Using Participatory Bird Survey to Assess Protected Area Management Impacts: *Baseline Report*

Nishorgo Support Project

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Prepared for

International Resources Group (IRG)

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June 2005

With partners: CODEC, NACOM & RDRS

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SUMMARY

The birds of five mixed-evergreen forest sites under Nishorgo Support Project (NSP), located in the northeast and southeast of Bangladesh, were surveyed from February to June 2005 (29 observation-days in the field), with active participation of the members of Bangladesh Bird Club (BBC) and the local communities living around these sites. The main aim of this survey was to assess impacts of co-management efforts. Strip transects sampling and opportunistic survey methods were followed in the field. Eight species of primarily forest birds were taken as indicators, and their population densities (no. of individuals/km^2) in each of the five sites were estimated. The indicator birds are Red Junglefowl (*Gallus gallus*), Oriental Pied Hornbill (*Anthracoceros albirostris*), Red-headed Trogon (*Harpactes erythrocephalus*), Greater Racket-tailed Drongo (*Dicrurus paradiseus*), White-rumped Shama (*Copsychus malabaricus*), Hill Myna (*Gracula religiosa*), White-crested Laughingthrush (*Garrulax leucolophus*) and Puff-throated Babbler (*Pellorneum ruficeps*), and their respective densities in five NSP sites were estimated as: Lawachara National Park – 7.17, 14.34, 3.87, 31.07, 89.99, 21.51, 0.00, 26.29; Rema-Kalenga Wildlife Sanctuary – 8.32, 9.25, 2.12, 36.59, 64.87, 10.99, 0.00, 18.98; Satchori Reserve Forest – 8.25, 15.25, 3.44, 33.00, 86.63, 12.38, 0.00, 33.00; Chunati Wildlife Sanctuary – 11.78, 0.00, 0.00, 9.96, 23.78, 7.57, 4.12, 9.76; and Teknaf Game Reserve – 6.33, 11.65, 1.06, 37.28, 18.98, 32.23, 0.00, 14.65. A total of 200 species of birds was recorded in five NSP sites, of which 170 (85%) were resident and the rest 30 (15%) migrant. Out of 200 species, 37 (19%) were Very Common, 64 (32%) Common, 36 (18%) Uncommon and 63 (31%) Rare. These results are the baseline, which will be compared with the results of repeated surveys to see if there is any change in the density of indicator birds and the overall species diversity of birds. If the densities of the indicator birds and the species diversity of birds are increased or decreased, that will indicate the improvement or degradation of the condition of the forest and biodiversity of the NSP sites.

Chapter 1

INTRODUCTION

USING PARTICIPATORY BIRD SURVEY TO ASSESS PROTECTED AREA MANAGEMENT IMPACTS: BASELINE REPORT

1. INTRODUCTION

Birds are not only the ornaments of nature, they play the key role in ecosystem functioning. They are relatively more visible and more responsive to any change in the habitat. Unlike other groups of organisms, birds are more colourful and attractive to people. These phenomena have made them one of the most suitable indicators of the ecological condition of the areas they live in.

Bangladesh is exceptionally rich in avifaunal diversity and abundance. Not only the avifauna, Bangladesh is unique in its biodiversity of genetic resources, both wild and domestic. The genetic resources comprise forest resources, agricultural crops, wildlife resources and wetland resources. In an area of only 147,570 km^2, Bangladesh harbors over 660 species of birds (Harvey 1990), including about 250 migratory species. Moreover, new species often adds to the list. This can be compared with the total number of bird species in the whole Europe, or the United Sates, each of which is about 800. The total number of bird species recorded in Bangladesh is about 50% of the total of the Indian Subcontinent, and about 7% of the world's total (Harvey 1990).

Despite the exceptional richness of avian diversity, and biodiversity in general, the natural forests and other wilderness areas of the country are under great pressure of legal and illegal overexploitation. People living around the forests are largely dependant on the forest products. Some people almost entirely subsist on the illegal harvest of the timber, bamboo and other forest products. The rate of forest loss in Bangladesh is one of the highest in the world. It is estimated that the forest cover has been reduced to more than 50% since the 1970s (IUCN-Bangladesh 2000). Estimates in 1990 revealed that Bangladesh had less than 0.02 ha of forest land per person – one of the lowest forests to population ratios in the world (IUCN Bangladesh 2000).

The urgent need to conserve the remaining natural forests and their habitants, while developing non-consumptive use of the forests at the same time, gave rise to a unique project, i.e., Nishorgo Support Project (NSP). This is a five-year project of the Forest Department (FD) of Bangladesh, which is financially supported by the United States Agency for International Development (USAID). The project is being implemented by the International Resources Group (IRG), with three local partners, i.e., Community Development Center (CODEC), Nature Conservation Management (NACOM), and Rangpur-Dinajpur Rural Services (RDRS). The project aims at improving the condition of the forest and biodiversity, together with the development of ecotourism, under active participation of the local communities. This will eventually develop a co-management system involving the local communities with the Forest Department.

The project has taken five protected areas in the mixed-evergreen forests located in the northeast (Lawachara National Park, Rema-Kalenga Wildlife Sanctuary and Satchori Reserve Forest) and southeast (Chunati Wildlife Sanctuary and Teknaf Game Reserve) of Bangladesh. Very few studies have taken place on birds of the mixed-evergreen forests of the country. The first report on the birds of a mixed-evergreen forest region of Bangladesh (Chittagong) was by Simmons (1948). Later on, Husain (1968) reported the birds of Chittagong Hill Tracts, Das (1973) studied the birds of Sylhet, Choudhury (1979) listed the wildlife (mammals and birds) of Chittagong Hill Tracts; Husain (1975), and Husain and Haque (1976) reported the birds of Pablakhali Wildlife Sanctuary, Chittagong Hill Tracts; and Husain et al. (1990) reported the birds of Dulahazra Safari Park, Cox's Bazar. Rashid (1967), Husain (1967, 1979), Khan (1982), Sarker and Sarker (1988), Harvey (1990), and Thompson and Johnson (1996) have produced lists of birds in Bangladesh where they have indicated that many of the species are found in the mixed-evergreen forests. Subsequent reports on notable birds (Thompson et al. 1993, Thompson and Johnson 2003) have updated the knowledge of the status and distribution of many species of birds found in the mixed-evergreen forests of Bangladesh.

Like any other project, this project requires an assessment of the level of success or failure. Surveying the population density of some selected birds as indicators, and the status of avian species diversity, came as the most convenient and useful tool for assessment. This is also a way to enrich our understanding and knowledge about the birds living in the mixed-evergreen forests. The participatory bird survey had the following aims –

- Develop a coordinated approach for the survey of population density of several selected bird species, and the overall bird species diversity, to assess impacts of co-management efforts.
- Train the participants of the survey team about the survey method and identification of birds.
- Raise awareness for rare bird species in need of more effective management/conservation efforts.
- Raise awareness of the general public, especially the stakeholders living around the project sites, to the status of birds and the importance of conservation.

Chapter 2

PROJECT SITES

2. PROJECT SITES

A total of five protected areas were selected from the northeast and southeast of Bangladesh. Bangladesh is a small sub-tropical country in South Asia. The country became independent in 1971. Geographically the country is located between 20º34′-26º33′ N latitudes and 88º01′-92º41′ E longitudes. The Tropic of Cancer passes through the middle of the country. Bangladesh is almost entirely surrounded by India, which borders Bangladesh to the west, north and east. Bangladesh shares a portion of its southeastern border with Myanmar (Burma). The Bay of Bengal lies to the south. The total area of the country is 147,570 km^2, where around 140 million people live. This is one of the most densely populated areas in the world.

According to IUCN-Bangladesh (2000), the climate of Bangladesh is tropical monsoon, characterized by marked seasonal variations. Abundant rainfall during the monsoon (July-October) is followed by a cool winter period (November-February), then a hot and dry summer (March-June). In the hot season, the average maximum and minimum temperatures are 34ºC and 21ºC, respectively. The average maximum and minimum temperatures in winter are 29ºC and 11ºC, respectively. The rainfall in the region shows great temporal and spatial variations. It is estimated that 70-80% of the annual rainfall occurs during the monsoon season. The average annual rainfall recorded within Bangladesh varies from 1,100 mm in the extreme west to 5,690 mm in the northeastern corner of the country.

Bangladesh has an exceptional hydrological setting. Three mighty rivers, the Ganges (Padma), the Brahmaputra (Jamuna) and the Meghna, drain a catchment extending over India, China, Nepal, Bangladesh and Bhutan. The total area of the Ganges-Brahmaputra-Meghna drainage basin is about 1,500,000 km2, of which about 62% is in India, 18% in China, 8% in Nepal, 8% in Bangladesh, and 4% in Bhutan. Ninety percent of the total incoming water runs into the Bay of Bengal through the lower Meghna estuary of Bangladesh. The rate of water flow through Bangladesh is vast. The outflow is the second in the world after the Amazon river

system in South America. In both breadth and total annual volume, the Padma-lower-Meghna river is the 3rd largest in the world.

Bangladesh can be divided into three main physiographic divisions – Tertiary hills, Pleistocene terraces and recent plains. The Tertiary hills are situated in Greater Chittagong and Chittagong Hill Tracts, and Sylhet areas. These hills are mainly formed of sandstone, shale and clay. The average altitude of the hills is 450 m. The highest peak of the country is Keokradong at 967 m. The Pleistocene terraces were formed 25,000 years ago. The total area of these terraces is about 13,500 km2 spread in different areas of the country, but mainly in the central and north-eastern regions. The average height of the terraces from the adjacent floodplains is 6-25 m. The recent plains comprise 124,266 km2 of the country (about 86%), i.e. the major portion of Bangladesh, and these can be further classified to piedmont, flood, deltaic, tidal and coastal plains.

According to the Forestry Master Plan (Ministry of Environment and Forests, Government of Bangladesh, 1993), there are 15.4% of the total area of the country are forests, of which 10.3% are classified and 5.1% are unclassified state forests, but according to unofficial sources, the natural forest of the country is as low as 5%. There are three classes of natural forests in Bangladesh: a) mangrove forests – situated in the south-west, b) mixed-evergreen forests – situated in the north-east and south-east, and c) moist deciduous forest – situated in the central, northern and north-western regions of the country (Figure 1). In the past three decades, the stock of forest trees has declined at an alarming rate. There are 15 protected areas in Bangladesh (Table 1), with a total area of 2,258.0 km2, covering only 1.5% of the total area of Bangladesh.

The country has a rich biological heritage as a consequence of its location at the confluence of the three major biotic regions – the Himalayas, Indo-China and the Indian Peninsula (MacKinnon and MacKinnon 1986). A total of 259 inland fishes, 442 marine fishes, 22 amphibians, 108 inland reptiles, 17 marine reptiles, 391 resident birds, 240 migratory birds, 110 inland mammals and 3 marine mammals has been recorded in Bangladesh (IUCN-Bangladesh 2000).

Table 1. Protected Areas of Bangladesh

Sl. No.	Name of Protected Area	Geographic Location	Name of District in Which Located	Year of Establishment/ Notification	Area (km^2)
National Park					
1	Madhupur	24°45′ N, 90°06′ E	Tangail	1962/1982	84.4
2	Bhawal	24°00′ N, 90°20′ E	Gazipur	1974/1982	50.2
3	Lawachara	24°15′ N, 91°45′ E	Moulvibazar	-/1996	12.5
4	Himchari	21°22′ N, 92°02′ E	Cox's Bazar	-/1980	17.3
5	Kaptai	22°30′ N, 92°20′ E	Rangamati	-/1974	30.3
6	Meda Kacchapia	21°38′ N, 92°03′ E	Cox's Bazar	-/2004	3.9
Wildlife Sanctuary					
7	Sundarbans East	21°47′-22°03′ N, 89°44′-89°56′ E	Bagerhat	1960 (part)/1996	312.3
8	Sundarbans South	21°39′-21°56′ N, 89°17′-89°30′ E	Khulna	-/1996	369.7
9	Sundarbans West	21°38′-21°58′ N, 89°00′-89°15′ E	Satkhira	-/1996	715.0
10	Char Kukri-Mukri	21°55′ N, 90°38′ E	Bhola	-/1981	0.4
11	Rema-Kalenga	24°05′ N, 91°37′ E	Habiganj	-/1996	18.0
12	Pablakhali	23°08′ N, 92°16′ E	Rangamati	1962/1983	420.9
13	Chunati	21°40′ N, 92°07′ E	Chittagong and Cox's Bazar	-/1986	77.6
14	Hazarikhil	22°40′ N, 91°40′ E	Chittagong	-/1974	29.3
Game Reserve					
15	Teknaf	21°00′ N, 92°20 E′	Cox's Bazar	-/1983	116.2
				Total protected area =	2,258.0

A total of five sites were initially selected for the implementation of the objectives, of which one is national park (Lawachara), two wildlife sanctuaries (Rema-Kalenga and Chunati), one game reserve (Teknaf) and one reserve forest which is a proposed national park (Satchori). All of these areas are located in the mixed-evergreen forest belts in the northeast (Habiganj and Moulvibazar Districts) and southeast (Chittagong and Cox's Bazaar Districts), although the mixed-evergreen forests have largely been destroyed and converted, but these areas still have some rich patches of mixed-evergreen forests. Recently, a new site (Sitakunda Ecopark, Chittagong) has been added, but field activities are yet to start. The five sites where the bird survey took place are –

2.1 Lawachara National Park

This is an area of 12.5 km^2 situated in Srimangal and Kamalganj Upazillas (sub-districts) of Moulvibazar District (Figure 2). The core area is an excellent compact forest of old plantations dating from the 1920s, which has now mixed up with naturally generated vegetation and the entire area now resemble a natural forest. Most of the species are of evergreen type, dominated by 'chapalish' (*Artocarpus chaplasha*), 'civit' (*Swintonia floribunda*), 'shimul' (*Bombax insignis*), fig (*Ficus* spp.), 'jam' (*Syzygium* spp.) and bamboo (*Bambusa* sp. and *Melocanna* sp.). This is one of the most popular birding areas of the country. However, the core area of this forest is surrounded by monoculture plantations of teak (*Tectona grandis*) and malakana (*Albizia malakana*), which are not good habitats for birds. Lawachara is the best forest to watch Hoolock Gobbon (*Bunipithecus hoolock*). Other important wildlife are Capped Langur (*Trachypithecus pileatus*), Pig-tailed Macaque (*Macaca nemestrina*), Orange-bellied Himalayan Squirrel (*Dremomis lokriah*), Barking Deer (*Muntiacus muntjac*) and Masked Civet (*Paguma larvata*). The surrounding habitants are mainly of Khasia tribal communities. These people often harvest the forest products, but their main subsistence is the cultivation of betel leaf, lemon and pineapple. Some of them work in the nearby tea estates. The forest is surrounded by tea estates. Magurchara Gas Field, and the gas processing plant, are in two ends of the National Park. A total of six transects were selected for the survey, which are given in Table 2.

2.2 Rema-Kalenga Wildlife Sanctuary

This is probably the most remote site among five NSP sites, but this remoteness is probably the main reason why such a luxuriant patch of mixed-evergreen forest still exists. It requires about 10 km of risky drive through damaged roads of the hill forests. This is an elongated strip of land along the Bangladesh-India border. The total area is 18.0 km^2 in Chunarughat Upazilla of Habiganj District (Figure 3). A nice watchtower is situated at the northwestern end of the Sanctuary (24°10.7′ N latitude and 91°37.6′ E longitude), besides a wetland. This is mainly a natural forest of evergreen trees mixed with some deciduous trees, but there are some

pockets of grasslands and ditches that make the habitat more diversified and suitable for wildlife. The forest is dominated by 'chapalish' (*Artocarpus chaplasha*), 'civit' (*Swintonia floribunda*), 'shimul' (*Bombax insignis*), 'jam' (*Syzygium* spp.), fig (*Ficus* spp.), 'hargaza' (*Dillenia pentagyna*) and bamboo (*Bambusa* sp. and *Melocanna* sp.). Rema-Kalenga is the forest where Malayan Giant Squirrel (*Ratufa bicolor*) is seen very often. Other important wildlife of the area are Leopard (*Panthera pardus*), Phayre's Langur (*Trachypithecus phayrei*) and Masked Civet (*Paguma larvata*). The people live around this Sanctuary are mainly non-tribal 'Bangalis', but there are people of ethnic Tripura, Khasia and Urang tribes as well. Their livelihood depends mainly on the cultivation of paddy in the nearby plain lands and working in the nearby tea estates. A total of four transects were selected for the survey, which are given in Table 2.

2.3 Satchori Reserve Forest

This is a small patch (2.4 km^2) of intact mixed-evergreen forest, located in Chunarughat Upazilla of Habiganj District (Figure 4). The area is roughly like a triangle, with one angel ended towards Bangladesh-India border. The forest stands on an area that had a forest even thousands of years ago. Fossilized tree trunks are often found in the area. At present the forest is dominated by 'chapalish' (*Artocarpus chaplasha*), 'civit' (*Swintonia floribunda*), 'shimul' (*Bombax insignis*), fig (*Ficus* spp.) and bamboo (*Bambusa* sp. and *Melocanna* sp.). Satchori is the area where Asiatic Black Bear (*Ursus thibetanus*) is seen quite frequently. Other important wildlife are Hoolock Gibbon (*Hylobates hoolock*), Phayre's Langur (*Trachypithecus phayrei*) and Barking Deer (*Muntiacus muntjak*). There is only one village of ethnic Tripura tribes, living at the border of the forest. They cultivate lemon and pineapple in the hills, and work in the tea estates. The bamboo and other forest products are illegally harvested mainly by 'Bangalis' coming from outside. The forest is almost entirely surrounded by tea estates. A total of three transects were selected for the survey, which are given in Table 2.

2.4 Chunati Wildlife Sanctuary

Although this Sanctuary is quite big (77.6 km^2), this is the most degraded site among the five NSP sites, located in Lohagara and Bahskhali Upazillas of Chittagong District and Chakaria Upazilla of Cox's Bazar District (Figure 5). There are two partially damaged watchtowers at the top of two hills (21°55.3′ N latitude and 92°02.7′ E longitude), one beside the other. The hills are quite high (50-100 m from the sea level). These hills were once covered by giant trees like 'garjan' (*Dipterocarpus* spp.) and 'chapalish' (*Artocarpus chaplasha*), but now they have almost entirely been cleared out by illegal felling. Only in Banopukur area of the Sanctuary, a small patch of giant 'garjan' still stands to remind us that once there were many trees in that area. Now the hills are covered mainly by a number of species of dwarf bamboo (*Melocanna* spp., *Bambusa* spp. and *Teinostachyum* spp.), reeds (*Phragmites* spp., *Saccharum* spp., etc.), wild banana (*Musa* spp.) and many other dwarf and scrubby vegetation. The most important wildlife of the area is Asian Elephant (*Elephas maximus*), but there are Wild Boar (*Sus scrofa*), Rhesus Macaque (*Macaca mulatta*) and some other wildlife as well. The habitants of the area are non-tribal 'Bangalis'. Their main subsistence are agriculture (paddy, lemon and betel leaf) and fish farming, but some of them illegally harvest the bamboo and other forest products. A total of five transects were selected for the survey, which are given in Table 2.

2.5 Teknaf Game Reserve

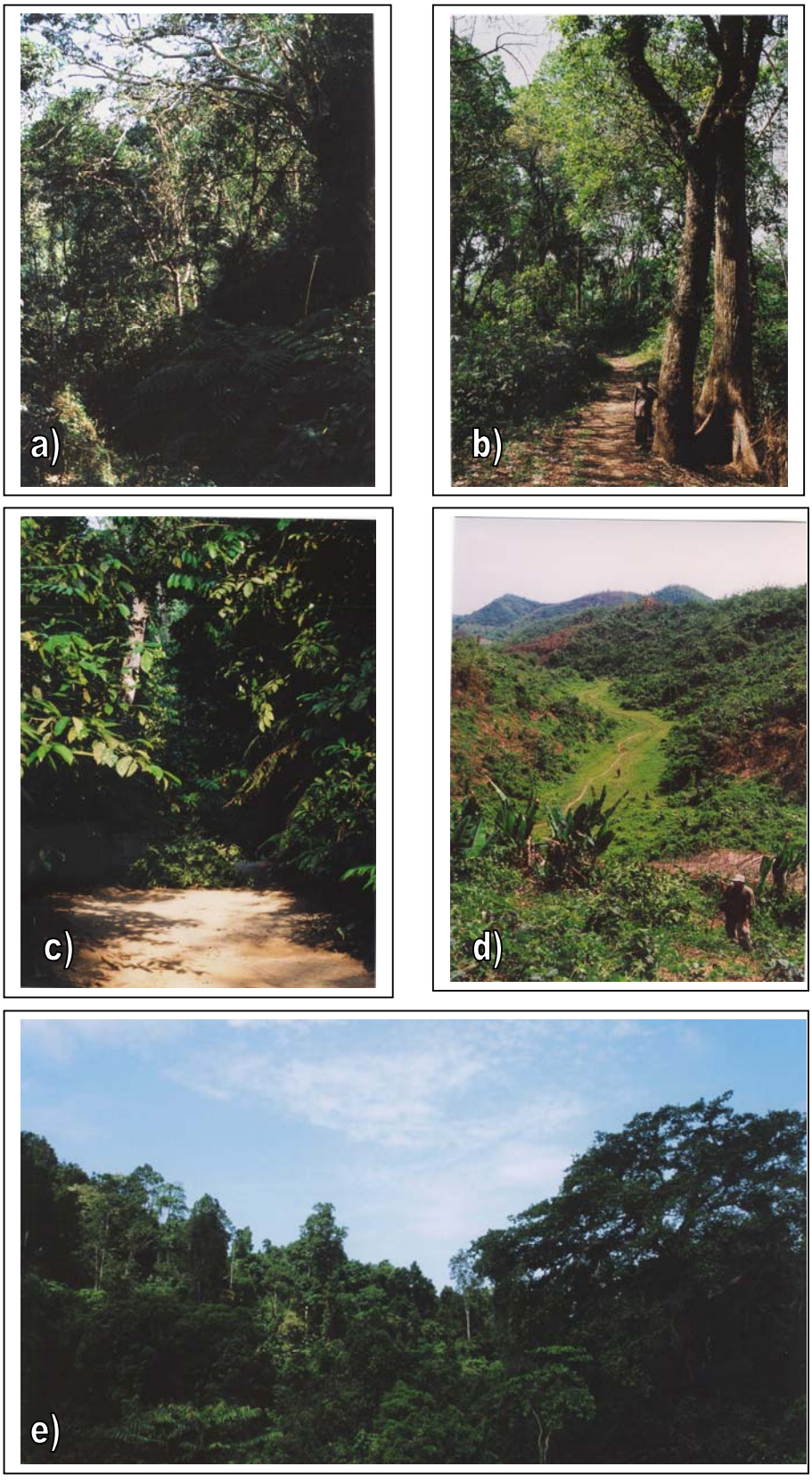
This is the largest (116.2 km^2) and most undulated area, with steep terrain, among the five NSP sites (Figure 6). According to the Bangladesh Wildlife Act 1974, a permit-holder can hunt game animals in a Game Sanctuary. Being the only Game Sanctuary of the country, there is no legal game hunting in this area. The hills are much higher than the other four sites, with the height of 100-150 m from the sea level. Toynga Hill is highest hill in the areas we surveyed, with the height of 200 m. Other than the wildlife and plants, there are three tourist attractions in this Game Reserve. In Toynga Hill there is a wonderful cliff called Cooty (21°04.5′ N latitude and 92°11.9′ E longitude). In ancient time this was a sea-bed (salt layers and

marine shells are found in the deposits), which is now at a high hill, showing different layers of sand deposition on a concave surface. In the same hill there is a small waterfall (21°04.9′ N latitude and 92°11.7′ E longitude). In the northern end of the Game Reserve there is a natural cave called Kudum Cave (21°05.2′ N latitude and 92°10.2′ E longitude), located in Kudum Hill. The area still has some luxuriant patches of mixed-evergreen forests, with tall 'civit' (*Swintonia floribunda*), 'chapalish' (*Artocarpus chaplasha*), 'garjan' (*Dipterocarpus* spp.), 'shimul' (*Bombax insignis*), 'uriam' (i.e., wild mango, *Mangifera longipes*), fig (*Ficus* spp.) and many other trees, including 'ashok' (*Saraca indica*), a popular medicinal plant. Among the wildlife, Asian Elephant (*Elephas maximus*) is the most important, but there are Wild Boar (*Sus scrofa*), Clouded Leopard (*Neofelis nebulosa*), Hog-badger (*Arctonyx collaris*) and many other wildlife. The people live around this area are non-tribal 'Bangalis', with some ethnic Chakma and Mogh tribes. A total of five transects were selected for the survey, which are given in Table 2.

Table 2. Strip transects in five sites of Nishorgo Support Project (NSP)

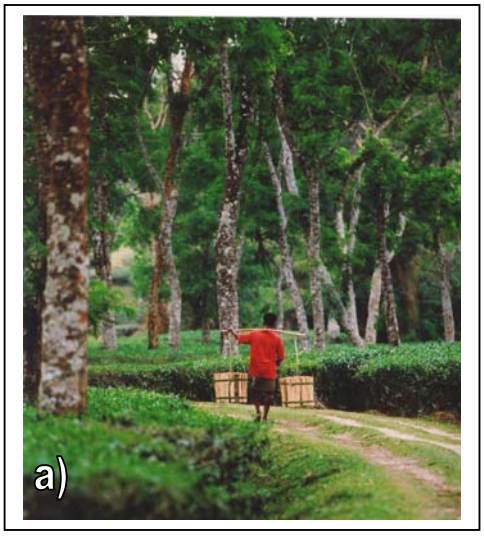
Name of Project Site	Name of Transect	Location in Project Site	Geographic Locations of Two Ends	Landmarks at Two Ends	Length (km)
Lawachara National Park	Magurchara	Eastern	24°19.9′ N, 91°47.6′ E; 24°20.2′ N, 91°47.5′ E	Gasfield, stream	0.50
	Train Line	Central	24°19.7′ N, 91°47.2′ E; 24°19.8′ N, 91°47.5′ E	Signboard, metalled road	0.61
	Rest House	Central	24°19.8′ N, 91°47.2′ E; 24°20.2′ N, 91°47.2′ E	Sharp turn, culvert	0.50
	Tea Estate	Central	24°19.5′ N, 91°47.2′ E; 24°19.7′ N, 91°47.6′ E	Bus stand, tea estate	0.70
	Lawachara Punji	Western	24°19.2′ N, 91°47.1′ E; 24°19.4′ N, 91°46.8′ E	Three large trees, betel-leaf plantation	0.52
	Jankichara	Western	24°18.8′ N, 91°46.4′ E; 24°19.1′ N, 91°46.9′ E	Jankichara Forest Office, 'Mofi' Point	0.89
Rema-Kalenga Wildlife Sanctuary	Watchtower	Northern	24°10.7′ N, 91°37.6′ E; 24°09.6′ N, 91°38.0′ E	Watchtower, Chharabari	2.02
	Chharabari	Central	24°09.6′ N, 91°38.0′ E; 24°09.8′ N, 91°37.5′ E	Chharabari, paddy field	0.78
	Chhanbari	Northern	24°10.2′ N, 91°37.5′ E; 24°10.3′ N, 91°37.9′ E	Chhanbari, slope	0.80
	Rema	Southern	24°06.9′ N, 91°37.5′ E; 24°06.4′ N, 91°37.8′ E	Large 'chapalish' tree, BDR camp	1.11

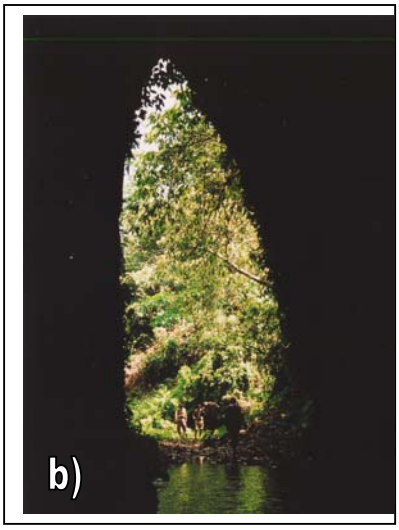
Satchori Reserve Forest	Satchori West	Central	24°07.5′ N, 91°26.7′ E; 24°06.6′ N, 91°27.2′ E	'Wilderness' signboard, teak plantation	1.94
	Satchori East	Central	24°07.6′ N, 91°27.0′ E; 24°07.3′ N, 91°27.2′ E	Sloppy passage, open grassland	0.56
	Satchori North	Northern	24°07.4′ N, 91°26.7′ E; 24°07.5′ N, 91°27.0′ E	Lemon plantation, metalled road	0.50
Chunati Wildlife Sanctuary	Two Towers	Eastern	21°55.4′ N, 92°03.5′ E; 21°55.3′ N, 92°02.7′ E	Metalled road, second tower	1.41
	Banyan Tree	Central	21°55.3′ N, 92°02.7′ E; 21°55.5′ N, 92°02.3′ E	Second tower, banyan tree	0.76
	Hindur Jhiri	Eastern	21°55.7′ N, 92°02.5′ E; 21°56.1′ N, 92°03.5′ E	Hindur Jhiri, brick field	1.91
	Banopukur South	Northern	21°57.3′ N, 92°04.1′ E; 21°57.2′ N, 92°03.7′ E	Mosque, western 'garjan'	0.65
	Banopukur North	Northern	21°57.2′ N, 92°03.7′ E; 21°57.4′ N, 92°04.0′ E	Western 'garjan', farm	0.65
Teknaf Game Reserve	Kudum North	Northern	21°05.8′ N, 92°09.8′ E; 21°05.2′ N, 92°10.2′ E	NSP signboard, Kudum cave	1.25
	Kudum South	Northern	21°05.2′ N, 92°10.2′ E; 21°05.4′ N, 92°09.5′ E	Kudum cave, mahogany plantation	1.27
	Shukna Amtoli	Northern	21°06.3′ N, 92°11.7′ E; 21°05.5′ N, 92°10.8′ E	Dead banyan tree, 'jhum' cultivation	0.74
	Toynga	Central	21°05.2′ N, 92°11.9′ E; 21°03.9′ N, 92°11.6′ E	Wooden bridge, Toynga Hill peak	2.49
	Cooty	Central	21°03.9′ N, 92°11.6′ E; 21°04.5′ N, 92°11.9′ E	Toynga Hill peak, Cooty cliff	1.21

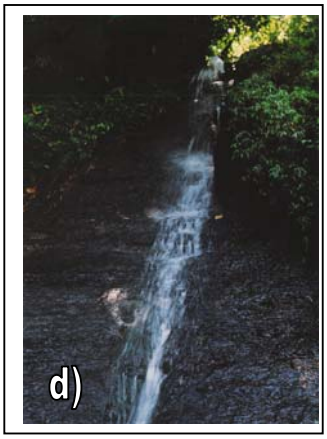


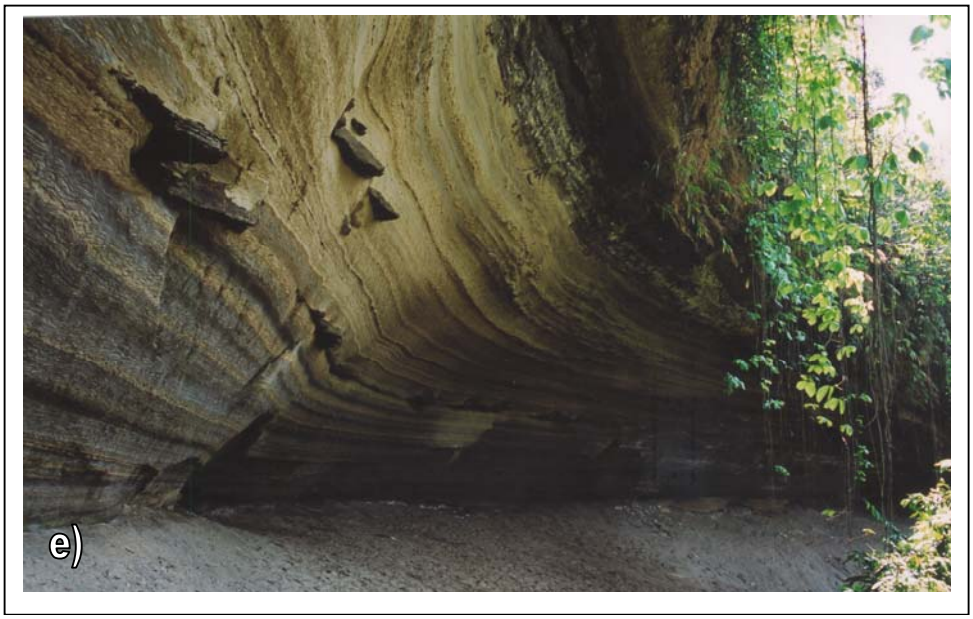
View of five NSP sites: a) Lawachara National Park, b) Rema-Kalenga Wildlife Sanctuary, c) Satchori Reserve Forest, d) Chunati Wildlife Sanctuary, and e) Teknaf Game Reserve.

Plate 1









Tourist attractions in NSP sites: a) Rema Tea Estate beside Rema-Kalenga, b) Kudum Cave in Teknaf, c) Toynga Hill in Teknaf, d) Waterfall in Kudum Hill, Teknaf, and e) Cooty Cliff in Kudum Hill, Teknaf.

Human cultures in NSP sites: a) Ethnic Urang tribal boy and girl as ‘Radha’ and ‘Krishna’ in Satchori, b) A girl plucking tobacco leaves in Teknaf, c) Three ethnic Chakma tribal women watching their ‘jhum’ cultivation in Teknaf, d) Tree-house in Chunati used to take shelter from wild elephants, and e) Concrete tower as the substitute of tree-house since there is no tree left in the area.

Plant diversity in NSP sites: a) tree fern (*Alsophila* sp.) in Chunati, b) wild banana (*Musa* sp.) in Chunati, c) 'ashok' (*Saraca indica*) flowers in Teknaf, and d) wild jasmine (*Jasminum* sp.) in Teknaf.

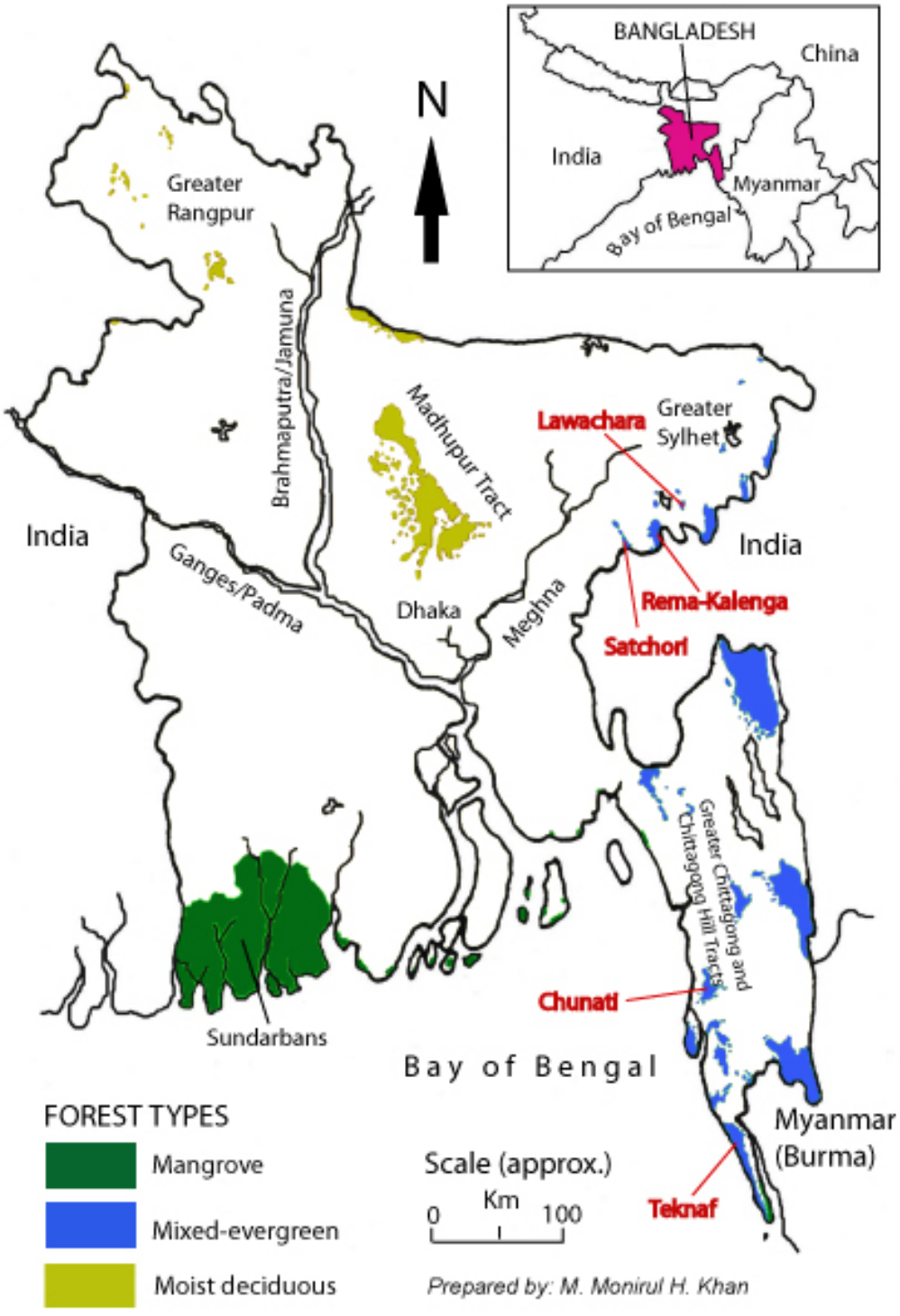


Figure 1. Forested areas of Bangladesh showing the locations of five sites under Nishorgo Support Project (NSP).

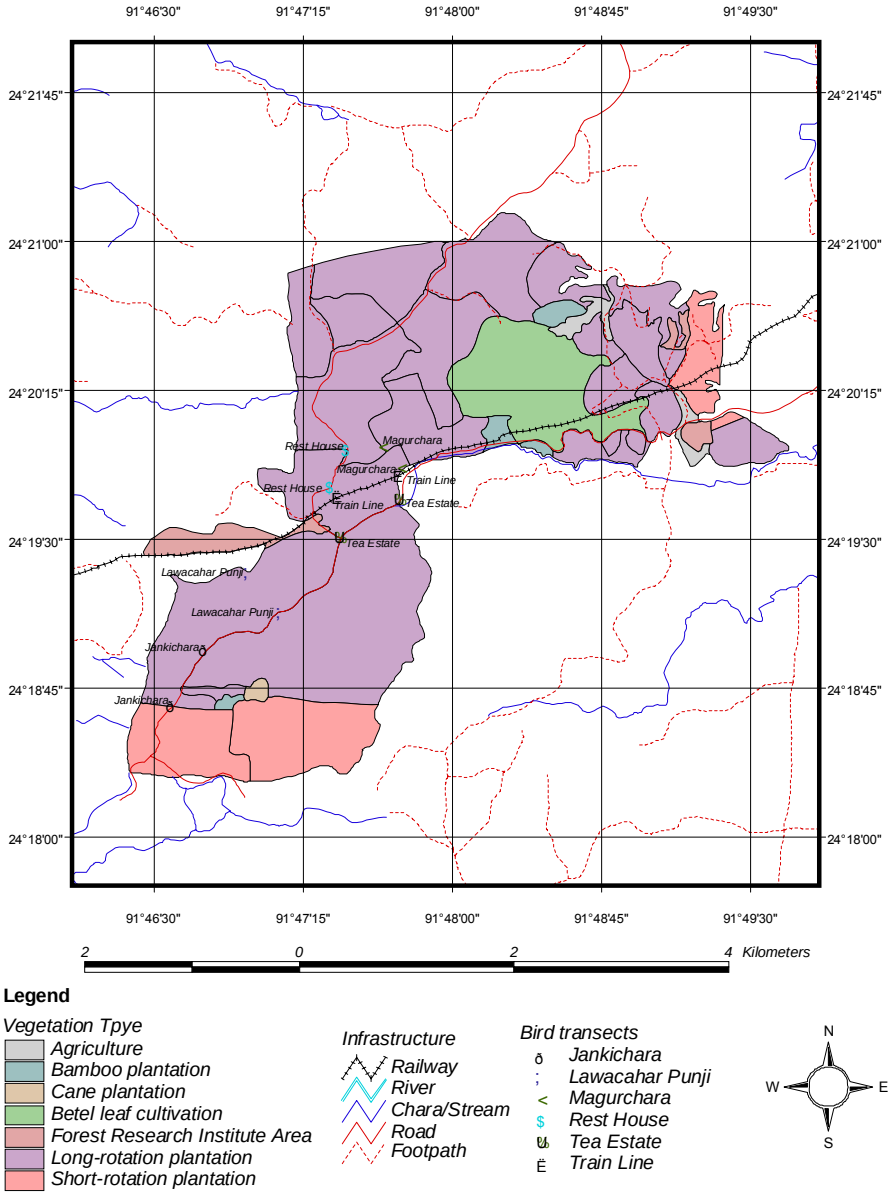


Figure 2. Lawachara National Park showing the starting and ending points of bird survey transects

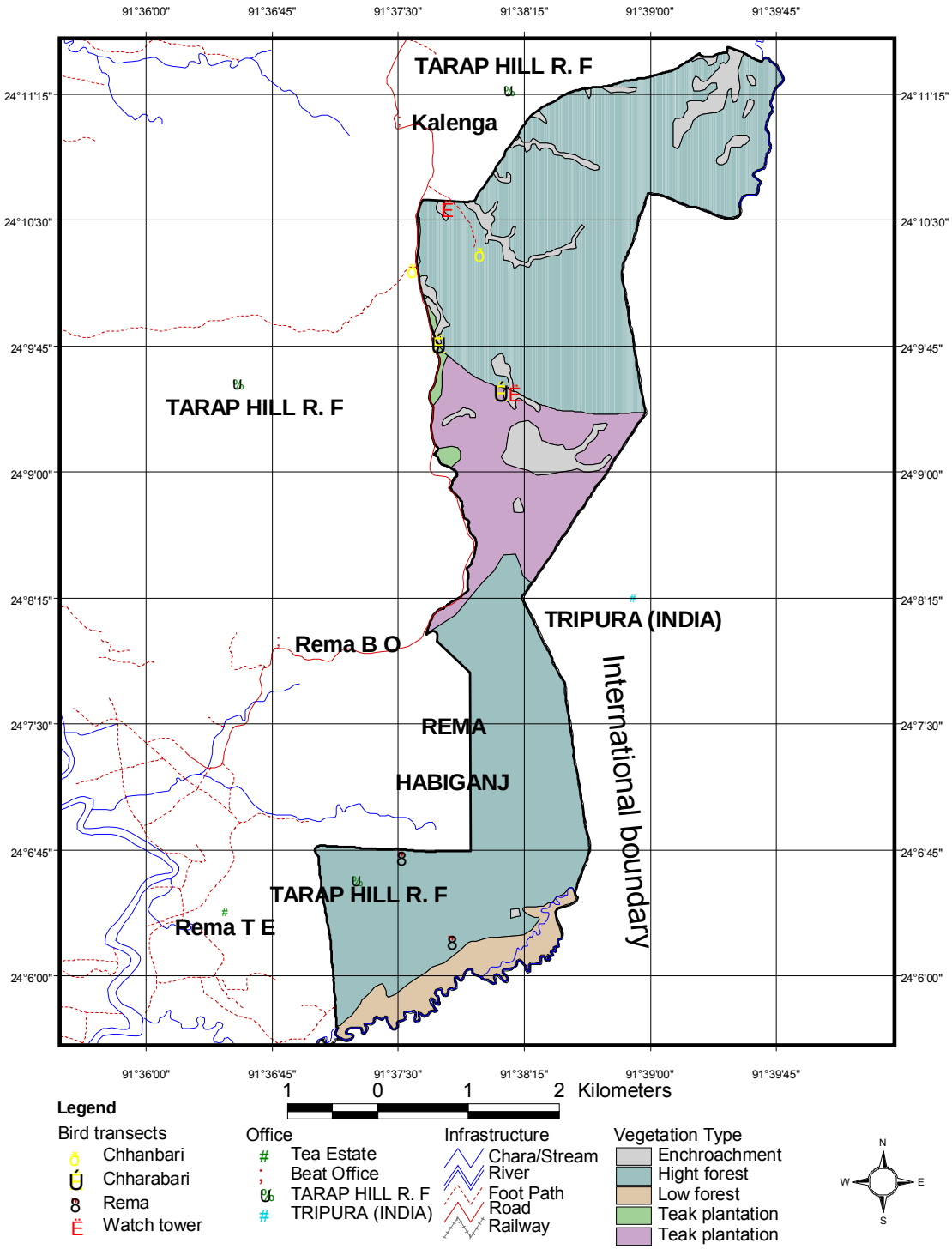


Figure 3. Rema-Kalenga Wildlife Sanctuary showing the starting and ending points of bird survey transects

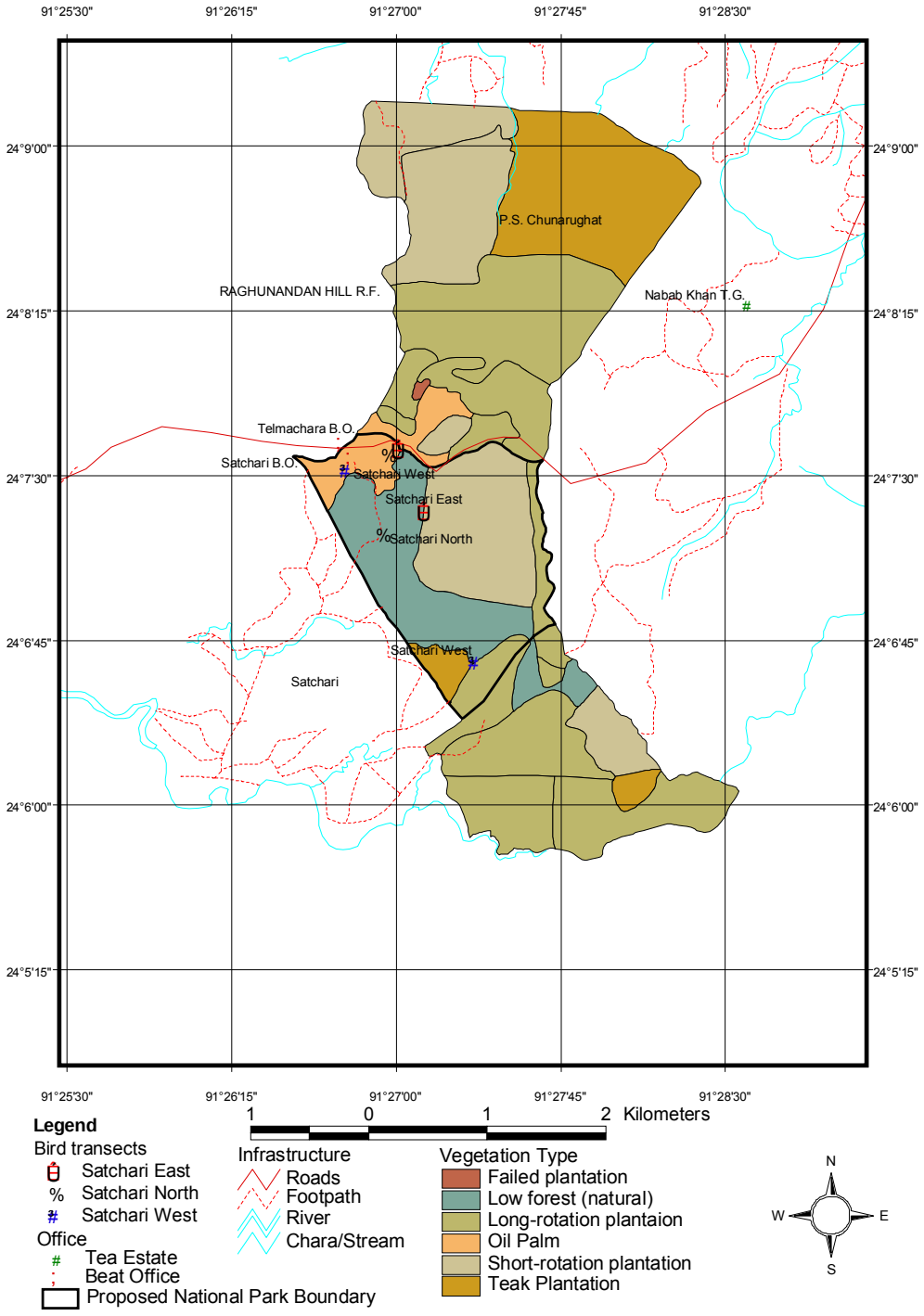


Figure 4. Satchori Reserve Forest showing the starting and ending points of bird survey transects

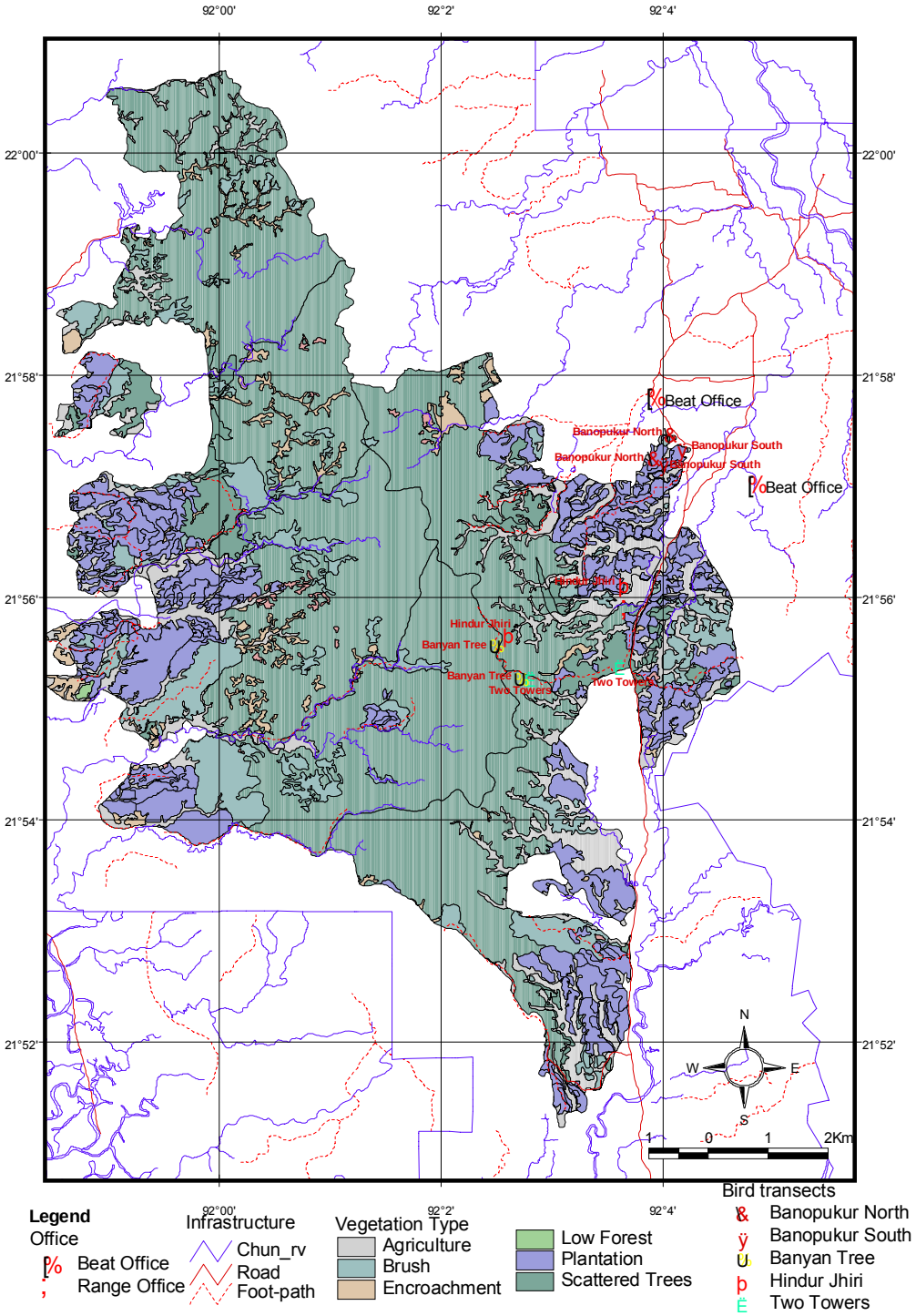


Figure 5. Chunati Wildlife Sanctuary showing the starting and ending points of bird survey transects

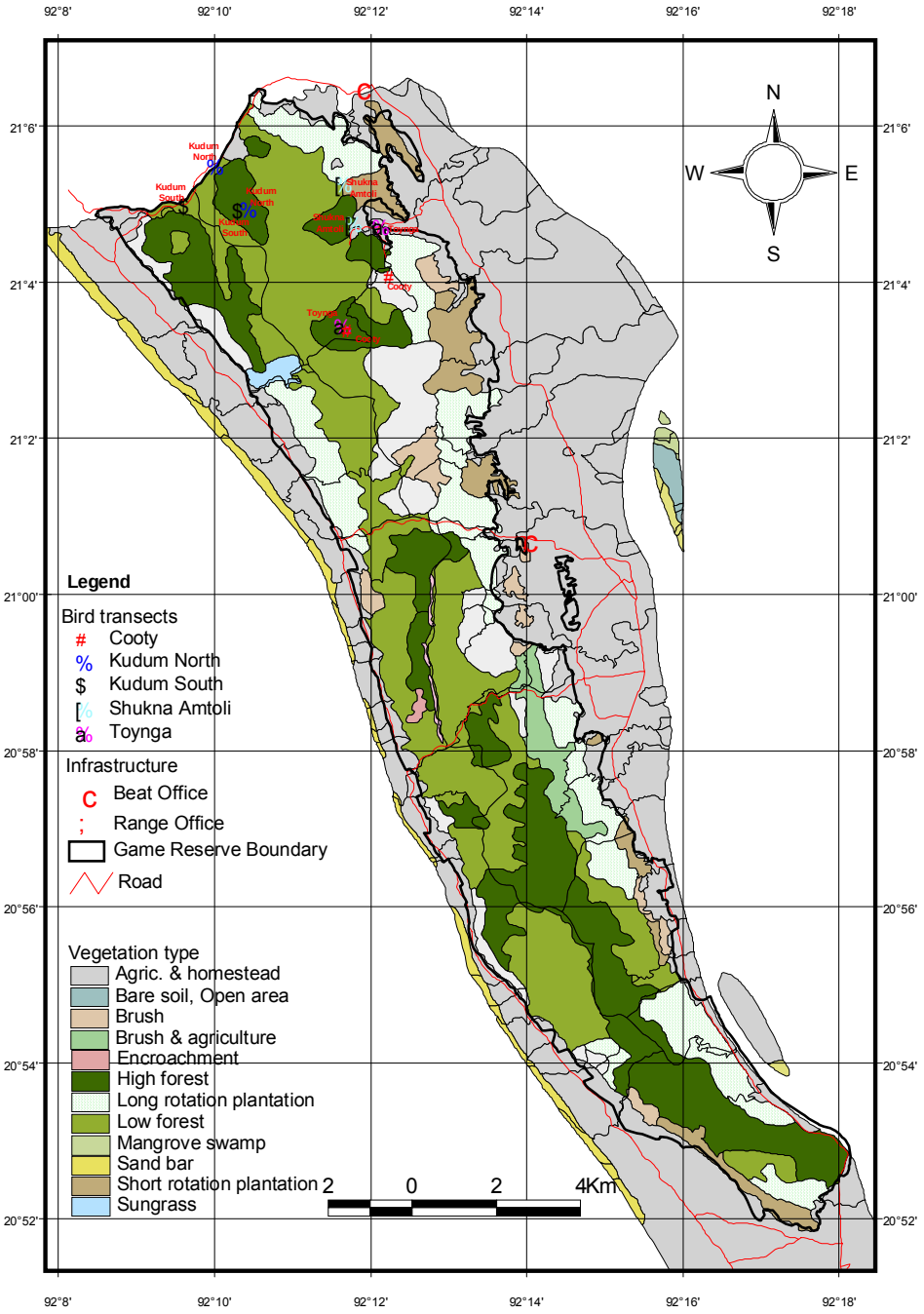


Figure 6. Teknaf Game Reserve showing the starting and ending points of brid survey transects

Chapter 3

MATERIALS AND METHODS

3. MATERIAL AND METHODS

3.1 Material Used

Since the survey was conducted through simple methods, no sophisticated equipment was needed for the data collection and analyses. A few things were required in the filed, such as some binoculars for better observation and identification of birds, books (field guides) on birds for identification, a GPS (Geographic Positioning System; Garmin 12XL) to mark the start and end points of each transect, and to measure the distance of each transect, a compass to make sure that the survey team is walking straight (roughly), and standard data sheets (see Appendix I) to record the raw data in the field. Moreover, for professional photographs and video clips, two Nikon F80 camera bodies, two Nikkor lenses (300 mm and 28-105 mm), one Nikon SB-24 flashgun, one Panasonic NVGS-11 MiniDV with a tripod were used.

3.2 Selection of Indicator Birds

A total of eight species of birds were selected as indicators for assessment of the overall condition of the wilderness (Table 3). As per the framework proposed by Nasim Aziz (NSP-Monitoring Specialist), these eight species were suggested on a meeting of bird experts (including Enam ul Haque and Paul Thompson), organized at IRG. These birds were selected because: 1) these are primarily forest birds, 2) each of these lives in different canopies, i.e., different strata, of the forest, 3) these are noisy birds, so easy to spot, and 4) these are resident birds.

Table 3. Eight indicator bird species of different canopies of the forest

Sl. No.	English Name	Scientific Name	Forest Canopy Where it Lives
1	**Red Junglefowl**	***Gallus gallus***	**Lower canopy**
2	**Oriental Pied Hornbill**	***Anthracoceros albirostris***	**Upper canopy**
3	**Red-headed Trogon**	***Harpactes erythrocephalus***	**Middle canopy**
4	**Greater Racket-tailed Drongo**	***Dicrurus paradiseus***	**Middle canopy**
5	**White-rumped Shama**	***Copsychus malabaricus***	**Middle canopy**
6	**Hill Myna**	***Gracula religiosa***	**Upper canopy**
7	**White-crested Laughingthrush**	***Garrulax leucolophus***	**Lower canopy**
8	**Puff-throated Babbler**	***Pellorneum ruficeps***	**Lower canopy**

3.3 Survey Team

The survey team was formed by participants from Bangladesh Bird Club (BBC) and the local communities living around or close to the project sites. BBC is an informal club of active amateur birdwatchers who are based in Dhaka, but frequently visit the wilderness areas of the country. Mr. Enam Ul Haque, the prominent birdwatcher of the country is the informal leader of BBC. The whole survey team was lead by a wildlife expert (Dr M. Monirul H. Khan) from Jahangirnagar University, Savar, Dhaka. See Appendix II for the names and addresses of the survey team members.

3.4 Training Programs on Bird Survey

Two training programs were organised on bird survey, one in Srimangal, Moulvibazar, where the local participants from Lawachara, Rema-Kalenga and Satchori regions were attended, and another was in Ukhia, Cox's Bazar, for participants from Chunati and Teknaf regions (see Appendix II for the list of participants). Each of the training programs was for three days. The first day was in the classroom and the next two days were in the field in order to do some practical exercise, and part of the actual survey. The training programs were organised just before the commencement of the actual survey. Dr M. Monirul H. Khan was the main resource person for the training programs, but people from IRG (Kazi M.A. Hashem and Nasim Aziz), BBC (M. Ahsanul H. Khokan, Mustafezur Rahman and M. Abdul Aziz) and the local partner NGOs (CODEC, NACOM and RDRS) were also involved as resource persons. See Appendix III for an English version of the training manual (the Bengali version was used and distributed among the participants). Most of the participants had little or no formal education. The training program mainly covered the following aspects –

- Introduction and objectives of the bird survey
- Methods of estimating bird population density (different methods considered were discussed in brief, but strip transect sampling and opportunistic survey was discussed in detail, because these were the selected methods)

- Bird identification (topography of a bird, variable structures and colors of different parts of bird body, how to observe)
- Description of eight indicator bird species (their shape, size, colour, call and habits)
- Open discussion
- Practical demonstration in the field and experimental survey
- Assessment of perception of the participants.

3.5 Bird Survey Methods

A number of methods were considered, but two methods were finally selected for the survey (Table 4). The methods were selected on the basis of simplicity and effectiveness, so that even the uneducated local people can do the survey and produce indicative results. It was decided that the survey should be conducted in the breeding season of birds (February-June), so that there are more activities of birds. One of the main objectives of this project is to involve local communities in all activities, including the monitoring, so that they feel ownership of the project, and even they themselves can do the survey, after receiving relevant training from NSP. Hence, it was not very easy to design survey methods that would be simple and feasible, yet reliable to indicate the change in the population density of some indicator birds, and the species diversity of forest birds, which in turn will indicate the level of success or failure of NSP. Taking all these into account, strip transect sampling and opportunistic survey methods were selected.

Table 4. Different methods considered for bird survey

Method	Description	Suitability	Decision
Quadrat sampling	Objects are counted from sample quadrats	Suitable for population estimation of less mobile or immobile organisms, e.g. earthworms, plants	Rejected
Strip transect sampling	A combination of quadrat sampling and line transect sampling where objects are counted from straight, long and narrow strips	Suitable for population estimation of visible organisms, no problem for mobile organisms, requires no expert knowledge	**Accepted**

Line transect sampling	Objects are counted from two sides of a straight line; no restriction of distance while observing, but the sighting distance and sighting angle for each observation must be recorded	Suitable for population estimation of visible organisms, no problem for mobile organisms, but requires expert knowledge and use of DISTANCE software	Rejected
Point transect sampling	It may be considered as a line transect of zero length (i.e. a point) where the sighting (radial) distance of each of the objects are measured from random points	Suitable for areas where transect sampling is difficult due to inaccessibility; no problem for mobile organisms (if visible), but might not sufficiently cover the habitat diversity	Rejected
Oppor-tunistic survey	Any important observation or information is recorded whenever available without following any systematic way	Suitable for recording the species diversity and other important information, but not for population density	**Accepted**

3.5.1 Strip Transect Sampling

Strip transect sampling method (Buckland *et al.* 2001) was found most suitable to estimate the population density of eight indicator bird species. This method is simple, so even the local communities can do it without the help of an expert. In this method the observer(s) slowly walk (ca. 1.5 km/hr) on a relatively straight line through the study area and count the objects from both sides. The observation-range varies depending on the visibility of the study area. For mixed-evergreen forests of Bangladesh, the observation-range of 20 m on each side of the centreline would be suitable. The initial location of the object is always considered, because the object might move away after watching the observer(s). If any object is sighted beyond the pre-decided observation-range, or if the object is coming from the back (in order to avoid duplication), the observation is not recorded. The is conducted in early mornings and late afternoons when the birds are most active. Transects are located in areas which are suitable in terms of accessibility and observation.

Each strip transect count is actually the total count of an area of the strip [length of the strip X width of the strip (2 X observation-range)]. Suppose there are *k* number of strips, each of width 2*w* (*w* is the observation-range on either side of the centreline), and the total length of all strips (same strips repeated are treated as

new strips) is *L* in a study area. If the total number of recorded objects in all strips is *n*, the population density *D* is estimated by –

$$D = n/2wL$$

Since the project sites are not very big, it was not possible to make longer or more transect lines in all the project sites. Hence, each transect was repeated for three times, but each of them were treated as a new transect, i.e., a new *k.* Notably, the birds are highly mobile, so when a transect is repeated, differential counts of birds are recorded.

This method assumes that all objects in the strip are recorded, so the observer(s) were very careful in observing and recording the objects. Even then, the observer(s) might have missed some of the objects in the strip, but if it is not more than 5% of the total objects recorded, the error is statistically negligible. The more areas covered in strip transects, the less error in the result will be. The transects were located mainly in the rich parts of the NSP sites. Even if any centreline of a transect was slightly undulated, the observation-strip was maintained straight (roughly) by manipulating the observation distance to that particular area. The birds were observed and identified properly and correctly, so that there is no misidentification. The main weakness of this method is that the error cannot be estimated.

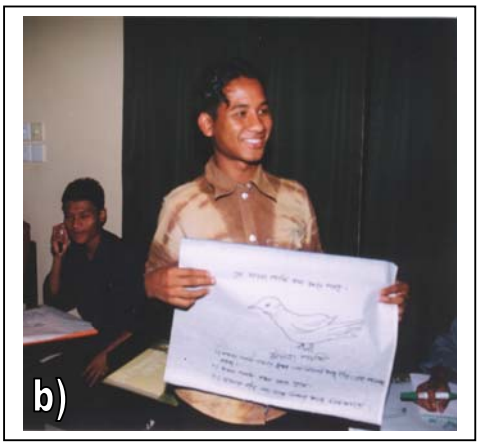
3.5.2 Opportunistic Survey

In opportunistic survey, any important or interesting observation/information is recorded at any time while in the field. This method is suitable for recording the occurrence, relative abundance and distribution of different species of birds and other wildlife. The birds were identified by following some authentic books (Ali and Ripley 1987, Grimmet *et al.* 1998, 1999; Grewal *et al.* 2002). The relative abundance of birds was assessed by direct observation in the field and by interviewing local people. The ‘resident’ bird is defined as the species always lives in Bangladesh and normally breeds in Bangladesh and the ‘migrant’ bird is defined

as the species that does not live in Bangladesh all through the year and normally breeds elsewhere. Some species make significant local movements and they have been designated as local migrants.

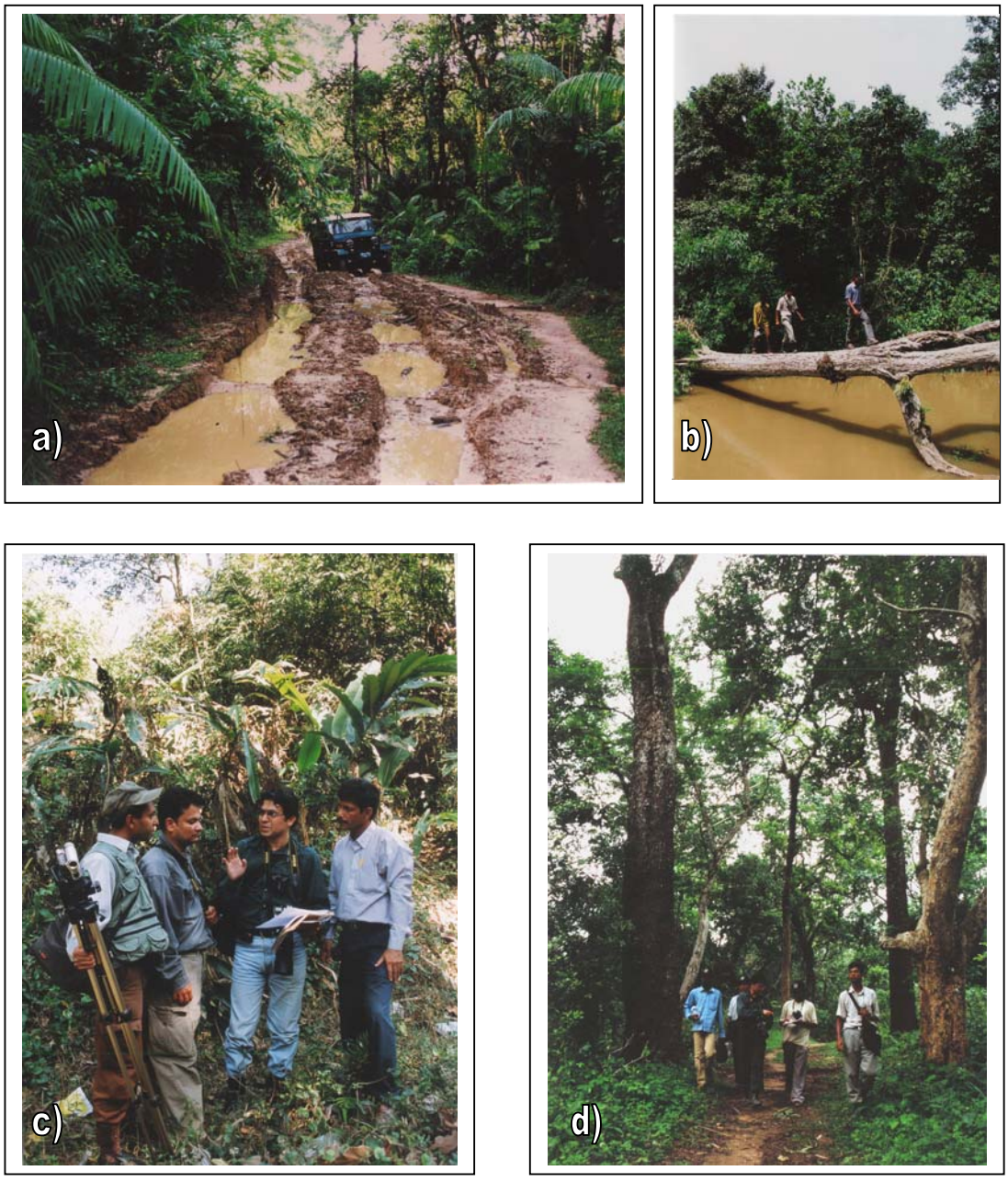
Although opportunistic survey is an informal way of collecting information, the outcome can be very useful. However, if this is not carried out with sufficient care, wrong information can be recorded and the results can be biased. This method gives the opportunity to record scattered, but important, observations and information on rare and threatened birds and other wildlife, which could not be studied formally due to their rarity. The following aspects were recorded for birds –

- Occurrence of a species, with its relative abundance
- Breeding season (mating, nesting, feeding young, etc.)
- Food materials
- Calls or songs
- Threats (lack of food, lack of nesting place, lack of habitat, hunting and trapping, etc.)



Classroom training on bird survey: a) lecture in Srimangal, Moulvibazar, b) a local participant has drawn a Hill Myna, and c) lecture in Ukhia, Cox's Bazar.

Plate 5



Bird survey in NSP sites: a) tough drive on the way to Rema-Kalenga, b) crossing a stream through a fallen tree in Rema-Kalenga, c) field discussion in Lawachara, and d) field demonstration and survey in Rema-Kalenga.

Chapter 4

RESULTS AND DISCUSSION

4. RESULTS AND DISCUSSION

The survey was conducted for five-month (February-June 2005), with 29 observation-days in the field (two visits in every NSP site). Two main outcomes of this survey are the estimates of population density of eight indicator species of birds and a list of all birds recorded in each of the project sites. Since all the indicator birds are primarily forest birds, which live in different strata of the forest, and they are more sensitive than others, the density in each of the five project sites will be the baseline for the future (preferably on an annual basis) surveys. However, the consecutive surveys must be conducted at the same season, i.e., the breeding season of birds (February-June), because the densities of indicator birds and overall species diversity will vary in different seasons due to migration.

Any increment or decrement of the densities of the indicator bird population will indicate whether the condition of the forest has been improved or degraded. The list of birds (including their relative abundance) will have the information on the birds that are primarily forest-dwellers. Any increment or decrement on the number of primarily forest birds will indicate whether the biodiversity of the forest has been improved or degraded. More diversified plants, insects and small animals means that they can support more diversified forest birds since different birds prefer to feed on different food types, and they have different ecological requirements.

4.1 Population Densities of Eight Indicator Bird Species

The population density, i.e., the number of individuals per square kilometre, was estimated for each of the eight indicator bird species in each of the five NSP sites (Figure 7a-e). Since these are primarily forest birds, any change in the condition of the forest will be reflected in their population density. This is evident even in the density estimates for five NSP sites. In the field it was observed that Chunati is the most degraded among five sites, with very few trees, hence two of the eight indicator species (Oriental Pied Hornbill and Red-headed Trogon) were not recorded there, and the densities of four of the rest six species were the lowest (Figure 8). However, the density of Red Jungle was the highest in Chunati, and

this was the only site where White-crested Laughingthrush was recorded. Another evidence of the strong correlation between the forest condition and the density of these eight species has found in three sites (Lawachara, Rema-Kalenga and Satchori) of the northeast. The ecosystems and forest conditions are very similar in these three sites. Hence, there is a similarity in the density of all the indicator species (Figure 8).

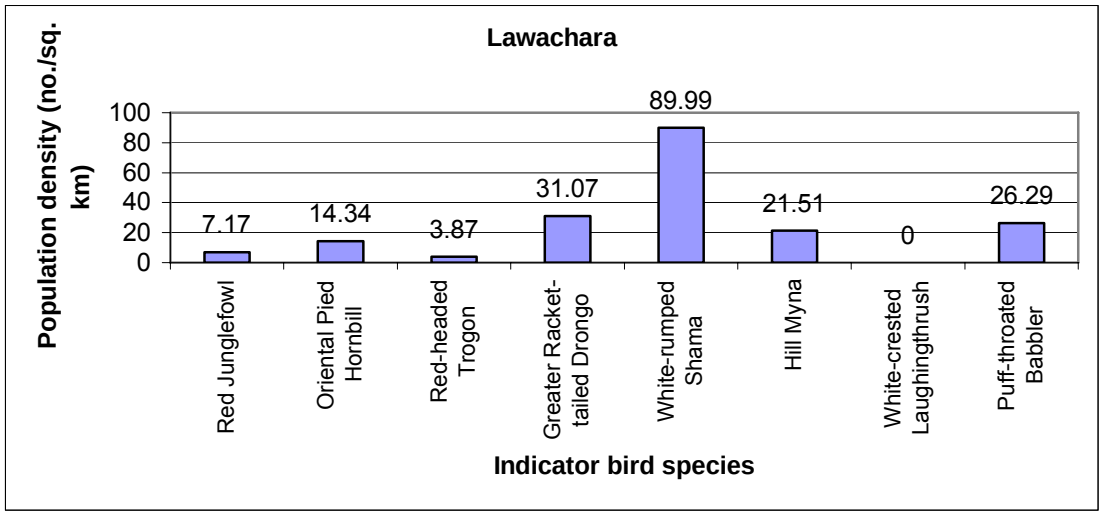


Figure 7a. Population density (no./sq. km) of eight indicator bird species in Lawachara National Park.

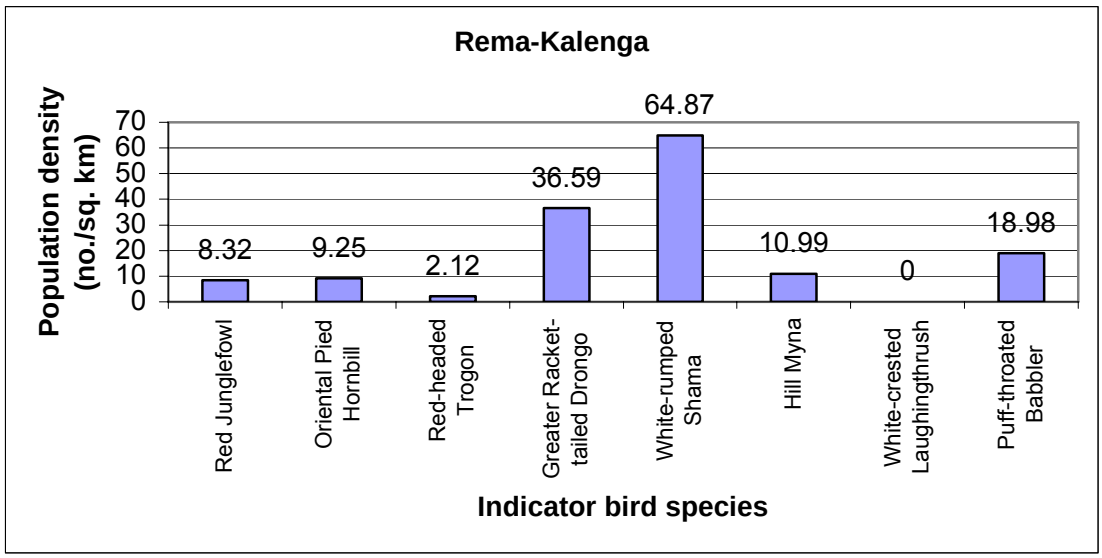


Figure 7b. Population density (no./sq. km) of eight indicator bird species in Rema-Kalenga Wildlife Sanctuary.

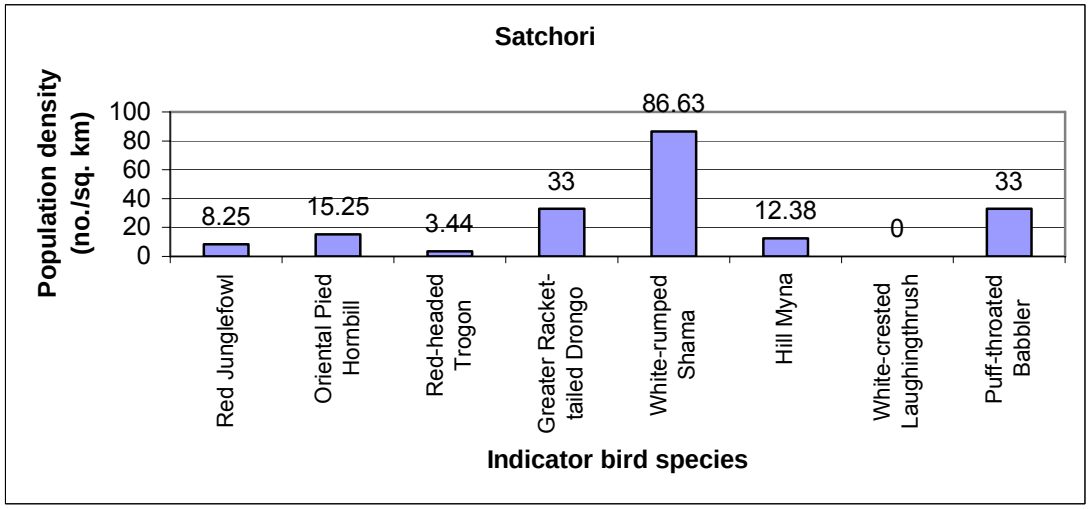


Figure 7c. Population density (no./sq. km) of eight indicator bird species in Satchori Reserve Forest.

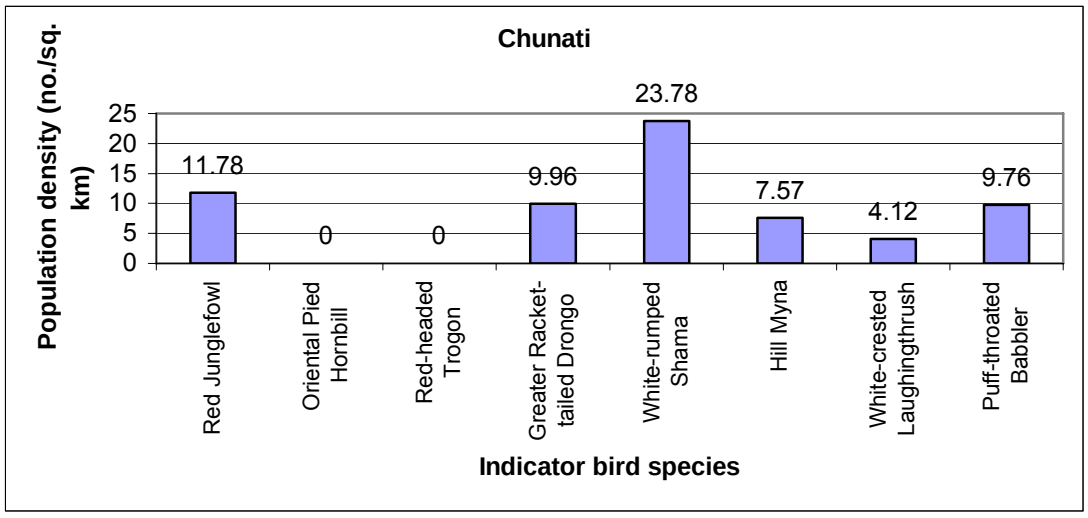


Figure 7d. Population density (no./sq. km) of eight indicator bird species in Chunati Wildlife Sanctuary.

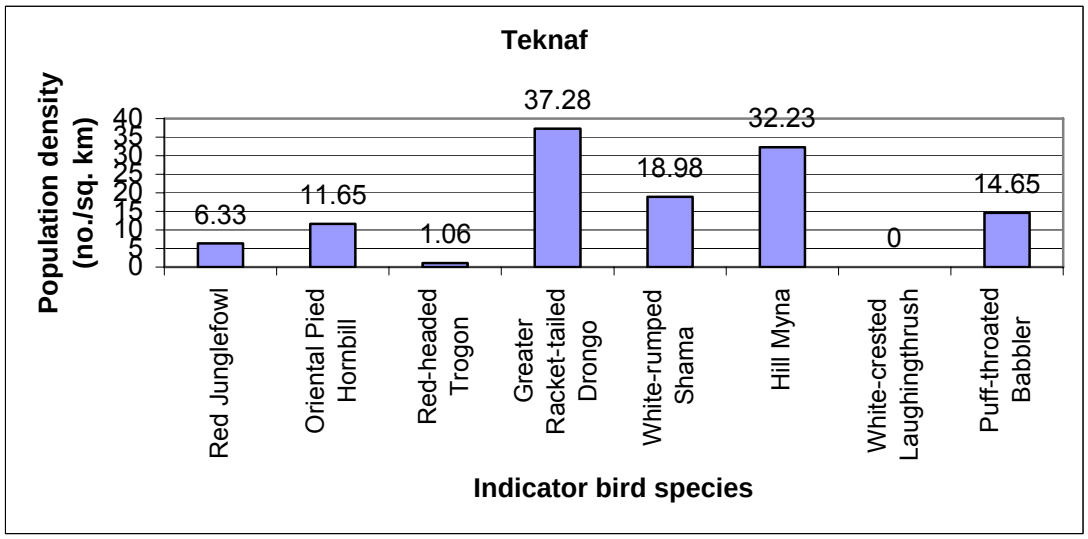


Figure 7e. Population density (no./sq. km) of eight indicator bird species in Teknaf Game Reserve.

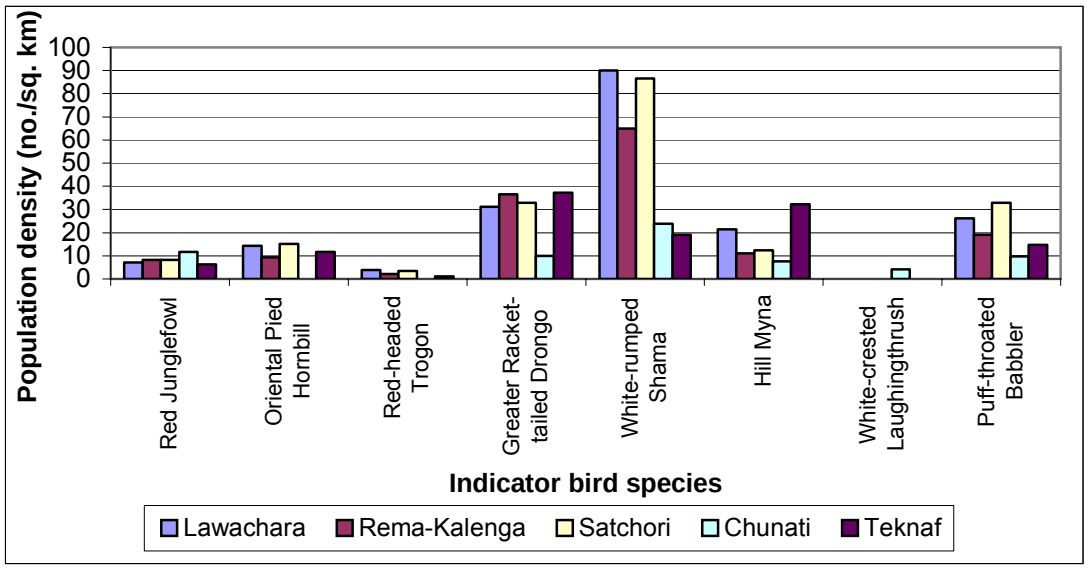


Figure 8. Comparison of the population density of eight indicator bird species across five NSP sites.

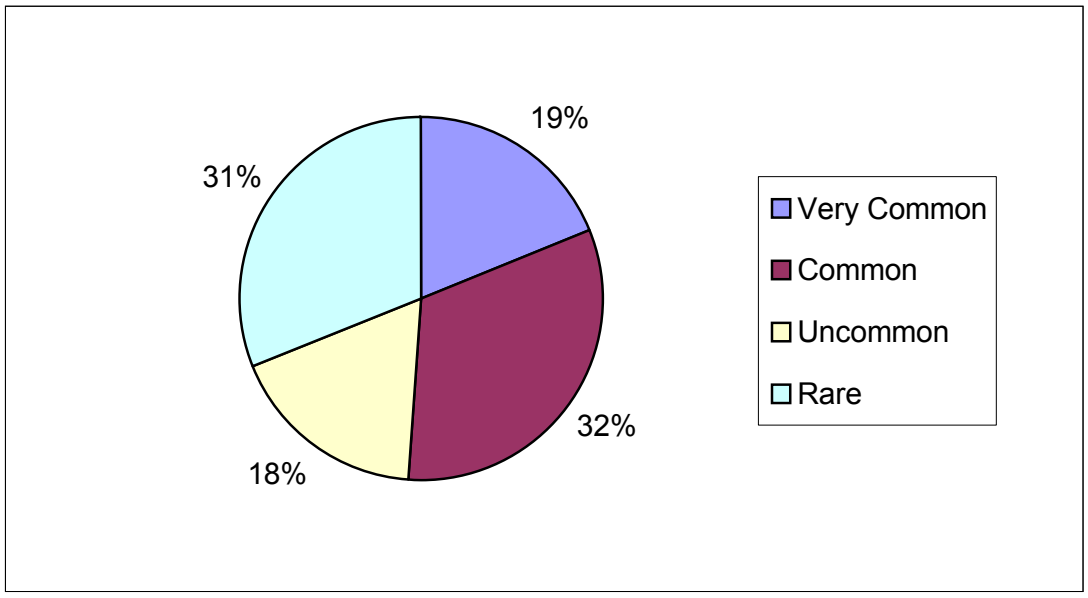


Figure 9. Proportions of Very Common, Common, Uncommon and Rare species of birds in NSP sites.

4.2 Bird Species Diversity

A total of 200 species of birds was recorded in five NSP sites, of which 170 (85%) were resident and the rest 30 (15%) migrant (Table 5). Among the resident birds, a total of 7 species are known to locally migrate significantly. Out of 200 species, 37 were Very Common, 64 Common, 36 Uncommon and 63 Rare. The proportions of Very Common, Common, Uncommon and Rare species of birds are almost equal (Figure 9).

The total bird species (200) recorded in five NSP sites in a limited period of time (29 observation-days in the field) indicates that the areas are still very rich in biodiversity. The recorded bird species represents over 30% of the birds recorded in Bangladesh (Harvey 1990), and almost 3% recorded in the Indian Subcontinent (Grewal *et al.* 2002). Although the proportions of Very Common, Common, Uncommon and Rare birds are almost equal, 31% species are rare in the area – a high ratio of rare birds. This emphasizes the need of continuous monitoring of birds and the immediate need of improving the ecological condition of these areas. Similar studies in other areas of the country (Khan *et al.* 1998, Islam *et al.* 1999, Khan and Islam 2000, Das *et al.* 2000, Khan 2005) strengthened the knowledge of bird species diversity and highlighted that a significant proportion of birds are now rare in different parts of the country.

A total of 120 species of birds were recorded in all the five NSP sites, but the total number of species, and the total number of primarily forest species was different (Figure 10). Strong correlation (r = 0.799764) was found between the total number of bird species and the total number of primarily forest bird species, which indicates that, not only the forest species, even the total number of bird species can be an indicator of the overall biodiversity of an area. If the overall biodiversity (especially of plants and insects, on which the birds are depended) and ecosystem of any NSP site degrades or improves, it will be reflected in the total number of bird species as well as in the total number of primarily forest bird species. However, more emphasis should be given on any change in the number of primarily forest bird species, because even if an area degrades, together with the

loss of forest species, it is possible that the area might become suitable for some new species, which might colonize there, causing relatively less reduction of the total number of species.

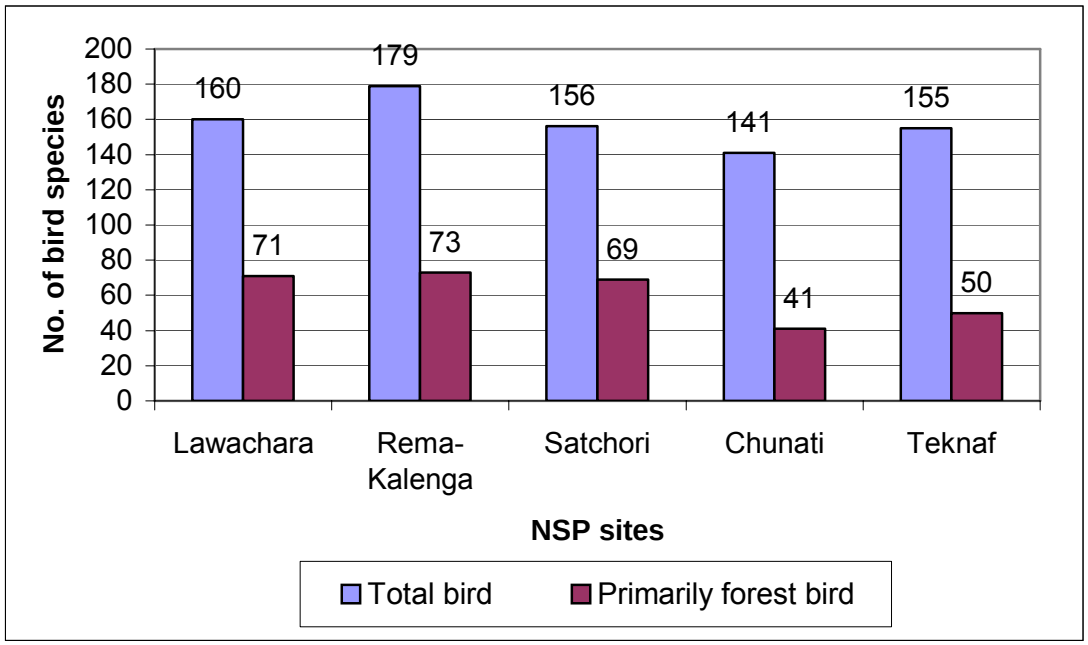


Figure 10. A comparison of the total number of bird species and total number of primarily forest bird species across five NSP sites.

Table 5. List of birds recorded in five NSP sites (Lawachara, Rema-Kalenga, Chunati, Teknaf and Satchori) [N.B. The classification followed Inskipp *et al.* (1996)]

Abbreviations: vc – Very Common, c – Common, uc – uncommon, and r – Rare (in NSP sites); R – Resident, M – Migrant, Rm – Resident but local migration often recorded; L – Lawachara National Park, RK – Rema-Kalenga Wildlife Sanctuary, S – Satchori Reserve Forest, C – Chunati Wildlife Sanctuary, T – Teknaf Game Reserve, and W – Wide (all NSP sites).

Sl. No.	English Name	Scientific Name	Relative abundance, Resident/ Migrant	Distribution
	ORDER: GALLIFORMES **Family: Phasianidae**			
1	Common Quail	*Coturnix coturnix*	r, M	L, RK, S
2	White-cheeked Partridge*	*Arborophila atrogularis*	r, R	L, RK, S
3	Red Junglefowl*	*Gallus gallus*	c, R	W
4	Kalij Pheasant*	*Lophura leucomelanos*	uc, R	W
5	Green Peafowl*	*Pavo muticus*	r, R	T? One local report of trapping in early 2004
6	Grey Peacock Pheasant*	*Polyplectron bicalcaratum*	r, R	T, RK?
	ORDER: ANSERIFORMES **Family: Dendrocygnidae**			
7	Lesser Whistling-duck	*Dendrocygna javanica*	c, R	T, RK
	Family: Anatidae			
8	Cotton Pygmy-goose	*Nettapus coromandelianus*	r, R	T
	ORDER: PICIFORMES **Family: Picidae**			
9	Eurasian Wryneck	*Jynx torquila*	uc, M	RK, L
10	Rufous Woodpecker	*Celeus brachyurus*	c, R	W
11	Great Slaty Woodpecker*	*Mulleripicus pulverulentus*	r, R	T
12	Grey-capped Pygmy Woodpecker*	*Dendrocopos canicapillus*	r, R	L, RK, S
13	Fulvous-breasted Woodpecker	*Dendrocopos macei*	vc, R	W
14	Greater Yellownape*	*Picus flavinucha*	c, R	W
15	Streak-throated Woodpecker	*Picus xanthopygaeus*	r, R	RK
16	Black-rumped Flameback	*Dinopium benghalense*	vc, R	W
17	Greater Flameback*	*Chrysocolaptes lucidus*	vc, R	W
	Family: Megalaimidae			
18	Lineated Barbet	*Megalaima lineata*	vc, R	W
19	Blue-throated Barbet	*Megalaima asiatica*	vc, R	W
20	Coppersmith barbet	*Megalaima haemacephala*	vc, R	W
	ORDER: BUCEROTIFORMES **Family: Bucerotidae**			
21	Oriental Pied Hornbill*	*Anthracoceros albirostris*	uc, R	L, RK, S, T
	ORDER: UPUPIFORMES **Family: Upupidae**			

22	Common Hoopoe	*Upupa epops*	c, R	W
	ORDER: TROGONIFORMES Family: Trogonidae			
23	Red-headed Trogon*	*Harpactes erythrocephalus*	r, R	L, RK, S, T
	ORDER: CORACIIFORMES Family: Coraciidae			
24	Indian Roller	*Coracias benghalensis*	vc, R	W
25	Dollarbird*	*Eurystomus orientalis*	r, R	W
	Family: Alcedinidae			
26	Common Kingfisher	*Alcedo atthis*	c, R	W
	Family: Halcyonidae			
27	White-throated Kingfisher	*Halcyon smyrnensis*	c, R	W
	Family: Cerylidae			
28	Pied Kingfisher	*Ceryle rudis*	r, R	T
	Family: Meropidae			
29	Blue-bearded Bee-eater*	*Nyctyornis athertoni*	r, R	W
30	Green Bee-eater	*Merops orientalis*	vc, R	W
31	Blue-tailed Bee-eater*	*Merops philippinus*	c, R	W
32	Chestnut-headed Bee-eater*	*Merops leschenaulti*	vc, R	W
	ORDER: CUCULIFORMES Family: Cuculidae			
33	Pied Cuckoo	*Clamator jacobinus*	r, Rm	W
34	Common Hawk Cuckoo	*Hierococcyx varius*	vc, R	W
35	Indian Cuckoo	*Cuculus micropterus*	c, Rm	W
36	Plaintive Cuckoo	*Cacomantis merulinus*	c, Rm	W
37	Drongo Cuckoo*	*Surniculus lugubris*	r, Rm	L, RK, S
38	Asian Koel	*Eudynamys scolopacea*	vc, R	W
39	Green-billed Malkoha*	*Phaenicophaeus tristis*	vc, R	W
	Family: Centropodidae			
40	Greater coucal	*Centropus sinensis*	vc, R	W
41	Lesser coucal*	*Centropus bengalensis*	c, R	W
	ORDER: PSITTACIFORMES Family: Psittacidae			
42	Vernal Hanging Parrot*	*Loriculus vernalis*	r, R	L, RK, S
43	Rose-ringed Parakeet	*Psittacula krameri*	vc, R	W
44	Grey-headed Parakeet*	*Psittacula finschii*	r, R	L, RK, S
45	Blossom-headed Parakeet*	*Psittacula roseata*	r, R	L, RK, S
46	Red-breasted Parakeet*	*Psittacula alexandri*	vc, R	W
	ORDER: APODIFORMES Family: Apodidae			
47	Asian Palm Swift	*Cypsiurus balasiensis*	c, R	W
	ORDER: STRIGIFORMES Family: Strigidae			
48	Oriental Scops Owl*	*Otus sunia*	r, R	L, RK, S
49	Brown Fish Owl	*Ketupa zeylonensis*	r, R	W
50	Tawny Fish Owl*	*Ketupa flavipes*	r, R	RK, T
51	Asian Barred Owlet*	*Glaucidium cuculoides*	c, R	W
52	Spotted Owlet	*Athene brama*	vc, R	W
53	Brown Hawk Owl	*Ninox scutulata*	c, R	W
	Family: Caprimulgidae			
54	Large-tailed nightjar*	*Caprimulgus macrurus*	c, R	W
	ORDER: COLUMBIFORMES Family: Columbidae			
55	Rock Pigeon	*Columba livia*	c, R	RK, C, T
56	Green Imperial Pigeon*	*Ducula aenea*	r, R	L, RK, S
57	Oriental Turtle Dove*	*Streptopelia orientalis*	r, Rm	L, RK, S

58	Spotted Dove	*Streptopelia chinensis*	vc, R	W
59	Red Collared Dove	*Streptopelia tranquebarica*	c, R	W
60	Eurasian Collared Dove	*Streptopelia decaocto*	c, R	W
61	Emerald Dove*	*Chalcophaps indica*	c, R	W
62	Orange-breasted Green Pigeon*	*Treron bicincta*	r, R	L, RK, S
63	Pompadour Green Pigeon*	*Treron pompadora*	c, R	W
64	Thick-billed Green Pigeon*	*Treron curvirostra*	r, R	L, RK, S
65	Yellow-footed Green Pigeon	*Treron phoenicoptera*	c, R	W
66	Wedge-tailed Green Pigeon*	*Treron sphenura*	r, R	L, RK, S
	ORDER: GRUIFORMES			
	Family: Rallidae			
67	White-breasted Waterhen	*Amaurornis phoenicurus*	uc, R	L, RK, C, T
	ORDER: CICONIIFORMES			
	Family: Scolopacidae			
68	Pintail Snipe	*Gallinago stenura*	r, M	W
69	Common Snipe	*Gallinago gallinago*	r, M	W
70	Green Sandpiper	*Tringa ochropus*	r, M	W
71	Wood Sandpiper	*Tringa glareola*	c, M	W
72	Common Sandpiper	*Actitis hypoleucos*	c, M	W
	Family: Rostratulidae			
73	Greater Painted Snipe	*Rostratula benghalensis*	uc, R	W
	Family: Jacanidae			
74	Bronze-winged Jacana	*Metopidius indicus*	uc, R	RK, C, T
	Family: Charadriidae			
75	Little Ringed Plover	*Charadrius dubius*	r, M	RK, C, T
76	Red-wattled Lapwing	*Vanellus indicus*	uc, R	RK, C, T
	Family: Accipitridae			
77	Black Baza*	*Aviceda leuphotes*	uc, Rm	L, RK, S, T
78	Black-shouldered Kite	*Elanus caeruleus*	uc, R	W
79	Black Kite	*Milvus migrans*	uc, R	RK, C, T
80	Brahminy Kite	*Haliastur indus*	c, R	W
81	White-rumped Vulture	*Gyps bengalensis*	uc, R	RK, C, T
82	Crested Serpent Eagle*	*Spilornis cheela*	c, R	W
83	Shikra*	*Accipiter badius*	uc, R	W
84	Changeable Hawk Eagle*	*Spizaetus cirrhatus*	r, R	L, RK, S
	Family: Falconidae			
85	Common Kestrel*	*Falco tinnunculus*	uc, M	W
86	Amur Falcon*	*Falco amurensis*	r, M	L
	Family: Phalacrocoracidae			
87	Little Cormorant	*Phalacrocorax niger*	r, R	T
	Family: Ardeidae			
88	Little Egret	*Egretta garzetta*	uc, R	RK, C, T
89	Cattle Egret	*Bubulcus ibis*	uc, R	RK, C, T
90	Indian Pond Heron	*Ardeola grayii*	vc, R	W
91	Black-crowned Night Heron	*Nycticorax nycticorax*	r, R	RK
92	Cinnamon Bittern	*Ixobrychus cinnamomeus*	uc, R	RK, C, T
	Order: Ciconiidae			
93	Asian Openbill	*Anastomus oscitans*	r, R	RK
	ORDER: PASSERIFORMES			
	Family: Pittidae			
94	Hooded Pitta*	*Pitta sordida*	r, Rm	L, RK, S
	Family: Irenidae			
95	Asian Fairy Bluebird*	*Irena puella*	c, R	L, RK, S, T
96	Golden-fronted Leafbird	*Chloropsis aurifrons*	vc, R	W
	Family: Laniidae			

97	Brown Shrike	*Lanius cristatus*	c, M	W
98	Long-tailed Shrike	*Lanius schach*	c, R	W
	Family: Corvidae			
99	Common Green Magpie*	*Cissa chinensis*	r, R	S
100	Rufous Treepie	*Dendrocitta vagabunda*	c, R	W
101	House Crow	*Corvus splendens*	uc, R	C, T
102	Large-billed Crow	*Corvus macrorhynchos*	uc, R	W
103	Ashy Woodswallow	*Artamus fuscus*	uc, R	W
104	Black-hooded Oriole	*Oriolus xanthornus*	vc, R	W
105	Maroon Oriole*	*Oriolus traillii*	r, R	L
106	Large Cuckooshrike	*Coracina macei*	c, R	W
107	Black-winged Cuckooshrike*	*Coracina melaschistos*	r, M	L, RK, S
108	Rosy Minivet*	*Pericrocotus roseus*	r, R	L, RK, S
109	Ashy Minivet*	*Pericrocotus divaricatus*	r, R	L, RK, S
110	Small Minivet*	*Pericrocotus cinnamomeus*	vc, R	W
111	Scarlet Minivet*	*Pericrocotus flammeus*	c, R	W
112	Bar-winged Flycatcher-shrike*	*Hemipus picatus*	uc, R	L, RK, S
113	White-throated Fantail	*Rhipidura albicollis*	c, R	W
114	Black Drongo	*Dicrurus macrocercus*	vc, R	W
115	Ashy Drongo	*Dicrurus leucophaeus*	r, M	W
116	Bronzed Drongo*	*Dicrurus aeneus*	vc, R	W
117	Lesser Racket-tailed Drongo*	*Dicrurus remifer*	r, M	L, RK, S
118	Spangled Drongo*	*Dicrurus hottentottus*	c, R	W
119	Greater Racket-tailed Drongo*	*Dicrurus paradiseus*	c, R	W
120	Black-naped Monarch	*Hypothymis azurea*	c, R	W
121	Common Iora	*Aegithina tiphia*	vc, R	W
122	Large Woodshrike*	*Tephrodornis gularis*	c, R	L, RK, S
123	Common Woodshrike*	*Tephrodornis pondicerianus*	c, R	L, RK, S
	Family: Muscicapidae			
124	Blue Rock Thrush	*Monticola solitarius*	uc, M	W
125	Blue Whistling Thrush*	*Myophonus caeruleus*	r, R	T
126	Orange-headed Thrush	*Zoothera citrina*	r, R	W
127	Red-throated Flycatcher	*Ficedula parva*	vc, M	W
128	Verditer Flycatcher*	*Eumyias thalassina*	uc, M	W
129	Pale-chinned Flycatcher*	*Cyornis poliogenys*	r, R	RK
130	Grey-headed Canary Flycatcher	*Culicicapa ceylonensis*	c, R	W
131	Oriental Magpie Robin	*Copsychus saularis*	vc, R	W
132	White-rumped Shama*	*Copsychus malabaricus*	c, R	W
133	Black Redstart	*Phoenicurus ochruros*	r, M	W
134	Black-backed Forktail*	*Enicurus immaculatus*	r, R	L, RK, S
135	Slaty-backed Forktail*	*Enicurus schistaceus*	r, R	L, RK, S
136	Common Stonechat	*Saxicola torquata*	c, M	W
137	Pied Bushchat	*Saxicola caprata*	r, R	C, T
	Family: Sturnidae			
138	Chestnut-tailed Starling	*Sturnus malabaricus*	vc, R	W
139	Asian Pied Starling	*Sturnus contra*	vc, R	W
140	Common Myna	*Acridotheres tristis*	vc, R	W
141	Bank Myna	*Acridotheres ginginianus*	r, R	RK, C, T
142	Jungle Myna	*Acridotheres fuscus*	vc, R	W
143	Hill Myna*	*Gracula religiosa*	c, R	W
	Family: Sittidae			
144	Velvet-fronted Nuthatch*	*Sitta frontalis*	r, R	RK
	Family: Paridae			
145	Great Tit	*Parus major*	vc, R	W

	Family: Hirundinidae			
146	Barn Swallow	*Hirundo rustica*	c, M	W
	Family: Pycnonotidae			
147	Black-headed Bulbul*	*Pycnonotus atriceps*	uc, R	L, RK, S
148	Black-crested Bulbul*	*Pycnonotus melanicterus*	c, R	W
149	Red-whiskered Bulbul	*Pycnonotus jocosus*	vc, R	W
150	Red-vented Bulbul	*Pycnonotus cafer*	vc, R	W
151	White-throated Bulbul*	*Alophoixus flaveolus*	c, R	L, RK, S
152	Olive Bulbul*	*Lole virescens*	r, R	RK
	Family: Cisticolidae			
153	Grey-breasted Prinia	*Prinia hodgsonii*	c, R	W
154	Plain Prinia	*Prinia inornata*	uc, R	W
155	Zitting Cisticola	*Cisticola juncidis*	c, R	W
	Family: Zosteropidae			
156	Oriental White-eye	*Zosterops palpebrosus*	vc, R	W
	Family: Sylviidae			
157	Blyth's Reed Warbler	*Acrocephalus dumetorum*	c, M	W
158	Striated Grassbird	*Megalurus palustris*	uc, R	C, T
159	Mountain Tailorbird*	*Orthotomus cuculatus*	r, R	T
160	Common Tailorbird	*Orthotomus sutorius*	vc, R	W
161	Dark-necked Tailorbird*	*Orthotomus atrogularis*	uc, R	T, C
162	Common Chiffchaff	*Phylloscopus collybita*	uc, R	W
163	Greenish Warbler*	*Phylloscopus trochiloides*	c, M	W
164	Blyth's Leaf Warbler	*Phylloscopus reguloides*	uc, M	L, RK, S
165	White-crested Laughingthrush*	*Garrulax leucolophus*	r, R	C
166	Greater Necklaced Laughingthrush*	*Garrulax pectoralis*	c, R	W
167	Rufous-necked Laughingthrush*	*Garrulax ruficollis*	uc, R	L, RK, S
168	Abbott's Babbler*	*Malacocincla abbotti*	c, R	W
169	Spot-throated Babbler*	*Pellorneum albiventre*	r, R	L
170	Puff-throated Babbler*	*Pellorneum ruficeps*	c, R	W
171	Large Scimitar Babbler*	*Pomatorhinus hypoleucos*	r, R	T
172	White-browed Scimitar Babbler*	*Pomatorhinus schisticeps*	r, R	L, RK, S
173	Striped Tit Babbler*	*Macronous gularis*	c, R	L, RK, S
174	Chestnut-capped Babbler*	*Timalia pileata*	r, R	C
	Family: Alaudidae			
175	Rufous-winged Bushlark	*Mirafra assamica*	c, R	W
	Family: Nectariniidae			
176	Thick-billed Flowerpecker	*Dicaeum agile*	uc, R	L, RK, S
177	Orange-bellied Flowerpecker*	*Dicaeum trigonostigma*	r, R	T
178	Pale-billed Flowerpecker	*Dicaeum erythrorynchos*	c, R	W
179	Scarlet-backed Flowerpecker*	*Dicaeum cruentatum*	c, R	W
180	Ruby-cheeked Sunbird*	*Anthreptes singalensis*	uc, R	T, C
181	Purple-rumped Sunbird	*Nectarinia zeylonica*	uc, R	W
182	Purple-throated Sunbird*	*Nectarinia sperata*	c, R	W
183	Purple Sunbird	*Nectarinia asiatica*	vc, R	W
184	Crimson Sunbird*	*Aethopyga siparaja*	c, R	C, T
185	Little Spiderhunter*	*Arachnothera longirostra*	vc, R	W
	Family: Passeridae			
186	House Sparrow	*Passer domesticus*	c, R	W
187	Forest Wagtail*	*Dendronanthus indicus*	uc, M	W
188	White Wagtail	*Motacilla alba*	c, M	W
189	White-browed Wagtail	*Motacilla maderaspatensis*	c, R	W
190	Citrine Wagtail	*Motacilla citreola*	r, M	W

191	Yellow Wagtail	*Motacilla flava*	uc, M	W
192	Grey Wagtail	*Motacilla cinerea*	uc, M	W
193	Paddyfield Pipit	*Anthus ruficollis*	c, R	W
194	Olive-backed Pipit*	*Anthus hodgsoni*	c, M	W
195	Red-throated Pipit	*Anthus cervinus*	r, M	RK
196	Baya Weaver	*Ploceus philippinus*	c, R	RK, C, T
197	Indian Silverbill	*Lonchura malabarica*	r, R	RK, C, T
198	White-rumped Munia	*Lonchura striata*	uc, R	W
199	Scaly-breasted Munia	*Lonchura punctulata*	c, R	W
200	Black-headed Munia	*Lonchura malacca*	r, R	W

*Primarily forest species.

4.3 Important Observations in the Field

One nest of Oriental Pied Hornbill was found in Satchori, which is probably the first observation of hornbill nest in Bangladesh by any observer. The hole-nest was located on a medium-sized tree at about 7 m height from the ground. At first the nest was found on 27 March, when the male was seen feeding the female, which was inside the hole-nest. In the second trip, the nest was observed again on 18 May, when the male was seen feeding its nestlings.

A total of five hole-nests of Hill Myna was seen in Teknaf, Chunati and Rema-Kalenga during March-May. All were 15-25 m above the ground. The local people informed that Hill Myna breeds 3-4 times a year, in the same hole-nest, if not disturbed.

One ground-nest of Red Junglefowl was found in Lawachara on 30 April. The nest was under the bush besides a foot-path. The hen was incubating the eggs and it flew away when we were unknowingly very close to the nest. There were four large white eggs.

One nest of Green-billed Malkoha was found on 27 March in Satchori. The nest was on a very bushy and dwarf tree at about 3 m height from the ground. There were three nestlings on this nest.

Two ground-nests of Striated Grassbird were found in Teknaf, one had four cream coloured eggs with brown blotches and another had two nestlings. Both nests were on the grass. The nest with the eggs had roof, but the other didn't.

Other important nests observed were of Greater Yellownape (Satchori, 18 May), Greater Flameback (Teknaf, 01 June), Asian Fairy Bluebird (Lawachara, 15 February), Bar-winged Flycatcher-shrike (Lawachara, 15 February, and 01 May), Large Woodshrike (Lawachara, 15 February), and Purple-throated Sunbird (Lawachara, 30 April).

Some rare birds were observed in the field, viz., Great Slaty Woodpecker, Blue-bearded Bee-eater, Drongo Cuckoo, Tawny Fish Owl, Oriental Turtle Dove, Wedge-tailed Green Pigeon, Amur Falcon, Maroon Oriole, Ashy Minivet, Lesser Racket-tailed Drongo, Blue Whistling Thrush, Pale-chinned Flycatcher, Black-headed Bulbul, Olive Bulbul, Mountain Tailorbird, Dark-necked Tailorbird, White-crested Laughingthrush, Spot-throated Babbler, Large Scimitar Babbler, Chestnut-capped Babbler and Orange-bellied Flowerpecker. There was on, or very few, sight records of these species in Bangladesh (Khan 1982, Harvey 1990, IUCN-Bangladesh 2000), so the findings will significantly enrich the knowledge on the national status these birds.

Other than the birds, some other important wildlife were observed in the field. These are rare frog (*Rana humeralis*; Rema-Kalenga, 25 March – the second record in Bangladesh and first record in the mixed-evergreen forest of the northeast), Flying Lizard (*Draco maculates*; Teknaf, 14 April – probably the only record in Bangladesh after 1978), Common Bronzeback Tree Snake (*Dendrelaphis tristis*; Rema-Kalenga, 25 March), rare bat (Kudum Cave, Teknaf; April-May), Masked Civet (Lawachara, 01 May), Malayan Giant Squirrel (Rema-Kalenga, March-May), Barking Deer (Satchori, 18 May), Pig-tailed Macaque (Satchori and Lawachara, March-May) and Phayre's Langur (Rema-Kalenga, Lawachara and Satchori, February-May).

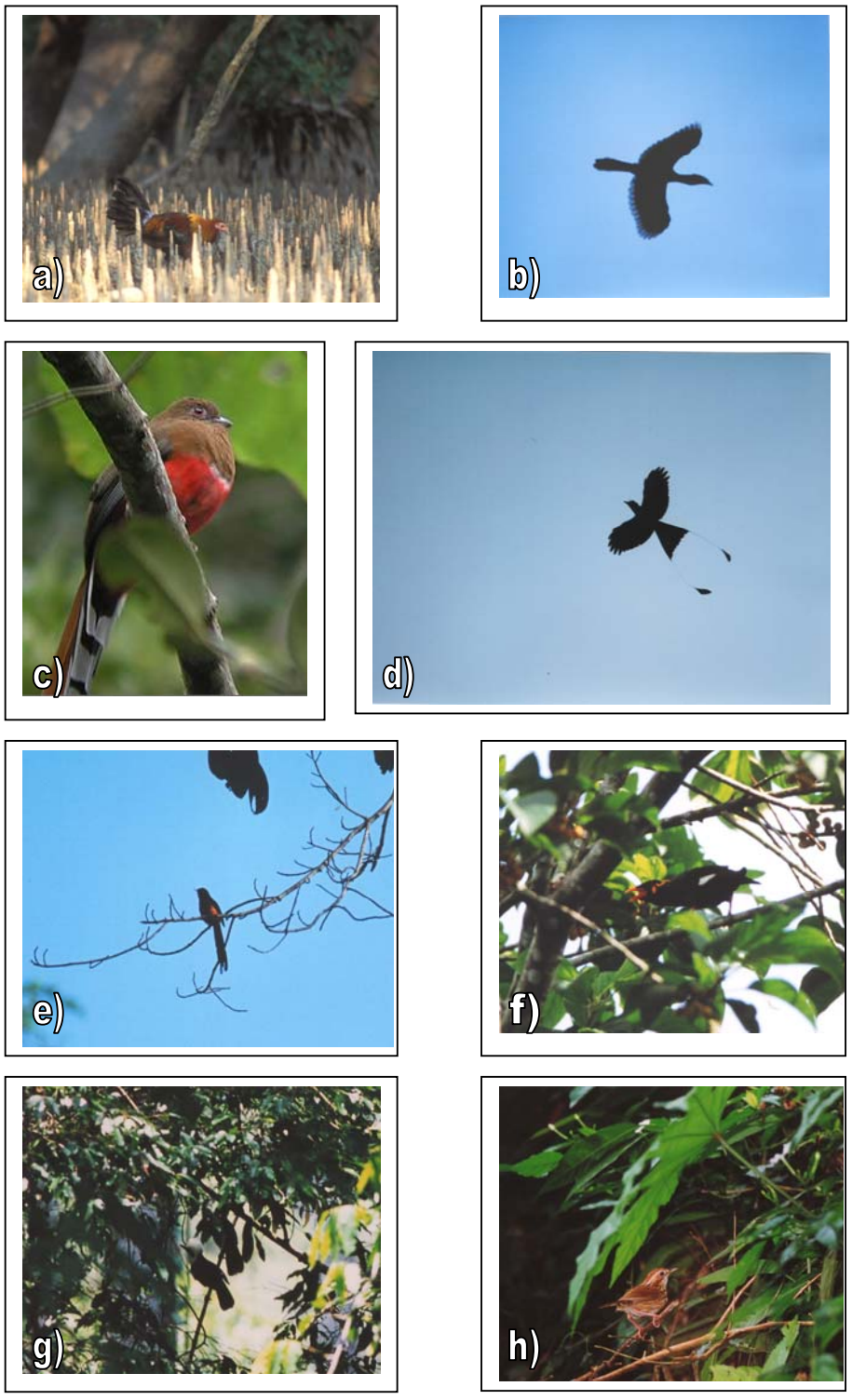
4.4 Threats to the Birds and Their Habitats

Habitat loss is certainly the main threat to the birds in all the five NSP sites. During this survey, illegal felling of trees and bamboo were often seen in all the sites.

Even the non-timber plants are cut down and taken away for firewood. In Teknaf and Chunati, large tracts of hills were seen cleared by burning for 'jhum' (shifting) cultivation. Illegal tree and bamboo cutting are relatively low in Rema-Kalenga, probably because of transport problem.

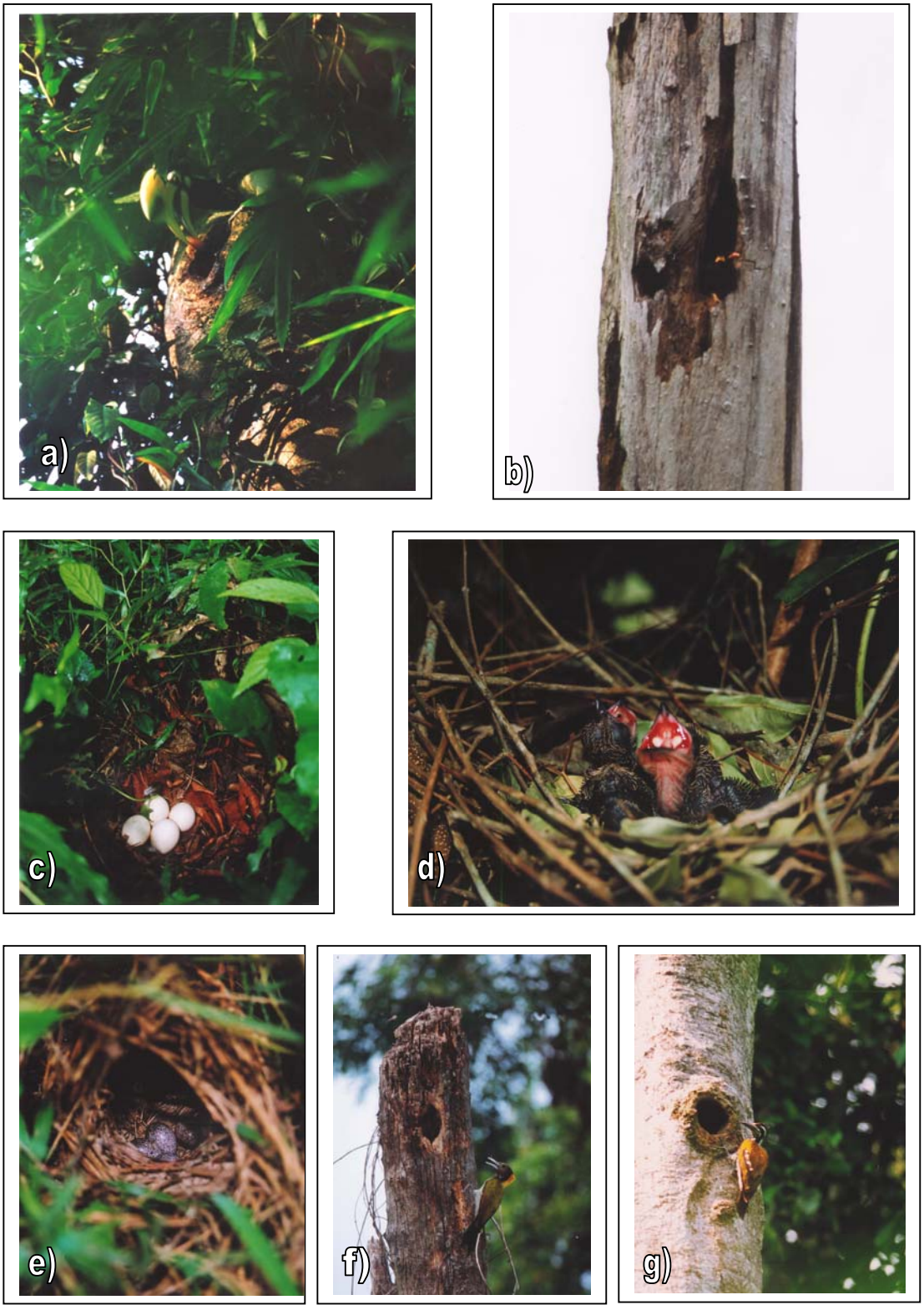
Hunting and trapping of birds, mainly by the ethnic tribal people, together with nestling-theft for selling as cage birds, is another major threat. People use arrows and bows to hunt Red Junglefowl, Kalij Pheasant, Oriental Pied hornbill and many other large birds and mammals. Some of them have guns to make the hunt more successful. They also use loop-traps for ground birds (mainly galliform birds) and glue-traps for small birds. Both tribal and non-tribal 'Bangalis' steal the nestlings of Hill Myna and other colourful birds and put them into the cage. Some of them commercially collect the nestlings to sale them elsewhere. Locally, a young Hill Myna is sold by Tk 700-1000 (US $ 11-16), which is a very high price. This is about one week's subsistence for a small family.

NSP should immediately act to reduce these two threats, because the rate of loss of tree cover, as seen during our survey, is very alarming. If this rate continues, 30-40% of the tree cover in all NSP sites might vanish in the next five years. The local communities should be motivated and alternative livelihood (including ecotourism) should be made available in order to reduce the consumptive use of the forest products. The network of poachers and corrupted custodians has to be broken down by making the local young people, conservationists and journalists more aware and vigilant. These forests may remain intact, and even improve, if NSP can stimulate these activities. However, this is a long-term process, so the project should continue for at least ten years. The participatory bird survey should be repeated, either supported by NSP or voluntarily, on an annual basis to assess the overall trend of condition of five NSP sites.

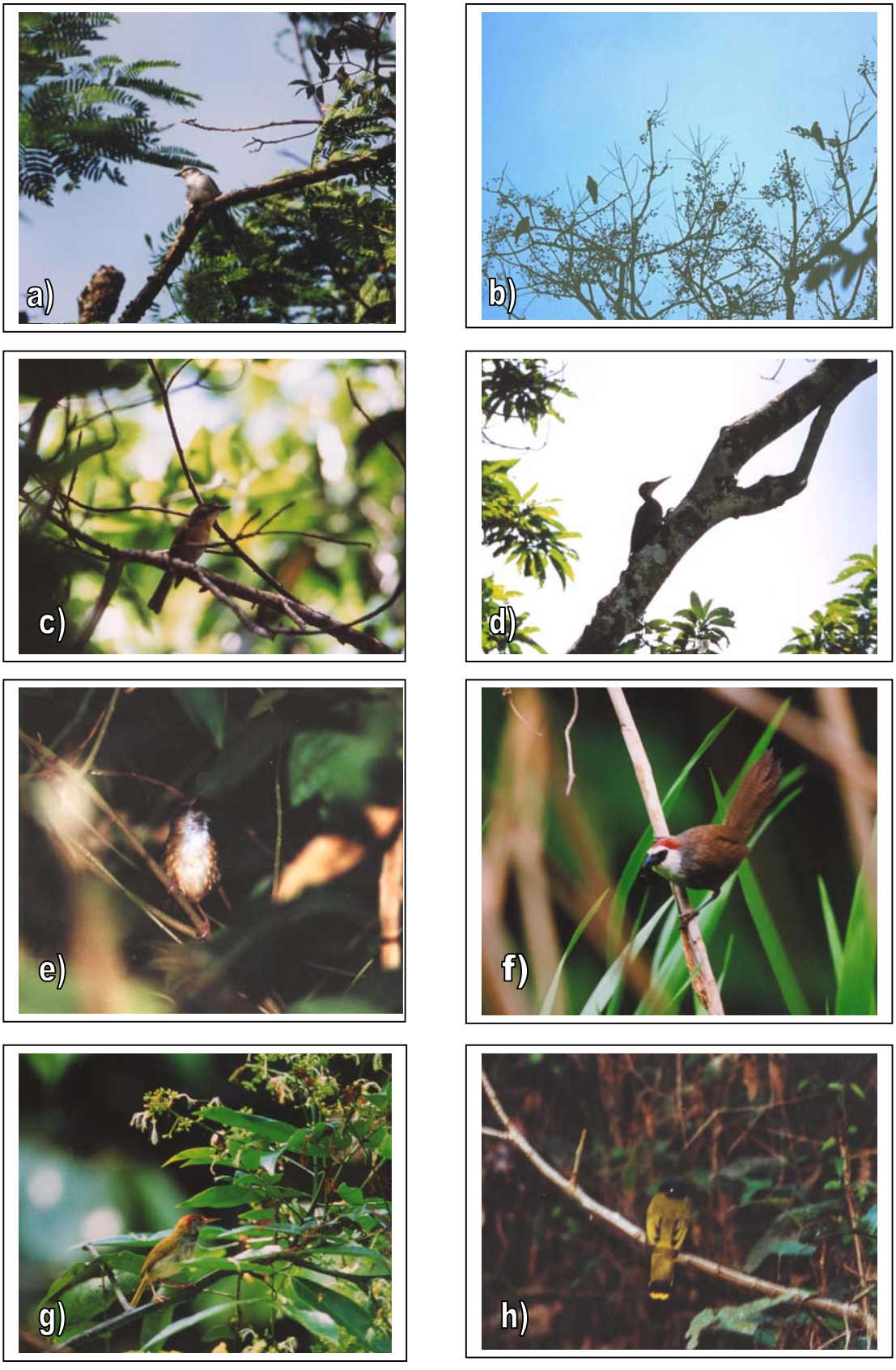


Eight indicator bird species: a) Red Junglefowl, b) Oriental Pied Hornbill, c) Red-headed Trogon, d) Greater Racket-tailed Drongo, e) White-rumped Shama, f) Hill Myna, g) White-crested Laughingthrush, and h) Puff-throated Babbler.

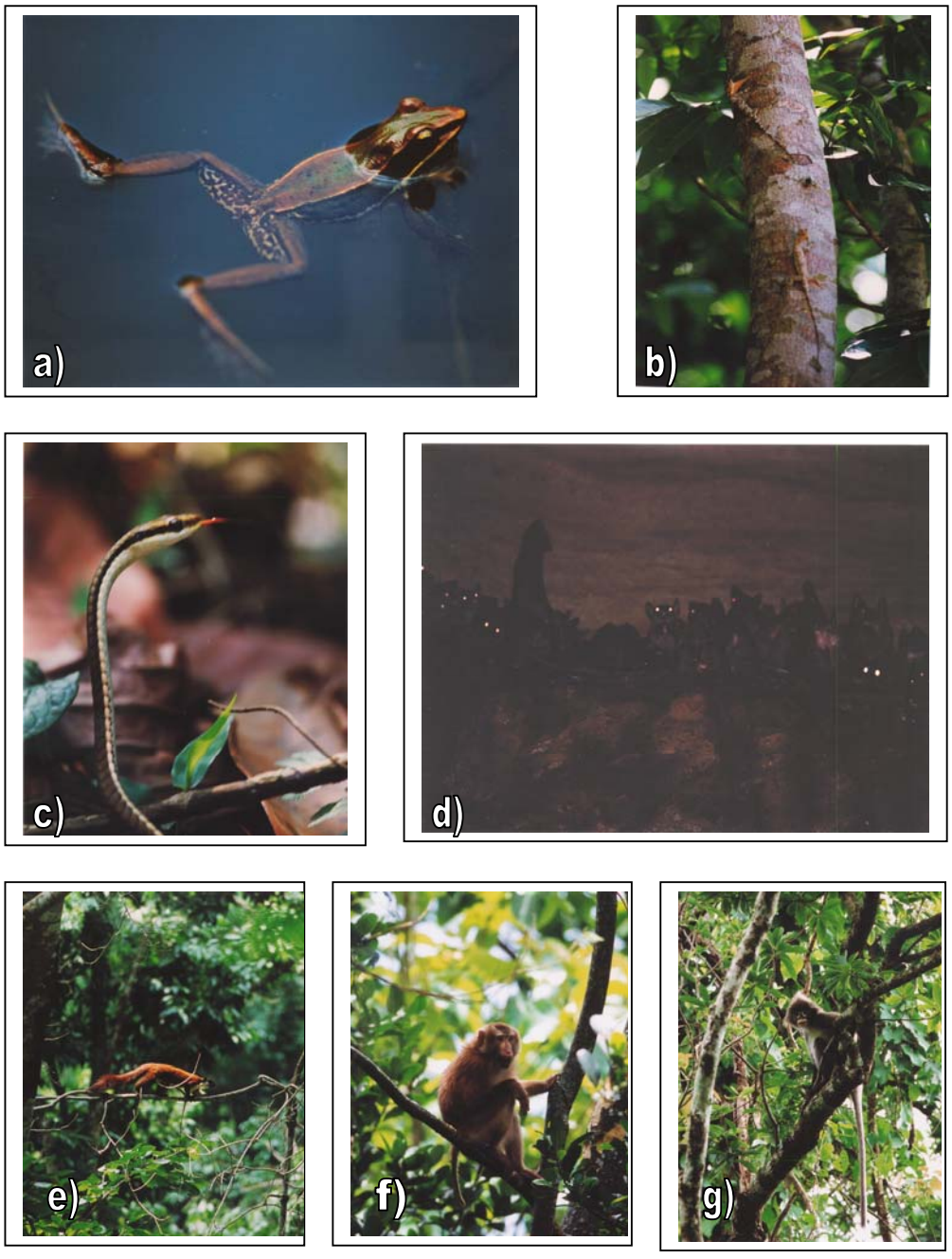
Plate 7



Nests of some rare birds found during the survey: a) Oriental Pied Hornbill feeding its nestlings, b) Hill Myna coming out from its nest, c) Red Junglefowl nest with four eggs, d) Green-billed Malkoha nest with three nestlings, e) Striated Grassbird nest with four eggs, f) Greater Flameback besides its nest, and g) Greater Flameback about to enter its nest.



Some rare birds observed during the survey: a) Ashy Minivet in Rema-Kalenga, b) Wedge-tailed Green Pigeon in Satchori, c) Pale-chinned Flycatcher in Rema-Kalenga, d) Great Slaty Woodpecker in Teknaf, e) Spot-throated Babbler in Lawachara, f) Chestnut-capped Babbler in Chunati, g) Dark-necked Tailorbird in Chunati, and h) Black-headed Bulbul in Satchori



Some important wildlife (except birds) observed during the bird survey: a) *Rana humeralis* in Rema-Kalenga – the second record in Bangladesh, b) Flying Lizard (*Draco maculates*) in Teknaf – probably the only record after 1978, c) Common Bronzeback Tree Snake (*Dendrelaphis tristis*) in Rema-Kalenga, d) bats in Kudum Cave, Teknaf, e) Malayan Giant Squirrel (*Ratufa bicolor*) in Rema-Kalenga, f) Pig-tailed Macaque (*Macaca nemestrina*) in Satchori, and g) Phayre's Langur (*Trachypithecus phayrei*) in Rema-Kalenga.

Threats to the birds and their habitats: a) Hill Myna caught from Rema-Kalenga for sale, b) hill burnt for 'jhum' cultivation in Chunati, c) hill cut down to supply soil to the brick field in Chunati, d) an woodcutter with an illegally-cut log in Teknaf, e) bunches of illegally-harvested bamboos awaiting transport

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APPENDICES

Appendix I. A sample of the data sheet for bird survey, the Bengali version was used in the field

Nishorgo Support Project	**Nishorgo Support Project (NSP)** Participatory Bird Survey to Assess Protected Area Management Impacts

Name of the Protected Area: ……..
Name of the Transect: ……
GPS Coordinates of Two Ends: ……..
Visible Landmarks of Two Ends: ……..
Length of the Transect: …….. km Width of the Transect: ……...…… km
Date: …… Time – Start: ……., End: ……
Name of Surveyors: ……..……...……
……..
Name of Supervisor(s): ……..……

Indicator Bird Species			**Total Bird Species** (including indicator species) (Tally Count)	**Miscellaneous Notes** (Any important information on wildlife and nature, recorded at any time while in the field)
Sl. No.	Name	Tally Count		
1	Greater Racket-tailed Drongo			
2	Hill Myna			
3	Oriental Pied Hornbill			
4	Red-headed Trogon			
5	Red Junglefowl			
6	White-crested Laughing-thrush			
7	Puff-throated Babbler			
8	White-rumped Shama			

Appendix II. Names and addresses of the bird survey team members

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11) ***M. Idris***, Laturikhola, Whykeong, Teknaf, Cox's Bazar. Mobile: 0189-344515.

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13) ***Saiful Islam (Sakeer)***, Tecchi Bridge, Whykeong, Teknaf, Cox's Bazar. Mobile: 0189-943495 (on req.), 0189-353604 (on req.).

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Appendix III. A sample of the training manual on bird survey (the Bengali version was used in the program)

Using Participatory Bird Survey to Assess Protected Area Management Impacts: A Handbook on Field Methods

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International Resource Group (IRG)
Nature Conservation Management (NACOM)

With partners: CODEC, NACOM & RDRS

Background

The birds are responsive to ecological changes. Since they are relatively more visible and more attractive to people, they are popularly used as indicators. This handbook is on the field methods for bird survey so that the success/failure of the Nishorgo Support Project (NSP) can be assessed. This project is a five-year effort of the Forest Department (FD) of Bangladesh with International Resource Group (IRG), Community Development Centre (CODEC), Nature Conservation Management (NACOM) and Rangpur-Dinajpur Rural Services (RDRS). The project is financed by USAID. The project aims at improving the condition of the forest and biodiversity, together with the development of ecotourism, under active participation of the local communities.

Field Survey Team

The field activities will be conducted by a team of people from concerned organisations, together with the members of Bangladesh Bird Club (BBC) and the local communities living around the PAs, under the coordination of a wildlife expert.

Aim of the Participatory Bird Survey

- Develop a coordinated approach for the survey of the bird species diversity and population density of several selected bird species to assess impacts of co-management efforts.
- Train the participants of the survey team about the survey method and identification of birds.
- Raise awareness for rare bird species in need of more effective management/conservation efforts.
- Raise awareness of the general public especially PA-level stakeholders to the status of bird species and the importance of conservation.

Methods Considered

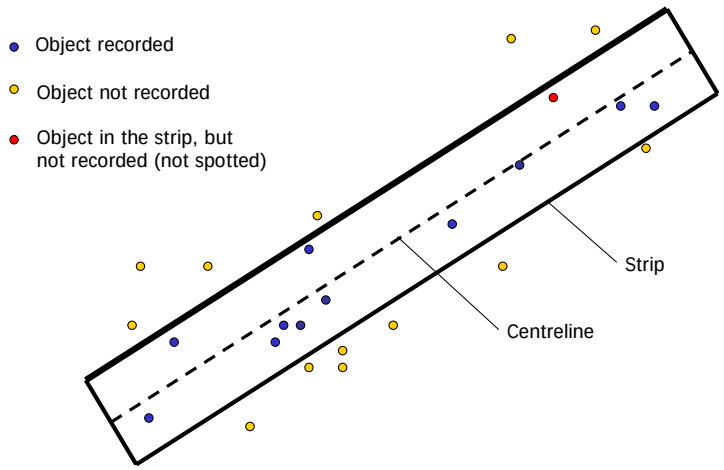
Method	Description	Suitability	Decision
Quadrat sampling	Objects are counted from sample quadrats	Suitable for population estimation of less mobile or immobile organisms, e.g. earthworms, plants	Rejected
Strip transect sampling	A combination of quadrat sampling and line transect sampling where objects are counted from straight, long and narrow strips	Suitable for population estimation of visible organisms, no problem for mobile organisms, requires no expert knowledge	**Accepted**
Line transect sampling	Objects are counted from two sides of a straight line; no restriction of distance while observing, but the sighting distance and sighting angle for each observation must be recorded	Suitable for population estimation of visible organisms, no problem for mobile organisms, but requires expert knowledge and use of DISTANCE software	Rejected
Point transect sampling	It may be considered as a line transect of zero length (i.e. a point) where the sighting (radial) distance of each of the objects are measured from random points	Suitable for areas where transect sampling is difficult due to inaccessibility; no problem for mobile organisms (if visible), but might not sufficiently cover the habitat diversity	Rejected
Oppor-tunistic survey	Any important observation or information is recorded whenever available without following any systematic way	Suitable for recording the species diversity and other important information, but not for population density	**Accepted**

Strip Transect Sampling

In this method the observer(s) slowly walk (ca. 1.5 km/hr) on a relatively straight line through the study area and count the objects from both sides. The observation-range varies depending on the visibility of the study area. For mixed-evergreen forests of Bangladesh, the observation-range of 20 m on each side of the centreline would be suitable. The initial location of the object is always considered, because the object might move away after watching the observer(s). If any object is sighted beyond the pre-decided observation-range, or if the object is coming from the back (in order to avoid duplication), the observation is not recorded. The survey should be conducted in early mornings and late afternoons. Transects should be located in areas which are suitable in terms of accessibility and observation.

Each strip transect count is actually the total count of an area of the strip [length of the strip X width of the strip (2 X observation-range)]. Suppose there are k number of strips, each of width $2w$ (w is the observation-range on either side of the centreline), and the total length of all strips is L in a study area. If the total number of recorded objects in all strips is n, the population density D is estimated by $D = n/2wL$.

Diagram of a Strip Transect



Tips to Reduce Biases in Strip Transect Sampling

- This method assumes that all objects in the strip are recorded, so the observer(s) must be very careful in observing and recording the objects. Even then, the observer(s) might miss some of the objects in the strip, but if it is not more than 5% of the total objects recorded, the error is statistically negligible.
- The more areas covered in strip transects, the less error in the result.
- The transects should be uniformly distributed throughout the study area.
- Even if any centreline is slightly undulated, the strip should be straight.
- The object should be correctly identified.

Opportunistic Survey

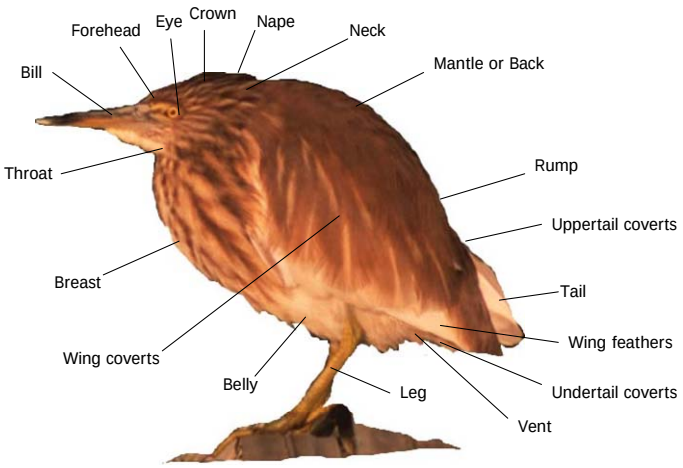
In opportunistic survey, any important or interesting observation/information is recorded at any time while in the field. Although this is an informal way of collecting information, the outcome can be very useful. The following aspects will be recorded for rare and important species of birds.

- Occurrence of a species, with its relative abundance.
- Breeding season (mating, nesting, feeding young, etc.).
- Food materials
- Calls or songs
- Threats (lack of food, lack of nesting place, lack of habitat, hunting and trapping, etc.).

Special Equipment Required

- One GPS (Global Positioning System)
- Five binoculars (ca. 8 X 42 or 7 X 50)
- One compass

Topography of a Bird



Things to Observe For Identification of a Bird

- Size and shape of the bird, particularly the tail.
- Plumage colour and markings, especially on head, wings, breast and vent.
- Structure and colour of bill and legs.
- Colour of eye/iris.
- Micro-habitat (where it was particularly seen).
- Call or song.
- Flight pattern.

Eight Indicator Bird Species

- Greater Racket-tailed Drongo (*Dicrurus paradiseus*)
- Hill Myna (*Gracula religiosa*)
- Oriental Pied Hornbill (*Anthracoceros albirostris*)
- Red-headed Trogon (*Harpactes erythrocephalus*)
- Red Junglefowl (*Gallus gallus*)
- White-crested Laughingthrush (*Garrulax leucolophus*)
- Puff-throated Babbler (*Pellorneum ruficeps*)
- White-rumped Shama (*Copsychus malabaricus*)

Greater Racket-tailed Drongo (*Dicrurus paradiseus*)
Local name: Bheemraj

- Size and Shape – Except 'rackets', size similar to a pigeon but slimmer. Two characteristic 'racket' feathers are on the tail. A crest on the forehead.
- Colouration – A completely glossy black bird.
- Voice – Very noisy. Variable whistling and screeching. Much mimicry.
- Habits – Inhabits forests and plantations. Often in small groups and mixed hunting groups.

Hill Myna (*Gracula religiosa*)
Local name: Myna

- Size and Shape – Similar to Common Myna.
- Colouration – Plumage glossy black, with prominent white wing patches. Yellow-orange bill, and yellow head wattles and legs.
- Voice – Very vocal and an exceptional mimic. Screeches, whistles, gurgles and croaks.
- Habits – Inhabits mainly evergreen forests. Feeds on fruits, often with other species. Usually in pairs or small parties. Nests in high tree hole.

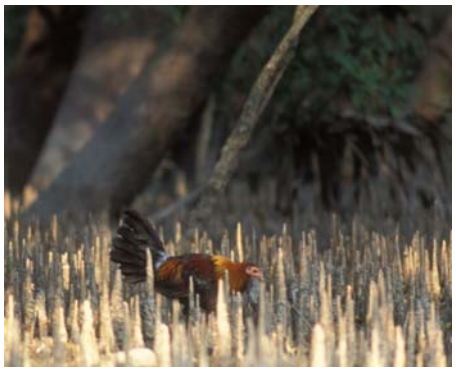
Oriental Pied Hornbill (*Anthracoceros albirostris*)
Local name: Kaw Dhanesh, Reshulla

- Size and Shape – Larger than a crow, with longer and broader tail and wings. A horn-like structure above the bill, which is called casque.
- Colouration – Mainly black upperparts and white underparts. Yellow bill and casque, with some black patches on the casque.
- Voice – Various high-pitched cackles and squeals. Also a fast *ka ka ka ka.*
- Habits – Inhabits mainly evergreen forests. Sociable and arborial. Prefers to feed on fruits, but also feed on young birds, large insects, reptiles and rodents. Nests in high tree holes.

Red-headed Trogon (*Harpactes erythrocephalus*)
Local name: Lalmatha Trogon

- Size and Shape – Similar to a pigeon, but tail proportionately longer, broader and square-ended tail.
- Colouration – A mainly red and fawn-brown bird. As the name suggests, head purely red.
- Voice – A scaled sequence of *chaup chaup chaup* notes.
- Habits – Inhabits dense broadleaved forests. Sits for long periods high in trees. Fly-catches in canopies, but also eats fruits. Solitary or in pairs.

Red Junglefowl (*Gallus gallus*)
Local name: Bon Morog/Murgi



- Size and Shape – Similar to indigenous domestic fowl.
- Colouration – Male has golden brown hackles covering neck and back, golden and green wings and black underparts. Long, curved black tail. Red comb and wattles. Female speckled reddish brown, with small red comb and wattle.
- Voice – Shrill rushed crow *kuk kurdi ru.*
- Habits – Inhabits forests and secondary growths. Feeds in groups. Roosts in trees.

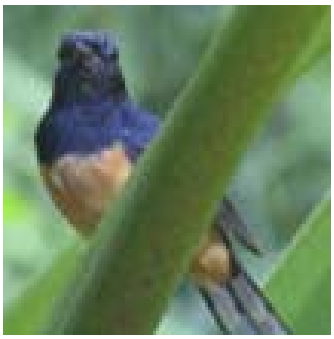
White-crested Laughingthrush (*Garrulax leucolophus*)
Local name: Sada-jhuti Panga

- Size and Shape – Similar to Jungle Babbler.
- Colouration – A brown bird with white head and crest, and black eye-patch.
- Voice – Very noisy. Various chattering calls and whistling, often delivered in chorus by flock.
- Habits – Inhabits forest undergrowth, secondary scrub and bamboos. Feeds on invertebrates and fruits. Always in parties. Nests in shrub or tree.

Puff-throated Babbler (*Pellorneum ruficeps*)
Local name: Phota-konthi Satbhaila

- Size and Shape – Slightly smaller than Jungle Babbler, but shape similar to Jungle Babbler.
- Colouration – A brown bird with strongly spotted underparts.
- Voice – Loud call *tee teu.* Extended loud mellow song.
- Habits – Inhabits forest undergrowth and bamboo thickets. Feeds singly or in pairs on invertebrates, mainly on ground.

White-rumped Shama (*Copsychus malabaricus*)
Local name: Shama



- Size and Shape – Similar to Oriental Magpie Robin, but with much longer tail.
- Colouration – A black and orange bird with a large, white back patch. Female paler than the male.
- Voice – A harsh *chrrr* call. Very rich song often with mimicry.
- Habits – Inhabits forest undergrowth, favouring bamboo. Frequently cocks tail. Feeds on invertebrates. Nests low down.

Selected Reading

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