Stint, Broadbill Sandpiper, Nordmann's Greenshank, Great Blackheaded Gull, Whiskered Tern, Common Tern, Western & Eastern Marsh Harriers, Pied Harriers, Steppe Eagle, Pallas Fish Eagle, Osprey.

Mammalia: Grey Musk Shrew, Bandicoot Rat, Fishing Cat, Jackal, Smooth Otter, Large Indian Civet, Flying Fox, Fruit Bats, False Vampire and Gangetic Dolphins in the adjacent Kushiya river.

23. **Noteworthy flora:** (e.g. unique, rare endangered, or biogeographically important species/communities etc.)

Submerged: *Hydrilla verticillata*, *Ottelia alismoides*, *Sagittaria sagittifolia*, *Aponogeton natans*.

Free Floating: *Eichhornia crassipes*, *Utricularia stellaris*.

Rooted Floating: *Nymphaea stellata*, *Nymphaea nouchali*, *Eurayle ferox*, *Nymphoides cristatum*, *N. indicum*, *Panicum paludosum*, *Pseudoraphis spinescens*, *Trapa maximowiczii*.

Sedges & Meadows: *Monochoria hastata*, *Cyperus* sp., *Eleocharis dulcis*, *Ludwigia abscondens*, *Ipomoea fistulosa*, *I. aquatica*, *Alternanthera philoxeroides*, *Aeschynomene aspera*, *A. indica*, *Sesbania roxburghii*, *Eclipta alba*, *Clinogyne dichotoma*.

Reeds: *Phragmites karka*, *Ficus heterophylla*, *Lippia javanica*.

Swamp Forest: *Barringtonia acutangula*, *Phyllanthus disticha*. (*Rosa involucrata*)

24. **Current scientific research and facilities:** (e.g. details of current projects; existence of field station etc.)

NERP/NACOM have recently completed a year-long study on the flora, fauna and ethno-biology of the Haor area. Studies on other disciplines like hydrology, sedimentology, water resources engineering, etc., are also being carried out with the reports coming out in September, 1993.

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25. Current conservation education: (e.g. visitors centre, hides, information booklet, facilities for school visits etc.)

No such conservation education centre or programmes are going on, however, through NERP/NACOM an experimental conservation education centre will be put under trial sometimes in the near future.

26. Current recreation and tourism: (state if wetland used for recreation/tourism; indicate type & frequency/intensity)

The wetland is not used for recreation or tourism though it has got all the potentials. Eco-tourism has not yet set its feet in Bangladesh. It is very restricted among the rich and some tethered, weather-bitten scientists who visit the wetlands both for research and recreation.

27. Management authority: (name and address of body responsible for managing the wetland)

Additional Deputy Commissioners (Revenue), Sylhet and Moulvibazar; Ministry of Land.

28. Jurisdiction: (territorial e.g. state/region and functional e.g. Dept of Agriculture. Dept of Environment etc.)

The vast haor area fall under the jurisdiction of various districts and thanas namely Fenchuganj, Juri, Borolekha, Kulaura. The functional jurisdiction lies with the Ministry of Land.

29. Bibliographical references: (scientific/technical only)

Berger Engineers. 1963. Feasibility Report: Hakaluki Haor Project. EPWAPDA. 166 p.

Scott, D.A. 1989. Asian Wetland Directory. IUCN/WWF.

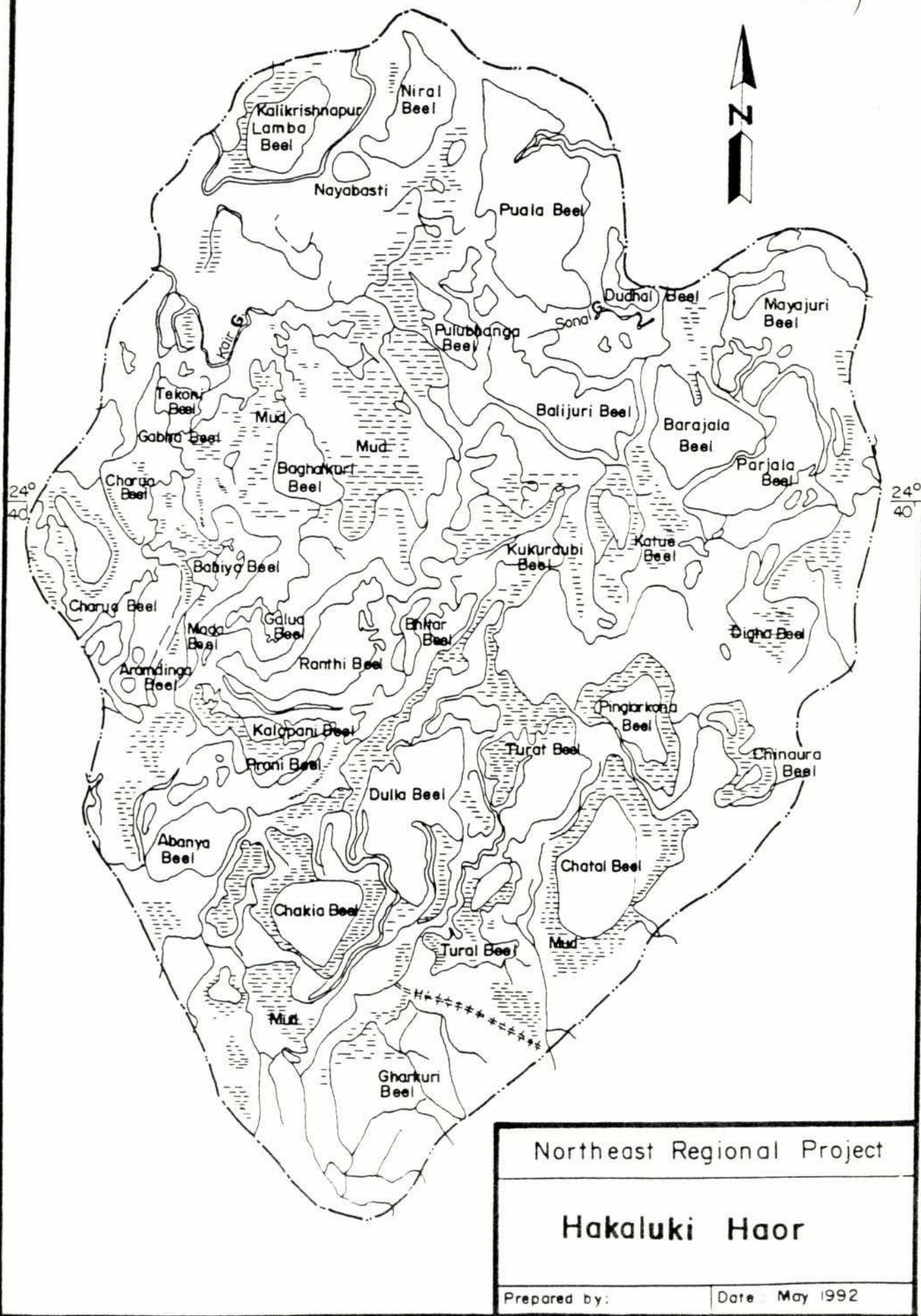
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Karim, A., Khan, S., Sobhan, I., Rashid, S.M.A. & Khan, A.Z. 1992. Interim Report on Wetland Assessment Studies. SLI/NHC/NERP/NACOM.

30. Reasons for inclusion: (state which Ramsar Criteria - as adopted by Rec.C.515 of the Montreux Conference - are applicable)

1(c), 2(a), 2(b), 3(a), 3(b)

31. Map of site (please enclose the most detailed and up-to-date map available - preferably at least 1:25,000 or 1:50,000)



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INFORMATION SHEET FOR KEY WETLAND SITE

As approved by Rec.C.4.7 of the Conference of the Contracting Parties, Montreux, Switzerland - July 1990.

1. Country: Bangladesh

2. Date: 23-03-93

3. Ref: office use only

4. Name and address of compilers:

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BANGLADESH

Dr. Sara L. Bennett

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N. Vancouver BC

CANADA V7M 3G2

5. Name of wetland:

HAIL HAOR

6. Date of Ramsar designation:

not yet proposed for designation

7. Geographical coordinates:

24°18' - 24°26' N to 91°38' - 91°45' E

8. General location: (e.g. administrative region and nearest large town)

3 km northwest of Srimangal and 14 km southwest of Moulvibazar town, Moulvibazar district.

9. Area: (in hectares)

1373.66

10. Wetland type: (see attached classification, also approved by Montreux Rec.C.4.7)

M (permanent rivers, streams)

O (permanent freshwater lake)

T (seasonal, intermittent freshwater marshes)

3, 4

11. Altitude: (average and/or maximum & minimum)

290
Minimum: 3.5 m (PWD)

Maximum: 6.5 m (PWD)

12. Overview: (general summary, in two or three sentences, of the wetland's principal characteristics)

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 Kushiya rivers. The haor is almost encircled by a chain of tea gardens 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 fields. Much of the lake's surface is overgrown with lotus and water hyacinth. The maximum depth of water during the rainy season is about 7.5 m.

13. Physical features: (e.g. geology; geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth; water permanence; fluctuations in water level; tidal variations catchment area; downstream area; climate)

The haor forms part of the Meghna Basin, which is of pleistocene origin and includes a series of plunging anticlines, filled up by recent sediments. The Hail Haor is located in the anticline between the Satgaon and Dinajpur hills in the west and the Barshijura and Balishira hills in the east. Geologically the soils, which belong to the Recent Era overlay the pleistocene formations occurring at greater depths.

About 60 % of the area is covered by semi-recent Surma-Kushiya flood plain alluvium, which is moderately to fine-textured. These soils are mostly seasonally flooded. Slightly more than 30 % of the area is covered by semi-recent piedmont colluvium and recent river outwash deposits, originating from sandy hill formations. These soils are commonly coarse to moderately (fine) textured and intermittently flooded after rains during the monsoon season.

Arable soils have been under cultivation for centuries. Because of the annual flooding these soils appear to be relatively fertile. The floodplain soils occupy flat to very gentle undulating (abandoned) levees in the transition zone between piedmont aprons and river basins (Harinarayanpur Series), basin margins (Jainka Series) and proper basins which are almost flat to slightly undulating (gilgay) and are occupied by the fine textured Kirtantala Series.

The highest topographic position is occupied by the Mirzapur Series, followed second by the Lungla and Harinarayanpur Series. The lowest topographic positions are for the Kirtantala Series, followed second by the Jainka Series, which seem to appear the most responsive to field surface drainage.

The climate relates to the sub-tropical type with three distinct seasons. From November to early April which is relatively cool and dry (winter), from April to June/July which is hot with some rain (summer) and from July to October wet and warm (monsoon).

Some 94 % of the total annual rainfall is recorded in a period of seven consecutive months (from April till November) with the total minimum rainfall equalling to more than 4 inches. The evapotranspiration index (ET), exceeds rainfall from the month of November up to April, resulting in a P/ET - ratio of 50 % or less. In all the other months the ratio is well above 100

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%, being highest in June (489 %). The annual P/ET - ratio equals 210 %. Lower temperatures are recorded during winter with the mean daily temperatures varying from 65 to 70° F while during summer the mean daily temperature is 80° F. The highest values for relative humidity occur during the late monsoon because of high rainfall and limited sunshine duration and in the winter season due to low night temperatures causing heavy dew formation in the early morning hours.

The haor system is a small part of a much larger catchment of about 160,000 hectares. The Lungla river is the main collector that discharges into the haor. The Gopla river is the main discharge channel. The main source of flooding for the area is evidently the Lungla; Kushiara flood flow apparently does not reach the haor's northern boundary. The khals that originate in hills east and west (the Borshijura/Balishira Hills and Satgaon Hills respectively) are relatively small flood sources. The Gopla river is the only drainage outlet from the basin. Reportedly, the Gopla's drainage capacity downstream of the project has been reduced by siltation. The Gopla also drains Gangajuri Haor and other low areas to the north of Hail Haor. The Gopla downstream to its discharge into the Upper Meghna has not been studied.

The area under water varies from 2,800 hectares during the dry season to about 9,400 hectares during the monsoon period. Maximum flooded depth is 7.5 m and minimum dry season depth is 5.5 m. There are 352 small canals (locally called as charas) enter into the Hail Haor which are originated mainly from the Indian Hills.

14. Ecological features: (main habitats and vegetation types)

15. Land tenure/ownership of:

(a) *site*

The water body and the land is owned by the government (khas land) and is leased out every year or every three years for fisheries.

(b) *surrounding area*

Based on the agro-economic survey, DP(S), 1980, it is estimated that 45,500 acres of land is available for cultivation. The land tenure system is different from other areas of Bangladesh. 67 % of the farmers own their farm completely, 29 % own land and also cultivate some other plots under share-cropping arrangements and 4 % are farm labourers.

Triple cropping and the cultivation of vegetables are relatively limited, almost equal proportions of the total arable land are either single or double cropped with rice. Single cropping is mostly found on the topographically low lying basin areas and double cropping on the topographically higher levee or piedmont land surfaces.

16. Conservation measures taken: (national category and legal status of protected areas - including any boundary changes which have been made; management practices; whether an officially approved management plan exists and whether it has been implemented)

No national categorization or legal protection has been declared for the area. The area was earmarked by the Forest Department to declared part of it as Bird Sanctuary, but no gazette

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notification has been made to date and the tangibility of such a plan is in question. However, management practice for the fisheries resources exist and is practised through the leasing system.

Asian Development Bank (ADB) is funding the Second Aquaculture Project which aims at increasing the fish production, mostly carps, which have been depleted during the recent years. They had been releasing fingerlings into the haor basin during 1992 but in 1993 they plan to build up stock by buying fingerlings from the local markets and rearing it in the culture centres before releasing it in the haor.

17. Conservation measures proposed but not yet implemented: (e.g. management plan in preparation; officially proposed as a protected area etc.)

No conservation measures have yet been planned for the Haor.

18. Current land use - principal human activities in:

(a) site

The water body is mostly used for fisheries management and extraction of wetland resources which includes thatching materials, animal fodder, wild plant fruits, food substitutes, fuel wood supplements and transportation.

(b) surroundings/catchment

The present use can be divided into several heads - homesteads (4.1 %), Orchards (3.9 %), Tanks/Ditches (2.8 %), Fallow (4.3 %), water bodies (9.3 %) and arable land (75.6 %).

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19. Disturbances/threats, including changes in land use and major development projects: (factors which may have a negative impact on the ecological character of the wetland)

(a) site

Over exploitation and annual harvesting of fish by complete de-watering of the basins.

Heavy siltation of the water bodies and reduction of dry season water hectare months. The Gopla river is gradually silted up and is suffering a loss in channel volume and discharge capacity. This results in regular occurrence of high flooding.

Deforestation within the haor area.

Expansion of agricultural land and excessive use of insecticides in the paddy fields.

Growth of excessive aquatic weeds during the rainy season. This is due to impeded discharge rates at downstream end of the haor, which induces water logging and poor drainage.

Fish disease (Epizootic Ulcerative Syndrome).

(b) surroundings/catchment

Expansion of agricultural land.

Intentional siltation of the marginal lands to increase cultivable land area.

Excessive use of insecticides and pesticides in the paddy fields.

Over exploitation of wetland resources.

20. Hydrological and physical values: (groundwater recharge, flood control, sediment trapping, shoreline stabilisation etc.)

21. Social and cultural values: (e.g. fisheries production, forestry, religious importance, archaeological site etc.)

There are 22 fishermen villages around the haor area, comprising an estimated number of 11,500 fishermen. All of these fishermen are dependent on the wetland for their livelihood. Fish are landed at 10 centres both near and far from the haor.

22. Noteworthy fauna: (e.g. unique, rare endangered, abundant or biogeographically important species; include count data etc.)

Amphibia: *Bufo melanostictus*, *Rana cyanophlyctis*, *R. tigrina*, *R. limnocharis*, *R. tytleri*.

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Reptiles: *Varanus bengalensis*, *Calotes versicolor*, *Morenia petersi*, *Hardella thurjii*, *Kachuga tecta*, *Aspideretes hurum*, *Lissemys punctata*, *Xenochrophis piscator*, *Enhydris enhydris*, *Atritium schistosum*, *Python molurus*.

Aves: Little Grebe, Yellow Bittern, Cinnamon Bittern, Chinese Pond Heron, Purple Heron, Grey Heron, Openbill Stork, Cotton Pygmy Goose, Watercock, Moorhen, Swamphe, Pheasant-tailed Jacana, Painted Snipe, Blackwinged Stilt, Oriental Pratincole, Marsh Sandpiper, Swinhoe's Snipe, Temminck's Stint, Whiskered Tern, Pallas's Fish Eagle, Greyheaded Fish Eagle, Steppe Eagle, Western Marsh Harrier, Eastern Marsh Harrier, Pied Harrier, Northern Hobby, Greater Spotted Eagle.

Mammalia: Grey Musk Shrew, Fishing Cat, Small Indian Mongoose, Jackal,

23. Noteworthy flora: (e.g. unique, rare endangered, or biogeographically important species/communities etc.)

Submerged: *Hydrilla verticillata*, *Najas* sp., *Ceratophyllum desmersum*, *Ottelia alismoides*, *Vallisneria spirallis*, *Sagittaria guayanensis*, *Aponogeton appendiculatus*, *A. natans*.

Free Floating: *Salvania cucullata*, *S. natans*, *Utricularia aurea*, *U. exoleata*, *Eichhornia crassipes*.

Rooted Floating: *Nymphaea nouchali*, *N. stellata*, *Nelumbo nucifera*, *Eurayle ferox*, *Nymphoides cristatus*, *N. indicus*, *Trapa maximowiczii*, *Echinochloa colonum*.

Sedges & Meadows: *Monochoria hastata*, *Cyperus* sp., *Ipomoea fistulosa*, *Setaria glauca*, *Polygonum perbatum*, *Polygonum* sp., *Colocasia esculenta*, *Alternanthera philoxeroides*, *Fimbristilis* sp., *Limnophila sessiliflora*.

Crop Field: *Cyperus cephalotus*, *Cyperus* sp., *Lindernia crustacea*, *Alternanthera philoxeroides*, *Aponogeton appendiculatus*.

24. Current scientific research and facilities: (e.g. details of current projects; existence of field station etc.)

NERP/NACOM have recently completed a year long study on the wetland resources mostly dealing with the flora and fauna and their utilization. WWF-US through their Biodiversity Programme have funded a Dhaka University Project to study the wetland resources which commenced in 1992. Asian Development Bank (ADB) is also funding an Aquaculture Project to increase the fish production of the flood basin. Overseas Development Administration (ODA) through FAP-17 is also carrying out a study on the fisheries aspects of the haor.

ODA has a Rest House at Srimangal, where scientists can have a brief stopover. NERP-FAP-6 has a Guest House at Moulvibazar where researchers can stay for a while. In addition, there are government rest houses both at Srimangal and Moulvibazar which can be used. Bangladesh Tea Research Institute (BTRI) also maintains Rest Houses at Srimangal which can be made available with the permission of the Tea Board authorities.

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25. Current conservation education: (e.g. visitors centre, hides, information booklet, facilities for school visits etc.)

No conservation education programmes are currently running. However, through NERP/FAP-6 an Environment Management Research and Education Centre (EMREC) is planned which will include this haor in its programme.

26. Current recreation and tourism: (state if wetland used for recreation/tourism; indicate type & frequency/intensity)

No recreation or tourism facilities are available. One can visit the wetland through own arrangements. Students from educational institutions and some members from conservation organisations do seldom visit the wetland. It is mostly visited by hunters to shoot ducks during the winter months.

27. Management authority: (name and address of body responsible for managing the wetland)

Additional Deputy Commissioner (Revenue), Moulvibazar and Thana Nirbahi Officer, Srimangal.

28. Jurisdiction: (territorial e.g. state/region and functional e.g. Dept of Agriculture. Dept of Environment etc.)

Territorial: Moulvibazar District

Functional: Ministry of Land

29. Bibliographical references: (scientific/technical only)

Scott, D.A. 1989. Asian Wetland Directory. WWF/IUCN.

Scott, D.A. & Rashid, S.M.A. 1992. Wetland Assessment Studies and Ornithological Main Surveys. SLI/NHC/NACOM.

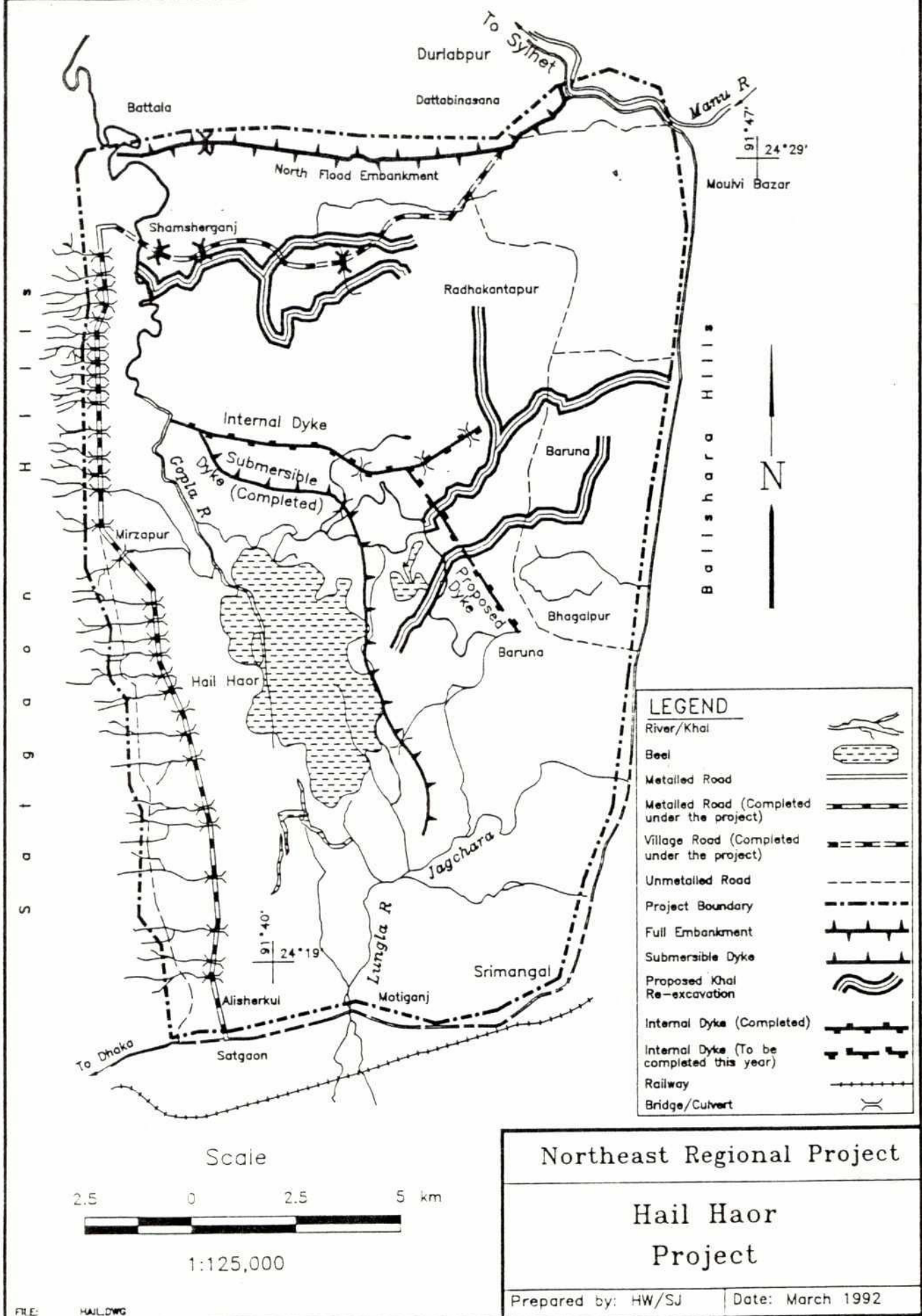
Karim, A., Khan, S., Sobhan, I., Rashid, S.M.A., Khan, A.Z. 1992. Wetland Assessment Studies: Interim Report. SLI/NHC/NACOM.

IECO. 1980. Project Feasibility Studies: Main Studies. Vol.1. BWDB.

30. Reasons for inclusion: (state which Ramsar Criteria - as adopted by Rec.C.515 of the Montreux Conference - are applicable)

31. Map of site (please enclose the most detailed and up-to-date map available - preferably at least 1:25,000 or 1:50,000)

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INFORMATION SHEET FOR KEY WETLAND SITE

As approved by Rec.C.4.7 of the Conference of the Contracting Parties, Montreux, Switzerland - July 1990.

1. Country: Bangladesh

2. Date: 09-03-93

3. Ref: office use only

4. Name and address of compilers:

S. M. A. Rashid
NACOM

5. Name of wetland:

BALAI HAOR

6. Date of Ramsar designation:

not yet designated

7. Geographical coordinates:

24°56' and 92°22' E

8. General location: (e.g. administrative region and nearest large town)

It is situated about 75 km east-northeast of Sylhet District town and 2 km northwest of Zakiganj township. Its location is between the two rivers, Surma in the north and Kushiya flowing in the south.

9. Area: (in hectares)

133.62

10. Wetland type: (see attached classification, also approved by Montreux Rec.C.4.7)

N (Seasonal/intermittent streams, creeks, rivers); O (Permanent freshwater lake); T (Seasonal intermittent freshwater marshes); W (Shrub dominated wetland).

11. Altitude: (average and/or maximum & minimum)

Minimum elevation: 10.5 m (PWD)

Maximum elevation: 12.5 m (PWD)

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12. Overview: (general summary, in two or three sentences, of the wetland's principal characteristics)

Balai Haor is an isolated haor between the Surma and Kushiya rivers in the extreme east of the northeastern region of Bangladesh. It is a complex of 59 beels, the principle ones being Dubail, Jugni, and Khagrakuri beels. These are surrounded by heavily grazed pasture land 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 fistulosa* (Convolvulaceae) and this is now spreading out into cultivable areas. The entire haor is included within the area of a proposed flood control project (Surma-Kushiya Project No.70), and has been suggested as part of an area suitable for water storage during the peak of the monsoon floods.

13. Physical features: (e.g. geology; geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth; water permanence; fluctuations in water level; tidal variations catchment area; downstream area; climate)

The location of the beel, in the extreme east of the northeastern region of Bangladesh is strategic in the sense of waterfowl migration and staging areas.

The hydrology of the wetland depends on the Tal Nadi, which emerges from the Kushiya below the bifurcation of the Barak river at Amalshid. It takes different names at different sections, flows through the wetland, branches off before joining the Kushiya again.

The wetland serves as a water storage area during flash floods. During flash floods and unprecedented rain when the volume of water discharge increases at both the rivers almost simultaneously, Balai Haor acts as a storage area minimising the loss.

The wetland is a bit different from the other haors because of its shallowness and broader expanse with most of the area, being shallow, are cultivated during non-flooding season. It is surrounded by villages on all sides - prone to exploitation and disturbance - and with a metalled road cutting the wetland area into half. The wetland is devoid of any trees excepting some lonely hijals (*Barringtonia acutangula*) on the village edges. The higher grounds and edges of the water courses are over-grown by *Ipomoea fistulosa*, which provides fuel substitute to the local people and cover to the few remaining wildlife particularly birds. The homestead in the adjoining villages are very rich in tree cover and species diversification providing possibly the main shelter to the wildlife.

The climatic features of the region are subtropical-monsoon in nature with three prominent seasons, viz. summer, monsoon and winter. Summer begins in April through to June. During this period the average mean temperature ranges from 30.9 to 33.4° C. The monsoon is the rainy season, extending from June to September with 80 % of the annual rainfall during this period. The average mean temperatures fluctuate between 25.8 to 29° C. Winter is the following season with the peak cold weather in December and January. Prior to these during October/November and at the later part during February/March the weather is intermittently cold. The temperatures during this period range between 8.5° to 16.6° C. The mean relative humidity varies between 83 % in the wet season and 64 % in the dry season.

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14. Ecological features: (main habitats and vegetation types)

Balai Haor is different ecologically from the other haors in the region because of its shallowness, its location between two rivers, and functioning as water reservoir during flash floods.

Due to shallowness the flood water recedes quickly and water is restricted mostly in the river and the three big beels. As a result most of the area comes under rice cultivation while the higher grounds and edges of water courses support dense growth of *Ipomoea fistulosa*.

The wetland and the surrounding areas are devoid of any reed plants and freshwater swamp forest trees but the peripheries of the homesteads do sometimes show a few of them among their own rich diversity.

In the beels various plant communities exist namely:

- A. **Submerged:** *Hydrilla verticillata*, *Ottelia alismoides*, *Naja sp.*, *Sagittaria guayanensis*, *Aponogeton natans*, *A. appendiculatus*, *Ceratophyllum desmersum*.
- B. **Free Floating:** *Eichhornia crassipes*, *Utricularia aurea*, *U. exoleata*, *Salvinia cucullata*, *Nymphaea stellata*, *N. nouchali*, *Nymphoides cristatum*.
- C. **Rooted Floating:** *Hygrorhiza aristata*, *Nymphaea stellata*, *N. nouchali*, *Trapa maximowiczii*, *Limnophila sessiliflora*.
- D. **Sedges & Meadows:** *Schoenoplectus articulatus*, *Ipomoea fistulosa*, *Alternanthera philoxeroides*, *Polygonum barbatum*, *Polygonum sp.*, *Scirpus juncoides*, *Fimbristylis sp.*, *Cyperus cephalotus*.

Reeds: Crop Field: *Cyperus sp.*, *Lindernia crustacea*, *Nymphoides sp.*, *Limnophila sp.*

15. Land tenure/ownership of:

(a) *site*

The wetlands are leased out to the lease holder for three years, under a Fisheries Development Scheme by the local authorities under the Ministry of Land.

(b) *surrounding area*

There are some government owned land (khas land) leased out to the members of the public and the remaining land belongs to the public.

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22. Noteworthy fauna: (e.g. unique, rare endangered, abundant or biogeographically important species; include count data etc.)

Amphibians: *Bufo melanostictus* (Toad: kuno bang); *Rana tigrina* (Bull Frog: sona bang); *Rana cyanophlyctis* (Skipper Frog: kotkoti bang); *Rana temporalis* (Cricket Frog: gechu bang)

Reptiles: *Varanus bengalensis* (Monitor Lizard: kalo gui), *Hemidactylus brooki* (House Lizard: tiktiki), *Xenochrophis piscator* (Checkered Keelback: dora sap), *Enhydryn enhydryn* (Smooth Water Snake: maitta sap), *Cerberus rhynchops* (Dog-faced Water Snake: andha sap), *Ptyas mucosus* (Rat Snake: daraish sap), *Bungarus fasciatus* (Banded Krait: sankhini sap), *Naja n. kaouthia* (Monocellate Cobra: jati sap, gokra sap), *Hardella thurjii* (Brahminy Turtle: kali kaitta), *Kachuga tecta* (Common Roof Turtle: kori kaitta), *Lissemys punctata* (Spotted Flapshell: sundi kasim).

Aves: Purple Heron (beguni bok), Grey Heron (koira), Openbill Stork (shamuk khol), Adjutant Stork (madantak, hargila), White Ibis (kastey chura), Shoveller (maulvi hanch), Common Teal (bali hanch), Ruddy Shelduck (chokha chokhi), Pheasant-tail Jacana (jol pipi), Steppe Eagle, Western Marsh Harrier, Pied Harrier.

Mammals: Fishing Cat, Small Indian Mongoose, Smooth Indian Otter, Jackal, Flying Fox, Fruit Bat. *Bufo melanostictus*, *Rana tigrina*, *R. cyanophlyctis*, *R. limnocharis*.

23. Noteworthy flora: (e.g. unique, rare endangered, or biogeographically important species/communities etc.)

Submerged: *Hydrilla verticillata*, *Ottelia alismoides*, *Najas* sp., *Sagittaria guayanensis*, *Aponogeton natans*, *A. appendiculatus*,

Free

Floating: *Eichhornia crassipes*, *Utricularia aurea*, *U. exoleata*, *Nymphaea stellata*, *N. nouchali*, *Salvinia cucullata*, *Nymphoides cristatum*.

Rooted

Floating: *Hygrophysa aristata*, *Nymphaea stellata*, *N. nouchali*, *Trapa maximowiczii*, *Limnophila sessiliflora*.

Sedges &

Meadows: *Schoenoplectus articulatus*, *Ipomoea fistulosa*, *Alternanthera philoxeroides*, *Polygonum barbatum*, *Polygonum* sp., *Scirpus juncooides*, *Fimbristylis* sp., *Cyperus cephalotus*.

Crop Field: *Cyperus* sp., *Lindernia crustacea*, *Nymphoides* sp., *Limnophila* sp.

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24. Current scientific research and facilities: (e.g. details of current projects; existence of field station etc.)

One year study on the flora, fauna and ethno-biology was carried out by NERP/NACOM studies from February 1992 through January 1993. Studies on the hydrology, sedimentology are currently being undertaken by NERP. No other facilities exist excepting the logistics support till August, 1993 through NERP.

25. Current conservation education: (e.g. visitors centre, hides, information booklet, facilities for school visits etc.)

Presently no such facility exists but through NERP/NACOM initiative an experimental conservation and education centre is planned to be launched in the near future.

26. Current recreation and tourism: (state if wetland used for recreation/tourism; indicate type & frequency/intensity)

The main utilization of the wetland is for fishing and irrigation purposes. No visitors either for recreation or tourism were noticed during our year-long study in the area. However, hunters do come here for duck shooting.

27. Management authority: (name and address of body responsible for managing the wetland)

The wetland is managed by the local thana administrative authority located at Zakiganj under the jurisdiction of the Additional Deputy Commissioner (Revenue), Sylhet District. The wetland is under the direct administration of the Ministry of land.

28. Jurisdiction: (territorial e.g. state/region and functional e.g. Dept of Agriculture. Dept of Environment etc.)

Territorial: Zakiganj Thana Parishad, Zakiganj; Sylhet District.

Functional: Ministry of Land.

29. Bibliographical references: (scientific/technical only)

Scott, D.A. & Rashid, S.M.A. 1992. Ornithological Main and Wetland Assessment Studies. SLI/NHC/NERP/NACOM.

Karim, A.; Khan, S.; Sobhan, I.; Rashid, S.M.A. & Khan, A.Z. 1992. Interim Report on Wetland Assessment Studies. SLI/NHC/NERP/NACOM.

ISPAN. 1992. Environmental Impact Assessment: Case Study - Surma-Kushiyara Project. 226 pp

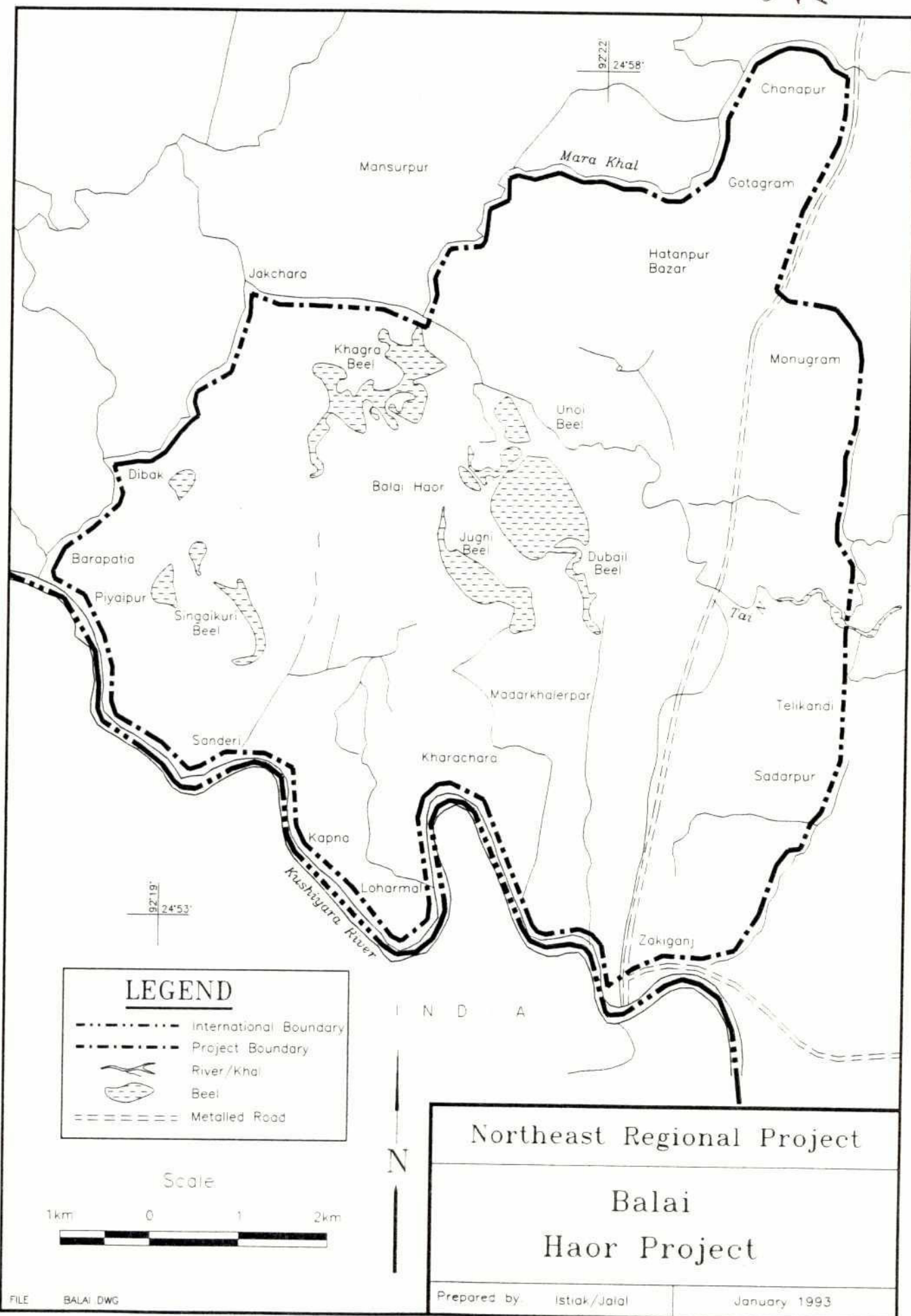
SLI/NHC. 1992. Regional Water Management Plan. Draft Report on Regional Considerations. 110 pp.

30. Reasons for inclusion: (state which Ramsar Criteria - as adopted by Rec.C.515 of the Montreux Conference - are applicable)

1(d), 2(b), 3(b)

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31. Map of site (please enclose the most detailed and up-to-date map available - preferably at least 1:25,000 or 1:50,000)



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INFORMATION SHEET FOR KEY WETLAND SITE

As approved by Rec.C.4.7 of the Conference of the Contracting Parties, Montreux, Switzerland - July 1990.

1. Country:	Bangladesh	2. Date:	14-03-93	3. Ref:	office use only
4. Name and address of compilers: S. M. A. Rashid NACOM					
5. Name of wetland: KAWADIGHI HAOR					
6. Date of Ramsar designation: not yet designated					
7. Geographical coordinates: 24°35' N and 91°48' E					
8. General location: (e.g. administrative region and nearest large town) 15 km NNE of Moulvibazar District town.					
9. Area: (in hectares) 2673.31					
10. Wetland type: (see attached classification, also approved by Montreux Rec.C.4.7) M (permanent river); O (permanent freshwater lakes); T (seasonal intermittent freshwater marshes)					
11. Altitude: (average and/or maximum & minimum) Minimum: 5.0 m (PWD) Maximum: 8.5 m (PWD)					



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12. Overview: (general summary, in two or three sentences, of the wetland's principal characteristics)

A group of six to eight freshwater lakes (beels), important among them are Majherbandha, Patasingha, Halkatua, Rukka and Ulauli. The beels are isolated from one another during dry season, but unite to form a large shallow lake during the rainy season. The margins of the beels are converted into rice fields during dry season. Full-flood embankments have been constructed around the haor to improve the possibilities for fishing and agriculture. The maximum depth of water is 3-6 m during the rainy season and 1-2 m during dry season.

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13. Physical features: (e.g. geology; geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth; water permanence; fluctuations in water level; tidal variations catchment area; downstream area; climate)

The project area is build up of recent and sub-recent alluvial sediments laid down by the rivers Kushiya and Manu. The northeastern part is covered with outwash from the adjoining hills. The major area is occupied by a wide basin which is believed to be the result of tectonic subsidence of the earth surface. The general slope of the area is from east to northwest.

This haor is within the Manu River Irrigation Project (MRIP). The history goes back to early 1960's when the local people acting on their own initiative constructed a dwarf embankment along the right bank of the Manu river to protect their crop from early floods. Subsequently, a low embankment of about 37 km in length, and ranging from 0.6 m to 1.52 m in height was constructed by local authorities. This embankment was breached frequently resulting in damage to the crops. In 1961 the Manu river flood problem came under active consideration of EPWAPDA which assigned some international company to undertake a feasibility study. In 1963, the Executive Committee of the national Economic Council (ECNEC) sanctioned the project but administrative approval to proceed with the project was not given until 1968.

The project started in 1975-76 with Kuwaiti aid of Tk.130 million out of an estimated cost of Tk.686.6 million. The project was declared complete in 1982-83.

The project structures included flood control embankment; flood control embankment cross-drainage structures; barrage; irrigation headworks; irrigation canal system; irrigation canal cross-drainage structures; drainage sluices; and drainage pumping station.

The entire irrigation system is under Bangladesh Water Development Board (BWDB) control. Local participation seems to be totally absent. BWDB officials decide when to supply irrigation water and in what quantities. The supply is regulated by the canal headwork gates but when the pond level exceeds 11.58 m GTS the barrage gates are opened to release the excess water. There is no diversion after April when the monsoon season sets in. At that time any excess diversion does not need pumping out as it drains out through the two sluice gates adjacent to the pumping station. The drainage through these sluice gates seem to be inadequate and may need pumping the water out.

The project area is roughly elliptical in shape, with a 22.8 km southwest to northeast axis and 14.8 km wide. The 6000 h area of low hills (up to 43 m PWD) known as Bhatara Hills, form its upper catchment. The Bhatara Hills to the east, the Manu river to the west and south and Kushiya river to the north form the boundaries of the project area.

The area comprises a concave alluvial plain with the land sloping gently from the foothills in the east and river levees to the low north centre. Elevations range from 12.5 m PWD near the hills to below 4 m PWD at the low points. The area is occupied by

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grey, heavy silty clay loams on the ridges and clays in the basins. Noncalcareous Grey Floodplain soil is the only general type. the organic matter content of the soil is moderate. Soil reaction ranges from strongly acidic to neutral. Levels of CEC and Zn are high while that of other essential nutrients are medium.

The area is bisected by numerous former distributaries and tributaries of the Manu and Kushiya rivers and many smaller drainage khals. The Kawadighi Haor is the largest, permanent water body in the area. Most of the other smaller water bodies (beels) located in the north and northwest dry up during the winter months. Before the implementation of this project, 25-30 % of the area was permanently and deeply inundated.

Maximum temperatures vary from about 28° C to 36° C with the highest temperatures experienced during the period March to June. There is a significant diurnal fluctuation with minimum temperatures ranging from about 6° C to 23° C.

The mean annual rainfall over the project area is about 2,865 mm. The rainfall exhibits a seasonal pattern with up to 65 % of the annual total experienced during the monsoon period - June to September. The period from December to March is significantly dry with less than 5.5 % of the annual total.

The relative humidity is high throughout the year, with average humidity ranging from 72 to 88 %. The humidity is highest during the monsoon period June to September. The average wind speed varies from about 3.5 to 5.4 m/s with the highest speeds occurring in between March and July. Potential evapotranspiration rates reflect seasonal patterns with the highest rates of up to 4.9 mm/day during the pre-monsoon month in May. The lowest rates, 2.6 mm/day occur during the winter months - December and January.

14. Ecological features: (main habitats and vegetation types)

15. Land tenure/ownership of:
(a) site

The land is owned by the government and is leased out to the lease holder in exchange of some revenue for a year. Every year open public auction takes place for the lease.

(b) surrounding area

Contrasting variations are noticed in the land ownership. The average farm size of the households is 1.60 h. But in terms of farmer's category the difference in farm size varies significantly. The average farm size of the landless farmers is only 0.13 h, which is totally leased in land. Agricultural land ownership is mostly by the large farmers (47.8 %), followed by medium farmers (35.49 %) and small farmers own only 16.68 %. Per capita agricultural land of large, medium and small farmers are 1.09 h, 0.25 h, and 0.087 h respectively. Average per capita agricultural land is 0.226 h. Land tenurial pattern in the project area suggest that a number of arrangements are followed for land operation. 57 % of the farmers are owner operator while 12 % are owner-cum-barga leaser. Only share cropper is 3 % of the total farmers and owner-cum-share cropper is 12.5 %.

16. Conservation measures taken: (national category and legal status of protected areas - including any boundary changes which have been made; management practices; whether an officially approved management plan exists and whether it has been implemented)

No national category exists for classification of wetlands and considering them as protected areas. The legal status of the wetlands is still not in favour of declaring them as protected areas. However, the government is keen in protecting some of the wetlands.

No conservation measures have been undertaken but the wetland is within the Manu River Irrigation Project. Because of this the whole project area is bounded by a full-flood embankment, with a barrage built upstream and irrigation canals within the project area. The project, so far has an adverse effect on the ecology of the wetland by destroying the fish spawning ground, blocking the migratory route of fishes, stagnation of water thus encouraging aquatic weeds to flourish, etc., etc.

17. Conservation measures proposed but not yet implemented: (e.g. management plan in preparation; officially proposed as a protected area etc.)

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18. Current land use - principal human activities in:

(a) site

Open water fishery is the first priority. Other uses of the site include extraction of fodder plant species, thatching materials and edible parts (esp. fruits) of aquatic plants, extráction of molluscs for making duck feed and for pearls.

(b) surroundings/catchment

Major land use in the surroundings is for agricultural purposes. The major crop is rice (boro, aman and aus). No other crop with significant area is grown within the project area.

19. Disturbances/threats, including changes in land use and major development projects: (factors which may have a negative impact on the ecological character of the wetland)

(a) site

1. Destruction of fish spawning ground;
2. Obstructing fish migrating route;
3. Influencing increase of aquatic weeds;
4. Increase in the rate of infestation of fish viral disease;
5. Increase in the unemployment of local people;
6. Decrease in fish production resulting in the protein deficiency among the local people;
7. Increase in the sedimentation rate, and several other negative impacts.

(b) surroundings/catchment

1. Siltation/sedimentation of the river bed;
2. Degradation of water quality;
3. Changes in the land fertility;
4. Use of more fertilizers and pesticides;
5. Drainage congestion.

20. Hydrological and physical values: (groundwater recharge, flood control, sediment trapping, shoreline stabilisation etc.)

The area is protected from flooding by flood embankments along the right bank of the Manu river from the southern Bhatera hills to Manumukh and along the left bank of Kushiya from the northern Bhatera Hills to Manumukh. The Bhatera hills forming the eastern boundary is also the upper catchment of the area. Moulvibazar town has been constructed on both banks of the Manu river and the major part on the right bank is frequently threatened by flooding.

The Manu, Kushiya and Dhalai rivers are the principal water courses and are subject to flash floods. The Kushiya river has a high catchment area, most of this area is in India but 520 km² is in Bangladesh. The Manu and Dhalai rivers originate in Lushai hill range in India; the Dhalai river flows into the Manu river about 4.6 km upstream of the Manu Barrage site. From its point of origin in India up to its confluence with the Kushiya at Manumukh, the Manu is about 182 km in length. The Manu and Dhalai rivers have catchment areas of 2226 km² and 572 km² respectively in India and 59.5 km² and 292.5 km² respectively in Bangladesh up to their confluence point.

21. Social and cultural values: (e.g. fisheries production, forestry, religious importance, archaeological site etc.)

This haor was known for its fishes prior to the inception of the MRIP. Existing project water level management indicates that areas under standing water bodies has been decreased significantly. Consequently this has reduced the fish population and has adverse impact over the livelihood of fishermen. Every year these water bodies are leased out for fishing. Open water capture fishery predominates in the area yielding a total fish production of 186.3 tons from eight beels and rivers/channels and 2310 h of floodplain (the low areas which dry up between November and February). Closed water culture fisheries is mostly confined to privately owned and managed ponds usually located in homestead areas.

Information from the old villagers adjacent to the haor suggest that there was once freshwater swamp forest in the northwestern part of the wetland. Presently no such forest exist except some lonely *Barringtonia* to witness the changes in the haor system.

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22. Noteworthy fauna: (e.g. unique, rare endangered, abundant or biogeographically important species; include count data etc.)

Amphibians: *Bufo melanostictus*, *Rana tigerina*, *Rana limnocharis*, *Rana cyanophlyctis*.

Reptiles: *Varanus bengalensis*, *Xenochrophis piscator*, *Enhydris enhydris*, *Atretium schistosum*, *Aspideretes hurum*, *Lissemys punctata*.

Aves: Little Grebe, Grey Heron, Purple Heron, Cotton Pygmy Goose, Shoveler, Gadwall, Ferruginous Duck, Ruddy Crake, Watercock, Purple Swamphen, Coot, Pheasant-tailed Jacana, Bronze-winged Jacana, Oriental Pratincole, Redwattled Lapwing, Blackwinged Stilt, Spotted Redshank, Marsh Sandpiper, Little Stint, Blackheaded Gull, Whiskered Tern, Common Tern, Blackwinged Kite, Western Marsh Harrier, Eastern Marsh Harrier, Pied Harrier, Crested Serpent Eagle, Pallas's Fish Eagle, Steppe Eagle, Kestrel, Peregrine Falcon.

Mammals: Small Indian Mongoose, Fishing Cat, Jackal, Large Indian Civet, Bandicoot Rat, Gangetic Dolphin (in the Kushiya and Manu rivers).

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23. Noteworthy flora: (e.g. unique, rare endangered, or biogeographically important species/communities etc.)

Submerged: *Potamogeton mucronatus*, *P. crispus*, *Hydrilla verticillata*, *Ottelia alismoides*, *Vallisneria spiralis*, *Najas* sp., *Blyxa* sp., *Ceratophyllum demersum*, *Myriophyllum tetrandrum*, *M. tuberculatum*, *Sagittaria sagittifolia*, *S. guayanensis*, *aponogeton natans*, *A. undulatus*, *A. appendiculatus*.

Free

Floating: *Eichhornia crassipes*, *Utricularia aurea*, *U. exoleata*, *U. stellaris*, *Pistia stratiotes*, *Spirodella polyrhiza*, *S. punctata*, *Wolffia microscopia*, *Lemna perpusilla*, *Salvinia natans*, *S. cucullata*, *Azolla pinnata*.

Rooted

Floating: *Nymphaea stellata*, *N. nouchali*, *Nymphoides cristatum*, *N. indicum*, *Hygrophysa aristata*, *Panicum paludosum*, *Pseudoraphis spinescens*, *P. brunoniana*, *Trapa maximowiczii*, *Limnophila indica*, *L. sessiliflora*, *L. heterophylla*.

Sedges &

Meadows: *Monochoria hastata*, *Cyperus* sp., *Eleocharis dulcis*, *Schoenoplectus articulatus*, *Ludwigia abscondens*, *Ipomoea fistulosa*, *I. aquatica*, *Alternanthera philoxeroides*, *Aeschynomene aspera*, *A. indica*, *Sesbania roxburghii*, *Enhydra fluctuans*, *Eclipta alba*.

Crop Field: *Cyperus cephalotes*, *Cyperus* sp., *Monochoria hastata*, *Aponogeton appendiculatus*, *Eichhornia crassipes*, *Sagittaria guayanensis*, *S. sagittifolia*, *Lindernia crustacea*, *Nymphoides* sp., *Limnophila* sp., *Alternanthera sessilis*.

Homestead: *Pongamia pinnata*, *Barringtonia acutangula*, *Crataeva nurvala*, *Lagerstromia speciosa*, *Trewia nudiflora*, *Mangifera indica*, *Ficus hispida*, *Ficus* sp., *Albizia procera*, *Artocarpus heterophyllus*, *Syzygium cumini*, *Bambusa* sp., *Salix tetrasperma*, *Pandanus* sp., *Zizyphus mauritiana*, *Musa paradisiaca*.

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24. Current scientific research and facilities: (e.g. details of current projects; existence of field station etc.)

Under the Flood Action Plan (FAP) various studies are being carried out which include fisheries, wildlife, flora, sociology, hydrology, sedimentology. Detailed studies on the fauna, flora have been done while some studies related to fisheries and social anthropology are still continuing within NERP (FAP-6) sponsored by CIDA. ODA funded FAP-17 are also conducting a study on fisheries in Kawadighi Haor. Temporary field stations were established by FAP-6 and one of them is still in function. However, NERP (FAP-6) has a guest house in Moulvibazar, 15 km south of the haor.

The haor area is within the Manu river irrigation project, so prior to the inception of the project several studies on the engineering, topography, hydrology, etc., were carried out. Unfortunately no detailed studies were undertaken on biological resources like fisheries.

25. Current conservation education: (e.g. visitors centre, hides, information booklet, facilities for school visits etc.)

No such activities exist but through the NERP/NACOM initiative, planning is underway to start an environmental research and education centre on an experimental basis. Activities of this centre will be extended to Kawadighi Haor too.

26. Current recreation and tourism: (state if wetland used for recreation/tourism; indicate type & frequency/intensity)

No facilities are available for recreation or tourism. Eco-tourism is in infancy in Bangladesh and also not well understood. It will take time before any such recreational activities begin. The wetland is visited by duck hunters during the winter months when the migratory ducks are wintering here.

27. Management authority: (name and address of body responsible for managing the wetland)

Additional Deputy Commissioner (Revenue), Moulvibazar

28. Jurisdiction: (territorial e.g. state/region and functional e.g. Dept of Agriculture. Dept of Environment etc.)

Territorial: Moulvibazar and Rajnagar Thana under Moulvibazar District.

Functional: Additional Deputy Commissioner (Revenue), Moulvibazar under the Ministry of Land.

29. Bibliographical references: (scientific/technical only)

Scott,D.A. 1989. Asian Wetland Directory. IUCN/WWF

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Karim,A., Khan, M.S., Sobhan,I., Rashid, S.M.A. & Khan,A.Z. 1992. Wetland Assessment Surveys:Interim Report. SLI/NHC/NACOM.

Anonymous. 1990. Rapid Rural Appraisal:Manu River Project. 21 pp.

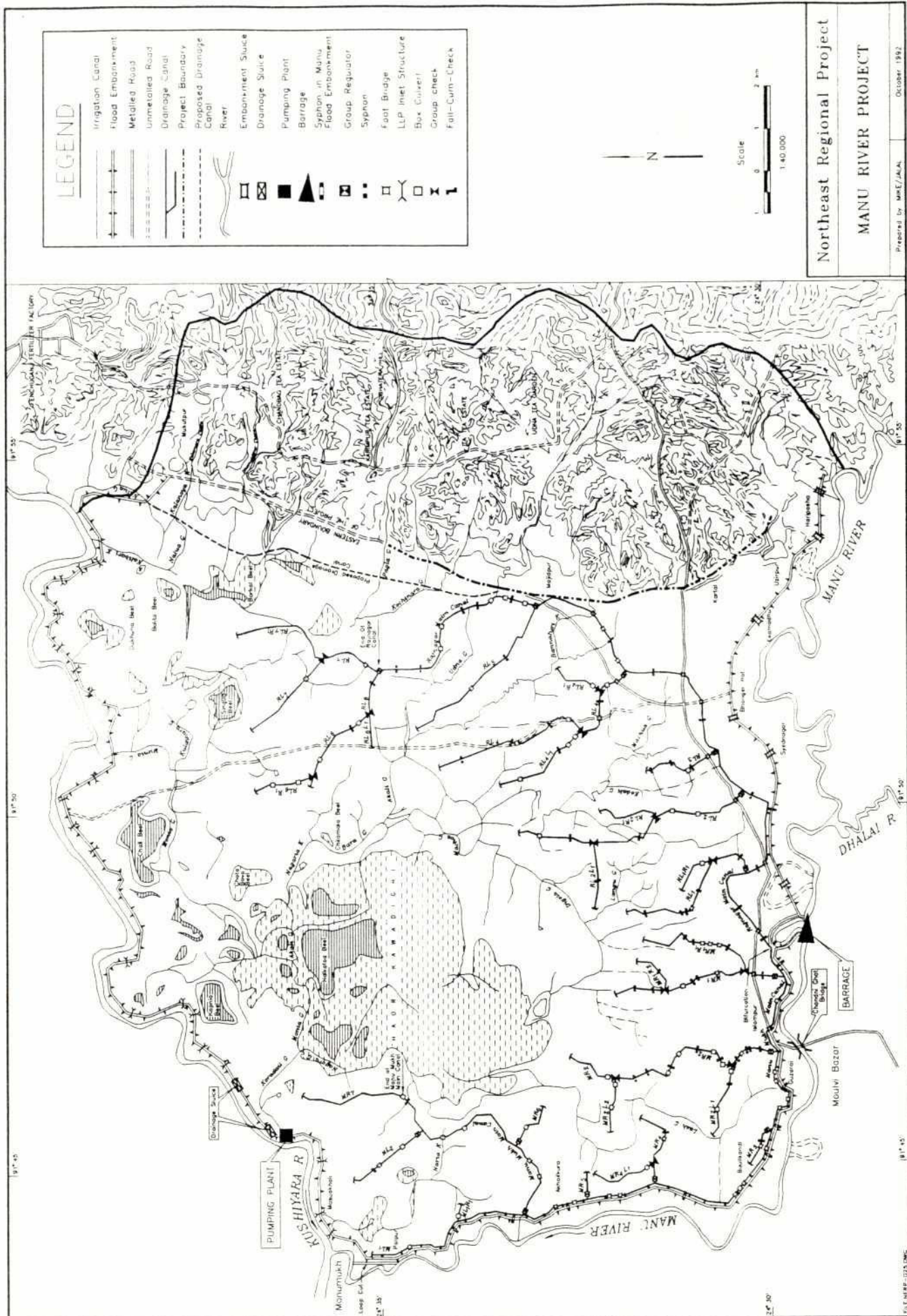
BWDB. 1992. Systems Rehabilitation Project : Manu River Irrigation Project. 26 pp.

BUET. 1990. Evaluation of the Manu river Irrigation Project. 65 pp.

30. Reasons for inclusion: (state which Ramsar Criteria - as adopted by Rec.C.515 of the Montreux Conference - are applicable)

1(c), 2(c), 3(b), 3(c)

31. Map of site (please enclose the most detailed and up-to-date map available - preferably at least 1:25,000 or 1:50,000)



ANNEX D
SPECIES LISTS

D.1 Wetland plant species by community [Incomplete]

Codes: Ex = Exotic; A = Annual; P = Perennial; H = Herb; S = Shrub; T = Tree; TI = Treelet; C = Climber

NAMES		Habit											
Scientific Name	Family	Local Name	Ex	Habit									
				A	P	H	S	T	TI	C			
Submerged													
<i>Aponogeton natans</i>	Aponogetonaceae	ghechu			x								
<i>Aponogeton undulatus</i>	Aponogetonaceae	ghechu			x								
<i>Aponogeton appendiculatus</i>	Aponogetonaceae	ghechu			x								
<i>Blyxa echinosperma</i>	Hydrocharitaceae	shayala											
<i>Ceratophyllum demersum</i>	Ceratophyllaceae	jhangi, katajhangi		x									
<i>Ceratophyllum submersum</i>	Ceratophyllaceae	jhangi			x								
<i>Hydrilla verticillata</i>	Hydrocharitaceae	kureli, jhangi			x								
<i>Nachamandra alternifolia</i>	Hydrocharitaceae	kaisa		x	x								
<i>Myriophyllum tuberculatum</i>	Haloraceae	--		x									
<i>Myriophyllum tetrandrum</i>	Haloraceae	--											
<i>Najas</i> sp.	Najadaceae	goisa		x									
<i>Ottelia alismoides</i>	Hydrocharitaceae	panikola, kaorali		x	x								
<i>Potamogeton crispus</i>	Potamogetonaceae	keorali		x	x								
<i>Potamogeton pectinatus</i>	Potamogetonaceae	keorali			x								
<i>Potamogeton mucronatus</i>	Potamogetonaceae	keorali			x								
<i>Rotala rutundifolia</i>	Lythraceae	--		x									
<i>Rotala wallichii</i>	Lythraceae	--											
<i>Sagittaria guayanensis</i> spp. lappula	Alismataceae	muamia, kaowathukri			x								
<i>Sagittaria sagitifolia</i>	Alismataceae	chhotokul			x								
<i>Vallisneria spiralis</i>	Hydrocharitaceae	pataseola, bicha		x	x								
Free Floating													
<i>Azolla pinnata</i>	Salvinaceae	kutipana			x								
<i>Eichhornia crassipes</i>	Pontederiaceae	kochuripana			x								
<i>Lemna perpusilla</i>	Lemnaceae	khudipana			x								

NAMES			Ex	Habit						
Scientific Name	Family	Local Name		A	P	H	S	T	TI	C
<i>Pistia stratiotes</i>	Araceae	topapana			x					
<i>Salvinia cucullata</i>	Salvinaceae	kuripana, indurkan			x					
<i>Salvinia natans</i>	Salvinaceae	tetulapana			x					
<i>Spirodela punctata</i>	Lemnaceae	khudipana			x					
<i>Spirodela polyrhiza</i>	Lemnaceae	khudipana			x					
<i>Utricularia exoleata</i>	Lentibulariaceae	chhotojhang		x						
<i>Utricularia aurea</i>	Lentibulariaceae	chhotojhang		x						
<i>Utricularia stellaris</i>	Lentibulariaceae	chhotojhang			x					
<i>Wolffia arrhiza</i>	Lemnaceae	guripana			x					
<i>Wolffia microscopica</i>	Lemnaceae	guripana			x					
Rooted Floating										
<i>Echinochloa colonum</i>	Gramineae	parua		x	x					
<i>Echinochloa</i> sp.	Gramineae			x						
<i>Eragrostis tenella</i>	Gramineae	koni		x						
<i>Euryale ferox</i>	Nymphaeaceae	makhna		x	x					
<i>Hygroryza aristata</i>	Gramineae	phutki			x					
<i>Leersia hexandra</i>	Gramineae	--		x						
<i>Linnophila indica</i>	Serophulariaceae	karpur		x						
<i>Linnophila sessiliflora</i>	Serophulariaceae	bijatighash		x						
<i>Linnophila heterophylla</i>	Serophulariaceae	karpur		x						
<i>Mersilea quadrifoliata</i>	Mersileaceae	sushnisak		x	x					
<i>Nelumbo nucifera</i>	Nymphaeaceae	padma			x					
<i>Nymphaea stellata</i>	Nymphaeaceae	nilshapla			x					
<i>Nymphaea nouchali</i>	Nymphaeaceae	sada, raktoshapla			x					
<i>Nymphoides cristatum</i>	Menyanthaceae	chandmala			x					
<i>Nymphoides indicum</i>	Menyanthaceae	panchuli			x					
<i>Panicum paludosum</i>	Gramineae	--		x						
<i>Pseudoraphis spinescens</i>	Gramineae	erali			x					
<i>Pseudoraphis brunninana</i>	Gramineae	--			x					
<i>Trapa maximowiczii</i>	Trapaceae	singra, paniphal			x					

NAMES			Ex	Habit							
Scientific Name	Family	Local Name		A	P	H	S	T	TI	C	
Sedges & Meadows											
<i>Aeschynomene aspera</i>	Leguminosae	shola, banda		x					x		
<i>Aeschynomene indica</i>	Leguminosae	katshola, bhatshola		x					x		
<i>Alternanthera philoxeroides</i>	Amaranthaceae	helencha		x				x			
<i>Arundo donax</i>	Gramineae	baranal, gobanal		x				x			
<i>Cleome hasslerana</i>	Capparidaceae	nunirleta, hurhuri	x	x							
<i>Clinogyne dichotoma</i>	Marantaceae	sital-pati			x				x		
<i>Colocasia esculenta</i>	Araceae	kachu			x						
<i>Cyperus</i> sp.	Cyperaceae	mutha		x				x			
<i>Eclipta alba</i>	Compositae	kalokeshi, kalohuza		x	x			x			
<i>Eleocharis dulcis</i>	Cyperaceae	panichaise		x				x			
<i>Enhydra fluctuans</i>	Compositae	helencha, harhach			x			x			
<i>Fimbristylis dichotoma</i>	Cyperaceae	joina chaise			x			x			
<i>Fimbristylis miliacea</i>	Cyperaceae	joina, chatkighash		x				x			
<i>Fimbristylis squarrosa</i>	Cyperaceae	jumka chaich		x				x			
<i>Hemarthria protensa</i>	Gramineae	chailla		x				x			
<i>Ipomoea aquatica</i>	Convolvulaceae	kalmi shak			x			x			
<i>Ipomoea fistulosa</i>	Convolvulaceae	dhol kalmi	x		x				x		
<i>Ludwigia abscondens</i>	Onagraceae	kesardam, mulcha		x				x			
<i>Ludwigia repens</i>	Onagraceae	panidoga		x				x			
<i>Monochoria hastata</i>	Pontederiaceae	baranukha, kechur			x			x			
<i>Oryza rufipogon</i>	Gramineae	jhara dhan		x				x			
<i>Polygonum glabrum</i>	Polygonaceae	bishkatali, kukra		x				x			
<i>Polygonum stagninum</i>	Polygonaceae	bishkatali, kukra		x				x			
<i>Polygonum lanatum</i>	Polygonaceae	kukra		x				x			
<i>Polygonum pedunculare</i>	Polygonaceae	kukra		x				x			
<i>Polygonum barbatum</i>	Polygonaceae	bishkatali		x				x			
<i>Rumex dentata</i>	Polygonaceae	bonpalong		x				x			
<i>Setaria glauca</i>	Gramineae	kulkulle, kauni		x				x			
<i>Setaria fusca</i>	Gramineae	pinginatchi		x				x			

NAMES			Ex	Habit						
Scientific Name	Family	Local Name		A	P	H	S	T	TI	C
<i>Schoenoplectus articulatus</i>	Cyperaceae	--		x		x				
<i>Scirpus juncoides</i>	Cyperaceae	chisra			x	x				
<i>Sclerostachya fusca</i>	Gramineae	ekor, khuri		x		x				
<i>Sesbania roxburghii</i>	Leguminosae	huli, phuli		x			x			
<i>Vetiveria zizanioides</i>	Gramineae	binna, gandhabena			x	x				
<i>Xanthium indicum</i>	Compositae	ghagra, khagra		x		x				
Reeds										
<i>Asclepias</i> sp.	Asclepiadiaceae				x					x
<i>Asparagus racemosus</i>	Liliaceae	satamuli, hilum			x		x			
<i>Ficus heterophylla</i> var. <i>heterophylla</i>	Moraceae	bonolat, baladumur			x		x			
<i>Lippia javanica</i>	Verbenaceae	bhuiokra			x			x		
<i>Phragmites karka</i>	Gramineae	khagra, nol			x		x			
<i>Rosa involucreta</i>	Rosaceae	gunja kata			x		x			
<i>Saccharum spontaneum</i>	Gramineae	khag, aisha			x		x			
Swamp Forest										
<i>Barringtonia acutangula</i>	Leechthidaceae	hijal			x			x		
<i>Crataeva nurvala</i>	Capparidaceae	barun			x			x		
<i>Phyllanthus disticha</i>	Euphorbiaceae	chitki			x		x			
<i>Phyllanthus reticulatus</i>	Euphorbiaceae	chitki			x		x			
<i>Pongamia pinnata</i>	Papilionoideae	karanch			x			x		
<i>Salix tetrasperma</i>	Salicaceae	bias, panihijal			x			x		
<i>Trewia nudiflora</i>	Euphorbiaceae	gotagammar, panidumur			x			x		
Crop Field										
<i>Ageratum conyzoides</i>	Compositae	fulkuri		x		x				
<i>Alternanthera sessilis</i>	Amaranthaceae	haicha, sachishak		x		x				
<i>Amaranthus spinosus</i>	Amaranthaceae	kata note		x		x				
<i>Ceratopteris thalictroides</i>	Parkeriaceae	--		x		x				
<i>Chenopodium ambrosioides</i>	Chenopodiaceae	chapali ghash		x		x				

NAMES			Ex	Habit						
Scientific Name	Family	Local Name		A	P	H	S	T	TI	C
<i>Coldenia procumbens</i>	Boraginaceae	tripankhi		x		x				
<i>Cotula hemispherica</i>	Compositae	kancha ghash		x		x				
<i>Croton bonplandianum</i>	Euphorbiaceae	morchagra, banjhal		x		x				
<i>Cuscuta australis</i>	Convolvulaceae	swarnalata		x						x
<i>Cynodon dactylon</i>	Gramineae	durba		x		x				
<i>Cyperus cephalotes</i>	Cyperaceae	niratraba		x	x	x				
<i>Cyperus</i> sp. (three species)	Cyperaceae	--		x		x				
<i>Centipeda orbicularis</i>	Compositae	machiti, hachuti		x		x				
<i>Dentella repens</i>	Rubiaceae	sadaphuli, sadajabri			x	x				
<i>Digitaria longiflora</i>	Gramineae	chota fulka		x	x	x				
<i>Dipteracanthus prostratus</i>	Acanthaceae	--		x		x				
<i>Eleocharis atropurpurea</i>	Cyperaceae	panichaise		x		x				
<i>Eleusina indica</i>	Gramineae	gaicha, chapre		x		x				
<i>Ehulia conyzoides</i>	Compositae	--		x		x				
<i>Eupatorium odoratum</i>	Compositae	assamlata	x		x	x				
<i>Euphorbia</i> sp.	Euphorbiaceae	--		x		x				
<i>Glinus lotoides</i>	Molluginaceae	alughas, kakdim		x		x				
<i>Graphalium luteo-album</i>	--	--								
<i>Grangea maderaspatana</i>	Compositae	nemuti, namuti		x		x				
<i>Hedyotis</i> sp.	Rubiaceae	--		x		x				
<i>Heliotropium indicum</i>	Boraginaceae	hatisur		x		x				
<i>Herpestis moniera</i>	Scrophulariaceae	brahmishak		x		x				
<i>Hydrocotyle bupleuroides</i>	Umbelliferae	--		x		x				
<i>Hygrophila deformis</i>	Acanthaceae	--		x		x				
<i>Hygrophila polysperma</i>	Acanthaceae	--		x		x				
<i>Hyptis capitata</i>	Labiatae	--		x		x				
<i>Justicia gendarusa</i>	Acanthaceae	nilnishinda		x		x				
<i>Justicia simplex</i>	Acanthaceae	--		x		x				
<i>Laplagathis</i> sp.	--	--		x		x				
<i>Leucas lavendulifolia</i>	Labiatae	dron		x		x				

NAMES				Ex	Habit						
Scientific Name	Family	Local Name			A	P	H	S	T	TI	C
<i>Lindernia crustacea</i>	Scrophulariaceae	bhui			x		x				
<i>Ludwigia hyssopifolia</i>	Onagraceae										
<i>Mimosa pudica</i>	Leguminosae	lajjabati		x		x	x				
<i>Nicotiana plumbaginifolia</i>	Solanaceae	bantamak			x		x				
<i>Paspalum conjugatum</i>	Gramineae	dadkuri				x	x				
<i>Persicaria viscosa</i>	Polygonaceae	lalkukra			x		x				
<i>Polygonum plebejum</i>	Polygonaceae	--			x		x				
<i>Pogostemon stellatus</i>	Labiatae	--			x		x				
<i>Rottboellia protensa</i>	Gramineae	barajati				x	x				
<i>Rorippa indica</i>	Cruciferae	bansarisha				x	x				
<i>Rungia pectinata</i>	Acanthaceae	pindi			x		x				
<i>Sarcocaulis pulcherrima</i>	--	brihati, karabi			x		x				
<i>Scoparia dulcis</i>	Scrophulariaceae	bandhundi		x	x		x				
<i>Solanum khasianum</i>	Solanaceae	phutibegun			x	x	x				
<i>Solanum filicifolium</i>	Solanaceae	titbegun				x		x			
<i>Solanum nigrum</i>	Solanaceae	kakmachi			x		x				
<i>Solanum torvum</i>	Solanaceae	gothdegun				x		x			
<i>Solanum indicum</i>	Solanaceae	phutibegun				x		x			
<i>Spilanthes acmella</i>	Compositae	marhatitiga			x		x				
<i>Triumfetta rhomboides</i>	Compositae	banokra			x		x				
Homestead											
<i>Achyranthes aspera</i>	Amaranthaceae	apang			x		x				
<i>Aegle marmelos</i>	Rutaceae	bel				x			x		
<i>Alstonia scholaris</i>	Apocynaceae	chatim				x			x		
<i>Albizia sp.</i>	Leguminosae	koroi				x			x		
<i>Albizia procera</i>	Leguminosae	sadakorai, silkorai				x			x		
<i>Alpinia sp.</i>	Zingiberaceae	tara				x		x			
<i>Anthocephalus chinensis</i>	Rubiaceae	kadom				x			x		
<i>Aponomoxis polystachya</i>	Meliaceae	ryana				x			x		
<i>Ardisia sp.</i>	Myrtaceae	narkoli				x				x	

NAMES			Ex	Habit						
Scientific Name	Family	Local Name		A	P	H	S	T	TI	C
<i>Areca catechu</i>	Palmae	supari			x			x		
<i>Areca triandra</i>	Palmae	bangua			x			x		
<i>Artocarpus heterophyllus</i>	Moraceae	khatal			x			x		
<i>Azadirachta indica</i>	Meliaceae	nim			x			x		
<i>Bombax ceiba</i>	Bombacaceae	shimul			x			x		
<i>Bambusa</i> sp. (four species)	Gramineae	bans			x			x		
<i>Borassus flabellifer</i>	Palmae	tal			x			x		
<i>Caesalpinia crista</i>	Leguminosae	lekanta			x				x	
<i>Calamus tenuis</i>	Palmae	jalibet			x					x
<i>Cassia occidentalis</i>	Leguminosae	barahalkasunda			x		x			
<i>Cassia siamea</i>	Leguminosae	minjuri, eskikoro			x			x		
<i>Caryota urens</i>	Palmae	bansupari, chaur			x			x		
<i>Centella asiatica</i>	Umbelliferae	thankuni			x	x				
<i>Chaetocarpus castanocarpus</i>	Euphorbiaceae	bulkokra			x			x		
<i>Citrus grandis</i>	Rutaceae	jambura			x			x		
<i>Cleorodendrum siphonanthus</i>	Verbenaceae	bamanhati, banchat			x			x		
<i>Cocos nucifera</i>	Palmae	natrikal			x			x		
<i>Crotalaria saltiana</i>	Leguminosae	jhanjhani			x					
<i>Diospyros perigrina</i>	Ebenaceae	gab, deshigab			x			x		
<i>Datura suaveolens</i>	Solanaceae	rajghanta	x		x		x			
<i>Erythrina variegata</i>	Leguminosae	mander, piltamander			x			x		
<i>Erythrina ovalifolia</i>	Leguminosae	talimander			x			x		
<i>Ficus benghalensis</i>	Moraceae	bot			x			x		
<i>Ficus rumphii</i>	Moraceae	hijulia			x			x		
<i>Ficus religiosa</i>	Moraceae	assawath			x			x		
<i>Ficus hispida</i>	Moraceae	dumur			x			x		
<i>Ficus</i> sp.	Moraceae	chini bot			x				x	
<i>Jasminum</i> sp.	Oleaceae	--			x					
<i>Lagerstromia speciosa</i>	Lythraceae	jarul			x			x		

NAMES			Ex	Habit						
Scientific Name	Family	Local Name		A	P	H	S	T	TI	C
<i>Lantana camara</i> var. <i>aculeata</i>	Verbenaceae	--	x		x		x			
<i>Litsea</i> sp.	Lauraceae	--						x		
<i>Mangifera indica</i>	Anacardiaceae	am			x			x		
<i>Melochia corchorifolia</i>	Starculaceae	tikiokra			x					
<i>Mikania scandens</i>	Compositae	assamlata			x			x		x
<i>Mikania cordata</i>	Compositae	veratilata	x		x					x
<i>Musa paradisiaca</i> var. <i>sapientum</i>	Musaceae	kala			x					
<i>Ocimum americanum</i>	Labiatae	tulshi					x		x	
<i>Pandanus</i> sp.	Pandanaceae	keya			x		x			
<i>Physalis minima</i>	Solanaceae	bantepari		x		x				
<i>Randia</i> sp.	Rubiaceae	--							x	
<i>Ricinus communis</i>	Euphorbiaceae	rerri, bheranda		x	x		x			
<i>Samanea saman</i>	Leguminosae	rendi, raintree	x		x			x		
<i>Sapium indicum</i>	Euphorbiaceae	harua.batul			x			x		
<i>Syzygium fruticosum</i>	Myrtaceae	khudijam			x				x	
<i>Syzygium cumini</i>	Myrtaceae	kalojam			x			x		
<i>Terminalia catappa</i>	Combretaceae	katbadam, deshivadam			x			x		
<i>Temarindus indica</i>	Leguminosae	tentul			x			x		
<i>Torinia</i> sp.	--	--			x			x		
<i>Trichosanthes bracteata</i>	Cucurbitaceae	makal								
<i>Urena lobata</i>	Malvaceae	--			x			x		
<i>Zizyphus mauritiana</i>	Rhamnaceae	boroi, kul			x					x

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D.2 Wetland Faunal Species (excepting fish and birds)

SPECIES / SCIENTIFIC NAME	ENGLISH NAME	PRESENT STATUS								REMARKS
		VC	C	UC	S	R	T	E	K	
AMPHIBIA :										
<i>Bufo melanostictus</i>	Common Toad	*	-	-	-	-	-	-	-	Very common & widely distributed
<i>Microhyla ornata</i>	Ornate Frog	-	-	*	-	-	-	-	-	Uncommon in the wetlands
<i>Microhyla rubra</i>	Red Microhylid	-	-	*	-	-	-	-	-	Uncommon in the wetlands
<i>Uperodon globulosum</i>	Balloon Frog	-	-	*	-	-	-	-	-	Uncommon in the wetlands
<i>Kaloula pulchra</i>	Kaloula Frog	-	-	-	*	-	-	-	-	Not observed during recent field visits
<i>Rana cyanophlyctis</i>	Skipper Frog	*	-	-	-	-	-	-	-	Most common frog
<i>Rana tigrina</i>	Bull Frog	-	*	-	-	-	*	-	-	Economically important species, losing grounds due to exploitation
<i>Rana limnocharis</i>	Cricket Frog	-	*	-	-	-	-	-	-	Common in the wetland margins
<i>Rana tyleri</i>	Tytler's Frog	-	-	*	-	-	-	-	-	Found around wetlands
<i>Rana temporalis</i>	Tree Frog	-	-	*	-	-	-	-	-	Not observed during field visits
<i>Rhacophorus leucomystax</i>	Tree Frog	-	-	*	-	-	-	-	-	Not observed during field visits
<i>Rhacophorus maculatus</i>	Tree Frog	-	-	*	-	-	-	-	-	Not observed

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REPTILIA :

CHELONIA :

<i>Hardella thurjii</i>	Brahminy Turtle	-	-	*	-	-	-	-	-	Widely distributed
<i>Kachuga tecta</i>	Common Roof Turtle	-	*	-	-	-	-	-	-	All over the wetlands
<i>Kachuga smithii</i>	Brown Roof Turtle	-	-	-	*	-	-	-	-	Large rivers
<i>Kachuga dhongoka</i>	Three Striped Roof Turtle	-	-	-	-	*	-	-	-	Once common, not observed
<i>Kachuga kachuga</i>	Painted Roof Turtle	-	-	-	-	*	-	*	-	Not seen, endangered
<i>Kachuga sylhetensis</i>	Sylhet Roof Turtle	-	-	-	-	-	-	-	*	Not observed
<i>Morenia petersi</i>	Bengal Eyed Turtle	-	-	*	-	-	-	-	-	In slow, stagnant waters
<i>Geoclemys hamiltoni</i>	Spotted Pond Turtle	-	-	-	*	-	-	-	-	In reed-lands, margins
<i>Cuora ambionensis</i>	Malayan Box Turtle	-	-	-	-	*	-	-	-	Not observed
<i>Lissemys punctata</i>	Spotted Flapshell	-	*	-	-	-	-	-	-	All over the wetlands
<i>Aspideretes hurum</i>	Peacock Soft Shell	-	*	-	-	-	-	-	-	All over the wetlands
<i>Chitra indica</i>	Narrow-headed Soft Shell	-	-	-	*	-	-	-	-	Large rivers

LACERTILIA :

<i>Hemidactylus brooki</i>	House Lizard	-	*	-	-	-	-	-	-	Homesteads around wetlands
<i>Hemidactylus frenatus</i>	Common Lizard	*	-	-	-	-	-	-	-	Homesteads around wetlands
<i>Gekko gekko</i>	Wall Lizard	-	-	*	-	-	-	-	-	Homesteads & swamp forests
<i>Calotes versicolor</i>	Garden Lizard	-	-	-	*	-	-	-	-	Homesteads
<i>Mabuya carinata</i>	Common Skink	-	-	-	*	-	-	-	-	Homesteads, swamp forests
<i>Varanus bengalensis</i>	Bengal Lizard	-	-	*	-	-	-	-	-	Homesteads, forests
<i>Varanus flavescens</i>	Yellow Lizard	-	-	*	-	-	-	-	-	Homesteads, forests

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OPHIDIA :

<i>Python molurus</i>	Rock Python	-	-	-	-	*	-	*	-	Swamp Forests, reeds
<i>Pareas monticola</i>	Assam Snail-eater	-	-	-	-	*	-	-	*	Wetland margins
<i>Lycodon jara</i>	Yellow Wolf Snake	-	-	*	-	-	-	-	-	Homesteads around wetlands
<i>Amphiesma stolata</i>	Striped Keelback	-	-	*	-	-	-	-	-	Wetland edges, homesteads
<i>Xenochrophis piscator</i>	Checkered Keelback	*	-	-	-	-	-	-	-	Widely distributed
<i>Xenochrophis cerasogaster</i>	Dark-bellied Marsh Snake	-	-	-	*	-	-	-	-	Once common, getting rarer
<i>Atretium schistosum</i>	Olive Keelback	-	-	*	-	-	-	-	-	Wetlands, also in ponds
<i>Ptyas mucosus</i>	Rat Snake	-	-	-	*	-	-	-	-	Wetland margins, getting rarer
<i>Enhydriis enhydriis</i>	Smooth Water Snake	*	-	-	-	-	-	-	-	Widely distributed
<i>Enhydriis sieboldi</i>	Siebold's Water Snake	-	-	-	-	-	-	-	-	A few reports from the region, no recent information
<i>Cerberus rhynchops</i> ¹	Dog-faced Water Snake	-	-	-	*	-	-	-	-	Interesting observation, needs further studies
<i>Bungarus fasciatus</i>	Banded Krait	-	-	*	-	-	-	-	-	Wetland margins, homesteads, commercially exploited
<i>Naja naja kaouthia</i>	Mono-cellate Cobra	-	-	*	-	-	-	-	-	Wetland margins, homesteads, commercially exploited

¹Known to be anadromous in breeding habits, usually inhabits coastal brackish and saline waters.

CROCODILIA :

<i>Crocodylus palustris</i>	Marsh Crocodile	Formerly common, presently extinct							
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MAMMALS :

<i>Suncus murinus</i>	Grey Musk	*	-	-	-	-	-	-	-	Homesteads, levees
<i>Pteropus giganteus</i>	Flying Fox	-	*	-	-	-	-	-	-	Few roosts on the homestead forests around the wetlands
<i>Cynopterus spinx</i>	Short-nosed	*	-	-	-	-	-	-	-	Wetlands and homesteads
<i>Megaderma lyra</i>	False Vampire	-	-	*	-	-	-	-	-	Homesteads, wetlands
<i>Pipistrellus coromandra</i>	Indian Pipistrelle	*	-	-	-	-	-	-	-	Widely distributed
<i>Hesperoptenus tickellii</i>	Tickell's Bat	*	-	-	-	-	-	-	-	Widely distributed
<i>Manis crassicaudata</i>	Indian Pangolin	-	-	-	-	*	-	*	-	Wetland margins, homesteads
<i>Canis aureus</i>	Jackal	-	*	-	-	-	-	-	-	Homesteads, higher grounds around wetlands
<i>Lutra lutra</i>	Common Otter	-	-	-	*	-	-	-	-	Few recent observations
<i>Lutra perspicillata</i>	Smooth-coated Otter	-	-	*	-	-	-	-	-	Wetlands, homestead edges
<i>Viverra zibetha</i>	Large Indian Civet	-	-	-	*	-	-	-	-	Homestead forests
<i>Viverricula indica</i>	Small Indian Civet	-	-	-	-	*	-	-	-	Homestead forests
<i>Felis viverrina</i>	Fishing Cat	-	*	-	-	-	-	-	-	Homesteads, wetland margins
<i>Felis chaus</i>	Jungle Cat	-	-	-	-	-	-	-	*	Present occurrence uncertain

<i>Panthera pardus</i>	Leopard	-	-	-	-	-	-	-	-	Formerly occurred, no longer found in freshwater swamps
<i>Panthera tigris</i>	Tiger	-	-	-	-	-	-	-	-	Formerly occurred, no longer found in freshwater swamps
<i>Rhinoceros unicornis</i>	One-horned Rhinoceros	-	-	-	-	-	-	-	-	Formerly common, presently extinct
<i>Rhinoceros sondaicus</i>	Javan Rhinoceros	-	-	-	-	-	-	-	-	Formerly common, presently extinct
<i>Didymoceros sumatrensis</i>	Two-horned Rhinoceros	-	-	-	-	-	-	-	-	Formerly common, presently extinct
<i>Sus scrofa</i>	Wild Boar	-	-	-	-	-	-	-	-	Formerly common, no longer in wetland habitat
<i>Bubalus bubalis</i>	Wild Buffalo	-	-	-	-	-	-	-	-	Formerly common, presently extinct
<i>Bos gaurus</i>	Gaur	-	-	-	-	-	-	-	-	Formerly common, presently extinct
<i>Cervus duvauceli</i>	Swamp Deer	-	-	-	-	-	-	-	-	Formerly common, presently extinct
<i>Axis porcinus</i>	Hog Deer	-	-	-	-	-	-	-	-	Formerly common, presently extinct
<i>Cervus unicolor</i>	Sambar	-	-	-	-	-	-	-	-	Formerly occurred, no longer found
<i>Caprolagus hispidus</i>	Hispid Hare	-	-	-	-	-	-	-	*	Present occurrence uncertain

Panthera pardus	Leopard	-	-	-	-	-	-	-	-	Formerly occurred, no longer found in freshwater swamps
Panthera tigris	Tiger	-	-	-	-	-	-	-	-	Formerly occurred, no longer found in freshwater swamps
Rhinoceros unicornis	One-horned Rhinoceros	-	-	-	-	-	-	-	-	Formerly common, presently extinct
Rhinoceros sondaicus	Javan Rhinoceros	-	-	-	-	-	-	-	-	Formerly common, presently extinct
Didermocoeros sumatrensis	Two-horned Rhinoceros	-	-	-	-	-	-	-	-	Formerly common, presently extinct
Sus scrofa	Wild Boar	-	-	-	-	-	-	-	-	Formerly common, no longer in wetland habitat
Bubalus bubalis	Wild Buffalo	-	-	-	-	-	-	-	-	Formerly common, presently extinct
Bos gaurus	Gaur	-	-	-	-	-	-	-	-	Formerly common, presently extinct
Cervus duvauceli	Swamp Deer	-	-	-	-	-	-	-	-	Formerly common, presently extinct
Axis porcinus	Hog Deer	-	-	-	-	-	-	-	-	Formerly common, presently extinct
Cervus unicolor	Sambar	-	-	-	-	-	-	-	-	Formerly occurred, no longer found
Caprolagus hispidus	Hispid Hare	-	-	-	-	-	-	-	*	Present occurrence uncertain

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Bandicota bengalensis	Mole Rat	-	*	-	-	-	-	-	-	Homesteads, freshwater swamps
Bandicota indica	Bandicot Rat	-	*	-	-	-	-	-	-	Homesteads, freshwater swamps
Mus booduga	Field Mouse	-	*	-	-	-	-	-	-	Homesteads
Mus musculus	House Mouse	-	*	-	-	-	-	-	-	Homesteads
Rattus rattus	Common House Rat	*	-	-	-	-	-	-	-	Homesteads, widely distributed
Platanista gangetica	Freshwater Dolphin	-	*	-	-	-	*	-	-	Large rivers

Legend: VC: Very Common; C: Common; UC: Uncommon; S: Scarce; R: Rare; T: Threatened; E: Endangered; K: Indeterminate/Unknown.

D.3 Bird species recorded in northeastern Bangladesh (18 Feb to 12 Mar 92 and 20 Apr to 9 May 92)

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 *Haliaeetus leucoryphus*
 Grey-headed Fish-Eagle *Ichthyophaga ichthyaeus*
 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 cirrhatous*
 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*

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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 *Chlidonias 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 *Eudynamis scolopacea*
 Green-billed Malkoha *Rhopodytes tristis*
 Greater Coucal *Centropus sinensis*
 Lesser Coucal *C. bengalensis*
 Brown Fish-Owl *Ketupa zeylonensis*
 Asian Barred Owllet *Glaucidium cuculoides*
 Spotted Owllet *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 *Nyctomys 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 *Eriothacus 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 *Zosterops 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. macrorhynchos*
 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*

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D.4 Waterfowl species 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).

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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.

222

(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.

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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).

428
(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).

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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).

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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).

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Purple Heron *A. purpurea*

Perhaps mainly a rather scarce summer visitor and passage migrant, with a few birds overwintering.

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

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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).

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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).

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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 Chalna 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,

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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 Chalna 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.

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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*



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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

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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: Chalna 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.

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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

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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).

Common Pochard *Aythya ferina*

Scarce winter visitor.

Only 119 were recorded during the Feb/Mar survey: 80 at Chatla Beel, 30 at Chalniah 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 Chalniah 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 Chalna 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*

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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

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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*

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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, Chalna 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

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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), Chalna 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 Deochapra 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*

286
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).

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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 overwintering).

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).

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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. gallinago* 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

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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.

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(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).

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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 overwintering).

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).

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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 overwintering).

246
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 *Chidonias 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).

216
D.5 Wetland birds of the Northeast Region of Bangladesh (other than waterfowl)

This annotated checklist contains all those species of birds (other than the true waterfowl listed in Section D.4) which are ecologically dependent on wetlands and floodplain grasslands, and are known or thought to have occurred in the Northeast Region of Bangladesh. 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.

The dates of the two surveys were:

18 Feb to 12 Mar 92

20 Apr to 9 May 92

Pallas's Fish-Eagle *Haliaeetus leucoryphus*

Fairly common resident.

Thirty 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 Beel (two adults and 17 immatures) and Tangua Haor (eight adults and five immatures) 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, Chalna 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.

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.

(Rare breeding resident. Formerly more common).

284

Grey-headed Fish-Eagle *Ichthyophaga ichthyaetus*

Fairly common resident.

Nineteen individuals were recorded during the two surveys, including a pair of adults at Boraduba Beel (west of Phulpur) and single adults by the Khowai River west of Habiganj, at three *beels* between Kaluma Kanda and Netrakona, at two *beels* near Bhairab Bazar, and at Mehdi Beel, Chalna Beel, Dekhar Haor, Deochapra Beel, Balai Haor, Pasua Beel, Pana Beel and Meda Beel. This could represent as many as 15 pairs. Single immatures were observed at Hail Haor and between Sylhet and Maulvibazar. This species is less prone to soaring than most other large raptors, and may therefore be even commoner than these records suggest.

(Local breeding resident).

Western Marsh Harrier *Circus aeruginosus*

Fairly common winter visitor.

Fairly common in wetlands with emergent marsh vegetation. Thirty-three individuals were recorded during the Feb/Mar survey, at a total of 23 sites. The highest counts were five at Hail Haor and four at Tangua Beel. Only eight were recorded in Apr/May, and six of these were in the Tangua Haor, Matian Haor and Gurmar Haor area. The latest was a bird at Kawadighi Haor on 29 Apr.

(Common winter visitor).

Eastern Marsh Harrier *Circus spilonotus*

Fairly common winter visitor.

Fairly common in Feb/Mar, but outnumbered more than two to one by *C. aeruginosus*. Fifteen individuals were recorded during the Feb/Mar survey, at 13 sites. Only three were seen in Apr/May: singles by the Surma River on 21 Apr, by the Someswari River on 22 Apr and at Hakaluki Haor on 30 Apr. The species was much less confined to wetlands than *aeruginosus*, and was often seen hunting over agricultural land and dry ground with herbaceous vegetation.

(Scarce winter visitor).

209
Pied Harrier *C. melanoleucos*

Fairly common winter visitor and probably also a passage migrant.

A fairly common and widespread raptor, occurring primarily over rice fields, wheat fields and dry ground with herbaceous vegetation. At least 18 individuals were recorded during the Feb/Mar survey and 15 during the Apr/May survey.

(Scarce winter visitor).

Greater Spotted Eagle *A. clanga*

Rare winter visitor.

Only one individual was recorded: an adult at Hail Haor on 21 Feb.

(Scarce winter visitor).

Osprey *Pandion haliaetus*

Rather scarce winter visitor.

Seven were recorded during the Feb/Mar survey as follows: two at Dubriar Haor on 5 Mar, and singles over the Kusiya River at Fenchuganj on 20 Feb, at Rauar Beel on 3 Mar, near Sunamganj and at Chalna Beel on 5 Mar, and at Balaganj Haor on 8 Mar. Five were recorded in Apr/May: singles at Pasua Beel, Pana Beel and Banuar Haor on 22 Apr, and along the Patnai Gang and at Pakertala Beel on 23 Apr.

(Scarce winter visitor).

Swamp Francolin *Francolinus gularis*

Probably extinct in the Northeast Region.

The Swamp Francolin is one of a number of species of birds which are more or less confined to reed-beds, stands of elephant-grass and scrub jungle in low-lying swampy areas subject to seasonal flooding in the basins of the Ganges and Brahmaputra rivers. With the massive loss of these habitats as a result of conversion to rice cultivation, overgrazing by domestic livestock and clearance for human settlement, many of these species have become rare and local throughout their ranges, and several are now listed in the IUCN Red Data Book of Threatened Animals. Most of these species would once have occurred widely in the floodplain grasslands and swampy scrub jungle of the Haor Basin in northeast Bangladesh, but all are now either extinct in the region or very rare. There have been no records of the Swamp Francolin anywhere in Bangladesh

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in recent years, and it is almost certainly extinct in the Northeast Region as there do not appear to be any sufficiently large tracts of suitable habitat remaining. This species is currently listed in the IUCN Red Data Book in the category "Vulnerable".

(?Former resident. No recent records).

Blue-breasted Quail *Coturnix chinensis*

Possibly a local resident.

A pair in marshy grassland by Chatla Beel (Hakaluki Haor) on 30 Apr. Apparently there has been only one other record of this species in Bangladesh in recent years (near Dhaka, in February 1986; personal observation).

(? Former resident. No recent records).

Bengal Florican *Eupodotis bengalensis*

Almost certainly extinct in the Northeast Region.

This large bustard of floodplain grasslands with scattered bushes is now seriously at risk throughout its range from the Nepal terai to northern Vietnam, and has not been recorded in Bangladesh for many years. It is currently listed in the IUCN Red Data Book in the category "Endangered". (See comments under Swamp Francolin).

(?Former resident. No recent records).

Australasian Grass Owl *Tyto longimembris*

Probably extinct in the Northeast Region.

The Grass Owl is a terrestrial owl of tall grass jungle and open grassland on floodplains. There have been few records of the species in Bangladesh and none in recent years, but it can be assumed that the species formerly occurred throughout much of the country. It is doubtful if any suitable habitat now remains in the Northeast Region. (See comments under Swamp Francolin).

(? Former resident. No recent records).

200
Brown Fish-Owl *Ketupa zeylonensis*

Probably a scarce resident.

One was observed on a roadside telegraph pole between Kulaura and Maulvibazar at dusk on 19 Feb.

(Local breeding resident. Not listed for the Northeast).

White-throated Kingfisher *Halcyon smyrnensis*

Common resident.

Common and widespread, primarily around small wetlands in homestead forests and tea estates, but also occasionally along rivers and at large wetlands. Fifty-five were recorded during the Feb/Mar survey, with a number of birds occurring in wetlands far from the nearest wooded areas. However, only 10 were recorded in Apr/May, and all were in homestead forest or tea estates.

(Common breeding resident).

Black-capped Kingfisher *Halcyon pileata*

Possibly a scarce winter visitor.

None was observed during the present surveys. The species remains quite common elsewhere in Bangladesh (e.g. in the Sundarbans), and has been recorded near Srimangal in recent years (John Woolner, pers. com.)

(Locally common winter visitor).

Stork-billed Kingfisher *Halcyon capensis*

Possibly a scarce resident.

None was observed during the present surveys, but the species has been recorded in tea estates near Srimangal in recent years (John Woolner, pers. com.)

(Locally common breeding resident).

230
Common Kingfisher *Alcedo atthis*

Very common resident.

Common at all types of wetlands including small ponds within homestead forests. Widely distributed throughout the wetlands during Feb/Mar, but much more confined to the vicinity of homestead forests and small rivers and khals in Apr/May, presumably because of the greater availability of nests sites in these areas. Approximately 160 were recorded in Feb/Mar and 50 in Mar/Apr.

(Abundant breeding resident).

Blyth's Kingfisher *Alcedo hercules*

Possibly only a rare visitor to the Northeast Region.

None was recorded during the present surveys, but there has been one recent record in the Northeast Region: a single at Hail Haor in the month of February. This is primarily a species of forest streams, and may never have been regular in the open wetlands of the Haor Basin. It is currently listed in the IUCN Red Data Book in the category "Indeterminate".

(Rare visitor?).

Pied Kingfisher *Ceryle rudis*

Fairly common resident, especially along the major rivers and at large beels.

Fairly common and widespread, favouring rivers and the larger, deeper beels with suitable perches (e.g. fish stakes). Thirty-four were recorded in Feb/Mar and 26 in Apr/May.

(Locally common breeding resident).

Plain Martin *Riparia paludicola*

Status uncertain. Possibly a locally common breeding bird and/or passage migrant.

None was observed during the Feb/Mar survey. Singles were observed over the Surma River, Patnai Gang and Manu River in Apr/May. This is primarily a species of large rivers with extensive sand banks, and is therefore more likely to be commoner in the extreme west of the region

(Local breeding resident).

242
Sand Martin *R. riparia*

Locally common winter visitor and abundant passage migrant.

Very patchily distributed, but locally abundant in Feb/Mar; much commoner and more widespread in Apr/May, when several large migrating flocks were observed. The only records in Feb/Mar were at least 70 at Hail Haor on 21 and 23 Feb, several thousands in the Tangua Haor area on 1-4 Mar, and 95 at Petangi Beel (Kawadighi Haor) on 8 Mar. In Apr/May, concentrations of several hundred to a thousand individuals were observed in the Tangua Haor area and at Pasua Beel, Kawadighi Haor, Hakaluki Haor, Hail Haor and Srimangal.

(Local winter visitor and common passage migrant).

Red-throated Pipit *A. cervinus*

Probably a regular winter visitor in small numbers.

At least eight individuals were recorded during the Feb/Mar survey as follows: one in wet grassland south of Hakaluki Haor and one by Gharkuri Beel (Hakaluki Haor) on 19 Feb; four in wet rice fields near Puala Beel (Hakaluki Haor) on 20 Feb; one in rice fields east of Kawadighi Haor on 22 Feb, and two in the same area on 8 Mar. These apparently constitute the first confirmed records of this species in Bangladesh, although Rashid (1967) assumed that it must occur as a passage migrant. *A. cervinus* breeds in the tundra zone from northern Scandinavia to the Bering Straits, and winters south to north Africa, the Middle East, Burma, Indochina and the Philippines. Although regular in winter in Pakistan and on passage in Nepal, there are rather few records from elsewhere in the Indian Subcontinent. The species has been recorded in Manipur, and is listed as a winter visitor to the Andaman and Nicobar Islands (Ali and Ripley, 1973). *A. cervinus* is generally a shy and secretive pipit, crouching when alarmed and flying a considerable distance when flushed. It is best identified on call, which resembles that of the much commoner *A. hodgsoni*, and is thus easily overlooked. On its winter quarters, it typically frequents marshy grassland and wet rice fields.

None was recorded during the Apr/May survey, by which time the wintering birds had presumably departed for their breeding grounds.

(Not listed).

Rosy Pipit *A. roseatus*

Common winter visitor.

Common and widespread around wetlands, frequenting muddy shores of beels, river banks, damp grassland and occasionally also wet rice fields. About 240 were recorded during the Feb/Mar survey, but many had left by Apr/May, when only 70 were seen (the last being one at Hail Haor

232
on 2 May).

(Local winter visitor).

Yellow Wagtail *Motacilla flava*

Common winter visitor.

Common and widespread on damp grassland, on arable land and around wetlands, occasionally occurring in large flocks. *M. flava* generally showed a preference for somewhat drier habitats than *M. citreola*. About 430 were recorded in Feb/Mar. Most had left by late April, and only 35 were recorded during the second survey (the latest being four at Balai Haor on 27 Apr).

(Common winter visitor).

Yellow-hooded Wagtail *M. citreola*

Very common winter visitor.

Common and widespread on damp grassland - the commonest wagtail - favouring wet marshes and rice fields, but also occurring on muddy shores of *beels* and on river banks. Over 470 were recorded during the Feb/Mar survey, and 150 during the Apr/May survey. There were still at least 17 at Hail Haor on 2 May.

(Locally common winter visitor).

Grey Wagtail *M. cinerea*

Scarce winter visitor.

The only records were three around ponds in homestead forest south of Hakaluki Haor on 19 Feb, and one in Sunamganj on 1 Mar.

(Scarce winter visitor).

White Wagtail *M. alba*

Fairly common winter visitor.

About 80 individuals were recorded during the Feb/Mar survey in a wide variety of habitats, but most commonly along the banks of large rivers. Only one was recorded during Apr/May: at Pasua Beel on 24 Apr.

(Abundant winter visitor).

246
White-browed Wagtail *M. maderaspatensis*

Probably a scarce breeding resident.

None was recorded during the present surveys, but the species has been recorded in the Hail Haor area in recent years (John Woolner, pers. com.).

(Scarce breeding resident).

Bluethroat *Erithacus svecicus*

Fairly common winter visitor.

Fairly common and widespread around wetlands wherever there was sufficient cover; usually flushed from herbaceous vegetation on embankments. *E. svecicus* is a secretive species, generally keeping to dense cover. At least 42 individuals were recorded during the Feb/Mar survey, suggesting that the species is a common winter visitor to the area, rather than a passage migrant as listed by Harvey (1990). Only three were recorded during the Apr/May survey: two at Tangua Haor on 23 Apr and one at Pasua Beel on 24 Apr.

(Locally common passage migrant).

White-tailed Bushchat *Saxicola leucura*

Possibly now only a rare visitor to the Northeast Region.

This is another species typical of tall grass, reeds and bushes on damp or inundated ground, especially in the vicinity of large rivers. Little of this habitat remains in the Northeast Region, and no *S. leucura* were observed during the present surveys, but there has been one recent record (April) in the Northeast (John Woolner, pers. com.). (See comments under Swamp Francolin).

(? Former resident. No recent records).

Jerdon's Bushchat *S. jerdoni*

Possibly only a rare winter visitor to the Northeast Region.

This species, even more than *S. leucura*, is a bird of large stands of elephant-grass and reeds. None was recorded during the present surveys, but there have been two recent records from the Srimangal area; in February 1986 and February 1988 (John Woolner, pers. com.). (See comments under Swamp Francolin).

728
(Rare visitor. Only one recent record).

Zitting Cisticola *Cisticola juncidis*

Abundant resident. One of the commonest birds of the rice fields.

Very common and widespread around wetlands, frequenting emergent marsh vegetation and wet rice fields. Many birds were heard in song during both surveys, and were presumably nesting.

(Local breeding resident).

Yellow-bellied Prinia *Prinia flaviventris*

Rare resident.

None was recorded during the present surveys, but the species has been recorded at least once in the Srimangal area in recent years. In Southeast Asia, this is a very common bird of rank vegetation around wetlands.

(Rare resident).

Swamp (Long-tailed) Prinia *P. (burnesii) cinerascens*

Possibly extinct in the Northeast Region.

There have been no records of this threatened species in Bangladesh in recent years, although it remains locally common in parts of northeastern India. It is typically a bird of swamps and vast expanses of elephant-grass in the vicinity of large rivers. The form *cinerascens*, confined to the basin of the Brahmaputra, is usually treated as a subspecies of the Long-tailed Prinia (*Prinia burnesii*), which is now listed in the IUCN Red Data Book in the category "Rare". (See comments under Swamp Francolin).

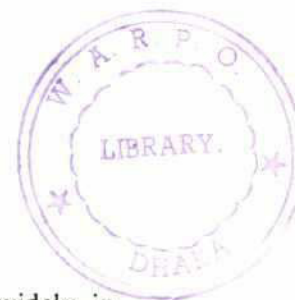
(? Former resident. No recent records).

Large Grass-Warbler *Graminicola bengalensis*

Possibly extinct in the Northeast Region.

This is another species of tall grass and reeds which must once have occurred widely in Bangladesh, but has not been recorded in recent years. (See comments under Swamp Francolin).

(? Former resident. No recent records).



244
Pallas's Warbler *Locustella certhiola*

Possibly a fairly common passage migrant, but easily overlooked.

At least five were located in dense herbaceous vegetation along embankments near Arabiakona Beel (Tangua Haor) on 23 Apr, and two were found in dense, damp thickets at Pasua Beel on 24 Apr.

(Rare passage migrant).

Lanceolated Warbler *L. lanceolata*

Possibly a fairly common winter visitor and/or passage migrant, but easily overlooked.

One was flushed from herbaceous vegetation on an embankment at Pasua Beel on 4 Mar. This is apparently the first record of this extremely secretive warbler in Bangladesh in recent years. The species winters from northern India east to Indochina and south to the Andaman and Nicobar Islands, Sumatra and Borneo.

(Rare passage migrant or winter visitor. No recent records).

Grasshopper Warbler *L. naevia*

Status uncertain. Perhaps a rare winter visitor or passage migrant.

None was observed during the present surveys. The species favours rank vegetation in and around wetlands and is extremely secretive and easily overlooked. Bangladesh lies close to the eastern extremity of the species' wintering range, and it may be that the bird is uncommon here.

(? Rare passage migrant or winter visitor).

Bristled Grass-Warbler *Chaetornis striatus*

Possibly extinct in the Northeast Region.

This is yet another species of tall grasses in swampy areas which once occurred widely in Bangladesh, but has not been recorded in recent years. (See comments under Swamp Francolin).

(? Former resident. No recent records).

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Striated Warbler *Megalurus palustris*

Very common resident, especially in the north.

Very common and widespread around wetlands wherever there is sufficient herbaceous cover, but absent from pure stands of rice. Particularly common in the Tangua Haor area where several hundred individuals were recorded in early March and again in late April. Many birds were in song and presumably about to breed.

(Locally common breeding resident).

Thick-billed Warbler *Acrocephalus aedon*

Winter visitor and/or passage migrant.

Four in secondary scrub near Maulvibazar on 30 Apr and one in a tea estate near Srimangal on 3 May were the only records. This species commonly occurs in secondary scrub and forest edge situations, and is less dependent on wetland vegetation than others of the genus *Acrocephalus*.

(Local winter visitor).

Blunt-winged/Paddyfield Warbler *A. concinens/agricola*

Status uncertain because of difficulties in field identification. *A. concinens* is probably a scarce winter visitor and very common passage migrant.

Recorded at three localities in Feb/Mar: at least eight in herbaceous vegetation on the edge of Rauar Beel (Tangua Haor) on 3 Mar; one in herbaceous vegetation by Arabiakona Beel (Tangua Haor) also on 3 Mar; and at least five in *Ipomoea* scrub on embankments in Balai Haor on 6 Mar. Very common in late April and early May, with hundreds in the Tangua Haor, Matian Haor and Gurmar Haor area on 22-24 Apr, 20 at Hakaluki on 30 Apr and two at Hail Haor on 2 May. Many birds were in song, especially in the tall reed-beds at Pasua Beel. All birds examined closely were thought to be *A. concinens*. However, *A. concinens stevensi*, which breeds in Assam and has been recorded in winter in Bangladesh, and *A. agricola*, which breeds in central Asia and winters throughout the Indian Subcontinent, are generally regarded as being indistinguishable in the field.

(Rare winter visitor (*concinens*), ? scarce passage migrant (*agricola*).

209
Blyth's Reed Warbler *A. dumetorum*

Fairly common winter visitor and probably also passage migrant.

Fairly common in homestead forests throughout the region in Feb/Mar and again in Apr/May.

(Abundant winter visitor).

Black-browed Reed Warbler *A. bistrigiceps*

Scarce winter visitor and probably also passage migrant.

One was observed in herbaceous vegetation by Rauar Beel (Tangua Haor) on 3 Mar. The bird was in the same area as about eight *A. concinens/agricola* and was readily distinguishable by its bold head markings and different call. At least four were singing (two seen well) in extensive stands of rushes at Hail Haor on 2 May. These apparently constitute the first records of *A. bistrigiceps* in Bangladesh, although Rashid (1967) indicated that it might occur as a winter visitor to the northeast and southeast. The species breeds from northeast Mongolia and southeast Siberia east to Sakhalin and Japan and south to the lower Yangtze Valley in China, and winters mainly in southeast China and Southeast Asia west to Burma. It has been recorded in winter in West Bengal (where it is regular in small numbers), eastern Assam and Manipur (Ali and Ripley, 1973), and is therefore not unexpected in Bangladesh.

(Not listed).

Clamorous Reed Warbler *A. stentoreus*

Scarce winter visitor and fairly common passage migrant.

Recorded only once during the Feb/Mar survey: three in *Ipomoea* scrub at Balai Haor on 6 Mar. Fairly common and widespread in Apr/May, with about 35 birds recorded at Dekhar Haor, Pasua Beel, Tangua Haor, Dubriar Haor, Balai Haor and Hail Haor. Most individuals were found in stands of *Barringtonia*, *Pongamia* or *Ipomoea*, and several were giving short bursts of song.

(Common winter visitor, sometimes oversummering).

Dusky Warbler *P. fuscatus*

Very common winter visitor and probably also passage migrant.

Fairly common during Feb/Mar, and very common in Apr/May. About 15 were recorded during the first survey, at Erali Beel, Balai Haor, Kaluma Kanda and Meda Beel, and 50 during the

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second survey, at Pasua Beel, Tangua Haor, Balai Haor, Hakaluki Haor and Hail Haor. Most were in low shrubbery or rank vegetation (including *Ipomoea* scrub) near water.

(Abundant winter visitor).

Marsh Babbler *Pellorneum palustre*

Possibly still a very local resident in the Northeast.

None was recorded during the present surveys, despite a special search in potentially suitable habitat. The species has, however, been recorded on one occasion in the Northeast Region in recent years: a bird in damp forest scrub in February 1989 (Harvey, 1990). This is a bird of extensive reed-beds, coarse high grass alongside swamps and rivers, elephant-grass and also bushes and low tree-jungle on marshy ground. It has now become very rare over much of its range in Arunachal Pradesh, Assam and Bangladesh, and is listed in the IUCN Red Data Book in the category "Insufficiently Known". (See comments under Swamp Francolin).

(? Rare local resident or winter visitor).

Chestnut-capped Babbler *Timalia pileata*

Probably a scarce and local resident.

None was recorded during the present surveys, but there have been a number of records of this species in tea estates near Srimangal in recent years (John Woolner, pers. com.). This is a bird of low-lying swampy areas, affecting tall grass, reed-beds, brushwood and scrub jungle, often along streams. (See comments under Swamp Francolin).

(Local breeding resident).

Jerdon's Moupinia *Chrysomma altirostre*

Possibly extinct in the Northeast.

This species is confined to large stands of elephant-grass, reed-beds and other dense marsh vegetation. It occurs in three separate populations: on the plains on the Indus in Pakistan, in the basin of the Ganges and Brahmaputra in northeast India and Bangladesh, and on the plains of the Irrawaddy in south-central Burma. All three populations are at risk, and the latter may be extinct. The species is currently listed in the IUCN Red Data Book in the category "Vulnerable". (See comments under Swamp Francolin).

(? Former resident. No recent records).

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Black-breasted Parrotbill *Paradoxornis flavirostris*

Possibly extinct in the Northeast.

This is a species of reeds and wet grassland, occurring from Nepal and Bhutan east to northeast India, Bangladesh, west Burma and southwest China. There are very few recent records from anywhere in its range, and the species is now listed in the IUCN Red Data Book in the category "Indeterminate". (See comments under Swamp Francolin).

(? Former resident. No recent records).

Striated Babbler *Turdoides earlei*

Local resident, presumably now much reduced in numbers.

Recorded on only two occasions: one in a wheat field near Boraduba Beel on 12 Mar, and at least four in secondary scrub near Maulvibazar on 30 Apr. Elsewhere in the Indian Subcontinent, this is primarily a species of tall grass, elephant-grass, rushes and reed-beds in swampy areas. It seems likely that the babbler would have been much commoner and more widespread in the Northeast Region when these were the dominant habitats of the floodplains. (See comments under Swamp Francolin).

(Locally common breeding resident).

Slender-billed Babbler *T. longirostris*

Possibly extinct in the Northeast Region.

Another bird of long grass, usually near water, which has not been recorded in Bangladesh in recent years. (See comments under Swamp Francolin).

(Rare? resident. No recent records).

Black-breasted Weaver *Ploceus benghalensis*

Locally common resident.

None was recorded during the Feb/Mar survey, but in winter the species resembles the Baya Weaver (*Ploceus philippinus*), and is easily overlooked in large flocks of that species. Several small breeding colonies (with about 100 birds) were located in the extensive rush beds at Hail Haor on 2 May.

(Locally common breeding resident).

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Streaked Weaver *P. manyar*

Possibly a rare resident.

Only one individual was recorded: a female amongst Black-breasted Weavers at Hail Haor on 2 May.

(Rare breeding resident).

Chestnut Munia *L. malacca*

Common resident.

Fairly common in pairs and small parties in reed-beds, herbaceous vegetation around wetlands, and occasionally also in rice and wheat fields. At least 100 were present amongst the vast flocks of Baya Weavers (*Ploceus philippinus*) and Scaly-breasted Munias (*Lonchura punctulata*) in rice fields south of Hail Haor on 29 Apr.

(Local resident).

Black-faced Bunting *Emberiza spodocephala*

Common winter visitor.

Recorded on a number of occasions during both surveys as follows: a male at Arabiakona Beel (Tangua Haor) on 3 Mar; two at Pasua Beel on 4 Mar; at least three at Dubriar Haor on 5 Mar; at least 20 at Balai Haor on 6 Mar; one at Maijeil Haor on 8 Mar; one by the Surma River on 21 Apr; three by the Someswari River and 10 at Pasua Beel on 22 Apr; four at Arabiakona Beel and at least 30 at Pasua Beel on 23 Apr; and 10 at Pasua Beel on 24 Apr. The great majority were observed in rank herbaceous vegetation, *Ipomoea* scrub or shrubbery along embankments adjacent to wetlands. This series of records suggests that this rather secretive bunting is a common winter visitor to northeastern Bangladesh.

(Rare winter visitor).

Chestnut-eared Bunting *E. fucata*

Fairly common winter visitor.

This inconspicuous bunting was observed on several occasions during both surveys as follows: at least 20 in herbaceous vegetation in a large sandy area between Dubriar Beel and Baisha Beel (Dubriar Haor) on 5 Mar; one in a wheat field near Meda Beel on 11 Mar; one in herbaceous vegetation at Dekhar Haor on 20 Apr; one in herbaceous vegetation at Arabiakona Beel on 23 April; three at Dubriar Haor on 26 Apr (in the same area as on 5 Mar); three in herbaceous

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vegetation at Maijeil Haor on 28 Apr; one in rushes at Chatla Beel (Hakaluki Haor) on 30 Apr; and one in rice stubble at Hail Haor on 2 May. These are apparently the first records of this rather secretive and easily overlooked bunting in Bangladesh in recent years, although it is listed as a winter visitor to most of Bangladesh by Ali and Ripley (1974).

(? Former winter visitor. No recent records).

Yellow-breasted Bunting *E. aureola*

Common winter visitor.

Flocks and small parties were recorded on a number of occasions during both surveys as follows: four near Kulaura on 19 Feb; one near Kawadighi Haor on 22 Feb; a flock of 60 at Hail Haor on 23 Feb; 12 near Sunamganj on 1 Mar; seven at Samsar Beel (Tangua Haor) on 3 Mar; a flock of 30 by the Surma River on 21 Apr; six at Pasua Beel and 10 at Rauar Beel on 22 Apr; one at Arabiakona Beel and at least 100 roosting in shrubbery at Pasua Beel on 23 Apr; two at Pasua Beel on 24 Apr; and one at Hail Haor on 2 May. Birds were commonly seen feeding in rice stubble.

(Locally common winter visitor).

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D.6 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 E
WATERFOWL COUNT DATA

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SITE NAME	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
TANGUAR	12883	4712	2111	124	130	5	113	312	619	30332	32299	41742
BANUAR	1252	1935	298	105	1	0	0	0	456	158	748	2054
PANA BEEL	9220	7142	515	67	1	0	0	2	145	2548	2078	1521
PASHUA	3696	2056	6334	7727	1347	10	14	261	613	16332	127906	238910
ERALI BEEL	6	33	62	0	0	5	0	1	30	4	6	32
BALAI HAOR	559	32694	1165	124	155	35	63	397	620	528	529	2109
CHALNIA & DEODAR	1903	353	117	8	16	5	17	14	283	217	65	654
HAORKHAL	8242	7673	545	5	4	0	3	10	1394	16147	27963	63789
PATACHATAL	4253	1057	248	10	3	9	7	2	10	722	11	65
KAWADIGHI	9196	10441	1599	619	105	88	80	131	1796	6146	3933	12916
CHATLA	17892	5770	1872	131	6	2	5	206	326	5181	5966	15423
FISH POND	886	37	18	3	15	3	40	1360	940	169	431	550
HAIL HAOR	729	289	920	177	124	216	245	969	703	3374	918	4561
KURI BEEL	374	91	27	8	2	0	9	16	424	165	15	56
DEOCHAPRA	247	230	55	0	0	2	0	6	23	391	35	97
MONTHLY TOTAL	71338	74513	15886	9108	1909	380	596	3686	8382	82414	202903	384478

NORTHEAST REGIONAL PROJECT - BANGLADESH
MONTHLY WATERFOWL COUNTS
FEBRUARY 1992 TO JANUARY 1993
TOTAL SPECIES

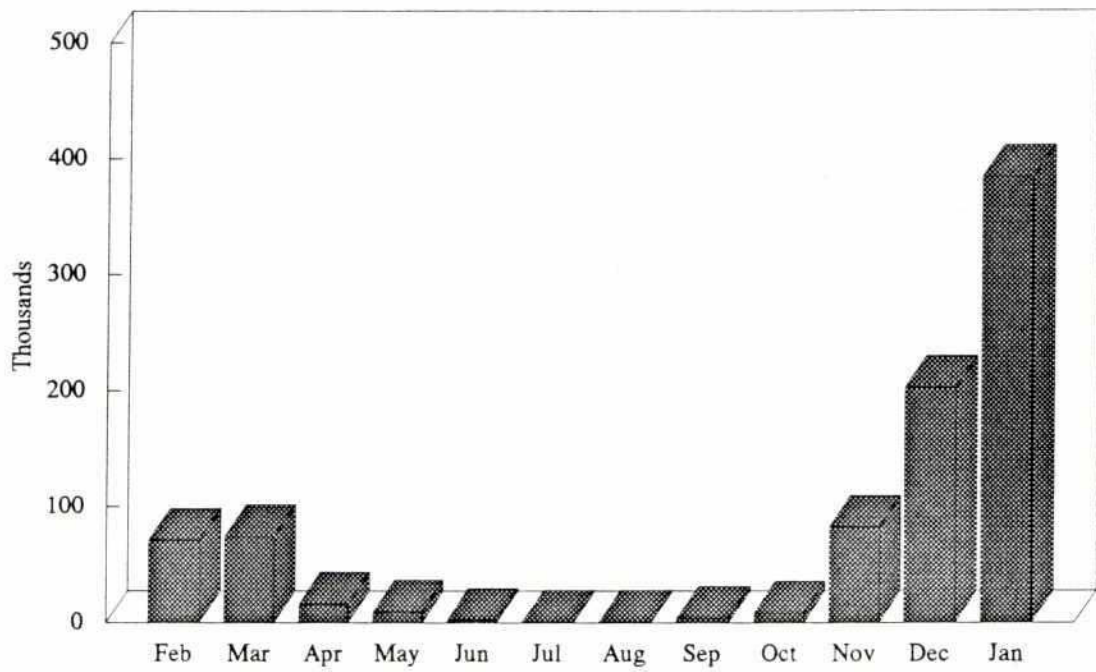
SITE/MONTH	FEB	MAR	APR	MAY	JUN	JULY	AUG	SEP	OCT	NOV	DEC	JAN
PANA	31	23	17	6	1	0	0	1	5	11	15	12
PASHUA	36	36	45	35	20	5	6	9	16	20	37	53
TANGUA	41	30	27	20	10	4	8	19	15	23	23	38
BANUAR	16	11	11	7	1	0	0	0	5	6	11	10
KURI	19	20	9	4	3	1	4	10	19	4	6	13
DEOCHAPRA	16	11	10	0	1	2	0	3	9	8	7	9
ERALI	6	8	3	0	0	3	1	3	12	5	4	6
BALAI	33	28	31	11	16	8	7	23	18	25	22	29
CHALNI/DEODER	23	20	8	3	3	4	2	6	14	13	13	15
HAORKHAL	36	21	26	4	3	1	2	2	23	31	26	40
CHATLA/PINGLA	34	24	24	11	1	2	2	3	11	28	28	38
PATA/BOROCHATAL	24	19	14	4	5	3	3	1	4	17	5	6
KAWADIGHI	43	24	28	17	11	9	8	10	22	28	20	37
HAIL	30	17	28	12	14	11	10	15	17	30	21	29
FISH POND	14	8	7	2	7	1	8	11	21	19	14	21



29^d

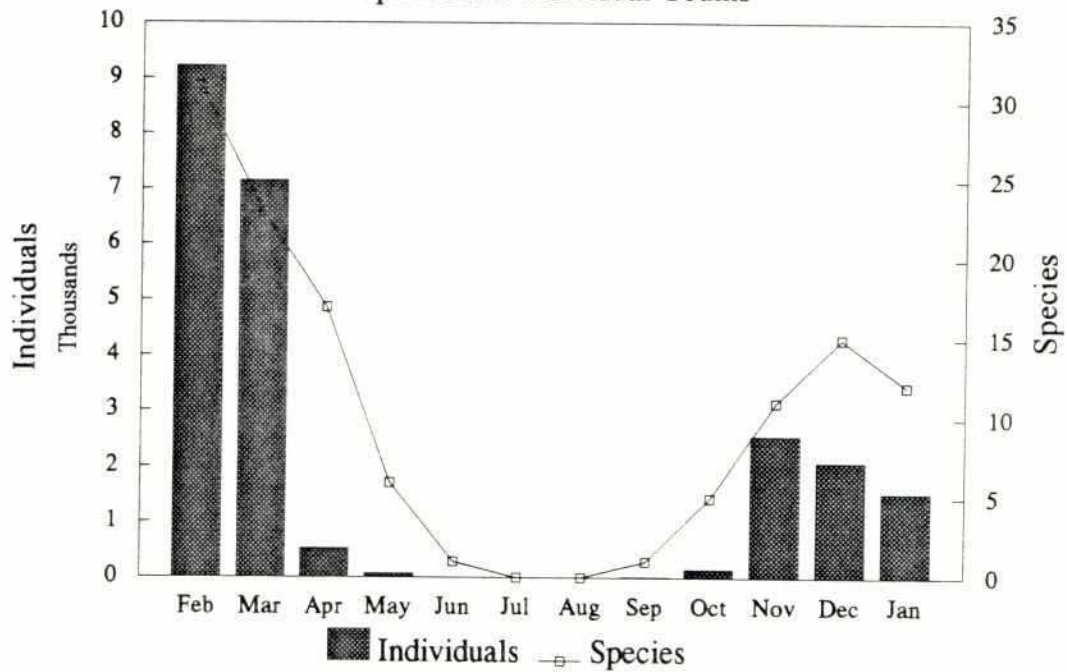
Waterfowl Count Summary

Individuals



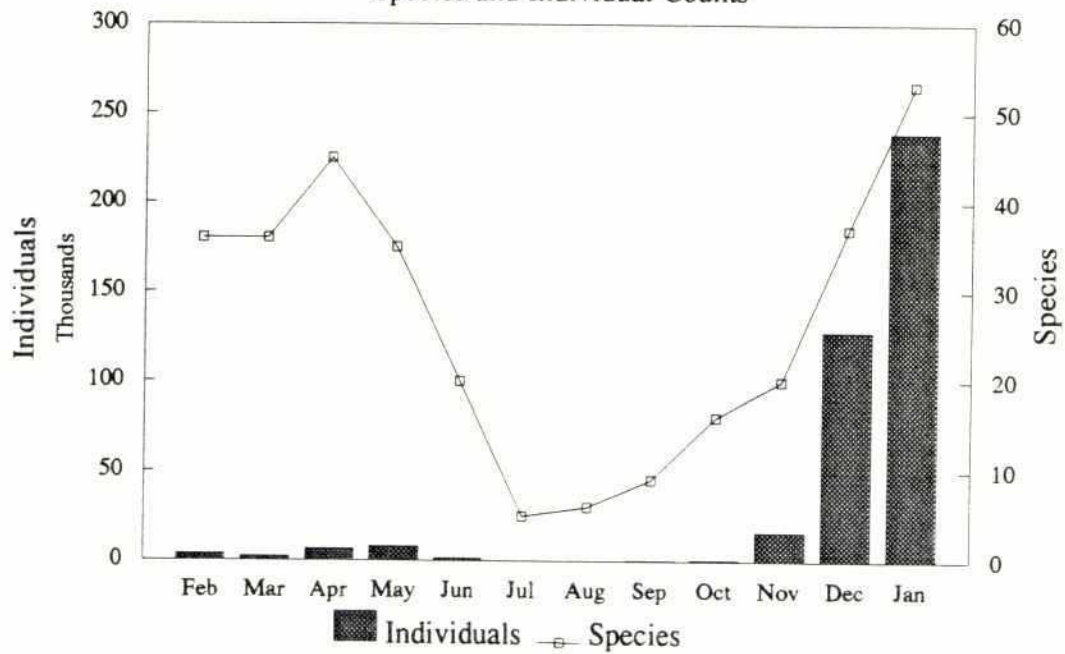
Pana Beel

Species and Individual Counts



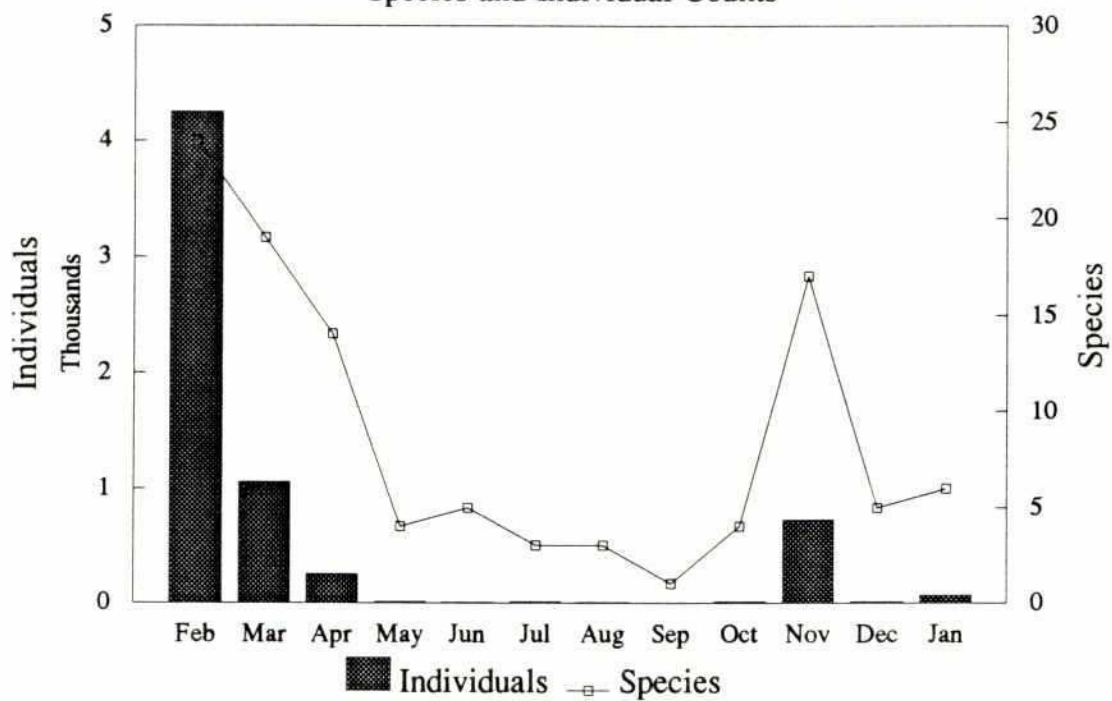
Pashua Beel

Species and Individual Counts



Patachatal Beel

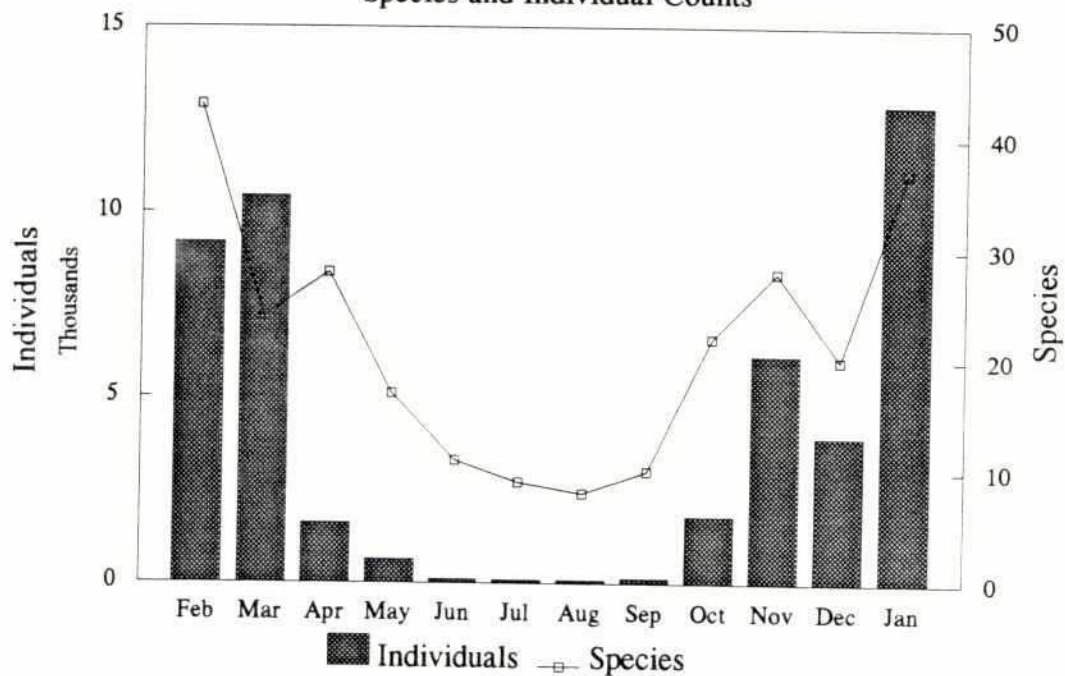
Species and Individual Counts



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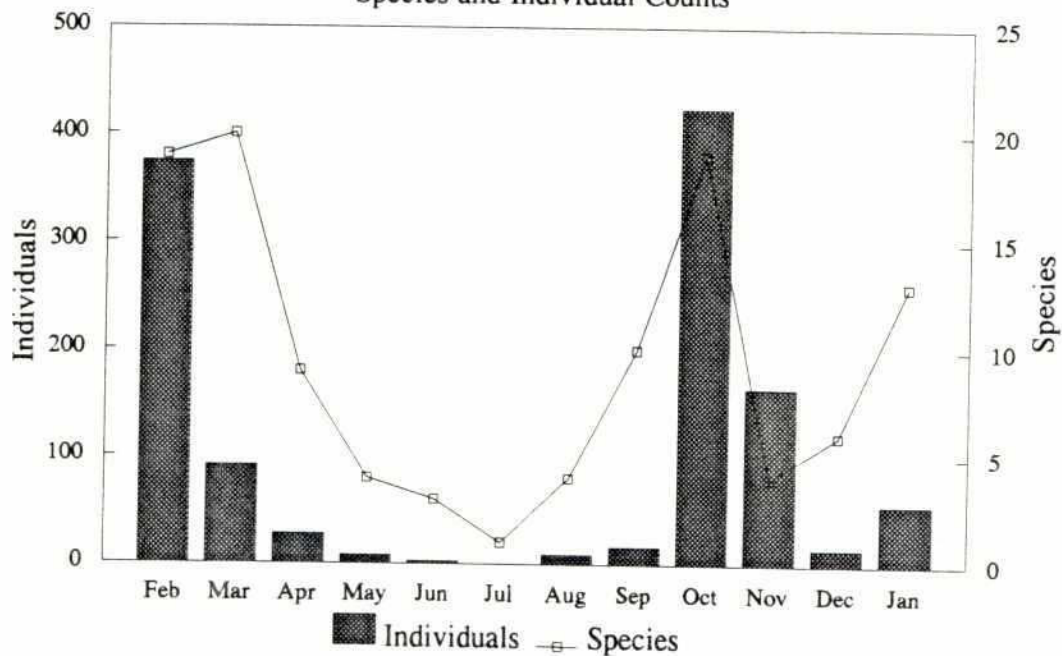
Kawadighi Haor

Species and Individual Counts



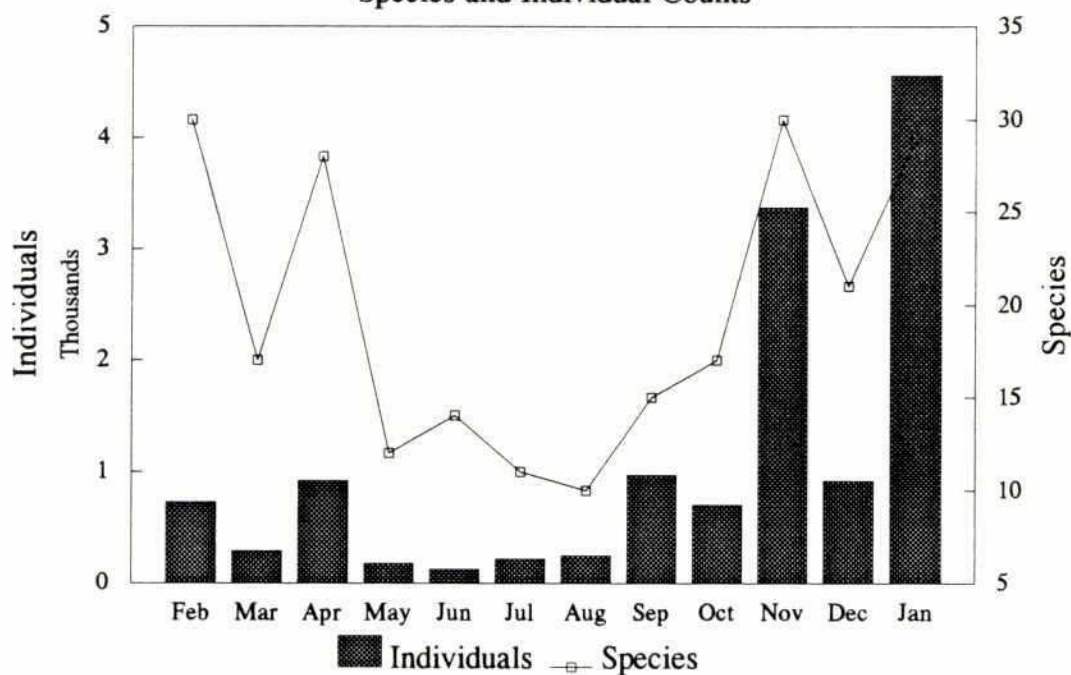
Kuri Beel

Species and Individual Counts



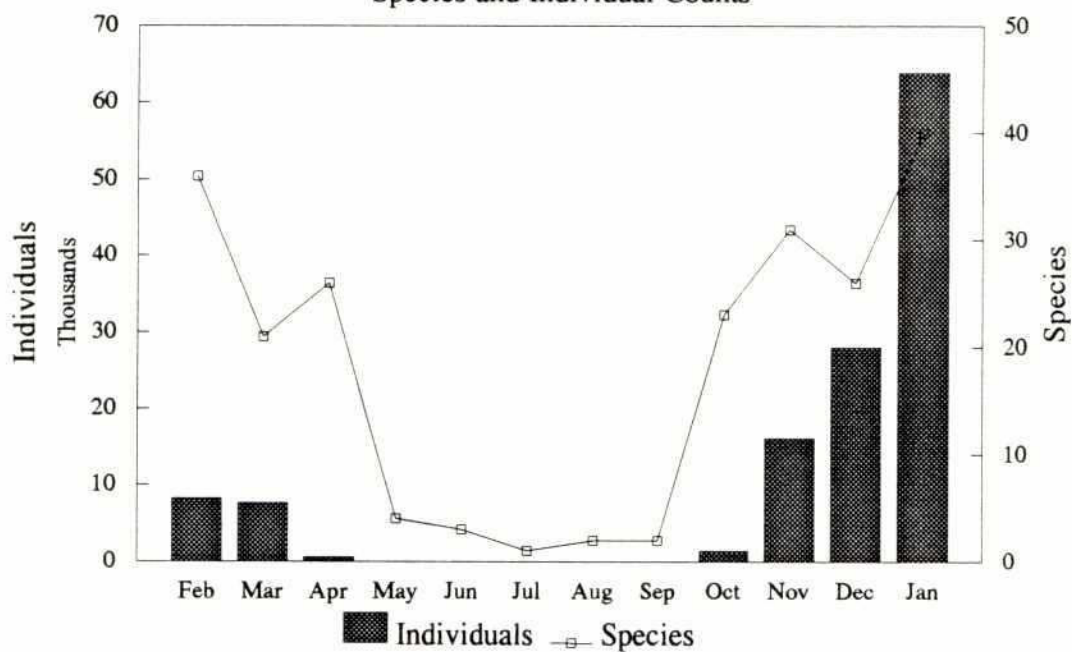
Hail Haor

Species and Individual Counts



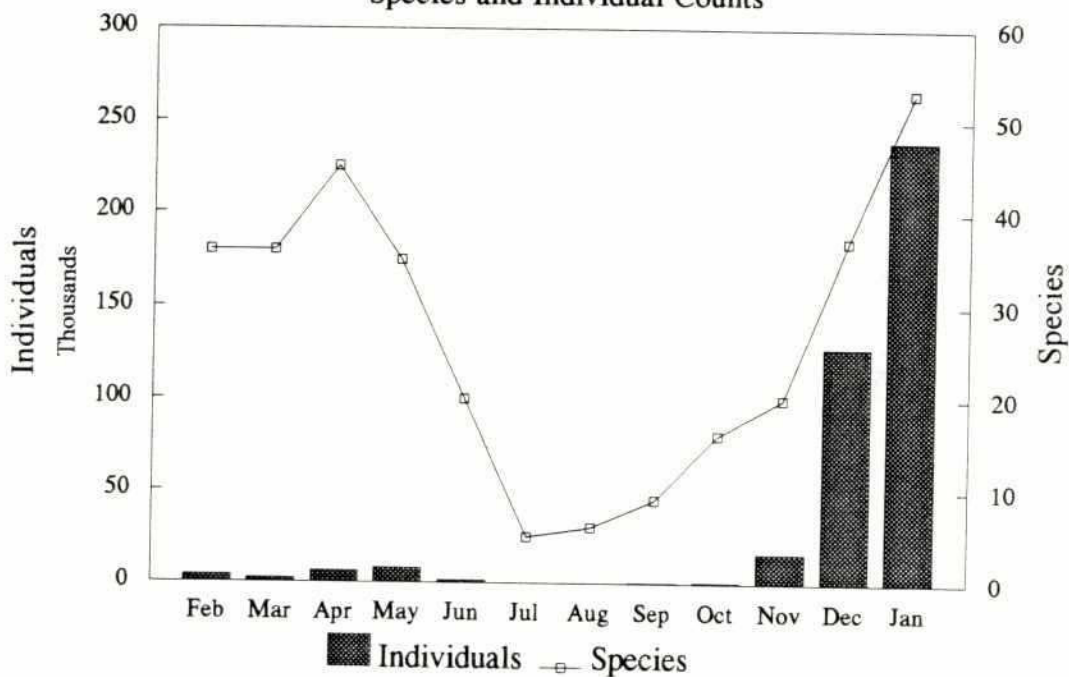
Haorkhal Beel

Species and Individual Counts



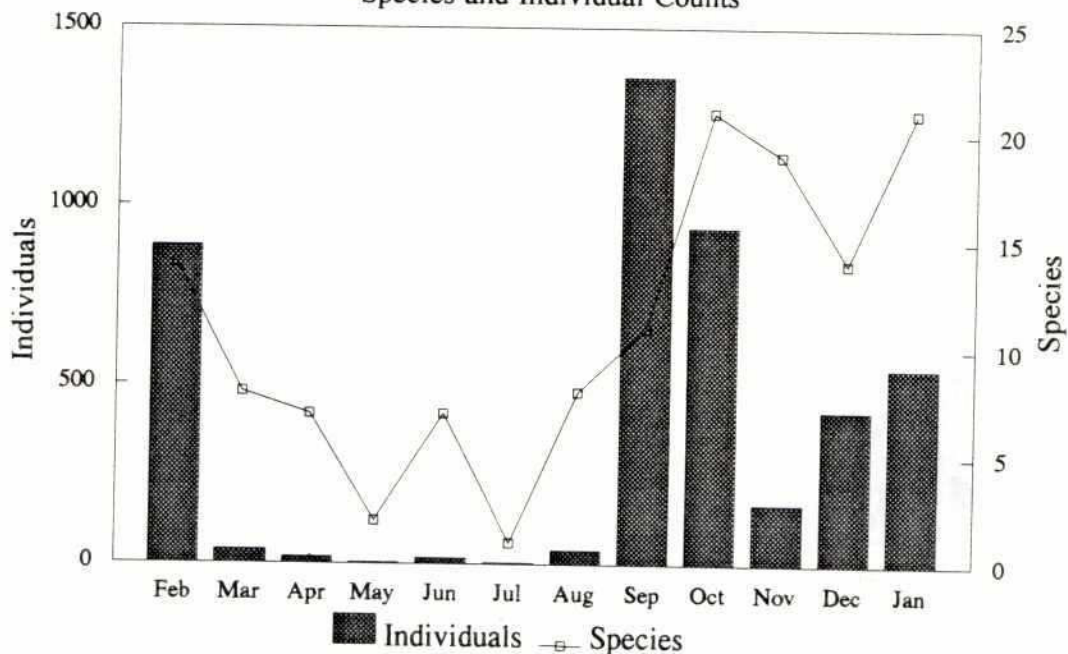
Erali Beel

Species and Individual Counts



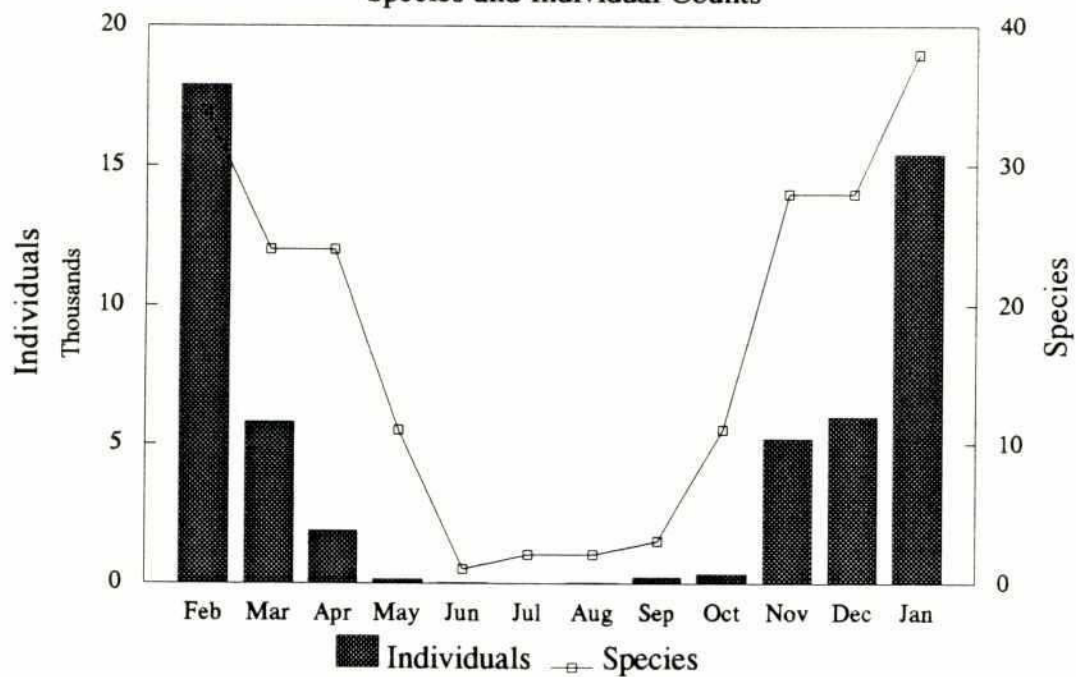
Fish Pond (Hail Haor)

Species and Individual Counts



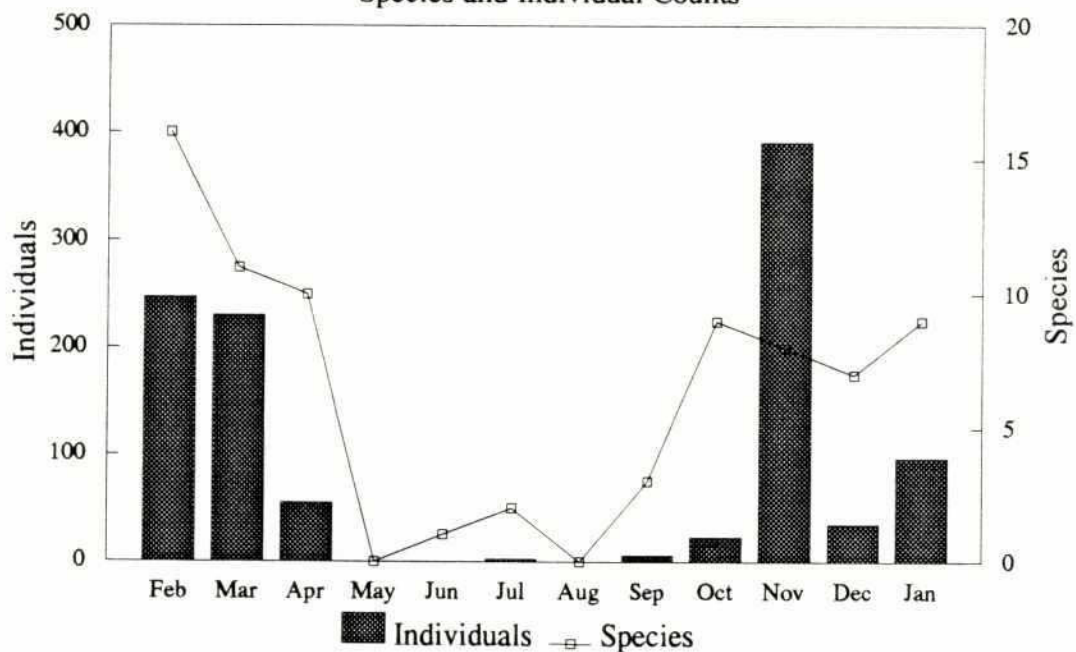
Chatla Beel

Species and Individual Counts



Deochapra Beel

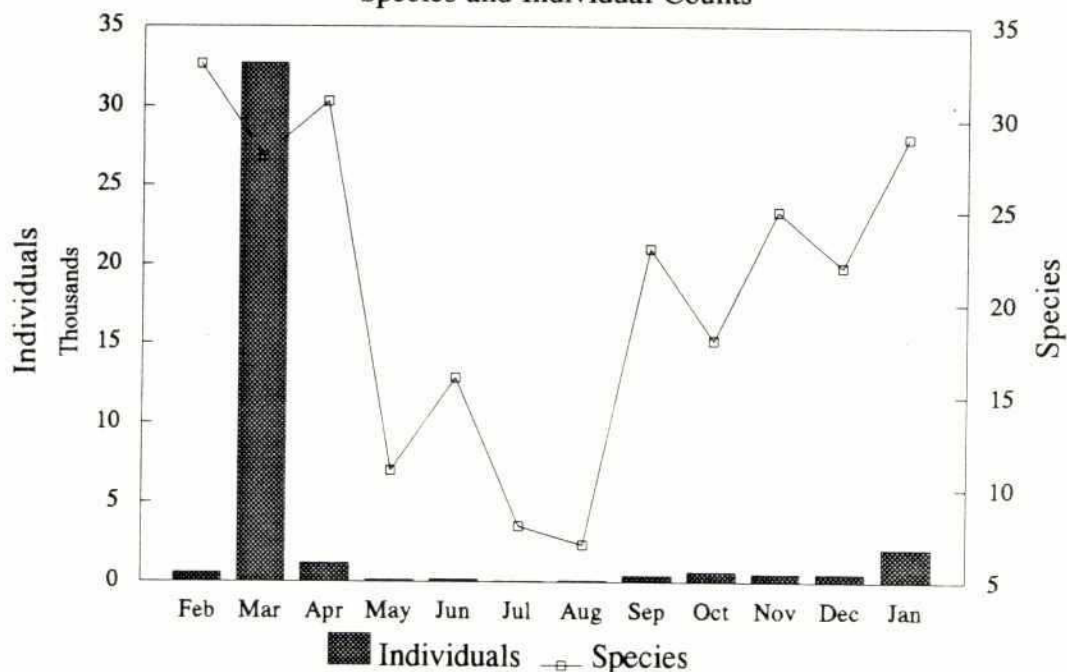
Species and Individual Counts



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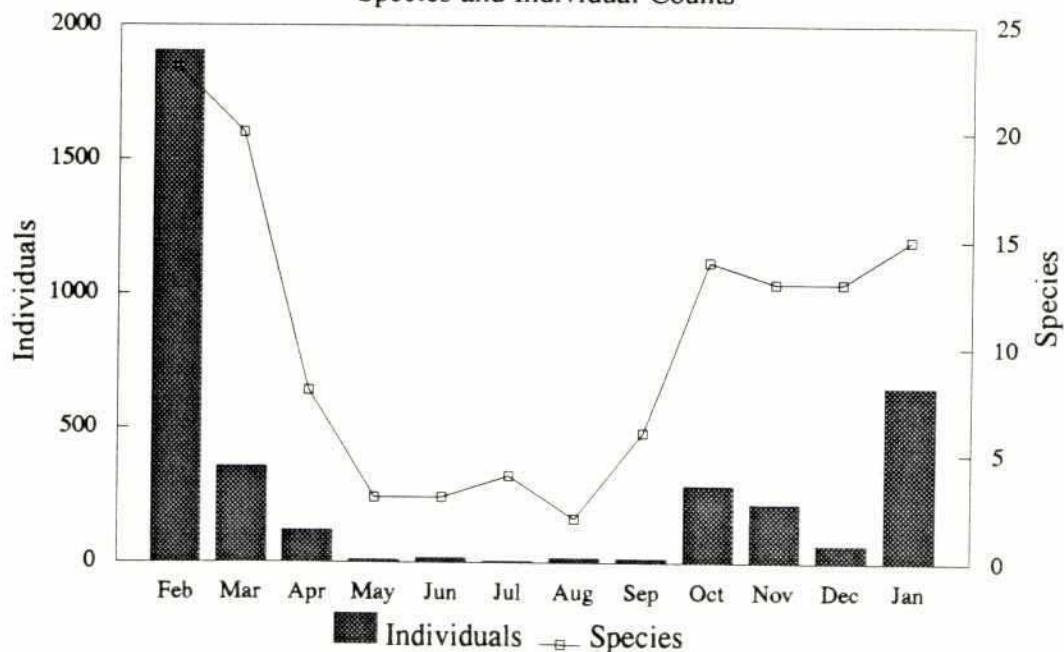
Balai Haor

Species and Individual Counts



Chalnia & Deodar Beel

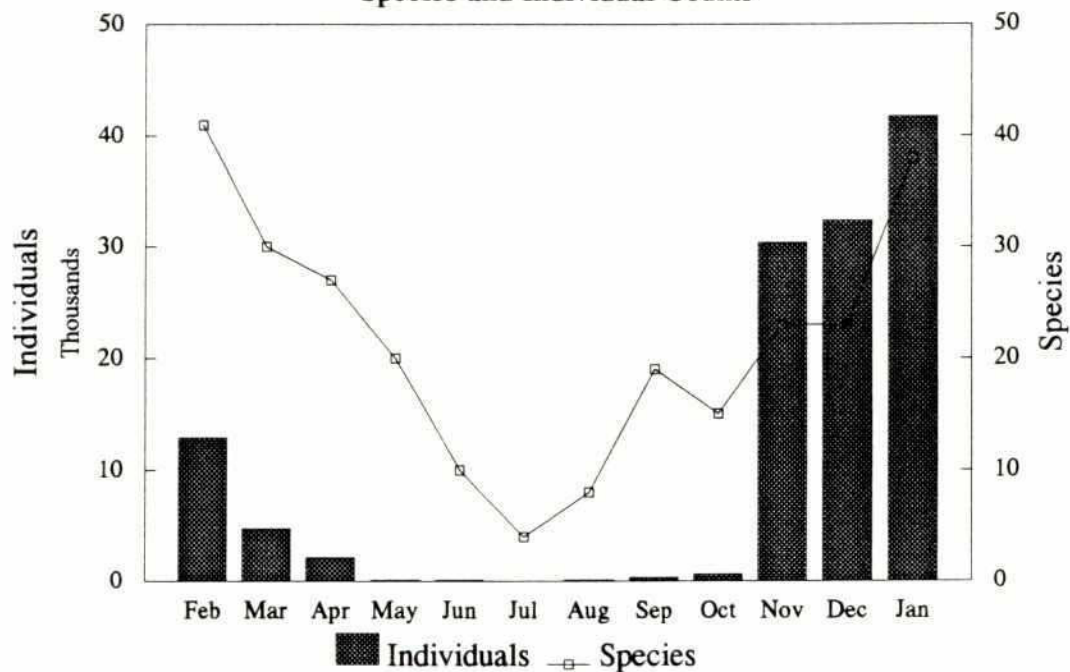
Species and Individual Counts



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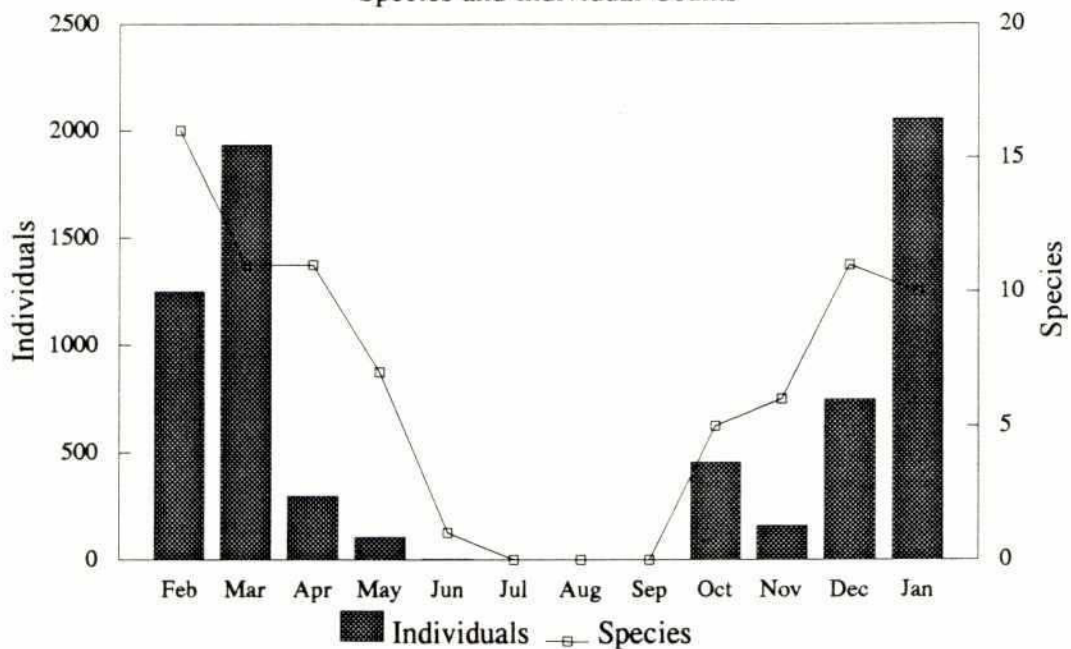
Tanguar Haor

Species and Individual Counts



Banuar Haor

Species and Individual Counts



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**NORTHEAST REGIONAL PROJECT-BANGLADESH
MONTHLY WATERFOWL COUNTS
FEBRUARY 1992 TO JANUARY 1993
PANA BEEL**

COUNT DATES AND OBSERVERS

MONTH	DATE	OBSERVERS	MONTH	DATE	OBSERVERS
FEB	2.3.92	DAS, SMAR	AUG	27.8.92	SMAR, AS
MAR	23.3.92	SMAR, AZK, AS	SEP	22.9.92	SMAR, PT, AS, IS
APR	22.4.92	DAS, SMAR, AS	OCT	27.10.92	SMAR, AS
MAY	23.5.92	SMAR, AZK	NOV	3.12.92	SMAR, AZK, ZH, PD, AS
JUN	22.6.92	SMAR, AS	DEC	3.1.93	SMAR, AS, QMH
JUL	21.7.92	AZK, AS, IS	JAN	27.1.93	PT, RA, MH, AS, AM

Waterfowl Counts, Feb92 to Jan 93, PANA BEEL

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Little Grebe				2								
Great Crested Grebe	30	7								1	17	31
Unidentified Grebe												
Great Cormorant	19									2	41	45
Indian Shag											7	
Little Cormorant	450	350	400	4					2	132	530	1874
Unidentified Cormorant												1250
Oriental Darter	1	3	3	2						1		3
Great Bittern												
Yellow Bittern												
Cinnamon Bittern												
Black Bittern												
Night Heron												
Little heron												
Indian Pond Heron		3				1					4	
Chinese pond Heron												
Cattle Egret			29							8		
Little Egret			3							2	2	
Intermediate Egret			4	35								
Great Egret	3	4	5							4	16	5
Unidentified Egret												
Purple Heron												
Grey Heron	3	8								1	1	
Asian Openbill												
Lesser Adjutant												
Black-headed Ibis												
White Spoonbill												
Fulvous Whistling Duck	3800	2500										
Lesser Whistling Duck	200	1500										
Greylag Goose												
Bar-headed Goose												
Unidentified Goose												
Ruddy Shelduck	132											
Common Shelduck												
Comb Duck												
Cotton Pygmy Goose												
Eurasian Wigeon	60	100										
Falcated Teal	1											
Gadwall	400	3										
Common Teal	3	1										
Mallard	1	1										
Spotbill Duck	10	20	20	18								
Northern Pintail	400	3							8		2	2
Garganey	600	1500	15							200	100	56
Northern Shoveler	500	1000								500		5
Red-crested Pochard	12											
Common Pochard	4	3								300		
Baer's pochard	660	6										
Ferruginous Duck	200	400		2								
Tufted Duck	280		14									14
Greater Scaup	5									1000		109
Mandarin Duck												
Unidentified Ducks	800											
Water Rail												
Slaty-breasted Rail												
Ruddy Crake												
White-breasted Waterhen												
Watercock												
Moorhen												
Purple Swamphen												
Common Coot	500	200	2									
Unidentified Rails/Crakes												
Pheasant-tailed Jacana												
Bronze-winged Jacana												
Painted Snipe												
Black-winged Stilt	4										5	
Avocet												
Oriental Pratincole												
Small Pratincole												
River Lapwing												
Grey-headed Lapwing												
Red-wattled Lapwing	1										1	
Asiatic Golden Plover												
Grey Plover												
Long-billed Plover												
Little Ringed Plover												
Kentish Plover												
Mongolian Plover												
Greater Sand Plover												
Black-tailed Godwit	140											
Eurasian Curlew												

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Waterfowl Counts, Feb92 to Jan 93, PANA BEEL

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Spotted Redshank												
Redshank												
Marsh Sandpiper												
Greenshank												
Normann's Greenshank												
Green Sandpiper												
Wood sandpiper				1								
Terek Sandpiper				1								
Common Sandpiper												
Pintail Snipe												
Swinhoe's Snipe												
Common Snipe												
Asiatic Dowitcher												
Little Stint												
Long-toed Stint												
Dunlin												
Curlew Sandpiper												
Spoon-billed Sandpiper												
Broad-billed Sandpiper												
Ruff	1											
Unidentified Waders												
Brown-headed Gull				8								
Black-headed Gull									4			1
Unidentified Gull												
Whiskered Tern		28	10									
White-winged Tern											8	
Gull-billed Tern												
Indian river Tern												
Common Tern												
Black-billed Tern												
Little Tern												
Unidentified Tern												
Black-shouldered Kite												
Black Kite											1	
Brahminy Kite												
Pallas Fish Eagle		1										
Grey-headed Fish Eagle			1						1			
Steppe Eagle												
White-rumped Vulture												
Crested Serpent Eagle												
Western Marsh Harrier		1										
Eastern Marsh Harrier												
Pied Harrier	1			1								
Osprey			1								1	
Eurasian Kestrel											1	1
Northern Hobby												
Peregrine Falcon												
Unidentified Raptors												
TOTAL WATERFOWL	9221	7642	518	63	1	0	0	2	146	2548	2081	1522

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**NORTHEAST REGIONAL PROJECT-BANGLADESH
MONTHLY WATERFOWL COUNTS
FEBRUARY 1992 TO JANUARY 1993
PASUA HAOR**

COUNT DATES AND OBSERVERS

MONTH	DATE	OBSERVERS	MONTH	DATE	OBSERVERS
FEB	4.3.92	DAS, SMAR	AUG	27.8.92	SMAR, AS
MAR	23.3.92	SMAR, AZK, AS	SEP	22.9.92	SMAR, PT, AS, IS
APR	22-24.4.92	DAS, SMAR, AS	OCT	27.10.92	SMAR, AS
MAY	22-23.5.92	SMAR, AZK, AS	NOV	3.12.92	SMAR, AZK, ZH, PD, AS
JUN	21.6.92	SMAR, AS	DEC	2.1.93	SMAR, AS, QMH
JUL	20.7.92	AZK, AS, IS	JAN	27.1.93	SMAR, AZK

Waterfowl Counts, Feb92 to Jan 93, PASHUA HAOR

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Little Grebe			6	7								6
Great Crested Grebe	10											75
Unidentified Grebe										25	210	
Great Cormorant	5											
Indian Shag									11	130	25	
Little Cormorant	400	14	2500	1753	1015							
Unidentified Cormorant								216	434	575	7500	5000
Oriental Darter	10	1	16	8	6							
Great Bittern								6	17	2	23	56
Yellow Bittern				5	5							
Cinnamon Bittern			5	2	5	4						
Black Bittern												1
Night Heron			33	11								
Little heron			3	20	10						6	17
Indian Pond Heron	1	7	30	35	12		6	6	4		1	6
Chinese pond Heron			1			3	5	7	3	20	300	200
Cattle Egret	5	9	300	180								
Little Egret	125	80	500	235	36						1200	1500
Intermediate Egret	15	45	300	2243	27			1	2		1000	600
Great Egret	600	59	900	1556	53						100	500
Unidentified Egret				703	63			10	15	105	6000	3000
Purple Heron			27	33	11						200	
Grey Heron	125	118	45	45	15							16
Asian Openbill	128	400	300	147		1		6	49	148	1140	346
Lesser Adjutant											656	700
Black-headed Ibis	11		3									
White Spoonbill			1									3
Fulvous Whistling Duck												
Lesser Whistling Duck		22	200	5						865	21500	60000
Greylag Goose										4200	41000	30000
Bar-headed Goose												
Unidentified Goose												
Ruddy Shelduck	4		19									
Common Shelduck												
Comb Duck												
Cotton Pygmy Goose				2								3
Eurasian Wigeon		4	40									
Falcated Teal												8
Gadwall			15	2	3							
Common Teal			1								800	5000
Mallard											500	4000
Spotbill Duck	120	4	40	187	13							2
Northern Pintail		45	15	14	8			9	26			109
Garganey	400	370	325	19						1500	20050	80000
Northern Shoveler	200	150	35	7					6	811	6000	12000
Red-crested Pochard			4							200	8000	8000
Common Pochard										4002		6
Beer's pochard	2										50	2000
Ferruginous Duck	1			2								600
Tufted Duck	5						1			219	400	2500
Greater Scaup										2054	4020	3000
Mandarin Duck												1
Unidentified Ducks	600			12							4000	1
Water Rail									22			15000
Slaty-breasted Rail												
Ruddy Crane												
White-breasted Waterhen												
Watercock			1	7	3		1					
Moorhen			11	54	81	2			3			6
Purple Swamphen	102	137	420	781					4		50	14
Common Coot	61									75	100	200
Unidentified Rails/Cranes									14	1400	3000	2000
Pheasant-tailed Jacana				4								1
Bronze-winged Jacana												
Painted Snipe												
Black-winged Stilt	55	85	6									
Avocet											31	120
Oriental Pratincole												
Small Pratincole												16
River Lapwing												
Grey-headed Lapwing	5	7										
Red-wattled Lapwing											11	6
Asiatic Golden Plover			14									
Grey Plover							1					
Long-billed Plover												
Little Ringed Plover		5										
Kentish Plover	2	14										
Mongolian Plover												
Great Sand Plover												
Black-tailed Godwit	12	3	23									
Eurasian Curlew												17

Waterfowl Counts, Feb92 to Jan 93, PASHUA HAOR

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Spotted Redshank	55	2	2									
Redshank			4									
Marsh Sandpiper		23										
Greenshank	11	17	2							1		
Normann's Greenshank												
Green Sandpiper		1										
Wood sandpiper	1											
Terek Sandpiper												
Common Sandpiper		2	2									
Pintail Snipe												
Swinhoe's Snipe												
Common Snipe												
Asiatic Dowitcher												
Little Stint												
Long-toed Stint												
Dunlin												
Curlew Sandpiper												
Spoon-billed Sandpiper												
Broad-billed Sandpiper												
Ruff	65	36										90
Unidentified Waders	200											
Brown-headed Gull	10	94	80								2	500
Black-headed Gull												2500
Unidentified Gull												
Whiskered Tern	350	198	100	1					3		31	78
White-winged Tern												
Gull-billed Tern		7										
Indian river Tern		3										
Common Tern					1							
Black-billed Tern												
Little Tern												
Unidentified Tern												6
Black-shouldered Kite		1	2	1	1							
Black Kite												3
Brahminy Kite					2	2	2	2	4			5
Pallas Fish Eagle	19	28	4								2	4
Grey-headed Fish Eagle	1											
Steppe Eagle		1										
White-rumped Vulture		2	1									
Crested Serpent Eagle												1
Western Marsh Harrier	2	4	2	1						1	2	4
Eastern Marsh Harrier												
Pied Harrier			2								22	
Osprey			1	1						1	1	
Eurasian Kestrel												
Northern Hobby				1								
Peregrine Falcon												
Shikra				1								
Unidentified reptors											1	
TOTAL WATERFOWL	3718	1998	6341	8085	1370	12	16	263	617	16334	127934	239827

**NORTHEAST REGIONAL PROJECT-BANGLADESH
MONTHLY WATERFOWL COUNTS
FEBRUARY 1992 TO JANUARY 1993
TANGUA & RAUAR BEEL**

COUNT DATES AND OBSERVERS

MONTH	DATE	OBSERVERS	MONTH	DATE	OBSERVERS
FEB	2-3.3.92	DAS, SMAR	AUG	27-28.8.9	SMAR, AS
MAR	24-25.3.92	SMAR, AZK, AS	SEP	22.9.92	SMAR, PT, AS, IS
APR	22-23.4.92	DAS, SMAR, AS	OCT	27.10.92	SMAR, AS
MAY	23-24.5.92	DAS, SMAR, AS	NOV	3.12.92	SMAR, AZK, ZH, PD, AS
JUN	22.6.92	SMAR, AS	DEC	3.1.93	SMAR, AS, QMH
JUL	21.7.92	AZK, AS, IS	JAN	27.1.93	RT, RA, MH

Waterfowl Counts, Feb92 to Jan 93, TANGUA & RAUAR BEEL

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Little Grebe	50	27			7							1
Great Crested Grebe											3	29
Unidentified Grebe											36	
Great Cormorant	2	2		1								6
Indian Shag									1			
Little Cormorant	1155	642	650	51	41	2	4	39	299	63	158	1031
Unidentified Cormorant												
Oriental Darter	2	1	2	9								4
Great Bittern												
Yellow Bittern												
Cinnamon Bittern				1	1							
Black Bittern												
Night Heron												
Little heron		1		3	2		1	16				
Indian Pond Heron	14	18	10			14	2	9	30	9	1	3
Chinese pond Heron											25	
Cattle Egret			100		61		91	35	50	4		2
Little Egret	70	277	25									5
Intermediate Egret	18	16	50	34								9
Great Egret	80	337	110	1				3	5			452
Unidentified Egret	50	100		8					25	1	7	
Purple Heron				1	1				15			
Grey Heron	21	38	3	3						1		1
Asian Openbill										1	64	74
Lesser Adjutant												
Black-headed Ibis												
White Spoonbill												
Fulvous Whistling Duck	650		22									
Lesser Whistling Duck	43		430									
Greylag Goose										2400		
Bar-headed Goose												
Unidentified Goose												
Ruddy Shelduck		11										6
Common Shelduck												
Comb Duck												
Cotton Pygmy Goose	11	33	12	2								
Eurasian Wigeon	33											800
Falcated Teal												39
Gadwall	9									3	6	1700
Common Teal	6									200	800	1150
Mallard								1				31
Spotbill Duck	24	4	14	36			6	82	137	77	14	96
Northern Pintail	130			1								13800
Garganey	3930	1190	60					1	1	8370	30	2445
Northern Shoveler	4	30	4							4110	800	10
Red-crested Pochard	75									200		875
Common Pochard										68	68	375
Baer's pochard	1									500	32	112
Ferruginous Duck	895		1									2764
Tufted Duck	2									38	3500	212
Greater Scaup										7000		1
Mandarin Duck												
Unidentified Ducks		358										
Water Rail									53	1050	25088	3000
Slaty-breasted Rail												
Ruddy Crane												
White-breasted Waterhen												
Watercock				10								
Moorhen			62		10							8
Purple Swampphen	31	14	245	17							60	174
Common Coot	4530	1134	54							15	43	12060
Unidentified Rails/Crakes										6000	1500	
Pheasant-tailed Jacana	560	290	33	2				1			56	70
Bronze-winged Jacana		1										
Painted Snipe												
Black-winged Stilt	6	12										6
Avocet											6	
Oriental Pratincole												
Small Pratincole								80				
River Lapwing				8								
Grey-headed Lapwing	13											
Red-wattled Lapwing												
Asiatic Golden Plover	4											
Grey Plover							2		1			
Long-billed Plover												
Little Ringed Plover		7										
Kentish Plover		1										
Mongolian Plover												
Greatr Sand Plover								10				
Black-tailed Godwit		2										
Eurasian Curlew			3									

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Waterfowl Counts, Feb92 to Jan 93, TANGUA & RAUAR BEEL

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Spotted Redshank												
Redshank			1									
Marsh Sandpiper												
Greenshank												
Normann's Greenshank												
Green Sandpiper			1									
Wood sandpiper	13	29										
Terek Sandpiper												
Common Sandpiper	1							1				
Pintail Snipe	3	15						2				
Swinhoe's Snipe												
Common Snipe	11											
Asiatic Dowitcher												1
Little Stint												
Long-toed Stint												
Dunlin												
Curlew Sandpiper												
Spoon-billed Sandpiper												
Broad-billed Sandpiper												
Ruff	321											
Unidentified Waders												
Brown-headed Gull	10	23	150	1					8			390
Black-headed Gull												
Great Blackheaded Gull												
Whiskered Tern	115	73	70			1		11				
White-winged Tern									15	230		
Gull-billed Tern												
Indian river Tern												
Common Tern												
Black-billed Tern												
Little Tern												
Unidentified Tern												
Black-shouldered Kite					1						3	
Black Kite								30				
Brahminy Kite					3	1	4					
Pallas Fish Eagle	4	13	4							2		2
Grey-headed Fish Eagle					1			5	7	2	4	4
Steppe Eagle									1			
White-rumped Vulture												
Crested Serpent Eagle								4				
Western Marsh Harrier	5											
Eastern Marsh Harrier	1										2	4
Pied Harrier			2									
Osprey								2				
Eurasian Kestrel	1						4	1				
Northern Hobby												
Peregrine Falcon												
Shikra				2								
Longbilled Vulture												
TOTAL WATERFOWL	12904	4699	2120	198	135	6	121	355	627	30336	32305	41752

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NORTHEAST REGIONAL PROJECT-BANGLADESH
MONTHLY WATERFOWL COUNTS
FEBRUARY 1992 TO JANUARY 1993
BANUAR HAOR

COUNT DATES AND OBSERVERS

MONTH	DATE	DAS, SMAR	MONTH	DATE	OBSERVERS
FEB	2.3.92	SMAR, AZK, AS	AUG	27.8.92	SMAR, AS
MAR	23.3.92	DAS, SMAR, AS	SEP	22.9.92	SMAR, PT, AS, IS
APR	22.4.92	SMAR, AZK	OCT	27.10.92	SMAR, AS
MAY	25.5.92	SMR,AZK,AS,AK,SK,I	NOV	3.12.92	SMAR,AZK,ZH,PD,AS
JUN	23.6.92	SMAR, AS	DEC	3.1.93	SMAR, AS, QMH
JUL	22.7.92	AZK,AS, IS	JAN	27.1.93	PT, RA, MH, AM, AS

Waterfowl Counts, Feb92 to Jan 93, BANUAR HAOR

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Little Grebe			40									
Great Crested Grebe											1	
Unidentified Grebe												1
Great Cormorant	5											
Indian Shag											6	
Little Cormorant	80	31	110	56					226	24	565	6
Unidentified Cormorant												
Oriental Darter												
Great Bittern												
Yellow Bittern												
Cinnamon Bittern				4								
Black Bittern												
Night Heron												
Little heron												
Indian Pond Heron		4		4	1				2			
Chinese pond Heron												
Cattle Egret												
Little Egret		5	10							2		7
Intermediate Egret	7	8	5									
Great Egret		130	40	2					3			6
Unidentified Egret				30					4	2	66	17
Purple Heron												
Grey Heron	3		5									
Asian Openbill											1	30
Lesser Adjutant												
Black-headed Ibis												
White Spoonbill												
Fulvous Whistling Duck												
Lesser Whistling Duck												
Greylag Goose												
Bar-headed Goose												
Unidentified Goose				3								
Ruddy Shelduck												
Common Shelduck												
Comb Duck												
Cotton Pygmy Goose	30	50	52									
Eurasian Wigeon												
Falcated Teal												
Gadwall												
Common Teal											27	1600
Mallard												
Spotbill Duck	4	10									2	5
Northern Pintail	1								221		51	
Garganey	880	500										130
Northern Shoveler		185										
Red-crested Pochard												
Common Pochard												
Beer's pochard	4											
Ferruginous Duck	65											
Tufted Duck											26	93
Greater Scaup											2	160
Mandarin Duck												
Unidentified Ducks		1000										
Water Rail												
Slaty-breasted Rail												
Ruddy Crake												
White-breasted Waterhen												
Watercock												
Moorhen												
Purple Swamphen												
Common Coot	4											
Unidentified Rails/Crakes												
Pheasant-tailed Jacana	30		20									
Bronze-winged Jacana												
Painted Snipe			1									
Black-winged Stilt	9											
Avocet												
Oriental Pratincole												
Small Pratincole												
River Lapwing												
Grey-headed Lapwing												
Red-wattled Lapwing												
Asiatic Golden Plover												
Grey Plover												
Long-billed Plover												
Little Ringed Plover												
Kentish Plover												
Mongolian Plover												
Greater Sand Plover												
Black-tailed Godwit												
Eurasian Curlew												

Waterfowl Counts, Feb92 to Jan 93, BANUAR HAOR

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Spotted Redshank												
Redshank												
Marsh Sandpiper												
Greenshank												
Normann's Greenshank												
Green Sandpiper												
Wood sandpiper												
Terek Sandpiper												
Common Sandpiper												
Pintail Snipe												
Swinhoe's Snipe												
Common Snipe												
Asiatic Dowitcher												
Little Stint												
Long-toed Stint												
Dunlin												
Curlew Sandpiper												
Spoon-billed Sandpiper												
Broad-billed Sandpiper												
Ruff	130	12										
Unidentified Waders										100		
Brown-headed Gull												
Black-headed Gull												
Unidentified Gull												
Whiskered Tern			15							30		
White-winged Tern												
Gull-billed Tern												
Indian river Tern												
Common Tern												
Black-billed Tern												
Little Tern												
Unidentified Tern												
Black-shouldered Kite												
Black Kite												
Brahminy Kite										1		
Pallas Fish Eagle	3											
Grey-headed Fish Eagle												
Steppe Eagle	1											
White-rumped Vulture												
Crested Serpent Eagle												
Western Marsh Harrier												
Eastern Marsh Harrier												
Pied Harrier												
Osprey				1	1							
Eurasian Kestrel												
Northern Hobby												
Peregrine Falcon												
Unidentified Raptors												
TOTAL WATERFOWL	1256	1935	299	100	1	0	0	0	456	159	748	2054

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**NORTHEAST REGIONAL PROJECT-BANGLADESH
MONTHLY WATERFOWL COUNTS
FEBRUARY 1992 TO JANUARY 1993
KURI BEEL**

COUNT DATES AND OBSERVERS

MONTH	DATE	OBSERVERS	MONTH	DATE	OBSERVERS
FEB	29.2.92	DAS, SMAR	AUG	29.8.92	SMAR, AS
MAR	26.3.92	SMAR, AZK, AS	SEP	25.9.92	SMAR, PT, AS, IS
APR	20.4.92	DAS, SMAR, AS	OCT	30.10.92	SMAR, AS
MAY	26.5.92	SMAR, AZK, AS	NOV	4.12.92	SMAR, AZK, ZH, PD, AS
JUN	20.6.92	SMAR, AS	DEC	6.1.93	AS
JUL	19.7.92	AZK, AS, IS	JAN	25.1.93	AS

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Waterfowl Counts, Feb92 to Jan 93, KURI BEEL

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Little Grebe			1									
Great Crested Grebe												6
Unidentified Grebe												
Great Cormorant	11	2									1	2
Indian Shag												
Little Cormorant		7	2						1		5	22
Unidentified Cormorant												
Oriental Darter												
Great Bittern												
Yellow Bittern												
Cinnamon Bittern												
Black Bittern												
Night Heron												
Little heron									12			
Indian Pond Heron	10	7	7	4	2		5	5	2			2
Chinese pond Heron												
Cattle Egret	22								5	105	4	
Little Egret	3	5	4	3			1	5			1	
Intermediate Egret	21											
Great Egret	5	7	1	1					20		1	5
Unidentified Egret												
Purple Heron												
Grey Heron	3	1	1						2	2		1
Asian Openbill												
Lesser Adjutant												
Black-headed Ibis												
White Spoonbill												
Fulvous Whistling Duck												
Lesser Whistling Duck												
Greylag Goose												
Bar-headed Goose	4											
Unidentified Goose												
Ruddy Shelduck												
Common Shelduck												
Comb Duck												
Cotton Pygmy Goose												
Eurasian Wigeon												
Falcated Teal												
Gadwall	9											
Common Teal	45											
Mallard												
Spotbill Duck												
Northern Pintail	3								33			
Garganey	185	3										
Northern Shoveler												
Red-crested Pochard												
Common Pochard												
Baer's pochard												
Ferruginous Duck												
Tufted Duck												
Greater Scaup												
Mandarin Duck												
Unidentified Ducks		2										
Water Rail												
Slaty-breasted Rail												
Ruddy Crake												
White-breasted Waterhen												
Watercock												
Moorhen												
Purple Swampphen												
Common Coot												
Unidentified Rails/Crakes												
Pheasant-tailed Jacana												
Bronze-winged Jacana												
Painted Snipe												
Black-winged Stilt									25	50		
Avocet												
Oriental Pratincole									200			
Small Pratincole												
River Lapwing												
Grey-headed Lapwing	10	6							21			8
Red-wattled Lapwing												
Asiatic Golden Plover			6					3	56	10		2
Grey Plover												
Long-billed Plover												
Little Ringed Plover											3	6
Kentish Plover												
Mongolian Plover												
Greatr Sand Plover												
Black-tailed Godwit		1							5			
Eurasian Curlew												

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Waterfowl Counts, Feb92 to Jan 93, KURI BEEL

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Spotted Redshank	2											
Redshank												
Marsh Sandpiper												
Greenshank	21											
Normann's Greenshank									5			
Green Sandpiper												
Wood sandpiper	15	5										
Terek Sandpiper							3		30			2
Common Sandpiper	3	3	2					1	2			
Pintail Snipe		2										
Swinhoe's Snipe												
Common Snipe												
Asiatic Dowitcher									4			
Little Stint												
Long-toed Stint												
Dunlin												
Curlew Sandpiper		3										
Spoon-billed Sandpiper									1			
Broad-billed Sandpiper												
Ruff												
Unidentified Waders												
Brown-headed Gull												
Black-headed Gull												
Unidentified Gull												
Whiskered Tern	2	11	1									
White-winged Tern												
Gull-billed Tern												
Indian river Tern												
Common Tern												
Black-billed Tern												
Little Tern												
Unidentified Tern												
Black-shouldered Kite												
Black Kite												
Brahmany Kite						1	2	1	2			1
Pallas Fish Eagle	1	1						4	2	1		6
Grey-headed Fish Eagle					1	1		1				
Steppe Eagle												
White-rumped Vulture		18	8									
Crested Serpent Eagle		1						2				
Western Marsh Harrier												
Eastern Marsh Harrier												
Pied Harrier												
Osprey		1										2
Eurasian Kestrel									1			
Northern Hobby												
Peregrine Falcon												
Unidentified Raptors												
TOTAL WATERFOWL	375	87	32	9	4	2	10	26	427	166	15	65

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NORTHEAST REGIONAL PROJECT-BANGLADESH
MONTHLY WATERFOWL COUNTS
FEBRUARY 1992 TO JANUARY 1993
DEOCHAPRA BEEL

COUNT DATES AND OBSERVERS

MONTH	DATE	OBSERVERS	MONTH	DATE	OBSERVERS
FEB	29.2.92	DAS, SMAR	AUG	29.8.92	SMAR, AS
MAR	26.3.92	SMAR, AZK, AS	SEP	25.9.92	SMAR, PT, AS, IS
APR	20.4.92	DAS, SMAR, AS	OCT	30.10.92	SMAR, AS
MAY	26.5.92	SMAR, AZK, AS	NOV	4.12.92	SMAR, AZK, ZH, PD, AS
JUN	20.6.92	SMAR, AS	DEC	6.1.93	AS
JUL	19.7.92	AZK, AS, IS	JAN	25.1.93	AS

Waterfowl Counts, Feb92 to Jan 93, DEOCHAPRA BEEL

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Little Grebe												
Great Crested Grebe												
Unidentified Grebe												
Great Cormorant												
Indian Shag												
Little Cormorant	30	18	5									
Unidentified Cormorant									2		2	
Oriental Darter												
Great Bittern												
Yellow Bittern												
Cinnamon Bittern												
Black Bittern												
Night Heron		16										
Little heron												
Indian Pond Heron	10	15	5			2		3			3	12
Chinese pond Heron												
Cattle Egret	1	2										
Little Egret	2	1							5	16	4	31
Intermediate Egret	5								1		1	2
Great Egret	4	1	1									
Unidentified Egret									8	8	2	
Purple Heron												
Gray Heron												
Asian Openbill												
Lesser Adjutant												
Black-headed Ibis												
White Spoonbill												
Fulvous Whistling Duck	1											
Lesser Whistling Duck	140	150										
Graylag Goose										300	20	30
Bar-headed Goose												
Unidentified Goose												
Ruddy Shelduck												
Common Shelduck												
Comb Duck												
Cotton Pygmy Goose	1											
Eurasian Wigeon												
Falcated Teal												
Gadwall												
Common Teal												
Mallard												
Spotbill Duck												
Northern Pintail												
Garganey												
Northern Shoveler												
Red-crested Pochard												
Common Pochard												
Beer's pochard												
Ferruginous Duck												
Tufted Duck												
Greater Scaup												
Mandarin Duck												
Unidentified Ducks												
Water Rail												
Slaty-breasted Rail												
Ruddy Crake												
White-breasted Waterhen												
Watercock												
Moorhen			1									
Purple Swamphen												
Common Coot												
Unidentified Rails/Crakes												
Pheasant-tailed Jacana	10	17	9						1	40		6
Bronze-winged Jacana	25	5	10							14	3	2
Painted Snipe												
Black-winged Stilt												
Avocet												
Oriental Pratincole												
Small Pratincole												
River Lapwing												
Gray-headed Lapwing												
Red-wattled Lapwing												
Asiatic Golden Plover			4									
Gray Plover									1			
Long-billed Plover												
Little Ringed Plover												
Kentish Plover												
Mongolian Plover												
Greater Sand Plover												
Black-tailed Godwit												
Eurasian Curlew												

Waterfowl Counts, Feb92 to Jan 93, DEOCHAPRA BEEL

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Spotted Redshank												
Redshank												
Marsh Sandpiper												
Greenshank												
Normann's Greenshank												
Green Sandpiper												
Wood sandpiper	2	2	16						3	5	10	12
Terak Sandpiper												
Common Sandpiper												
Pintail Snipe												
Swinhoe's Snipe												
Common Snipe	15										3	2
Asiatic Dowitcher												
Little Stint												
Long-toed Stint												
Dunlin												
Curlew Sandpiper												
Spoon-billed Sandpiper												
Broad-billed Sandpiper												
Ruff												
Unidentified Waders												
Brown-headed Gull												
Black-headed Gull												
Unidentified Gull												
Whiskered Tern	1		4									
White-winged Tern												
Gull-billed Tern												
Indian river Tern												
Common Tern												
Black-billed Tern												
Little Tern												
Unidentified Tern												
Black-shouldered Kite												
Black Kite										1		
Brahminy Kite						2	2		1		2	6
Pallas Fish Eagle			1						1	1		
Grey-headed Fish Eagle	1											
Steppe Eagle												
White-rumped Vulture												
Crested Serpent Eagle												
Western Marsh Harrier	1											
Eastern Marsh Harrier												
Pied Harrier		1										
Osprey												
Eurasian Kestrel												
Northern Hobby												
Peregrine Falcon												
Unidentified Raptors												
TOTAL WATERFOWL	249	228	56	0	2	4	0	7	25	393	35	103

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NORTHEAST REGIONAL PROJECT-BANGLADESH
MONTHLY WATERFOWL COUNTS
FEBRUARY 1992 TO JANUARY 1993
ERALI BEEL

COUNT DATES AND OBSERVERS

MONTH	DATE	OBSERVERS	MONTH	DATE	OBSERVERS
FEB	6.3.92	DAS, SMAR	AUG	29.8.92	SMAR, AS
MAR	27.3.92	SMAR, AZK, AS	SEP	28.9.92	SMAR, AS IS
APR	27.4.92	DAS, SMAR, AS	OCT	31.10.92	SMAR, AS
MAY	27.5.92	SMAR, AZK, AS	NOV	25.11.92	SMAR, AS
JUN	27.6.92	SMAR, AS	DEC	31.12.92	SMAR, AS
JUL	25.7.92	AZK, AS, IS	JAN	29.1.93	SMAR

Waterfowl Counts, Feb92 to Jan 93, ERAI BEEL

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Little Grebe												
Great Crested Grebe												
Unidentified Grebe												
Great Cormorant												
Indian Shag												
Little Cormorant	1		1									
Unidentified Cormorant												
Oriental Darter												
Great Bittern												
Yellow Bittern												
Cinnamon Bittern						1						
Black Bittern												
Night Heron		1										
Little heron												
Indian Pond Heron	2	5				4		1	1		4	
Chinese pond Heron												
Cattle Egret		4										
Little Egret												
Intermediate Egret									1			
Great Egret									3			
Unidentified Egret												
Purple Heron												
Gray Heron												
Asian Openbill												
Lesser Adjutant												
Black-headed Ibis												
White Spoonbill												
Fulvous Whistling Duck												
Lesser Whistling Duck		7	60									
Graylag Goose												
Bar-headed Goose												
Unidentified Goose												
Ruddy Shelduck												
Common Shelduck												
Comb Duck												
Cotton Pygmy Goose												
Eurasian Wigeon												
Falcated Teal												
Gadwall												
Common Teal												
Mallard												
Spotbill Duck												
Northern Pintail												29
Garganey									11			
Northern Shoveler												
Red-crested Pochard												
Common Pochard												
Baer's pochard												
Ferruginous Duck												
Tufted Duck												
Greater Scaup												
Mandarin Duck												
Unidentified Ducks												
Water Rail												
Slaty-breasted Rail												
Ruddy Crane												
White-breasted Waterhen												
Watercock												
Moorhen												
Purple Swamphen												
Common Coot												
Unidentified Rails/Crakes												
Pheasant-tailed Jacana												
Bronze-winged Jacana												
Painted Snipe												
Black-winged Stilt												
Avocet												
Oriental Pratincole												
Small Pratincole												
River Lapwing												
Grey-headed Lapwing												
Red-wattled Lapwing												
Asiatic Golden Plover												
Grey Plover												
Long-billed Plover												
Little Ringed Plover												
Kentish Plover												
Mongolian Plover												
Greater Sand Plover												
Black-tailed Godwit												
Eurasian Curlew												

Waterfowl Counts, Feb92 to Jan 93, ERAU BEEL

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Spotted Redshank												
Redshank												
Marsh Sandpiper												
Greenshank										1		
Normann's Greenshank												
Green Sandpiper												
Wood sandpiper			1						1	1	1	2
Terek Sandpiper									4	2		
Common Sandpiper		1		1								
Pintail Snipe		2	1						2	1	1	1
Swinhoe's Snipe												
Common Snipe												
Asiatic Dowitcher												
Little Stint												
Long-toed Stint												
Dunlin												
Curlew Sandpiper												
Spoon-billed Sandpiper												
Broad-billed Sandpiper												
Ruff												
Unidentified Waders												
Brown-headed Gull												
Black-headed Gull									6			
Unidentified Gull												
Whiskered Tern												
White-winged Tern												
Gull-billed Tern												
Indian river Tern												
Common Tern												
Black-billed Tern												
Little Tern												
Unidentified Tern												
Black-shouldered Kite												
Black Kite												
Brahmany Kite									1	1		
Pallas Fish Eagle						2	1	1	2	2	1	2
Grey-headed Fish Eagle												
Steppe Eagle												
White-rumped Vulture			1									
Crested Serpent Eagle		2										
Western Marsh Harrier												
Eastern Marsh Harrier										1		
Pied Harrier		1	2									
Osprey												1
Hen Harrier												
Northern Hobby												1
Peregrine Falcon												
Unidentified Raptors												
TOTAL WATERFOWL	9	22	62	0	0	7	1	3	34	7	7	36



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NORTHEAST REGIONAL PROJECT-BANGLADESH
MONTHLY WATERFOWL COUNTS
FEBRUARY 1992 TO JANUARY 1993
BALAI HAOR

COUNT DATES AND OBSERVERS

MONTH	DATE	OBSERVERS	MONTH	DATE	OBSERVERS
FEB	6.3.92	DAS, SMAR	AUG	29.8.92	SMAR, AS
MAR	27.3.92	SMAR, AZK, AS	SEP	26.9.92	SMAR, AS, IS
APR	27.4.92	DAS, SMAR, AS	OCT	31.10.92	SMAR, AS
MAY	27.3.92	SMAR, AZK, AS	NOV	25.11.92	SMAR, AS
JUN	27.6.92	SMAR, AS	DEC	31.12.92	SMAR, AS
JUL	25.7.92	AZK, AS, IS	JAN	29.1.93	SMAR

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Waterfowl Counts, Feb92 to Jan 93, BALAI HAOR

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Little Grebe	6	1	8						1			
Great Crested Grebe												
Unidentified Grebe												
Great Cormorant												
Indian Shag												
Little Cormorant	39	3	78	16	10	11	9	27	33	22	155	238
Unidentified Cormorant												
Oriental Darter												
Great Bittern	1											1
Yellow Bittern			1		1							
Cinnamon Bittern			1				2					
Black Bittern												
Night Heron												
Little heron					1							
Indian Pond Heron	66	23	7	3	4	2	9	13	13	16	16	54
Chinese pond Heron		1										
Cattle Egret	8		154	6	4		15	25	230	53	40	21
Little Egret	20	3	20	16	10	6		8	3		22	14
Intermediate Egret	3		118	10				2				5
Great Egret	3	2	35	12	40			92	78	4	17	3
Unidentified Egret				44				13	200			
Purple Heron	1		1									
Gray Heron	5		5		9					1	1	
Asian Openbill	1		13	12	30					8	46	21
Lesser Adjutant	2											67
Black-headed Ibis												
White Spoonbill												
Fulvous Whistling Duck		5000	36						9	20		2
Lesser Whistling Duck		15000	152	2	42	8	22	69	27	200		200
Graylag Goose												
Bar-headed Goose												
Unidentified Goose												
Ruddy Shelduck		1	1									
Common Shelduck												
Comb Duck												
Cotton Pygmy Goose	3	6	20	10		4	4	18		8		
Eurasian Wigeon			3									
Falcated Teal												
Gadwall		7										
Common Teal	2									8		
Mallard											2	230
Spotbill Duck												
Northern Pintail	48	7000										
Garganey		5000	50		1					31		706
Northern Shoveler	23	3	20							1	100	400
Red-crested Pochard												21
Common Pochard												
Beer's pochard												
Ferruginous Duck	4											
Tufted Duck										11		
Greater Scaup												
Mandarin Duck												
Unidentified Ducks		200										
Water Rail								3		80		
Slaty-breasted Rail												
Ruddy Crake												
White-breasted Waterhen				1								
Watercock	2											
Moorhen			12					1	5	2		
Purple Swamphen								6				
Common Coot										1		
Unidentified Rails/Crakes												
Pheasant-tailed Jacana	3		11		1			6	3	4	7	9
Bronze-winged Jacana			1		2	4	2	4	9	8	5	5
Painted Snipe												
Black-winged Stilt		9	2									
Avocet												
Oriental Pratincole												
Small Pratincole								47	2		11	
River Lapwing												
Gray-headed Lapwing	49											
Red-wattled Lapwing									3	34	4	19
Asiatic Golden Plover	180	59	345									
Gray Plover		2									52	67
Long-billed Plover												
Little Ringed Plover	6											
Kentish Plover											7	1
Mongolian Plover												
Greatr. Sand Plover												
Black-tailed Godwit												
Eurasian Curlew												

Waterfowl Counts, Feb92 to Jan 93, BALAI HAOR

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Spotted Redshank	2											
Redshank	2											
Marsh Sandpiper	1											
Greenshank	17										13	
Normann's Greenshank												
Green Sandpiper		5						1				2
Wood sandpiper	24	103	50					8	5	12	26	25
Terek Sandpiper												
Common Sandpiper		2										
Pintail Snipe			5									
Swinhoe's Snipe												
Common Snipe	28		15									
Asiatic Dowitcher								3		4	5	3
Little Stint												
Long-toed Stint												
Dunlin												
Curlew Sandpiper		3										
Spoon-billed Sandpiper												
Broad-billed Sandpiper												
Ruff	2	250	1									
Unidentified Waders								50				
Brown-headed Gull												
Black-headed Gull												
Unidentified Gull												
Whiskered Tern												
White-winged Tern												
Gull-billed Tern												
Indian river Tern												
Common Tern												
Black-billed Tern												
Little Tern												
Unidentified Tern												
Black-shouldered Kite												
Black Kite								2	4	2	7	2
Brahminy Kite					2	1		2	8	1	5	3
Pallas Fish Eagle	1											
Grey-headed Fish Eagle		1	1		1	1		1				
Steppe Eagle												
White-rumped Vulture									4			4
Crested Serpent Eagle		1	2		1						1	
Western Marsh Harrier	2	1										7
Eastern Marsh Harrier	1	1										
Pied Harrier	2	3	2									
Osprey												1
Eurasian Kestrel												
Northern Hobby												
Peregrine Falcon												
Unidentified Raptors									3			
TOTAL WATERFOWL	557	32690	1170	132	159	37	63	402	639	535	544	2133

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NORTHEAST REGIONAL PROJECT-BANGLADESH
MONTHLY WATERFOWL COUNTS
FEBRUARY 1992 TO JANUARY 1993
CHALNIA & DEODAR BEEL

COUNT DATES AND OBSERVERS

MONTH	DATE	OBSERVERS	MONTH	DATE	OBSERVERS
FEB	20.2/5.3.92	DAS, SMAR, AZK	AUG	24.8.92	SMAR
MAR	26.3.92	SMAR, AZK, AS	SEP	27.9.92	SMAR, AS, IS
APR	26.4.92	DAS, SMAR, AS	OCT	30.10.92	SMAR, AS
MAY	28.5.92	SMAR, AZK, AS	NOV	26.11.92	SMAR
JUN	28.6.92	SMAR, AS	DEC	6.1.93	AS
JUL	24.7.92	AZK, AS, IS	JAN	30.1.93	SMAR, AS

Waterfowl Counts, Feb92 to Jan 93, CHALNIA & DEODAR BEELS

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Little Grebe	17											3
Great Crested Grebe	5											
Unidentified Grebe												
Great Cormorant		1										
Indian Shag												
Little Cormorant					14							
Unidentified Cormorant	5	55	96							19	12	27
Oriental Darter												
Great Bittern												
Yellow Bittern												
Cinnamon Bittern							1					
Black Bittern												
Night Heron												
Little heron							1					
Indian Pond Heron	3	48	1		2	3			2	8		2
Chinese pond Heron												
Cattle Egret		3										
Little Egret									8	46	8	
Intermediate Egret	3	1							4	10	6	12
Great Egret	10	1	1									34
Unidentified Egret		15			1				36	3	4	150
Purple Heron												
Grey Heron		5										
Asian Openbill												
Lesser Adjutant												
Black-headed Ibis												
White Spoonbill												
Fulvous Whistling Duck	80	85										
Lesser Whistling Duck	455	25										
Greylag Goose												
Bar-headed Goose												
Unidentified Goose												
Ruddy Shelduck		2										
Common Shelduck												
Comb Duck												
Cotton Pygmy Goose		25										
Eurasian Wigeon			6									40
Falcated Teal												
Gadwall	41											
Common Teal												
Mallard										8		
Spotbill Duck												
Northern Pintail	30											
Garganey	4	25								45		
Northern Shoveler	11											
Red-crested Pochard												
Common Pochard	30											
Baer's pochard												
Ferruginous Duck	15											
Tufted Duck	1200	9										
Greater Scaup												
Mandarin Duck												
Unidentified Ducks									116			210
Water Rail												
Slaty-breasted Rail												
Ruddy Crake												
White-breasted Waterhen												
Watercock												
Moorhen												
Purple Swamphen												
Common Coot	2											
Unidentified Rails/Crakes												
Pheasant-tailed Jacana	5	34										
Bronze-winged Jacana	1											11
Painted Snipe												
Black-winged Stilt												
Avocet												
Oriental Pratincole								5	50			
Small Pratincole												
River Lapwing												
Grey-headed Lapwing									3			
Red-wattled Lapwing												
Asiatic Golden Plover		1	11				17			1	5	
Grey Plover												
Long-billed Plover												
Little Ringed Plover	2									20	6	57
Kentish Plover												
Mongolian Plover									1		8	
Greater Sand Plover												
Black-tailed Godwit												
Eurasian Curlew												

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Waterfowl Counts, Feb92 to Jan 93, CHALNIA & DEODAR BEELS

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Spotted Redshank												
Redshank			1									
Marsh Sandpiper												
Greenshank												
Normann's Greenshank												
Green Sandpiper												
Wood sandpiper	4	7										
Terek Sandpiper								3	21	50		85
Common Sandpiper												
Pintail Snipe										1	2	
Swinhoe's Snipe												
Common Snipe												
Asiatic Dowitcher									1		3	
Little Stint												
Temminck's Stint												
Dunlin												24
Curlew Sandpiper												
Spoon-billed Sandpiper											1	
Broad-billed Sandpiper												
Ruff												
Unidentified Waders											4	
Brown-headed Gull			2						8	14		
Black-headed Gull												
Unidentified Gull												
Whiskered Tern				7								
White-winged Tern								2	27		3	1
Gull-billed Tern												
Indian river Tern												
Common Tern												
Black-billed Tern								2				
Little Tern												
Unidentified Tern												
Black-shouldered Kite												
Black Kite												
Brahmany Kite					5	1	5	8	4	3		4
Pallas Fish Eagle	2		1						5	1		2
Grey-headed Fish Eagle			1	1								
Steppe Eagle												
White-rumped Vulture												
Crested Serpent Eagle												
Western Marsh Harrier		1										
Eastern Marsh Harrier												
Pied Harrier	1	1										
Osprey	1											1
Eurasian Kestrel												
Northern Hobby												
Peregrine Falcon												
Unidentified Raptors												
TOTAL WATERFOWL	1907	345	119	9	21	6	22	22	292	221	65	661

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**NORTHEAST REGIONAL PROJECT-BANGLADESH
MONTHLY WATERFOWL COUNTS
FEBRUARY 1992 TO JANUARY 1993
HAOR KHAL & KAIR GANG**

COUNT DATES AND OBSERVERS

MONTH	DATE	OBSERVERS	MONTH	DATE	OBSERVERS
FEB	7.3.92	DAS, SMAR, AS	AUG	25.8.92	SMAR
MAR	28.3.92	SMAR, AZK, AS	SEP	27.9.92	SMAR, AS, IS
APR	25.4.92	DAS, SMAR, AS	OCT	1.11.92	SMAR, AS, MR, SR
MAY	28.5.92	SMAR, AZK, AS	NOV	26.11.92	SMAR, AS
JUN	28.6.92	SMAR, AS	DEC	29.12.92	SMAR, AS, QMH
JUL	24.7.92	AZK, AS, IS	JAN	30.1.93	SMAR, AS

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Waterfowl Counts, Feb92 to Jan 93, HAOR KHAL AND KHAIRGANG

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Little Grebe												
Great Crested Grebe												
Unidentified Grebe										65	30	28
Great Cormorant												
Indian Shag												
Little Cormorant												
Unidentified Cormorant												7
Oriental Darter												
Great Bittern												
Yellow Bittern												1
Cinnamon Bittern												
Black Bittern												
Night Heron												
Little Heron			1						7			
Indian Pond Heron			2		1	4					4	2
Chinese pond Heron									7	1	2	12
Cattle Egret												
Little Egret	3		12							1	4	66
Intermediate Egret	3		12						4	9		
Great Egret			8	1	1					2		
Unidentified Egret									24	16	12	18
Purple Heron												
Grey Heron	51	14	2							1		
Asian Openbill										3		5
Lesser Adjutant												
Black-headed Ibis												
White Spoonbill												
Fulvous Whistling Duck		2000	12									
Lesser Whistling Duck	300	5000										
Greylag Goose									40	5000	10000	12000
Bar-headed Goose												
Unidentified Goose										5		
Ruddy Shelduck												
Common Shelduck												
Comb Duck												
Cotton Pygmy Goose												
Eurasian Wigeon	2											
Falcated Teal												50
Gadwall			2									
Common Teal	7									300	800	6000
Mallard											200	200
Spotbill Duck												
Northern Pintail	5050		14									
Garganey	75	277	120						32	3212	2500	36500
Northern Shoveler	425	50	6							3300	2000	1000
Red-crested Pochard									150	2100	6000	3000
Common Pochard											300	
Beer's pochard									5			100
Ferruginous Duck									2			300
Tufted Duck			6						50	300		1000
Greater Scaup									200	2		800
Mandarin Duck												
Unidentified Ducks												
Water Rail									600			220
Slaty-breasted Rail												
Ruddy Crake												
White-breasted Waterhen												
Watercock												
Moorhen												
Purple Swamphen												
Common Coot												
Unidentified Rails/Crakes										200	1575	
Pheasant-tailed Jacana												
Bronze-winged Jacana												
Painted Snipe												
Black-winged Stilt	10	7	16									
Avocet	4								33	537		
Oriental Pratincole												
Small Pratincole	2											
River Lapwing												
Grey-headed Lapwing	60	15	1									
Red-wattled Lapwing									4	45	276	83
Asiatic Golden Plover	230		7									
Grey Plover	3								38	38	69	385
Long-billed Plover												
Little Ringed Plover	175											
Kentish Plover	650									3	28	525
Mongolian Plover	7										18	
Greater Sand Plover												28
Black-tailed Godwit	1		13									
Eurasian Curlew												

Waterfowl Counts, Feb92 to Jan 93, HAOR KHAL AND KHAIRGANG

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Spotted Redshank	31			1								
Redshank				5					2			
Marsh Sandpiper	145											
Greenshank	12		2							1		55
Normann's Greenshank												
Green Sandpiper										10		
Wood sandpiper	120	103	24							25	36	116
Terek Sandpiper												
Common Sandpiper	1	1	1						3	1	3	7
Pintail Snipe	2	5										8
Swinhoe's Snipe												
Common Snipe	155		9							1	6	15
Sanderling												1
Little Stint	550											9
Long-toed Stint	2											79
Temminck's Stint	25											
Curlew Sandpiper	20		1									3
Spoon-billed Sandpiper												
Broad-billed Sandpiper	1											4
Ruff	30		50									1
Unidentified Waders									11	450		112
Brown-headed Gull	60	57	45						122	15	86	59
Black-headed Gull		5	1									
Great Blackheaded Gull									2			
Whiskered Tern	30	80	190	3			3	7	60		5	
White-winged Tern												
Gull-billed Tern												
Indian river Tern												
Common Tern												
Black-billed Tern												
Little Tern												
Unidentified Tern												
Black-shouldered Kite												
Black Kite									7		5	6
Brahminy Kite					4	1	2		9		3	3
Pallas Fish Eagle		1										
Grey-headed Fish Eagle												
Steppe Eagle	1	1										
White-rumped Vulture		4	5	35	4							
Crested Serpent Eagle												
Western Marsh Harrier	1									1		
Eastern Marsh Harrier												
Pied Harrier		1								3	2	2
Osprey												
Eurasian Kestrel												
Northern Hobby												
Peregrine Falcon												
Long-billed Vulture		1										
TOTAL WATERFOWL	8244	7633	558	40	12	1	5	10	1410	16149	27968	63803

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**NORTHEAST REGIONAL PROJECT-BANGLADESH
MONTHLY WATERFOWL COUNTS
FEBRUARY 1992 TO JANUARY 1993
CHATLA & PINGLA BEEL**

COUNT DATES AND OBSERVERS

MONTH	DATE	OBSERVERS	MONTH	DATE	OBSERVERS
FEB	19.2.92	DAS,AZK	AUG	25.8.92	SMAR
MAR	30.3.92	SMAR, AZK, AS	SEP	27.9.92	SMAR, AS, IS
APR	30.4.92	DAS, SMAR, AS	OCT	1.11.92	SMAR, AS, MR, SR
MAY	31.5.92	SMAR, AZK, AS	NOV	2.12.92	SMAR, AS
JUN	28.6.92	SMAR, AS	DEC	1.1.93	SMAR, AS
JUL	27.7.92	AZK, AS, IS	JAN	1.2.93	SMAR, AS

Waterfowl Counts, Feb92 to Jan 93, CHATLA & PINGLA BEEL

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Little Grebe	13										85	98
Great Crested Grebe	55	1							2	55	67	47
Unidentified Grebe												
Great Cormorant									7	6		
Indian Shag												
Little Cormorant	160	31	4	8			2		112	225	85	126
Unidentified Cormorant												
Oriental Darter									1			
Great Bittern												
Yellow Bittern												
Cinnamon Bittern												
Black Bittern												
Night Heron												
Little heron												
Indian Pond Heron		3	1	3						30		14
Chinese pond Heron												
Cattle Egret				23								50
Little Egret		10		13								
Intermediate Egret	23			5								
Great Egret	15	38	10	4					4			320
Unidentified Egret												
Purple Heron			1								1	3
Grey Heron		12	2						2	1	2	
Asian Openbill				60								84
Lesser Adjutant				1								
Black-headed Ibis												
White Spoonbill											3	
Fulvous Whistling Duck	500	2512	550									
Lesser Whistling Duck	6000	1000	550							250		
Graylag Goose												
Bar-headed Goose												
Unidentified Goose												
Ruddy Shelduck												
Common Shelduck		7	3									
Comb Duck												
Cotton Pygmy Goose												4
Eurasian Wigeon	1											10
Falcated Teal												3
Gadwall	30											
Common Teal	4									1500	800	2196
Mallard											50	200
Spotbill Duck												
Northern Pintail	5000	15	20							1145	1100	6825
Garganey	500	800	450								4	1050
Northern Shoveler	5004	1000	50								130	300
Red-crested Pochard											1	
Common Pochard	80										70	230
Baer's pochard	5											700
Ferruginous Duck	2									100	200	
Tufted Duck	250	200	14							1000	2179	1522
Greater Scaup												1
Mandarin Duck												
Unidentified Ducks												
Water Rail											100	
Slaty-breasted Rail												
Ruddy Crane												
White-breasted Waterhen												
Watercock												
Moorhen												1
Purple Swamphen												
Common Coot	200	54	1							130	890	851
Unidentified Rails/Crakes												
Pheasant-tailed Jacana	3	8	4									33
Bronze-winged Jacana		1	1									
Painted Snipe												
Black-winged Stilt	1		14							351	18	15
Avocet												
Oriental Pratincole												
Small Pratincole												
River Lapwing												
Grey-headed Lapwing	10									40	7	8
Red-wattled Lapwing											1	
Asiatic Golden Plover	5											
Grey Plover												
Long-billed Plover												
Little Ringed Plover	1	10									4	
Kentish Plover										1		
Mongolian Plover												
Greater Sand Plover												
Black-tailed Godwit												
Eurasian Curlew												

Waterfowl Counts, Feb92 to Jan 93, CHATLA & PINGLA BEEL

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Spotted Redshank			13									
Redshank												
Marsh Sandpiper	1											
Greenshank										21		
Spotted Greenshank										1	5	20
Green Sandpiper										25		
Wood sandpiper	20	9								3		
Terek Sandpiper									4	15	22	210
Common Sandpiper		1										
Pintail Snipe	2											
Swinhoe's Snipe												
Common Snipe	2											
Asiatic Dowitcher										3	2	64
Little Stint												
Long-toed Stint												
Temminck's Stint	3		3									
Curlew Sandpiper										20		
Spoon-billed Sandpiper												
Broad-billed Sandpiper												
Ruff												
Unidentified Waders		10								20		66
Brown-headed Gull	1		8							200	50	350
Black-headed Gull									139	39	90	22
Unidentified Gull												
Whiskered Tern		8	172	73	6		5	205	55	25		
White-winged Tern			1									
Gull-billed Tern												
Indian river Tern												
Common Tern												
Black-billed Tern								1				
Little Tern												
Unidentified Tern												
Black-shouldered Kite												
Black Kite												
Brahmany Kite									2	99		4
Pallas Fish Eagle	1	1	1			50	3	1	3	9		2
Gray-headed Fish Eagle											4	2
Steppe Eagle												
White-rumped Vulture			22	59								28
Crested Serpent Eagle												
Western Marsh Harrier	2	1										
Eastern Marsh Harrier	2		1									2
Pied Harrier	1	1								1		1
Osprey											1	8
Eurasian Kestrel												
Northern Hobby												
Peregrine Falcon												
Lesser Spotted Eagle	2											
Long-billed Vulture				2								
TOTAL WATERFOWL	17899	5733	1896	251	6	52	8	207	331	5315	5971	15470

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NORTHEAST REGIONAL PROJECT-BANGLADESH
MONTHLY WATERFOWL COUNTS
FEBRUARY 1992 TO JANUARY 1993
PATACHATAL & BORACHATAL BEEL

COUNT DATES AND OBSERVERS

MONTH	DATE	OBSERVERS	MONTH	DATE	OBSERVERS
FEB	8.3.92	DAS, SMAR, AS	AUG	30.8.92	SMAR, AS
MAR	29.3/1.4.92	SMAR, AZK, AS	SEP	28.9.92	SMAR, AS, IS
APR	28.4.92	DAS, SMAR, AS	OCT	25.10.92	SMAR, AS
MAY	29.5.92	SMAR, AZK, AS	NOV	5.12.92	AS
JUN	29.6.92	SMAR, AS	DEC	30.12.92	SMAR, AS, QMH
JUL	26.7.92	AZK, AS, IS	JAN	24.1.93	AS

6022
6026

Waterfowl Counts, Feb92 to Jan 93, PATACHATAL & BORACHATAL BEEL

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Little Grebe	8											
Great Crested Grebe												
Unidentified Grebe										2		16
Great Cormorant												
Indian Shag												
Little Cormorant		2	6		1							
Unidentified Cormorant												
Oriental Darter												
Great Bittern												
Yellow Bittern												
Cinnamon Bittern												
Black Bittern												
Night Heron		7										
Little heron				1		1						
Indian Pond Heron	3		4	3	1	8	2		5	24		2
Chinese pond Heron												
Cattle Egret		1										
Little Egret					1					78		
Intermediate Egret			1							34		
Great Egret		8										
Unidentified Egret				4					2	13		
Purple Heron									2			
Gray Heron		4	1									
Asian Openbill										5		
Lesser Adjutant												
Black-headed Ibis												
White Spoonbill												
Fulvous Whistling Duck	10	35										
Lesser Whistling Duck	240	906		2								
Greylag Goose										220		
Bar-headed Goose												
Unidentified Goose												
Ruddy Shelduck												
Common Shelduck												
Comb Duck												
Cotton Pygmy Goose												
Eurasian Wigeon	1		6									
Falcated Teal												
Gadwall												
Common Teal												
Mallard												
Spotbill Duck												
Northern Pintail	570		5									
Garganey	1150	200	150									
Northern Shoveler	1850		1									
Red-crested Pochard												11
Common Pochard												
Baer's pochard												
Ferruginous Duck												
Tufted Duck	360	90										
Greater Scaup												
Mandarin Duck												
Unidentified Ducks		100										
Water Rail												
Slaty-breasted Rail												
Ruddy Crake												
White-breasted Waterhen												
Watercock												
Moorhen												
Purple Swamphen												
Common Coot												
Unidentified Rails/Crakes												
Pheasant-tailed Jacana			13									
Bronze-winged Jacana												
Painted Snipe												
Black-winged Stilt												
Avocet										90		
Oriental Pratincole												
Small Pratincole												
River Lapwing												
Gray-headed Lapwing												
Red-wattled Lapwing												
Asiatic Golden Plover	16	2	47									
Gray Plover										37		5
Long-billed Plover												
Little Ringed Plover	19											
Kentish Plover											1	
Mongolian Plover												
Greatr Sand Plover												
Black-tailed Godwit												
Eurasian Curlew												

Waterfowl Counts, Feb92 to Jan 93, PATACHATAL & BORACHATAL BEEL

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Spotted Redshank												
Redshank										19		
Marsh Sandpiper										46		
Greenshank			1									
Normann's Greenshank												
Green Sandpiper												
Wood sandpiper	2	3	1					1		61	3	2
Terek Sandpiper												
Common Sandpiper	2											
Pintail Snipe												
Swinhoe's Snipe	1											
Common Snipe	2											
Asiatic Dowitcher										26	1	
Little Stint												
Long-toed Stint												
Temminck's Stint	1	2										
Curlew Sandpiper												
Spoon-billed Sandpiper										6		
Broad-billed Sandpiper												
Ruff												
Unidentified Waders		25						5		61		
Brown-headed Gull	3											
Black-headed Gull											6	29
Unidentified Gull												
Whiskered Tern	14	5	11						2			
White-winged Tern												
Gull-billed Tern												
Indian river Tern												
Common Tern												
Black-billed Tern												
Little Tern	1		2									
Unidentified Tern												
Black-shouldered Kite												
Black Kite												
Brahminy Kite					6	2	1		1	3	30	
Pallas Fish Eagle										6		
Grey-headed Fish Eagle												
Steppe Eagle	1											
White-rumped Vulture		200			33							
Crested Serpent Eagle	1											
Western Marsh Harrier	1	1										
Eastern Marsh Harrier												
Pied Harrier	1		1									
Osprey	1	1										
Eurasian Kestrel												
Northern Hobby												
Peregrine Falcon												
Longbilled Vulture					6							
TOTAL WATERFOWL	4258	1593	249	10	48	11	9	2	10	731	41	65

**NORTHEAST REGIONAL PROJECT-BANGLADESH
MONTHLY WATERFOWL COUNTS
FEBRUARY 1992 TO JANUARY 1993
KAWADIGHI HAOR**

COUNT DATES AND OBSERVERS

MONTH	DATE	OBSERVERS	MONTH	DATE	OBSERVERS
FEB	22.2/8.3.92	DAS, SMAR, AZK	AUG	22.8.92	SMAR, AS
MAR	29.3.92	SMAR, AZK, AS	SEP	30.9.92	SMAR, AS, IS
APR	29.4/3.5.92	DAS, SMAR, AS	OCT	21.10.92	SMAR, SLB, AS
MAY	30.5.92	SMAR, AZK, AS	NOV	30.11.92	SMAR, AS
JUN	30.6.92	SMAR, AS	DEC	5.1.93	SMAR, AS
JUL	28.7.92	AZK, AS, IS	JAN	31.1.93	SMAR, AS

Waterfowl Counts, Feb92 to Jan 93, KAWADIGHI HAOR

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Little Grebe	14		5									412
Great Crested Grebe												
Unidentified Grebe												
Great Cormorant											1	
Indian Shag												
Little Cormorant			40						4			17
Unidentified Cormorant												
Oriental Darter												
Great Bittern												
Yellow Bittern						1						
Cinnamon Bittern				4	2							
Black Bittern												
Night Heron												
Little Heron					1							
Indian Pond Heron	340	21	22	7	20	14	13	25	37	33	245	221
Chinese pond Heron												
Cattle Egret		50	256	4			3			126		419
Little Egret	430		229	47						4		7
Intermediate Egret	175		125	162					20	4		1
Great Egret	800	128	355	269					28	15	165	87
Unidentified Egret									600		1045	1000
Purple Heron												
Grey Heron	145	42	36	3				1			1	
Asian Openbill												
Lesser Adjutant												
Black-headed Ibis												
White Spoonbill												
Fulvous Whistling Duck	9	2000							89	667		2
Lesser Whistling Duck	50	300		2		1		91	182	1692		9
Greylag Goose												
Bar-headed Goose												
Unidentified Goose												
Ruddy Shelduck	4		1									
Common Shelduck												
Comb Duck												
Cotton Pygmy Goose	8	23		13	3	5	2			15		11
Eurasian Wigeon		15										
Falcated Teal												
Gadwall											2	
Common Teal												39
Mallard												
Spotbill Duck												
Northern Pintail	2825		3						61	457		388
Garganey	1430	5000	14						396	1250		16
Northern Shoveler	750	2000	12							3		
Red-crested Pochard												
Common Pochard												
Beer's pochard												
Ferruginous Duck		12								7		11
Tufted Duck		8										1
Greater Scaup												
Mandarin Duck												
Unidentified Ducks									279	1700	12	7066
Water Rail												
Slaty-breasted Rail												
Ruddy Crake												
White-breasted Waterhen												
Watercock				6	4	4	2		2	2		
Moorhen										1		
Purple Swampphen										14		
Common Coot	17											
Unidentified Rails/Crakes					2							
Pheasant-tailed Jacana	300	114	102	70	18	6	8	7	35	97	220	816
Bronze-winged Jacana	1			5								
Painted Snipe												
Black-winged Stilt	280	169	255							7		200
Avocet												
Oriental Pratincole												
Small Pratincole												
River Lapwing												
Grey-headed Lapwing	215	81	15						2	15	249	48
Red-wattled Lapwing										9		8
Asiatic Golden Plover	12	7	10				5		4			309
Grey Plover												
Long-billed Plover												
Little Ringed Plover	17	2									1	18
Kentish Plover	40	1										
Mongolian Plover	5											
Greatr Sand Plover												
Black-tailed Godwit	165		31								18	
Eurasian Curlew												

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Waterfowl Counts, Feb92 to Jan 93, KAWADIGHI HAOR

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Spotted Redshank	30											
Redshank	1		4									
Marsh Sandpiper	100		6									
Greenshank	20		2									
Normann's Greenshank												
Green Sandpiper												
Wood sandpiper	55	59	20									
Terek Sandpiper									7	12	353	228
Common Sandpiper	1	1					4					
Pintail Snipe		3									1	1
Swinhoe's Snipe												
Common Snipe	12											
Asiatic Dowitcher										8	19	250
Little Stint	100		4									
Dunlin	1											1
Temminck's Stint	15											
Curlew Sandpiper	2		3									
Spoon-billed Sandpiper											55	1
Broad-billed Sandpiper												
Ruff	150	8										3
Unidentified Waders	200										440	
Brown-headed Gull	12		8							5	300	500
Black-headed Gull												403
Unidentified Gull									2			
Whiskered Tern	455	159	38	35	56	53	47	1	36			
White-winged Tern									20		809	523
Gull-billed Tern												
Indian river Tern												
Common Tern			3	1								
Black-billed Tern								3	2			
Little Tern												
Unidentified Tern												
Black-shouldered Kite								3				
Black Kite												
Brahmany Kite					2	3	2	6	3	2	13	133
Pallas Fish Eagle	1	2							8		1	7
Grey-headed Fish Eagle												1
Steppe Eagle	1											
White-rumped Vulture	3		80	10		33						
Crested Serpent Eagle												20
Western Marsh Harrier	1		1					1				1
Eastern Marsh Harrier	1									3	2	
Pied Harrier												
Osprey								1	1	4	2	
Eurasian Kestrel												
Northern Hobby				1								
Peregrine Falcon												
Unidentified Raptors				1	1							
TOTAL WATERFOWL	9203	10205	1680	640	110	123	82	139	1818	6155	3951	13178

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NORTHEAST REGIONAL PROJECT-BANGLADESH
MONTHLY WATERFOWL COUNTS
FEBRUARY 1992 TO JANUARY 1993
HAIL HAOR

COUNT DATES AND OBSERVERS

MONTH	DATE	OBSERVERS	MONTH	DATE	OBSERVERS
FEB	21.2/23.2.9	DAS, AZK	AUG	23.8.92	SMAR, AS
MAR	31.3.92	SMAR, AZK, AS	SEP	29.9.92	SMAR, AS, IS
APR	2.5.92	DAS, SMAR, AS	OCT	22.10.92	SMAR, SLB, AS
MAY	1.6.92	SMAR, AZK, IS	NOV	1.12.92	SMAR, AS
JUN	1.7.92	SMAR, AS	DEC	4.1.93	SMAR, AS
JUL	29.7.92	AZK, AS, IS	JAN	2.2.93	SMAR, AS

Waterfowl Counts, Feb92 to Jan 93, HAIL HAOR

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Little Grebe	2		7		2		1				1	1
Great Crested Grebe												
Unidentified Grebe												
Great Cormorant												
Indian Shag												
Little Cormorant					1							
Unidentified Cormorant										3	1	
Oriental Darter												
Great Bittern												
Yellow Bittern			2	4	1	1						
Cinnamon Bittern			2	2	1	2	1					
Black Bittern												
Night Heron												
Little heron												
Indian Pond Heron	55	95	68	18	6	8	24	153	28	79	229	315
Chinese pond Heron			1									
Cattle Egret	5	3	10	13	87	191	204	3	14	119	255	695
Little Egret	7	25	61	2				4	2	8	24	14
Intermediate Egret	50		140	8						1		78
Great Egret	15	2	154	4								
Unidentified Egret				91					13	11	173	395
Purple Heron	4	3	3					600	300		78	
Grey Heron	135		10									1
Asian Openbill		4										86
Lesser Adjutant										201		162
Black-headed Ibis												
White Spoonbill												
Fulvous Whistling Duck												
Lesser Whistling Duck			51		3							
Greylag Goose								8	50	2200		
Bar-headed Goose												
Unidentified Goose												
Ruddy Shelduck												
Common Shelduck												
Comb Duck												
Cotton Pygmy Goose			14	6	2	6	2					
Eurasian Wigeon										14		
Falcated Teal												
Gadwall												
Common Teal												
Mallard												
Spotbill Duck												
Northern Pintail												
Garganey	140									90		
Northern Shoveler										60		
Red-crested Pochard												
Common Pochard												
Baer's pochard												
Ferruginous Duck												
Tufted Duck												
Greater Scaup												
Mandarin Duck												
Unidentified Ducks												
Water Rail										70		
Slaty-breasted Rail												
Ruddy Crane												
White-breasted Waterhen												
Watercock		2	6	5	1	2						
Moorhen	7		10		1					2		
Purple Swamphen	1		5	7								
Common Coot												
Unidentified Rails/Cranes												
Pheasant-tailed Jacana	4		53	16	10	5	5			105	26	9
Bronze-winged Jacana	3	1	11		3							
Painted Snipe			2									
Black-winged Stilt	1	10										
Avocet										18	2	64
Oriental Pratincole												
Small Pratincole									80			97
River Lapwing												
Grey-headed Lapwing	61	14	8									
Red-wattled Lapwing				1	6				18	53	34	63
Asiatic Golden Plover	40	7	88									
Grey Plover								64	16	5	3	40
Long-billed Plover												
Little Ringed Plover	6											
Kentish Plover											11	23
Mongolian Plover												
Greater Sand Plover								5				
Black-tailed Godwit												
Eurasian Curlew												

Waterfowl Counts, Feb92 to Jan 93, HAIL HAOR

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Spotted Redshank												
Redshank			2								3	
Marsh Sandpiper										15	2	6
Greenshank											1	
Normann's Greenshank												
Green Sandpiper		1										
Wood sandpiper	45	38	1				8	103	78	77	66	962
Terek Sandpiper												
Common Sandpiper						1				1		
Pintail Snipe	14	12						1				
Swinhoe's Snipe	2											
Common Snipe	55											
Asiatic Dowitcher								26	4	18	9	245
Little Stint												
Long-toed Stint												
Temminck's Stint	15											
Curlew Sandpiper												
Spoon-billed Sandpiper										3		3
Broad-billed Sandpiper												
Ruff	62											
Unidentified Waders										117		1286
Brown-headed Gull			8							35		1
Black-headed Gull												
Unidentified Gull												
Whiskered Tern			203					1	100	69		15
White-winged Tern												
Gull-billed Tern												
Indian river Tern												
Common Tern								1				
Black-billed Tern												
Little Tern												
Unidentified Tern												
Black-shouldered Kite												
Black Kite								12	4	1	12	156
Brahmany Kite					3	3	2	4	15	4	2	8
Pallas Fish Eagle		2										1
Gray-headed Fish Eagle	1					1						
Steppe Eagle	1	1										
White-rumped Vulture	29		10			4	4			2		2
Crested Serpent Eagle									1		1	1
Western Marsh Harrier	5								1	5		6
Eastern Marsh Harrier	1											
Pied Harrier	3	2	1					7	2	4	4	1
Osprey												
Eurasian Kestrel												
Northern Hobby			1									
Shikra							1					
Greater Spotted Eagle	1											
TOTAL WATERFOWL	770	222	932	177	127	224	252	992	726	3390	937	4736

CRB

NORTHEAST REGIONAL PROJECT-BANGLADESH
MONTHLY WATERFOWL COUNTS
FEBRUARY 1992 TO JANUARY 1993
HAIL HAOR FISH POND

COUNT DATES AND OBSERVERS

MONTH	DATE	OBSERVERS	MONTH	DATE	OBSERVERS
FEB	18.2.92	DAS, AZK	AUG	22.8.92	SMAR, AS
MAR	31.3.92	SMAR, AZK, AS	SEP	30.9.92	SMAR, AS
APR	29.4.92	DAS, SMAR, AS	OCT	24.10.92	SMAR, AS
MAY	30.5.92	SMAR, AKZ, AS	NOV	1.12.92	SMAR, AS
JUN	29.6.92	SMAR, AS	DEC	4.1.93	SMAR, AS
JUL	26.7.92	AZK, AS, IS	JAN	2.2.93	SMAR, AS

Waterfowl Counts, Feb92 to Jan 93, HAIL HAOR FISH POND

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Little Grebe	1	2	3		2							2
Great Crested Grebe												
Unidentified Grebe												
Great Cormorant												
Indian Shag												
Little Cormorant									1			
Unidentified Cormorant												
Oriental Darter												
Great Bittern												
Yellow Bittern												
Cinnamon Bittern			2				4	1				
Black Bittern												
Night Heron								1				
Little heron												
Indian Pond Heron	50	11	6		1	3	7	47	16	22	78	32
Chinese pond Heron												
Cattle Egret	1				2		24	1188	30		114	
Little Egret	10		4					4	15	4	7	13
Intermediate Egret									16	4		
Great Egret	40							60	12	1	32	1
Unidentified Egret									500			
Purple Heron												
Gray Heron									1			
Asian Openbill									1			
Lesser Adjutant											32	12
Black-headed Ibis												
White Spoonbill												
Fulvous Whistling Duck												
Lesser Whistling Duck	200	178	2		2		2	26	25			261
Greylag Goose												
Bar-headed Goose												
Unidentified Goose												
Ruddy Shelduck												
Common Shelduck												
Comb Duck												
Cotton Pygmy Goose					2							
Eurasian Wigeon												
Falcated Teal												
Gadwall	3											
Common Teal	3											
Mallard												
Spotbill Duck												
Northern Pintail												
Garganey	550	16										60
Northern Shoveler												
Red-crested Pochard												
Common Pochard												
Baer's pochard									2			
Ferruginous Duck												
Tufted Duck												
Greater Scaup												
Mandarin Duck												
Unidentified Ducks												
Water Rail												
Slaty-breasted Rail												
Ruddy Crake												
White-breasted Waterhen												
Watercock				1								
Moorhen	3											
Purple Swamphen												4
Common Coot												
Unidentified Rails/Crakes												1
Pheasant-tailed Jacana												
Bronze-winged Jacana											2	3
Painted Snipe												
Black-winged Stilt									13	11	18	
Avocet												
Oriental Pratincole									5			
Small Pratincole												
River Lapwing												
Grey-headed Lapwing										11	16	41
Red-wattled Lapwing					6						4	2
Asiatic Golden Plover	20		1									
Grey Plover							2					
Long-billed Plover												
Little Ringed Plover									4			
Kentish Plover												
Mongolian Plover										1		
Greater Sand Plover												
Black-tailed Godwit												
Bar-Tailed Godwit												2

1927

Waterfowl Counts, Feb92 to Jan 93, HAIL HAOR FISH POND

SPECIES	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Spotted Redshank											4	
Redshank										2		
Marsh Sandpiper										2		
Greenshank										2	2	
Normann's Greenshank											1	
Green Sandpiper	1	1							1	1		
Wood sandpiper	2	35										
Terek Sandpiper							1	32	206	68	114	90
Common Sandpiper			2									
Pintail Snipe		1						1	2	2		2
Swinhoe's Snipe												
Common Snipe	2											
Asiatic Dowitcher									90	13	6	26
Little Stint												
Long-toed Stint										1		
Dunlin												
Curlew Sandpiper												
Spoon-billed Sandpiper										2		
Broad-billed Sandpiper												
Ruff												
Unidentified Waders										20		
Brown-headed Gull											5	
Black-headed Gull												
Unidentified Gull												
Whiskered Tern												
White-winged Tern												
Gull-billed Tern												
Indian river Tern												
Common Tern												
Black-billed Tern												
Little Tern												
Unidentified Tern												
Black-shouldered Kite				2	2							
Black Kite							1	1				2
Brahminy Kite												38
Pallas Fish Eagle							2	2	2			3
Grey-headed Fish Eagle												
Steppe Eagle												
White-rumped Vulture												1
Crested Serpent Eagle												
Western Marsh Harrier												
Eastern Marsh Harrier										2		2
Pied Harrier												
Osprey									1	1		
Eurasian Kestrel		2										
Northern Hobby												
Peregrine Falcon												
Unidentified Raptors												
TOTAL WATERFOWL	886	246	20	3	17	3	43	1363	946	172	431	598



