



**Participatory Bird Survey to Assess  
Protected Area Management Impacts:  
*Final Year Report***





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*Prepared for*

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**O c t o b e r   2 0 0 8**



**With partners: CODEC, NACOM & RDRS**

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**CONTENTS**

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	<i>Page</i>
<b>Summary</b> .....	<b>4-5</b>
<b>1. Introduction</b> .....	<b>6-9</b>
<b>2. Project Sites</b> .....	<b>10-26</b>
2.1 Lawachara National Park .....	14
2.2 Satchori National Park .....	15
2.3 Rema-Kalenga Wildlife Sanctuary .....	15
2.4 Chunati Wildlife Sanctuary .....	16
2.5 Teknaf Game Reserve .....	17
<b>3. Material and Methods</b> .....	<b>27-34</b>
3.1 Material Used .....	28
3.2 Selection of Indicator Birds .....	28
3.3 Survey Team .....	29
3.4 Bird Survey Methods .....	29
3.4.1 Strip Transect Sampling .....	31
3.4.2 Opportunistic ( <i>Ad Libitum</i> ) Sampling .....	32
<b>4. Results and Discussion</b> .....	<b>35-57</b>
4.1 Population Densities of Eight Indicator Bird Species .....	36
4.2 Bird Species Diversity .....	42
4.3 Threats to the Birds and Their Habitats .....	53
<b>References</b> .....	<b>59-61</b>
<b>Appendices</b> .....	<b>62-64</b>
Appendix I. A sample of the data sheet for bird survey, the Bengali version was used in the field .....	62
Appendix II. Names and addresses of the bird survey team members who frequently attended the surveys .....	63

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## **SUMMARY**

The Nishorgo Support Project (NSP) is a project of Bangladesh Forest Department, which was implemented by International Resources Group (IRG) with its local partners (CODEC, NACOM and RDRS), and it was funded by the United States Agency for International Development (USAID). Participatory bird survey was taken as the tool to assess the management impacts of NSP in five protected areas, situated in the northeast and southeast of Bangladesh. Unlike animals of other taxa, birds are more visible and more responsive to any change. Therefore, birds were taken as the indicators of the ecological changes of their habitats.

This was the last year survey (2008) of systematic yearly surveys of four years (2005-2008). The fieldwork continued from February to August (about 30 observation-days in the field). The members of Bangladesh Bird Club (BBC) and the local communities living around these sites had actively participated in the surveys. Strip transect 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<sup>2</sup>) in each of the five sites were estimated. The indicator birds were 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 in this year (2008) were estimated at: Lawachara National Park – 14.0, 11.1, 3.9, 32.4, 89.8, 21.3, 0.0, 34.5; Satchari National Park – 16.2, 12.9, 3.5, 33.9, 86.8, 12.6, 0.0, 41.1; Rema-Kalenga Wildlife Sanctuary – 16.1, 6.4, 2.1, 37.2, 65.0, 10.3, 0.0, 27.1; Chunati Wildlife Sanctuary – 18.0, 0.0, 0.0, 10.1, 23.9, 7.5, 4.9, 16.4; and Teknaf Game Reserve – 12.8, 9.6, 1.1, 37.4, 18.8, 32.6, 0.0, 21.1.

When this year's density estimates were compared with those of the three previous years, it was found that two of the indicator birds (Red Junglefowl and

Puff-throated Babbler) that live in the understory of the forest have been increased over the last four years. This indicates that the forest understory has started regenerating, which increased the carrying capacity and nesting sites for these two species. The community patrolling, awareness programs and other activities by NSP played the key role in reducing the clearing of forest understory for firewood as well as reducing the hunting pressure. This, however, should not be treated as an overall improvement of the forest condition, because the forest (particularly the tree cover) requires a long time to complete the regeneration process. Hence, the improved protection to the forests must continue. Moreover, the illegal logging of timber trees and conversion of natural forests to monoculture plantations and agricultural fields are still going on in some areas, which is probably causing the decline of the Oriental Pied Hornbill population. This bird lives in the top canopy and hence is severely affected if the large trees are removed from the forest. The densities of other five indicator birds remained more or less unchanged over the last four years.

A total of 225 species of birds was recorded in five NSP sites, of which 190 (84%) were resident and the rest 35 (16%) migrant. Out of 225 species, 37 (17%) were Very Common, 65 (29%) Common, 41 (18%) Uncommon and 82 (36%) Rare. This shows that the largest proportion of birds is Rare, which requires monitoring and protection. Over the last three years no significant difference was found in the proportions of the number of species of primarily forest birds in relation to the total birds in any of the five NSP sites.

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*Chapter 1*

**INTRODUCTION**

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**PARTICIPATORY BIRD SURVEY TO ASSESS  
PROTECTED AREA MANAGEMENT IMPACTS:  
*FINAL YEAR REPORT***

## **1. INTRODUCTION**

Participatory bird survey was taken as the tool to assess the management impacts in five protected areas, situated in the northeast and southeast of Bangladesh, where Nishorgo Support Project (NSP) was working to improve the management system. Unlike animals of other taxa, birds are more visible, relatively fast-breeder, and more responsive to any change. Therefore, birds are one of the best indicators of the ecological changes (Johnston 1956, Morrison 1986, Welsh 1987, Temple and Wiens 1989, Canterbury *et al.* 2000, Browder 2002). Different species of birds occur in different strata of an area and are adapted to varied types of plant and animal food. Therefore, the avian population density and species diversity reflect the temporal changes of their habitat conditions. In other words, birds indicate the health of different strata of the forest. Determination of the extent to which ecological systems are experiencing changes is critical for long-term conservation of biotic diversity in the face of changing landscapes and land use (Canterbury *et al.* 2000).

Bangladesh is exceptionally rich in avifaunal diversity and abundance. Not only is the avifauna, the country 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<sup>2</sup>, Bangladesh harbors 690 species of birds that includes 380 residents, 209 winter visitors, 11 summer visitors, and 90 vagrants (Khan 2008). This can be compared with the total number of bird species in the whole of Europe, or the United States, each of which is about 800. The total number of bird species recorded in Bangladesh is 50% of the total of the Indian Subcontinent, and 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, together with improper management. People living around the forests are largely dependant on the forest resources. 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). Bangladesh has less than 0.02 ha of forest land per person – one of the lowest forest 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 uses 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 Bangladesh Forest Department (FD), which is financially supported by the United States Agency for International Development (USAID). The implementing agency of this project is 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 with active participation of the local communities. This will eventually develop a co-management system involving the local communities with the Forest Department.

The project took five protected areas in the mixed-evergreen forests located in the northeast (Lawachara National Park, Satchari National Park and Rema-Kalenga Wildlife Sanctuary) and southeast (Chunati Wildlife Sanctuary and Teknaf Game Reserve) of Bangladesh. Very few studies took 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 Dulahazara 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 occurs 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 projects, NSP requires an assessment of the impact. Systematic annual surveys on the population density of some selected indicator birds, together with an assessment of overall species diversity and composition of birds, came as the most convenient and useful tool for the assessment. This is also a way to enrich our knowledge and understanding of birds living in the mixed-evergreen forests. The participatory bird survey had the following objectives –

- Survey the population density of several selected species of indicator birds on an annual basis to assess the protected area management impacts.
- Record the status of all the species of birds occur in five NSP sites and gather information on the threatened species of birds.
- Train the participants of the survey team on the survey method and identification of birds.
- Raise awareness of the general public, especially the stakeholders living around the project sites, to the status of birds and the importance of conservation.

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*Chapter 2*

**PROJECT SITES**

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## **2. PROJECT SITES**

A total of five protected areas were selected for NSP activities from the northeast and southeast of Bangladesh – a small sub-tropical country in South Asia. The country became independent in 1971. Geographically the country is located between 20°34'-26°33' N latitudes and 88°01'-92°41' 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<sup>2</sup>, where about 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 34°C and 21°C, respectively. The average maximum and minimum temperatures in winter are 29°C and 11°C, 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 km<sup>2</sup>, 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 3<sup>rd</sup> 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 km<sup>2</sup> spread in different areas of the country, but mainly in the central and northeastern regions. The average height of the terraces from the adjacent floodplains is 6-25 m. The recent plains comprise 124,266 km<sup>2</sup> 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.

One-tenth (9.8% or 1.45 million ha) of Bangladesh's surface area is under the forest belts (Bangladesh Forest Department and Bangladesh Space Research and Remote Sensing Organization 2008), but the actual coverage of natural forests is lower than this, with most of this accounted for by the Sundarbans mangrove forest. There are three classes of natural forests in Bangladesh: a) mangrove forests – situated in the southwest, b) mixed-evergreen forests – situated in the northeast and southeast, and c) deciduous forests – situated in the central, northern and northwestern regions of the country (Figure 1). In the past three decades, the stock of forest trees has declined at an alarming rate. There are 19 protected areas and 6 other conservation sites in Bangladesh (Table 1), mostly in the forested areas, with a total area of 2,528.35 km<sup>2</sup>, covering only 1.7% of the total area of Bangladesh.

The country has a rich biological heritage as a consequence of its location at the confluence of the two major biotic subregions – the Indo-Himalayas and Indo-China (MacKinnon and MacKinnon 1986). A total of 121 species of mammals, 690 birds, 158 reptiles and 53 amphibians are expected to occur in Bangladesh (Khan 2008).

**Table 1.** Protected areas (National Parks, Wildlife Sanctuaries and Game Reserve) and other conservation sites (Eco-Parks and Safari Park) in Bangladesh

Sl. No.	Name of the Area	Type of the Area	Geographical Location (Approx.)	District in Which Located	Year of Establishment (Extension)	Area (ha)
<b>National Park</b>						
1	Madhupur	Moist deciduous forest in hillocks	24°45' N latitude, 90°06' E longitude	Tangail and Mymensingh	1962 (1982)	8,436
2	Bhawal	Moist deciduous forest in hillocks	24°45'00" N latitude, 90°20' E longitude	Gazipur	1974 (1982)	5,022
3	Himchari	Mixed-evergreen forest in hills	21°22' N latitude, 92°02' E longitude	Cox's Bazaar	1980	1,729
4	Lawachara	Mixed-evergreen forest in hills	24°15' N latitude, 91°45' E longitude	Moulvibazar	1996	1,250
5	Kaptai	Mixed-evergreen forest in hills	22°30' N latitude, 92°20' E longitude	Rangamati	1999	5,464
6	Nijhum Dweep	Mangrove forest on coastal island	25°35' N latitude, 88°45' E longitude	Noakhali	2001	16,352
7	Ramsagar	Huge lake surrounded by plantation	24°45' N latitude, 90°06' E longitude	Dinajpur	2001	28
8	Medha Kachhapia	Dipterocarp forest in hillocks	21°35' N latitude, 92°02' E longitude	Cox's Bazaar	2004	396
9	Satchari	Mixed-evergreen forest in hills	24°07' N latitude, 91°27' E longitude	Habiganj	2006	243
10	Khadimnagar	Mixed-evergreen forest in hills	24°55' N latitude, 91°57' E longitude	Sylhet	2006	679
<b>Wildlife Sanctuary</b>						
1	Sundarbans East	Mangrove forest in lowland coast	21°47'-22°03' N latitudes, 89°44'-89°56' E longitudes	Bagerhat	1960 (1996)	31,226
2	Pablakhali	Mixed-evergreen forest in hills	23°08' N latitude, 92°16' E longitude	Rangamati	1962 (1983)	42,087
3	Char Kukri-Mukri	Mangrove forest on coastal island	21°55' N latitude, 90°38' E longitude	Bhola	1981	40
4	Chunati	Dwarf bamboo and other vegetation in hills	21°40' N latitude, 92°07' E longitude	Chittagong and Cox's Bazar	1986	7,764
5	Sundarbans South	Mangrove forest in lowland coast	21°39'-21°56' N latitudes, 89°17'-89°30' E longitudes	Khulna	1996	36,970
6	Sundarbans West	Mangrove forest in lowland coast	21°38'-21°58' N latitudes, 89°00'-89°15' E longitudes	Satkhira	1996	71,502
7	Rema-Kalenga	Mixed-evergreen forest in hills	24°05' N latitude, 91°37' E longitude	Habiganj	1996	1,795
8	Fashiakhali	Mixed-evergreen forest in hills		Cox's Bazaar	2007	1,302
<b>Game Reserve</b>						
1	Teknaf	Mixed-evergreen forest in hills	21°00' N latitude, 92°20' E longitude	Cox's Bazaar	1983	11,615
<b>Eco-Park</b>						
1	Madhutilla	Moist deciduous	25°12' N latitude,	Sherpur	1999	100

*NSP Bird Survey: Final Year Report*

Sl. No.	Name of the Area	Type of the Area	Geographical Location (Approx.)	District in Which Located	Year of Establishment (Extension)	Area (ha)
		forest in hillocks	90°10' E longitude			
2	Madhabkunda	Mixed-evergreen forest in hills	22°30' N latitude, 92°20' E longitude	Moulvibazar	2000	266
3	Sitakunda	Mixed-evergreen forest in hills	22°30' N latitude, 92°20' E longitude	Chittagong	2000	808
4	Banshkhali	Dwarf bamboo and other vegetation in hills	21°58' N latitude, 91°59' E longitude	Chittagong	2003	1,200
5	Kuakata	Mangrove forest in lowland coast	20°50' N latitude, 90°10' E longitude	Patuakhali	2006	5,661
<b>Safari Park</b>						
1	Dulahazara	Dipterocarp forest in hillocks	21°39' N latitude, 92°03' E longitude	Cox's Bazaar	1997	900
<b>Total protected area and conservation sites = 252,835 ha or 2,528.35 km<sup>2</sup></b>						

A total of five sites were initially selected for the implementation of NSP, of which two are National Parks (Lawachara and Satchari), two Wildlife Sanctuaries (Rema-Kalenga and Chunati) and one Game Reserve (Teknaf). 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 Bazar Districts). Although the mixed-evergreen forests have largely been destroyed and converted, these areas still have some rich patches of mixed-evergreen forests. The five sites where the bird survey took place are –

## 2.1 Lawachara National Park

This is an area of 12.5 km<sup>2</sup> 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 mixed up with naturally grown vegetation and the entire area now resembles a natural forest. Most of the species are of evergreen type, dominated by 'chapolish' (*Artocarpus chaplasha*), 'civit' (*Swintonia floribunda*), 'shimul' (*Bombax insignis*), fig (*Ficus* spp.), 'jaam' (*Syzygium* spp.) and bamboo (*Bambusa* spp. and *Melocanna* spp.). 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 the Hoolock Gibbon (*Bunopithecus hoolock*) in the wild. Other important wildlife are Capped Langur (*Trachypithecus pileatus*), Phayre's Langur

(*Trachypithecus phayrei*), Pig-tailed Macaque (*Macaca nemestrina*), Orange-bellied Himalayan Squirrel (*Dremomys lokriah*), Barking Deer (*Muntiacus muntjac*) and Masked Civet (*Paguma larvata*). The surrounding habitants are mainly of indigenous Khasia communities. These people partially depend on the forest resources, 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. The Magurchara Gas Field and the gas processing plant are in two ends of the National Park. There are six transects for bird survey in this forest (Table 2).

## **2.2 Satchari National Park**

This is a small patch (2.4 km<sup>2</sup>) of natural mixed-evergreen forest located in Chunarughat Upazilla of Habiganj District (Figure 3). The area resembles a triangle, with one end 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 'chopalish', 'civit', 'shimul', fig and bamboo. Satchari is the area where the Asiatic Black Bear (*Ursus thibetanus*) is seen rarely, and also reported to breed in nearby grasslands (Chankhola). Other important wildlife are Hoolock Gibbon, Pig-tailed Macaque and Barking Deer. There is only one village of ethnic Tripura community, living in the forest. They cultivate lemon and pineapple in the hills, and work in the tea nearby 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. There are three transects for bird survey in this forest (Table 2).

## **2.3 Rema-Kalenga Wildlife Sanctuary**

This is 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<sup>2</sup> in Chunarughat Upazilla of Habiganj District (Figure 4). 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 diverse and suitable for wildlife. The forest is dominated by 'chupalish', 'civit', 'shimul', 'jaam', fig, 'hargaza' (*Dillenia pentagyna*) and bamboo. Rema-Kalenga is the forest where the Malayan Giant Squirrel (*Ratufa bicolor*) is seen quite often. Other important wildlife of the area are Leopard (*Panthera pardus*), Phayre's Langur and Masked Civet. The people live around this Sanctuary are mainly non-tribal 'Bangalis', but there are people of ethnic Tripura, Khasia and Orang communities as well. Their livelihood depends mainly on the cultivation of paddy in the nearby plainlands and working in the nearby tea estates. There are four transects for bird survey in this forest, which are given in Table 2.

#### **2.4 Chunati Wildlife Sanctuary**

Although this Sanctuary is quite large (77.6 km<sup>2</sup>), ecologically it is the poorest among five NSP sites. It is located in Lohagara and Banhskhali 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 'chupalish', but today 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. Today 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 the 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 is agriculture (paddy, lemon and betel leaf) and fish farming, but some of them illegally harvest the bamboo



and other forest products. There were five transects for bird survey in this Sanctuary (Table 2).

## **2.5 Teknaf Game Reserve**

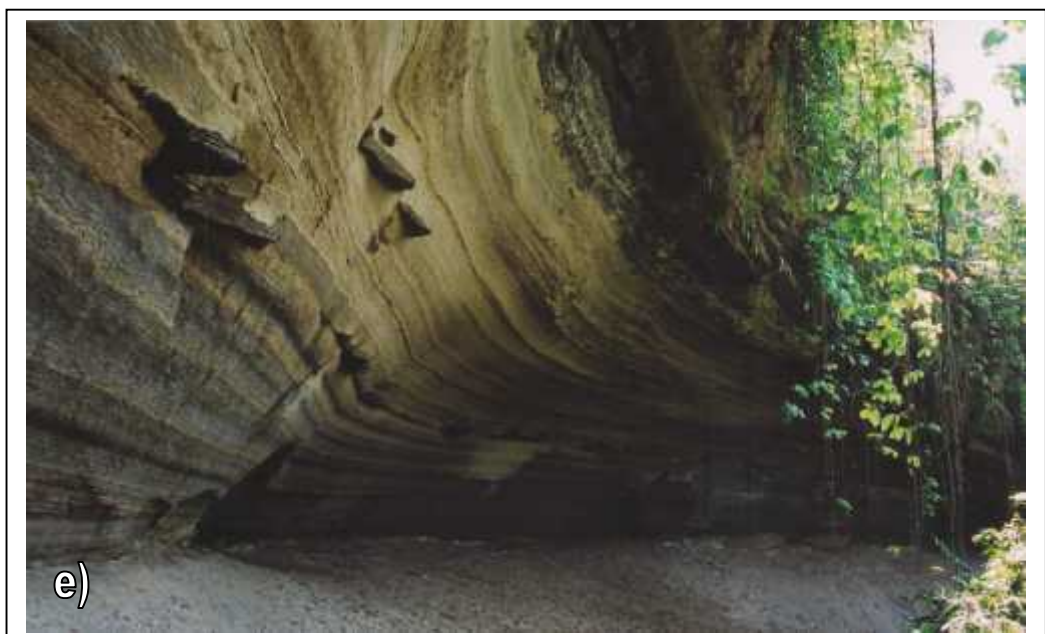
This is the largest (116.2 km<sup>2</sup>) and most undulated area, with steep terrain, among the five NSP sites (Figure 6). This Reserve was established in order to manage the game animals. According to the Bangladesh Wildlife Act 1974, a permit-holder can hunt game animals in a Game Sanctuary, but there is no record of legal game hunting in this area despite the fact that this is the only Game Sanctuary in the country. The hills are much higher than that of the other four sites, with the heights of 100-150 m from the sea level. The Toynga is the highest hill in the areas we surveyed, with the altitude 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 deposits 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 patches of natural mixed-evergreen forests, with tall 'civit', 'chupalish', 'garjan', 'shimul', 'uriaam' (i.e. wild mango, *Mangifera longipes*), fig and many other trees, including 'ashok' (*Saraca indica*), a popular medicinal plant. Among the wildlife, Asian Elephant is the most important, but there are Wild Boar, 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 communities. There were five transects for bird survey in this forest (Table 2).

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

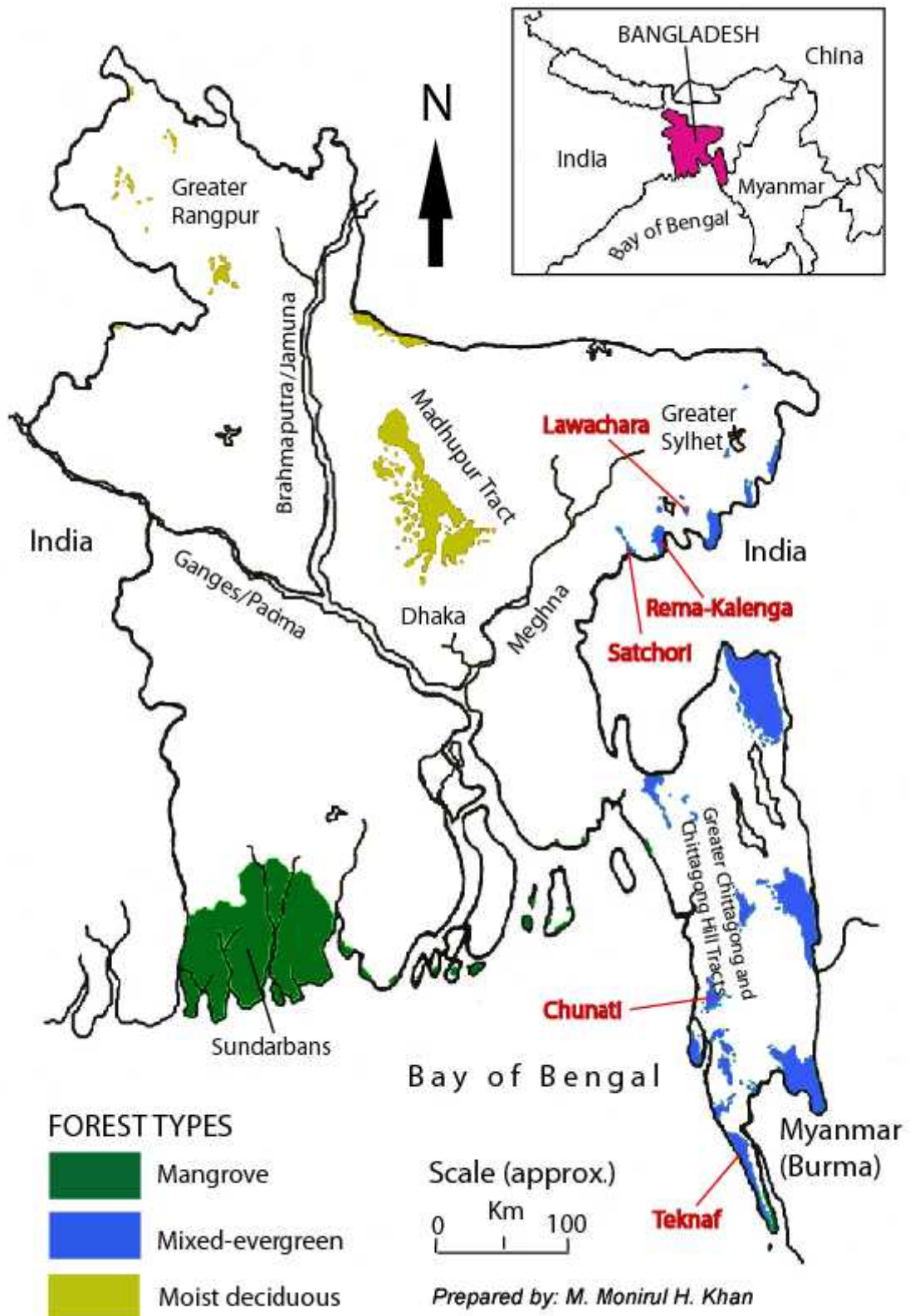
<b>Name of Project Site</b>	<b>Name of Transect</b>	<b>Location in Project Site</b>	<b>Geographic Locations of Two Ends</b>	<b>Landmarks at Two Ends</b>	<b>Length (km)</b>
<b>Lawachara National Park</b>	Magurchara	Eastern	24°19.9' N, 91°47.6' E; 24°20.2' N, 91°47.5' E	Gasfield, stream	0.50
	Train Line	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
<b>Satchari National Park</b>	Satchari West	Central	24°07.5' N, 91°26.7' E; 24°06.6' N, 91°27.2' E	'Wilderness' signboard, teak plantation	1.94
	Satchari East	Central	24°07.6' N, 91°27.0' E; 24°07.3' N, 91°27.2' E	Sloppy passage, open grassland	0.56
	Satchari North	Northern	24°07.4' N, 91°26.7' E; 24°07.5' N, 91°27.0' E	Lemon plantation, metalled road	0.50
<b>Rema-Kalenga Wildlife Sanctuary</b>	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 'chupalish' tree, BDR camp	1.11
<b>Chunati Wildlife Sanctuary</b>	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
<b>Teknaf Game Reserve</b>	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) Satchari National Park, c) Rema-Kalenga Wildlife Sanctuary, d) Chunati Wildlife Sanctuary, and e) Teknaf Game Reserve.**



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



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

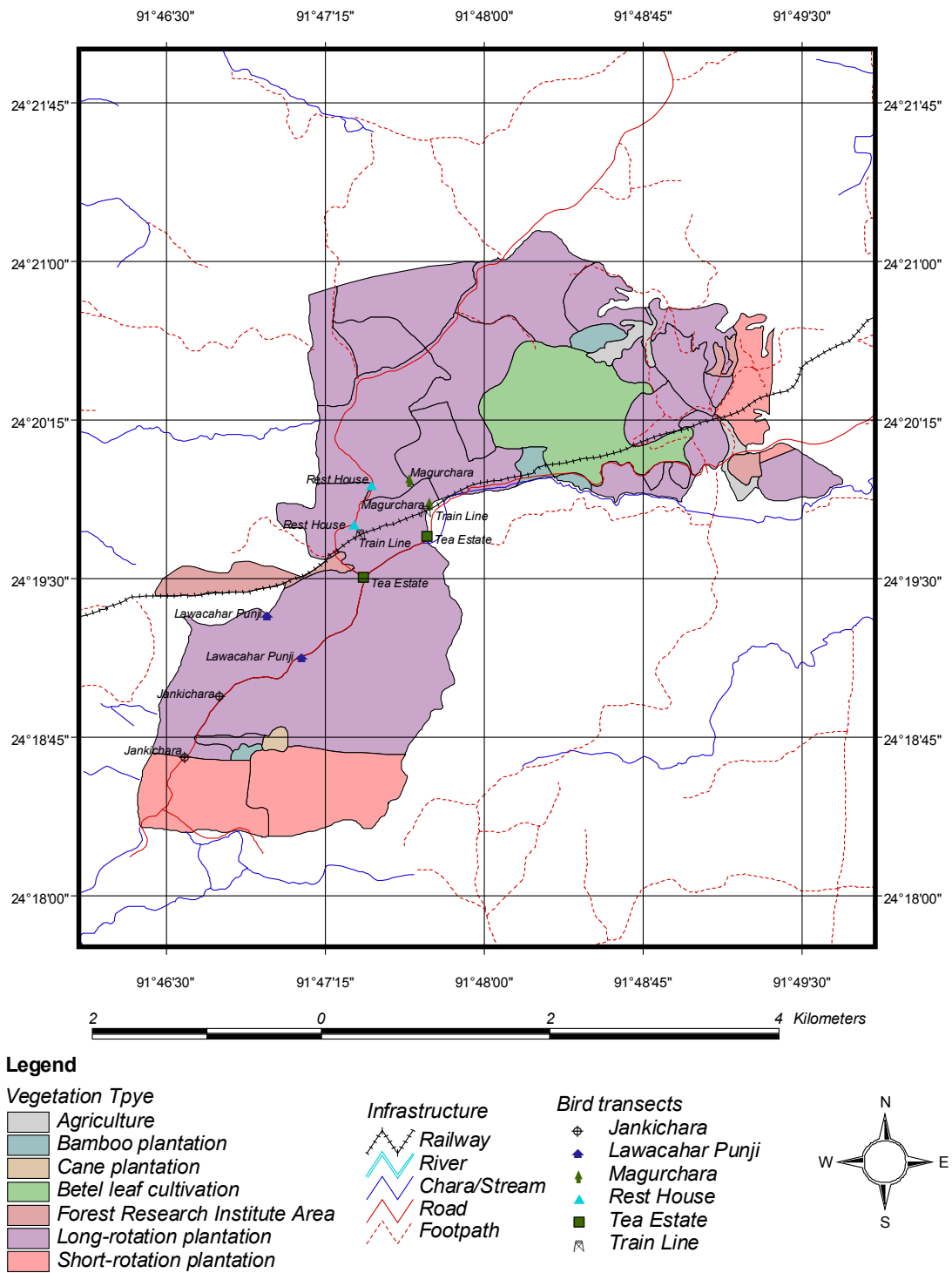


Figure 2. Lawachara National Park showing the starting and ending points of bird survey transects

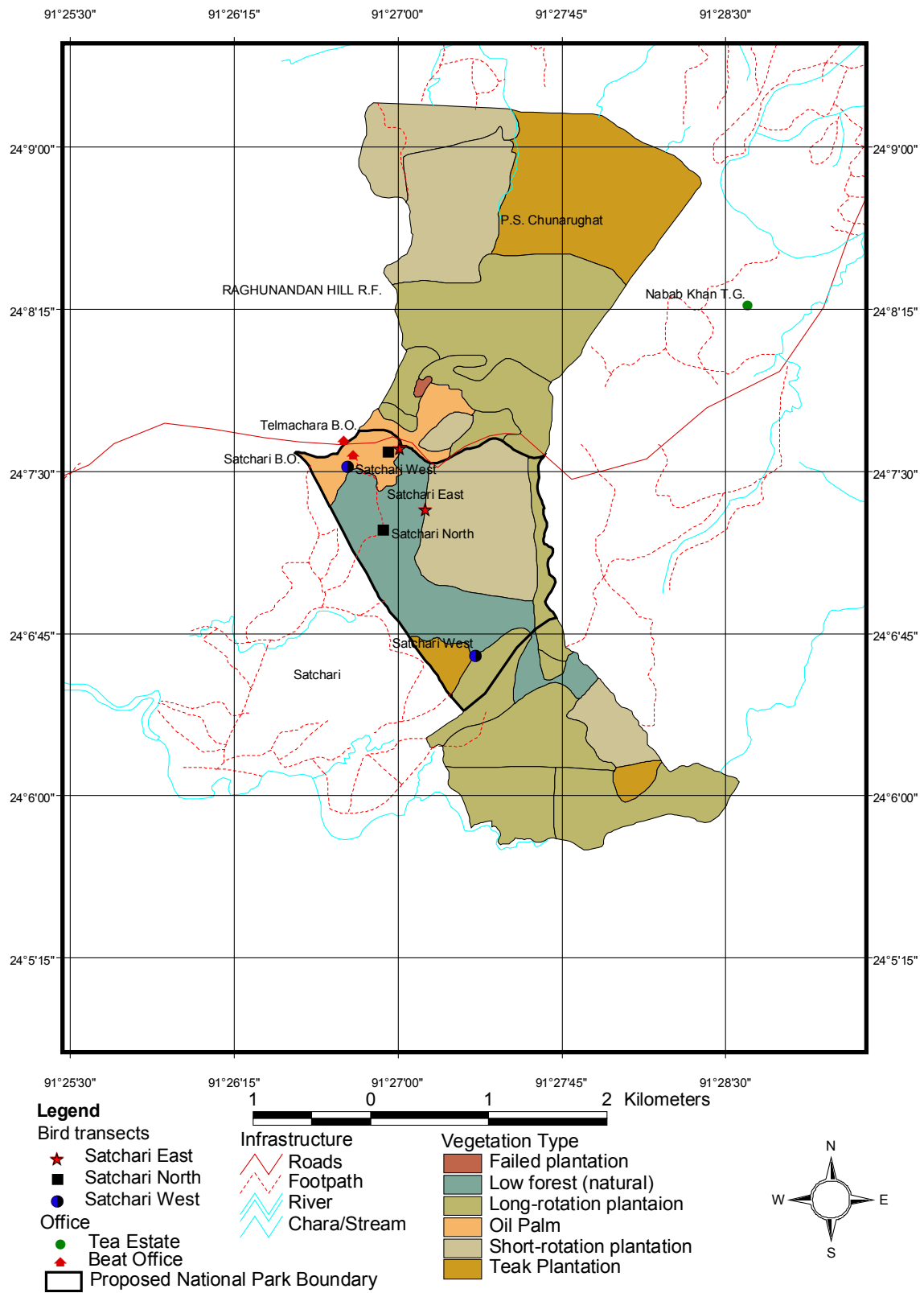


Figure 3. Satchari National Park showing the starting and ending points of bird survey transects

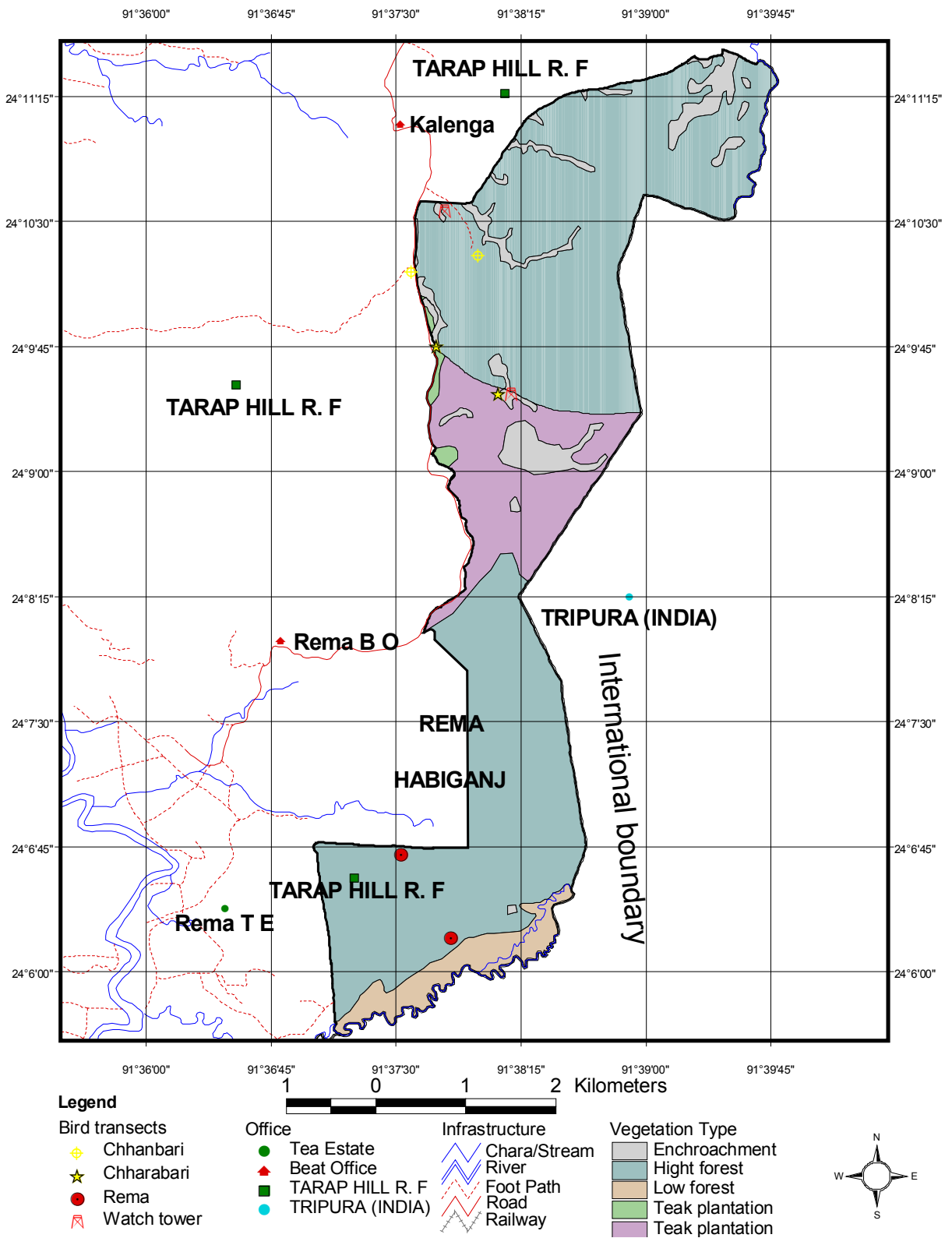


Figure 4. Rema-Kalenga Wildlife Sanctuary showing the starting and ending points of bird survey transects



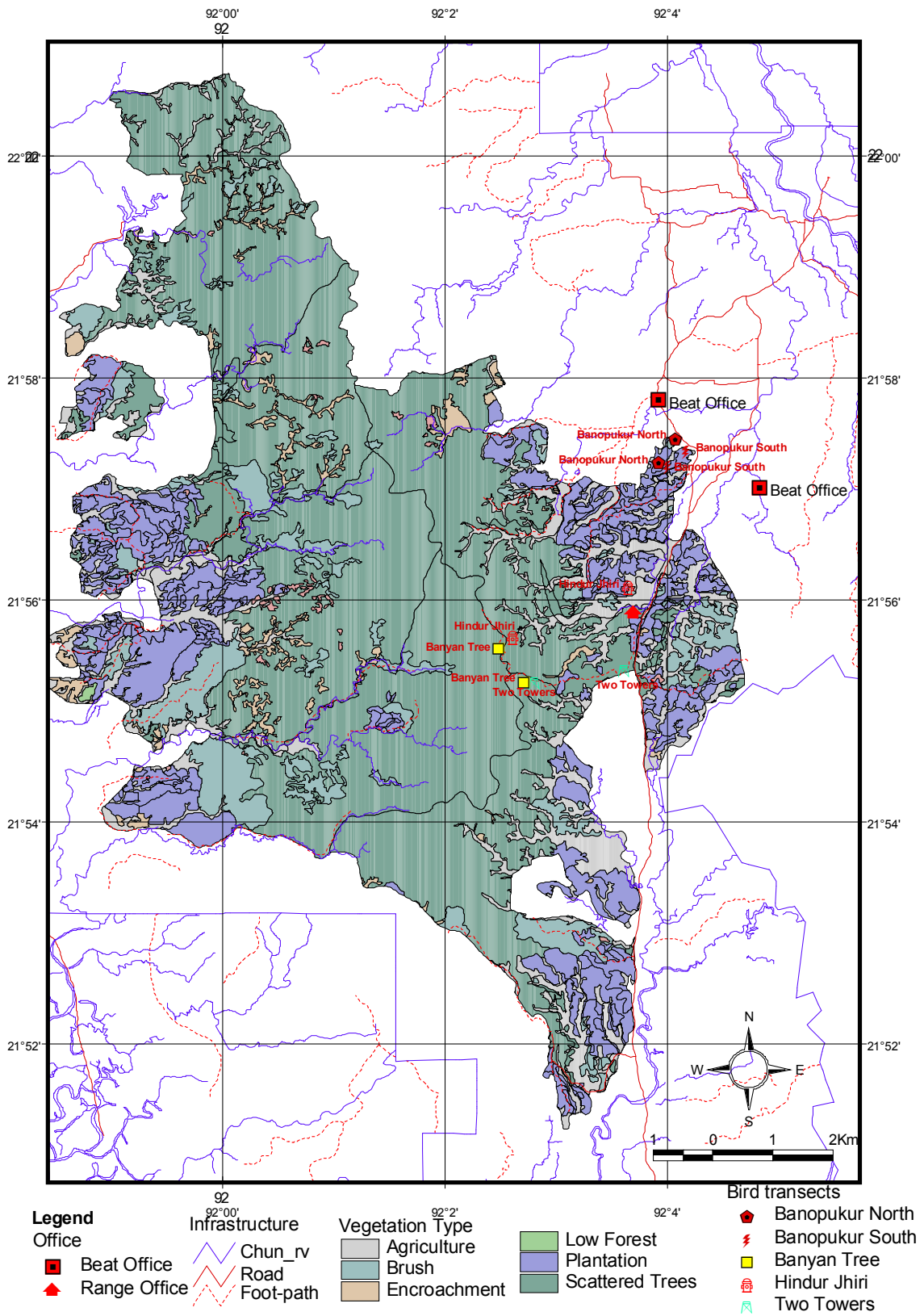


Figure 5. Chunati Wildlife Sanctuary showing the starting and ending points of bird survey transects

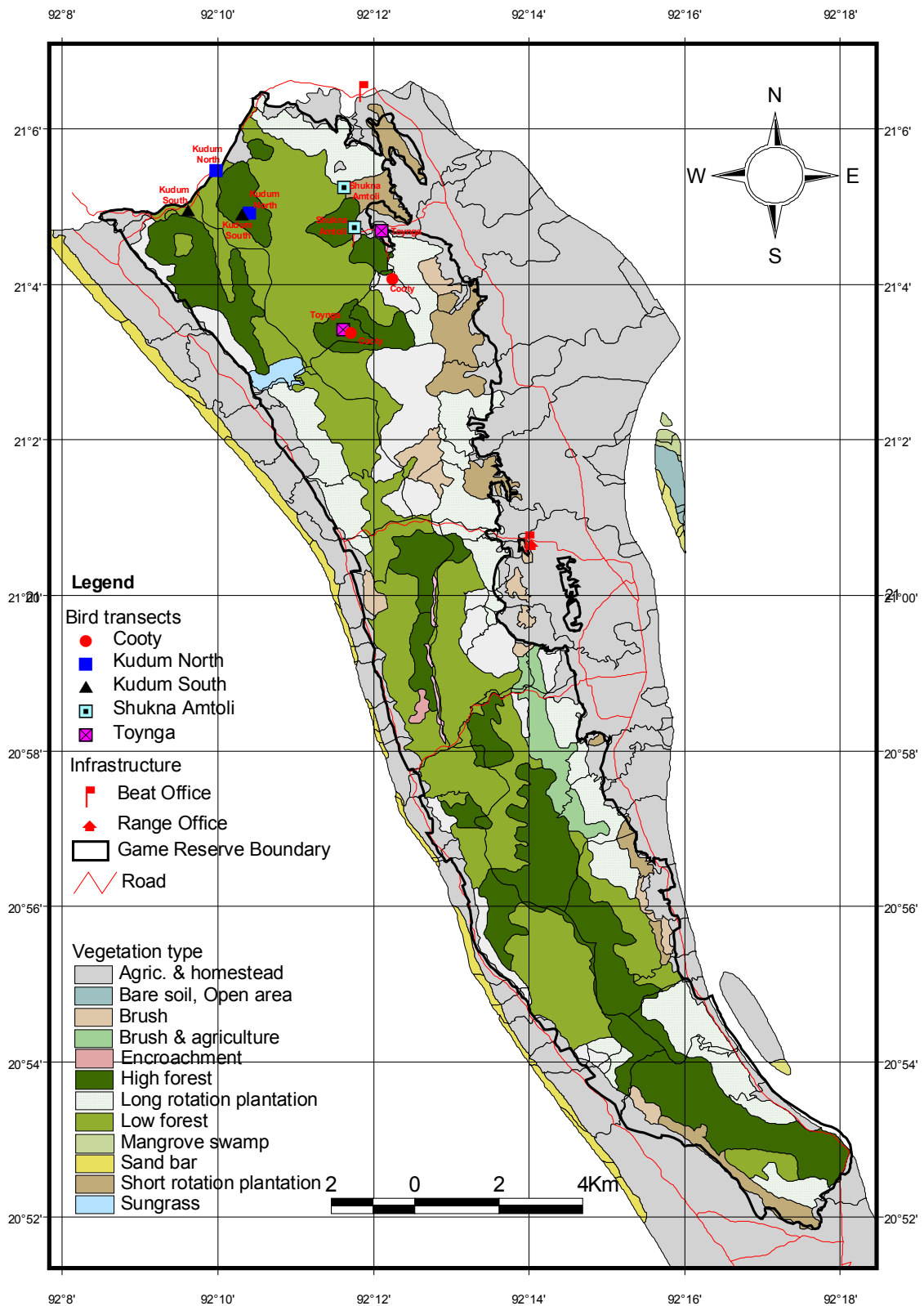


Figure 6. Teknaf Game Reserve showing the starting and ending points of bird survey transects

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*Chapter 3*

**MATERIAL AND METHODS**

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### **3. MATERIAL AND METHODS**

#### **3.1 Material Used**

Since the survey was conducted following simple methods (so that the local communities could participate), no sophisticated equipment was needed for the data collection and analyses. A few things were required in the field, such as some binoculars (8-10x) for better observation and identification of birds, books (field guides) on birds for identification, a GPS (Geographic Positioning System; E-trex Vista C) 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. For professional photographs and video clips, two Nikon D70S digital camera bodies, two Nikkor lenses (300 mm and 28-105 mm), one Nikon SB-800 flashgun, and one Panasonic NVGS-11 MiniDV with a tripod were used. Moreover, a pair of Motorola two-way radios (range: 8 km) were used for communication when the survey team was divided into two groups.

#### **3.2 Selection of Indicator Birds**

A total of eight species of birds were selected as indicators for assessment of the overall condition of wilderness (Table 3). These eight species were suggested on a meeting of bird experts (including Enam Ul Haque, Bill Collis and Paul Thompson), organised in NSP office in Dhaka, based on a set of criteria put forward by Nasim Aziz (ESMS-NSP). These criteria were: 1) they are primarily forest birds, 2) they live in different strata of the forest, 3) they are noisy birds (least likely to miss during the counts), 4) they are breeding residents and 5) they have communication value. Since all the eight indicator birds are primarily forest-dwellers, it was assumed that the improvement or degradation of the forest condition will have a direct impact on the feeding and breeding of the indicator species, which in turn will be reflected in the change of the population density of these species (Morrison 1986, Temple and Wiens 1989, Canterbury *et al.* 2000, Browder *et al.* 2002).

**Table 3.** Eight indicator bird species of different strata of the forest

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

### 3.3 Survey Team

The survey team was formed by participants from Bangladesh Bird Club (BBC), University students, and the local communities living around or close to the project sites, including the local Ecotour Guides and Co-management Council members, together with the local officials of the Forest Department. BBC is a club of active amateur birdwatchers who are based in Dhaka, but they frequently visit the wilderness areas of the country. Mr. Enam Ul Haque, the prominent birdwatcher of the country is the leader of BBC. The whole survey team was lead by a wildlife expert (Dr M. Monirul H. Khan) from Jahangirnagar University, Savar, Dhaka. The team members were trained during the survey so that they could play significant role in the survey process. See Appendix II for the names and addresses of the survey team members who commonly attended the surveys.

### 3.4 Bird Survey Methods

The bird survey was first started in the year 2005, which was repeated in 2006, 2007 and 2008. Before the starting of the fieldwork, 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 could participate in the survey. It was decided that the

survey will be conducted in the breeding season of birds (February-August), so that there are more activities of birds. One main concern was to involve local communities and other stakeholders in the survey process so that they feel ownership of the survey outcomes. 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 eight indicator birds, and register the status of birds, which in turn will indicate the status of management impact of NSP. Taking all these into account, strip transect sampling and opportunistic survey methods were selected. The baseline survey was conducted during February-August 2005, which was repeated in 2006, 2007 and 2008, in the same season and following the same transects so that the results could be compared across different years.

**Table 4.** Different methods considered for bird survey

<b>Method</b>	<b>Description</b>	<b>Suitability</b>	<b>Decision</b>
<b>Quadrat sampling</b>	Objects are counted from sample quadrats	Suitable for population estimation of less mobile or immobile organisms, e.g. earthworms, plants	Rejected
<b>Strip transect sampling</b>	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	<b>Accepted</b>
<b>Line transect sampling</b>	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
<b>Point transect sampling</b>	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
<b>Opportunistic survey</b>	Any important observation or information is recorded whenever available without following any systematic way	Suitable for recording the species diversity, composition and other important information, but not for population density	<b>Accepted</b>

### **3.4.1 Strip Transect Sampling**

Strip transect sampling (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 people could participate in the survey. 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 (half-width of strip) varies depending on the visibility of the study area. For mixed-evergreen forests in Bangladesh, the observation-range of 20 m on each side was found suitable, so the width of the transect was 40 m. The initial location of the object was considered while counting, because the object often moves away after watching the observer(s). If any object was sighted beyond the pre-decided observation-range, or if the object was seen coming from the back (in order to avoid duplication), the object was not counted. The survey was conducted in early mornings and late afternoons when the birds were most active. Transects were 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 centre-line), 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 as –

$$D = n/2wL$$

Since the project sites were not very big, it was not possible to make very long or many transect lines. 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 area covered in strip transects means the less error in mean density estimates. The transects were located mainly in the rich parts of the NSP sites. Even if any centre-line 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.

### **3.4.2 Opportunistic (*Ad Libitum*) Sampling**

In opportunistic or *ad libitum* sampling any important or interesting observation/information is recorded at any time while in the field. This sampling method is suitable for recording the occurrence, relative abundance and distribution of different species of birds and other wildlife. The birds were identified by using some authentic books (Ali and Ripley 1987, Grimmet *et al.* 1998, 1999; Grewal *et al.* 2002). The relative abundance of birds (Very Common, Common, Uncommon and Rare) was assessed on the basis of their relative frequencies of sightings in the field, which was verified by interviewing local people. The 'Resident' species was defined as the species that lives in Bangladesh year-round and breeds in Bangladesh, the 'Winter Visitor' spends the winter in Bangladesh and does not breed in Bangladesh, the 'Summer Visitor' spends the summer in Bangladesh and breeds in Bangladesh, and 'Vagrant' erratically visits Bangladesh and does not normally breeds in Bangladesh.

Although the opportunistic sampling 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 incorporated that leads to biased results. This method is particularly useful in recording bits and pieces of important observations and information on rare and endangered birds and other wildlife that could not be studied by any other method because of their rarity. Using opportunistic sampling the following aspects were recorded for different species of birds –



- Principal diet
- Principal foraging guild
- Status or relative abundance
- Breeding season (based on mating, nesting, feeding young, etc.)
- Calls or songs
- Threats (lack of food, lack of nesting place, lack of habitat, hunting and trapping, etc.)



**Bird survey related activities in NSP sites: a) strip transect sampling in Rema-Kalenga, b) interviewing local people in Chunati, c) setting remote camera-trap in Satchari in order to photograph ground birds, and d) strip transect sampling in Lawachara**

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*Chapter 4*

**RESULTS AND DISCUSSION**

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## **4. RESULTS AND DISCUSSION**

The survey was conducted during a seven-month period (February-August), with about 30 observation-days in the field, with annual repetition during 2005-2008. Knowing the changes in the population densities of eight indicator species of birds in four year period was the main outcome.

The list of all bird species (including the indications of their principal diet, principal foraging guild, status, and distribution), particularly the forest birds, will be useful as indicators of ecological changes in the long-term. If the decline of the number of avian species, particularly the forest species, is recorded in the future, it will be a strong indication of the degradation of overall biodiversity richness of the area.

### **4.1 Population Densities of Eight Indicator Bird Species**

Like the three previous years (2005, 2006 and 2007), the population density, i.e. the number of individuals per square kilometer, was estimated in the final year (2008) for each of the eight indicator bird species in each of the five NSP sites (Figure 7a-e and 8). However, like in the previous years, the density of the Red Junglefowl was the highest in Chunati, and this was the only site where White-crested Laughingthrush was recorded.

This year's density estimates of eight indicator birds in each of the five NSP sites were compared with the three previous years' estimates, which revealed that two of the indicator birds (Red Junglefowl and Puff-throated Babbler), that live in the understory of the forest, have been increased over the last four years (Figure 9). This indicates that the forest understory has started regenerating, which caused the increment of the carrying capacity and nesting sites for these two species. The community patrolling, awareness and other programs by NSP played the key role in reducing the clearing of understory vegetation for firewood as well as reducing the hunting pressure.

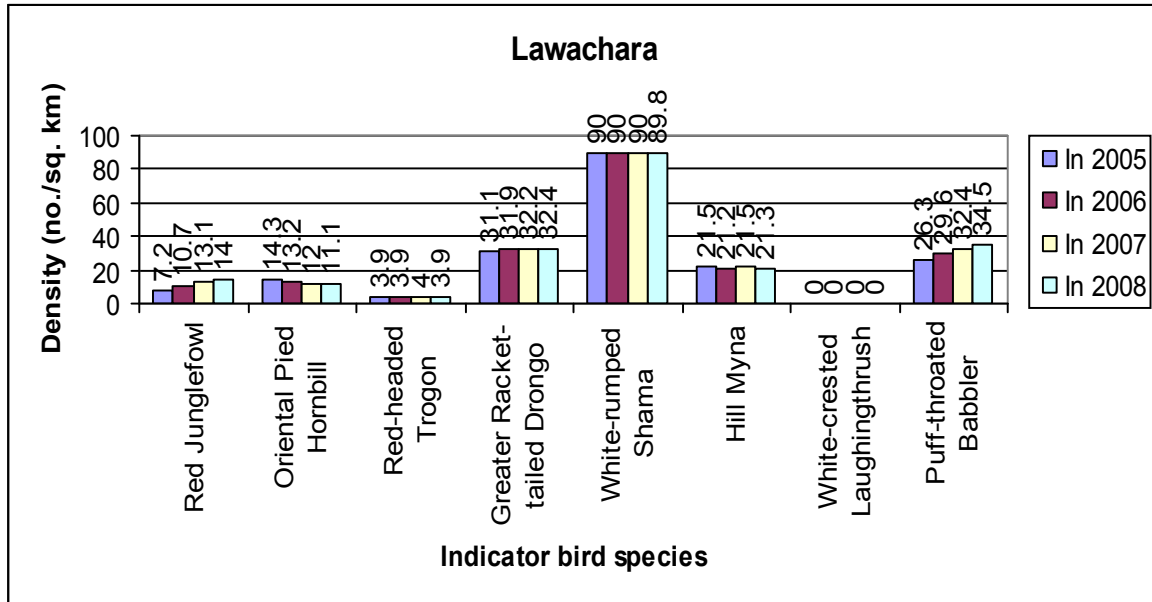
The increase of the density of these two birds, however, should not be treated as the overall improvement of the forest condition, because the forest (particularly the tree cover) requires a long time to complete the regeneration process. Ecologically, any regeneration process is very complex and dynamic, involving many natural and anthropogenic factors. Hence, the improved protection to the forest must continue. Moreover, the illegal logging of timber trees and conversion of natural forests to monoculture plantations and agricultural fields (particularly in Teknaf and Rema-Kalenga) still persists, which probably caused the decline of the Oriental Pied Hornbill over the last four years (Figure 9). This bird lives in the top canopy and hence is severely affected if the large trees are removed from the forest. The population densities of other five indicator birds have remained more or less unchanged over the last three year (Figure 9).

Only the populations of eight species of breeding resident birds were monitored during this study, because the populations of winter visitors, summer visitors and vagrants depend also on the resource status of other areas that they depend on (Temple and Wiens 1989).

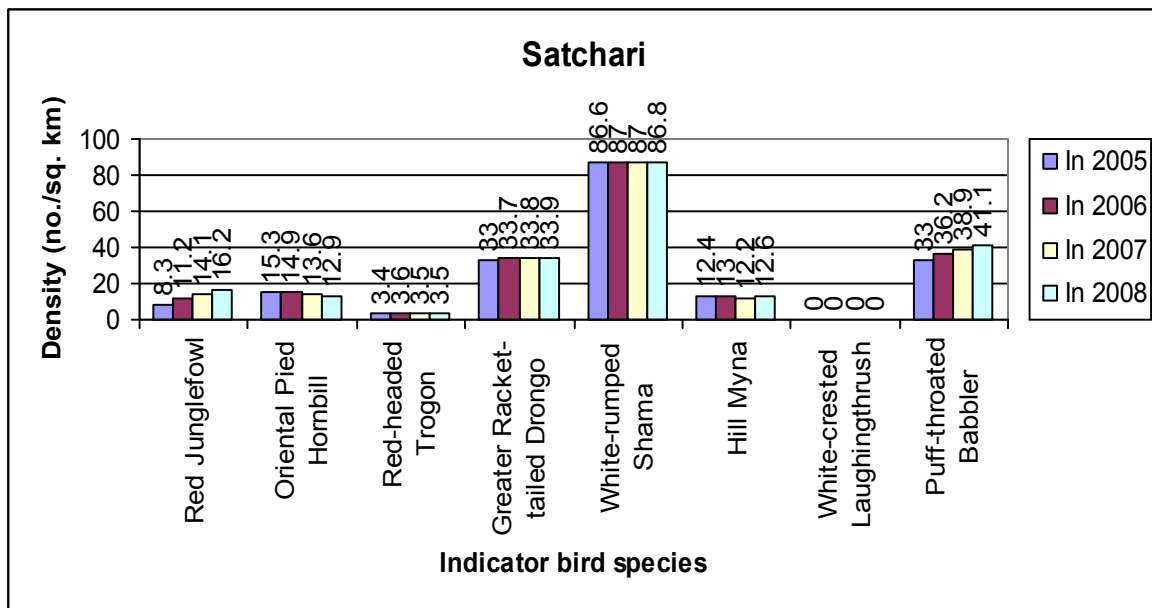
Species associations with habitat type depend partly on the detectability of the species during the count period, because the species are differentially detected depending on the frequency and loudness of their voices, and their relative visibility due both to behavioral and physical traits and the habitat in which they occur (Browder *et al.* 2002). Therefore, all the eight indicator birds selected at the beginning of this study were vocal and conspicuous so that there was very little chance of missing them during strip-transects.

Although birds are widely used as ecological indicators, it is also criticized by some experts (Martin and Li 1992; Martin 1993, 1995). According to them the individual species are questionable indicators of forest community responses, because co-occurring species typically differ in habitat requirements and life histories and can respond independently to environmental variations (James *et al.* 1984). Others

think that individual species may function as indicators of a restricted component of the community, such as the abundance of the other members of the same guild (Severinghaus 1981). Moreover, large increase in one or two species can mask the decline or loss of others in the same guild (Mannan *et al.* 1984).



**Figure 7a.** Population densities (no./sq. km) of eight indicator bird species in Lawachara National Park in 2005, 2006, 2007 and 2008.



**Figure 7b.** Population densities (no./sq. km) of eight indicator bird species in Satchari National Park in 2005, 2006, 2007 and 2008.

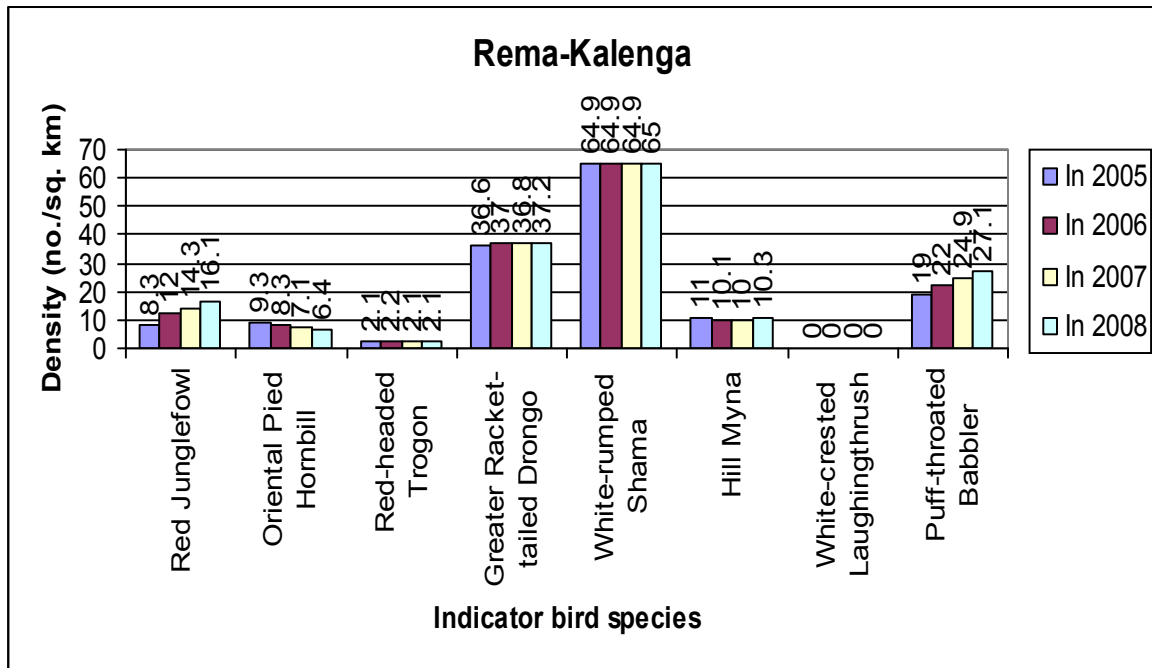


Figure 7c. Population densities (no./sq. km) of eight indicator bird species in Rema-Kalenga Wildlife Sanctuary in 2005, 2006, 2007 and 2008.

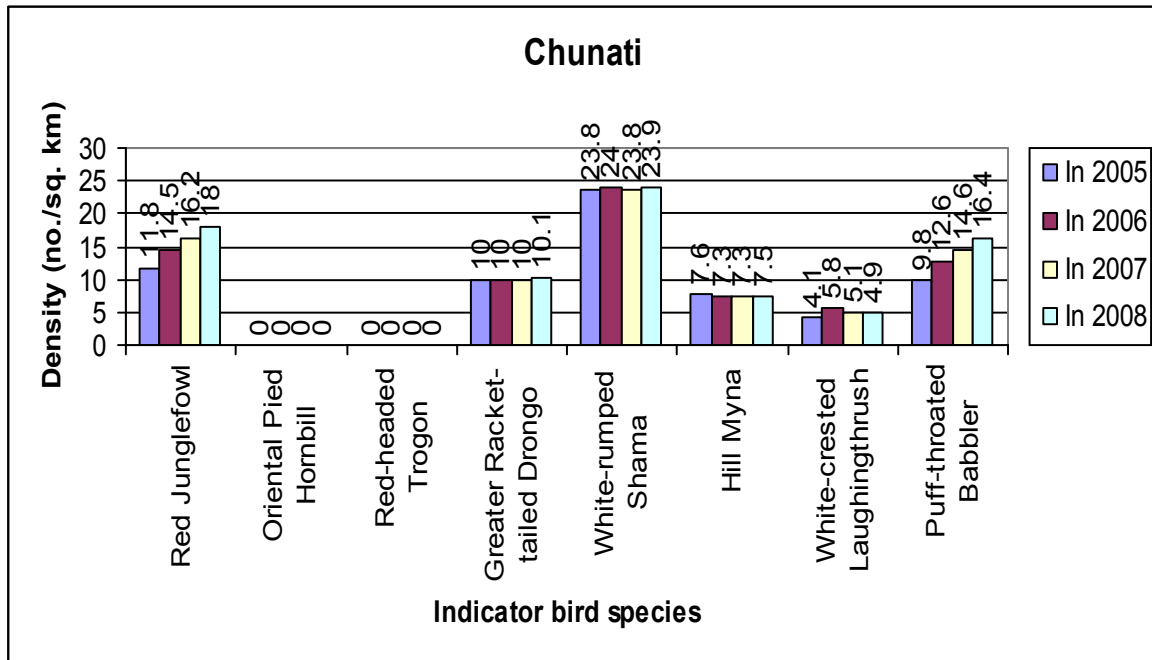
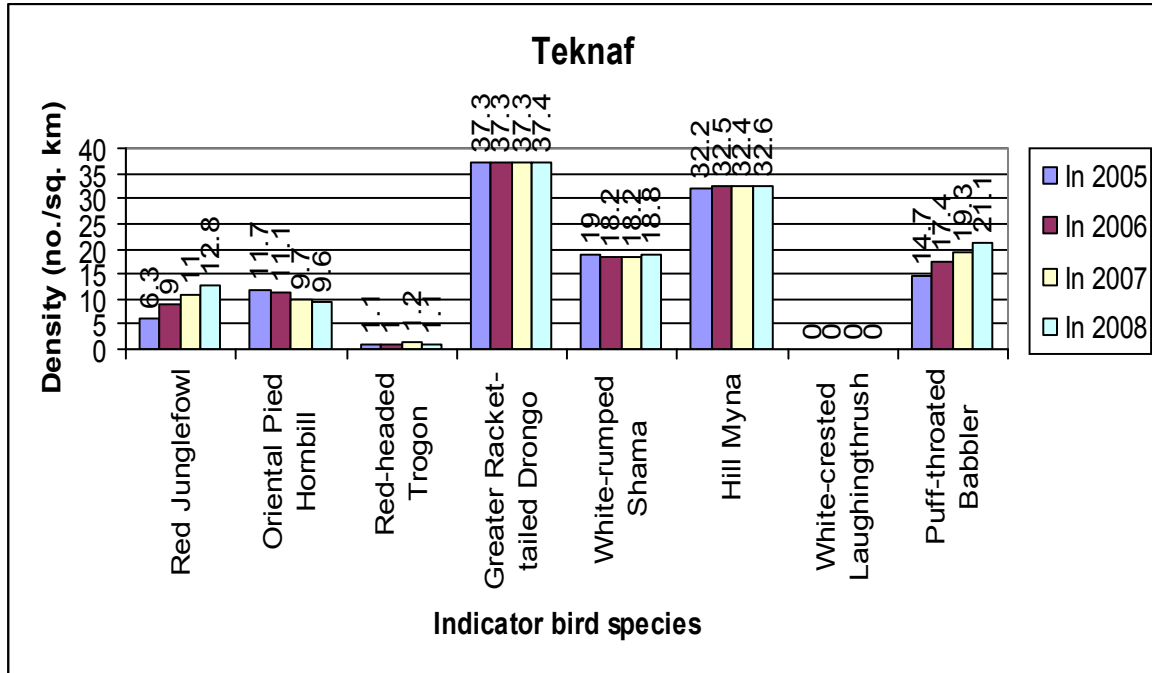
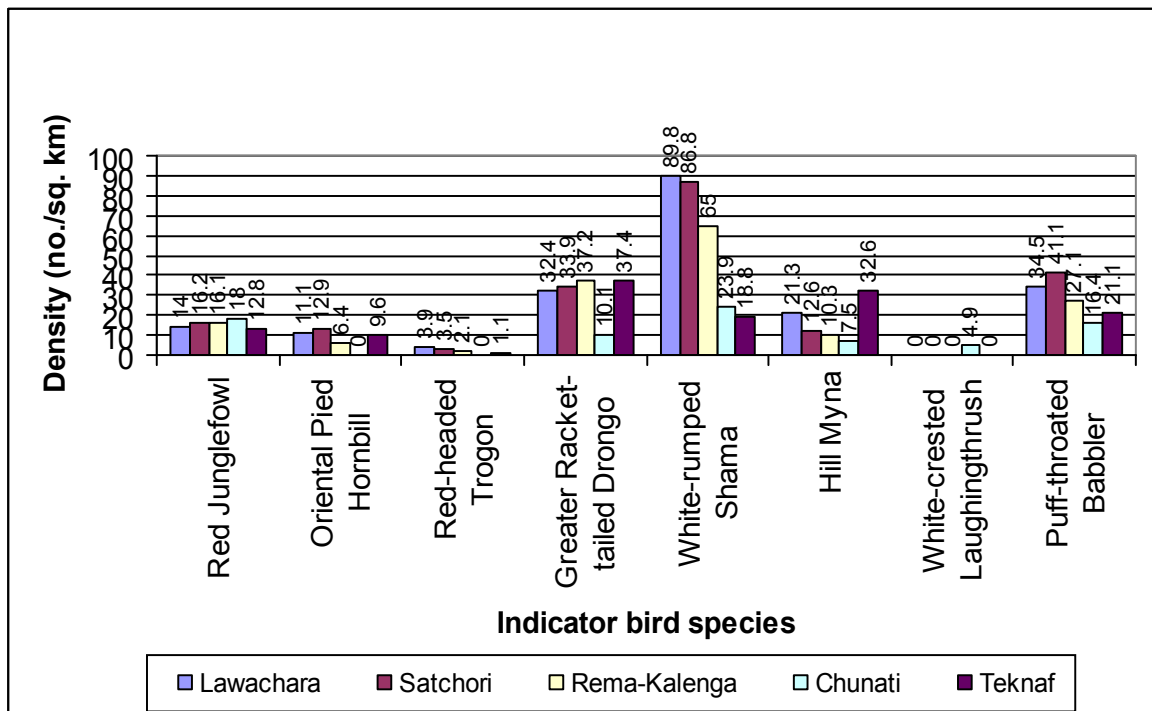


Figure 7d. Population densities (no./sq. km) of eight indicator bird species in Chunati Wildlife Sanctuary in 2005, 2006, 2007 and 2008.

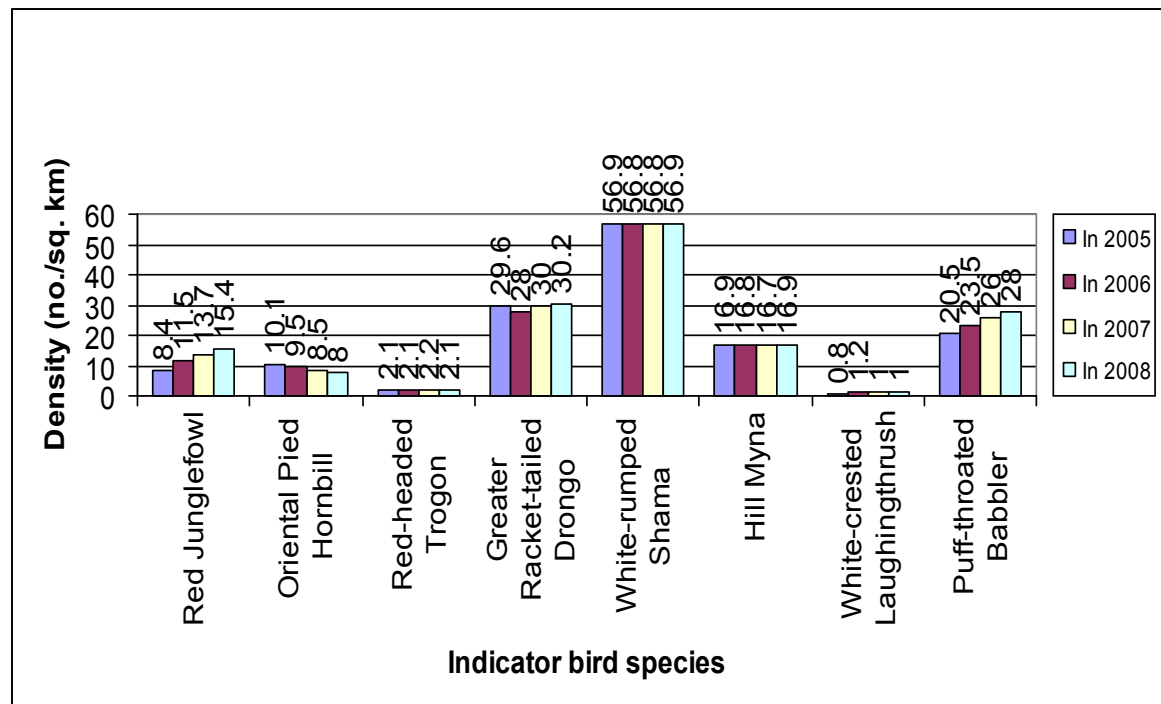


**Figure 7e.** Population densities (no./sq. km) of eight indicator bird species in Teknaf Game Reserve in 2005, 2006, 2007 and 2008.



**Figure 8.** Comparison of the population density of eight indicator bird species across five NSP sites in 2008.





**Figure 9.** Comparison of the population density of eight indicator bird species across five NSP sites in 2005, 2006, 2007 and 2008.

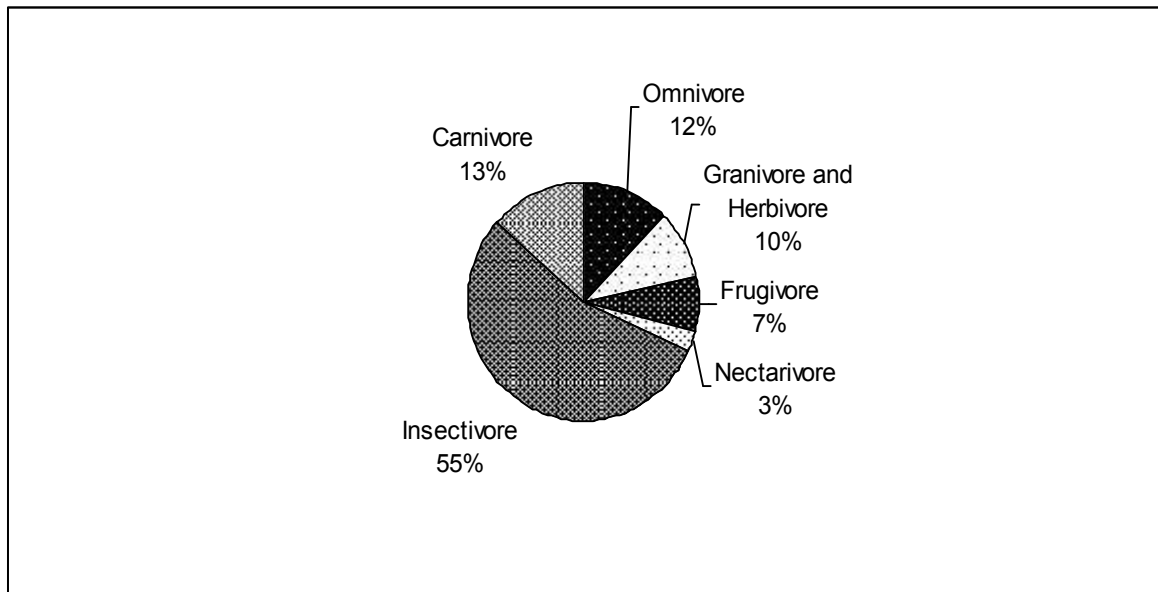
Since all the eight indicator birds are primarily forest birds, any change in the condition of the forest has an impact on their population densities. This is evident even in five NSP sites if we compare the respective densities with the conditions of five NSP sites. In the field it was very obvious that Chunati is the poorest 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 three (Greater Racket-tailed Drongo, Hill Myna and Puff-throated Babbler) of the rest six indicator species were the lowest (Figure 8). Another evidence of the strong correlation between the forest condition and the density of these eight species has found in three sites (Lawachara, Satchari and Rema-Kalenga) of the northeast. The ecosystems and forest conditions are very similar in these sites. Hence, there is a similarity in the density of all the indicator species despite the fact that the total areas are variable (Figure 8).

## **4.2 Bird Species Diversity**

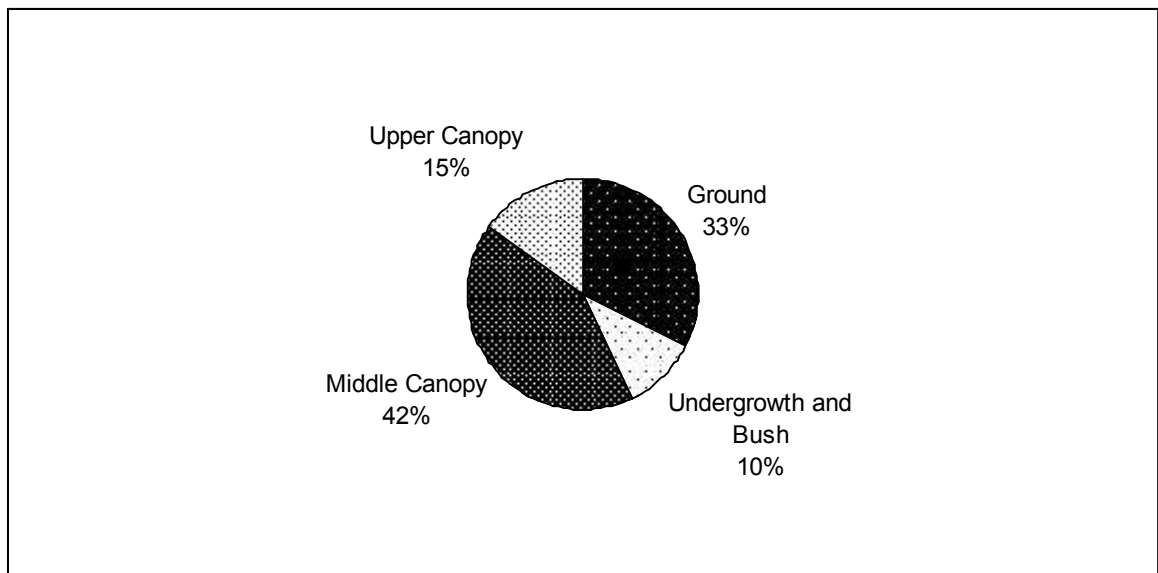
During the avian breeding season (February-August) of the last four years (2005-2008), a total of 239 species of birds have been recorded in five NSP sites, of which 189 were residents, 39 winter visitors, 6 summer visitors and 5 vagrants (Table 5). Most (55%) of the birds were insectivorous (Figure 10). Higher proportions of bird species occurs in the middle canopy (42%) and on the ground (33%) (Figure 11). Most species of birds were relatively rare (35%) in 2008's survey (Figure 12) and the proportion of rare species has increased gradually over the last four years.

The total bird species (239) recorded in five NSP sites in a limited period of time represents over 30% of the birds recorded in Bangladesh (Harvey 1990, IUCN-Bangladesh 2000), and almost 3% recorded in the Indian Subcontinent (Grewal *et al.* 2002). A relatively high ratio of rare birds (35%) 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.

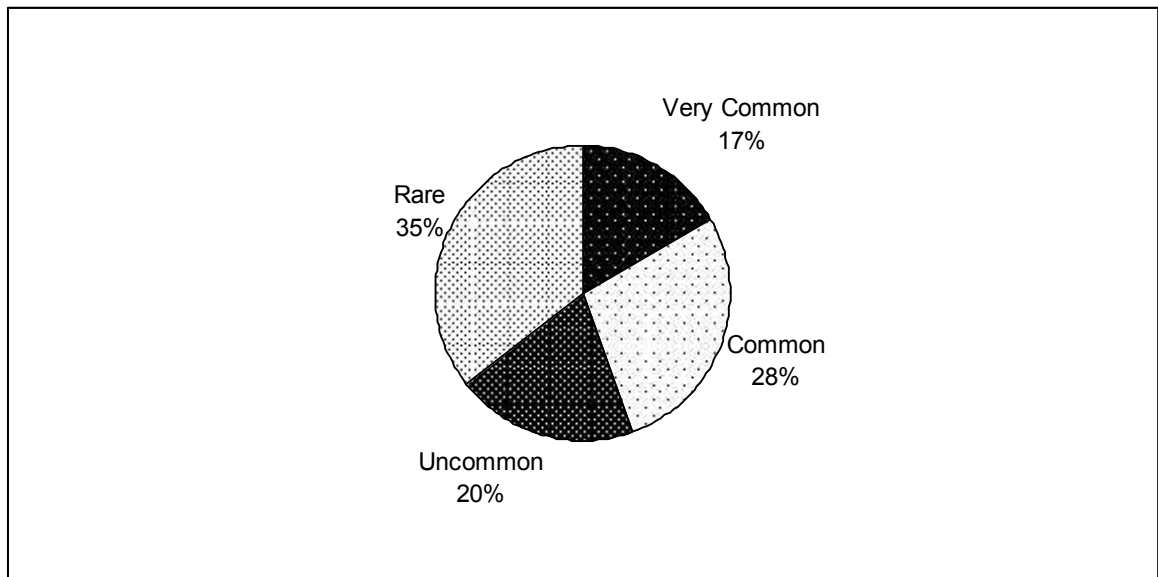
Among 239 species of birds, the total number of species and the total number of primarily forest species were different in five different sites (Figure 13). Very weak correlation ( $r = 0.32014$ ) was found between the total number of bird species and the total number of primarily forest bird species across five NSP sites. No significant difference was found in the proportions of the number of species of primarily forest birds in relation to the total birds during 2005-2008.



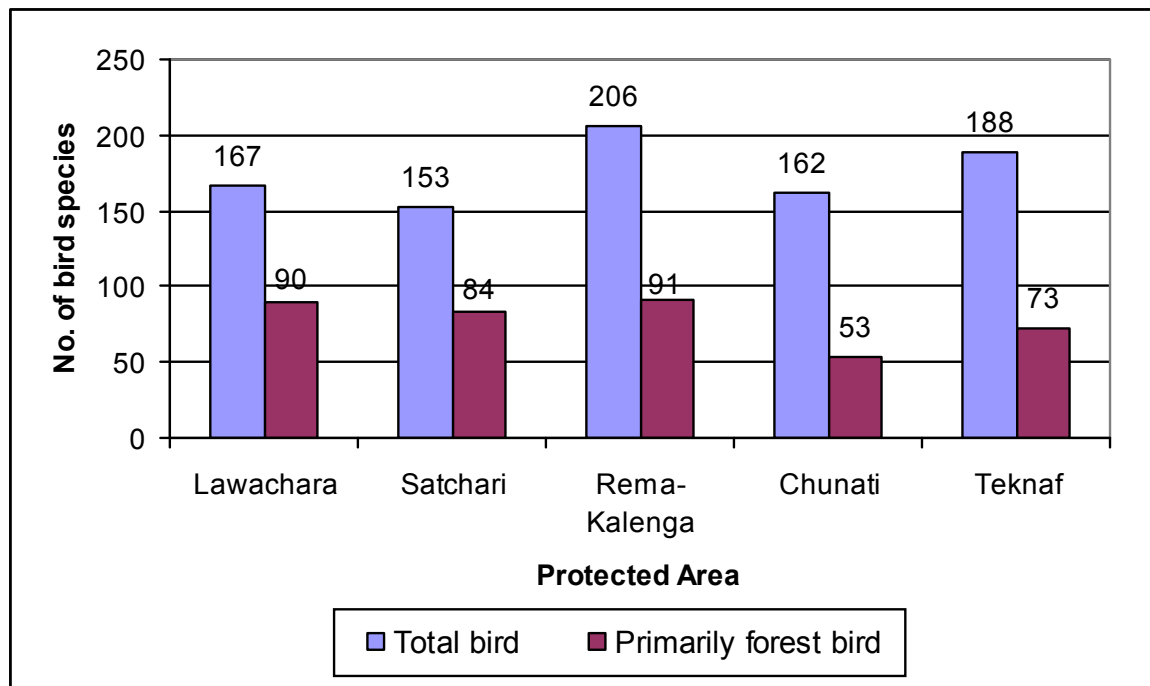
**Figure 10.** Proportions of bird species of different food habits in five NSP sites.



**Figure 11.** Proportions of different bird species in different strata of the forest in five NSP sites.



**Figure 12.** Proportions of Very Common, Common, Uncommon and Rare species of birds in five NSP sites.



**Figure 13.** A comparison of the total number of bird species and total number of primarily forest bird species across five NSP sites recorded during 2005-2008.

**Table 5.** List of birds recorded in five protected areas (Lawachara, Satchori, Rema-Kalenga, Chunati and Teknaf) under Nishorgo Support Project (NSP) during the breeding season (February-August) from 2005 to 2008 [N.B. The classification followed Inskipp *et al.* (1996)]

**ABBREVIATIONS**

**Principal Diet:** o – Omnivore, g – Granivore and Herbivore, f – Frugivore, n – Nectarivore, i – Insectivore, and c – Carnivore (including Piscivore). **Principal Foraging Guild:** gr – Ground, b – Bush and Undergrowth, m – Middle Canopy, and u – Upper Canopy. **Status:** vc – Very Common, co – Common, uc – Uncommon, and ra – Rare (in NSP sites); R – Resident, W – Winter Visitor, S – Summer Visitor, and V – Vagrant. **Distribution:** WI – Wide (all NSP sites), L – Lawachara National Park, S – Satchori National Park, RK – Rema-Kalenga Wildlife Sanctuary, C – Chunati Wildlife Sanctuary, and T – Teknaf Game Reserve.

Sl. No.	English and Scientific Name	Principal Diet	Principal Foraging Guild	Status	Distribution
<b>ORDER: GALLIFORMES</b>					
<b>Family: Phasianidae</b>					
1	Blue-breasted Quail <i>Coturnix coromandelica</i>	g	gr	uc, R	C, T, RK
2	White-cheeked Partridge <i>Arborophila atrogularis</i> *	g	gr	ra, R	L, S, RK
3	Red Junglefowl <i>Gallus gallus</i> *	g	gr	co, R	WI
4	Kalij Pheasant <i>Lophura leucomelanos</i> *	g	gr	uc, R	WI
5	Grey Peacock Pheasant <i>Polyplectron bicalcaratum</i> *	g	gr	ra, R	T, RK
<b>ORDER: ANSERIFORMES</b>					
<b>Family: Dendrocygnidae</b>					
6	Lesser Whistling-duck <i>Dendrocygna javanica</i> Ψ	g	gr	co, R	T, RK, C
<b>Family: Anatidae</b>					
7	Cotton Pygmy-goose <i>Nettapus coromandelianus</i> Ψ	g	gr	ra, R	T
<b>ORDER: TURNICIFORMES</b>					
<b>Family: Turnicidae</b>					
8	Barred Buttonquail <i>Turnix suscitator</i>	g	gr	uc, R	C, T, RK
<b>ORDER: PICIFORMES</b>					
<b>Family: Picidae</b>					
9	Eurasian Wryneck <i>Jynx torquilla</i>	i	gr	uc, W	C, T, RK
10	White-browed Piculet <i>Sasia ochracea</i> *	i	m	ra, R	S, RK
11	Rufous Woodpecker <i>Celeus brachyurus</i>	i	m	co, R	WI
12	Great Slaty Woodpecker <i>Mulleripicus pulverulentus</i> *	i	u	ra, R	T, C
13	Grey-capped Pygmy Woodpecker <i>Dendrocopos canicapillus</i> *	i	m	uc, R	WI

*NSP Bird Survey: Final Year Report*

14	Fulvous-breasted Woodpecker <i>Dendrocopos macei</i>	i	m	vc, R	WI
15	Lesser Yellownape <i>Picus chlorolophus</i> *	i	u	ra, R	L, C
16	Greater Yellownape <i>Picus flavinucha</i> *	i	u	co, R	WI
17	Grey-headed Woodpecker <i>Picus canus</i>	i	u	ra, R	L, S
18	Black-rumped Flameback <i>Dinopium benghalense</i>	i	m	vc, R	WI
19	Greater Flameback <i>Chrysocolaptes lucidus</i> *	i	u	vc, R	WI
<b>Family: Megalaimidae</b>					
20	Lineated Barbet <i>Megalaima lineata</i>	f	u	vc, R	WI
21	Blue-throated Barbet <i>Megalaima asiatica</i>	f	u	vc, R	WI
22	Blue-eared Barbet <i>Megalaima australis</i> *	f	u	uc, R	L, S, RK, T
23	Coppersmith barbet <i>Megalaima haemacephala</i>	f	m	vc, R	WI
<b>ORDER: BUCEROTIFORMES</b>					
<b>Family: Bucerotidae</b>					
24	Oriental Pied Hornbill <i>Anthracoceros albirostris</i> *	f	u	uc, R	L, S, RK, T
<b>ORDER: UPUPIFORMES</b>					
<b>Family: Upupidae</b>					
25	Common Hoopoe <i>Upupa epops</i>	i	gr	co, R	C, T, RK
<b>ORDER: TROGONIFORMES</b>					
<b>Family: Trogonidae</b>					
26	Red-headed Trogon <i>Harpactes erythrocephalus</i> *	i	m	ra, R	L, S, RK, T
<b>ORDER: CORACIIFORMES</b>					
<b>Family: Coraciidae</b>					
27	Indian Roller <i>Coracias benghalensis</i>	i	gr	co, R	C, T, RK
28	Dollarbird <i>Eurystomus orientalis</i> *	i	u	ra, V	L, S, RK, T
<b>Family: Alcedinidae</b>					
29	Common Kingfisher <i>Alcedo atthis</i>	c	gr (water)	co, R	WI
30	Oriental Dwarf Kingfisher <i>Ceyx erithacus</i> *	c	gr (water)	ra, V	L, S
<b>Family: Halcyonidae</b>					
31	White-throated Kingfisher <i>Halcyon smyrnensis</i>	c	gr (water)	co, R	WI
<b>Family: Cerylidae</b>					
32	Pied Kingfisher <i>Ceryle rudis</i>	c	gr (water)	ra, R	T
<b>Family: Meropidae</b>					
33	Blue-bearded Bee-eater <i>Nyctyornis athertoni</i> *	i	u	ra, R	WI
34	Green Bee-eater <i>Merops orientalis</i>	i	m	vc, R	WI
35	Blue-tailed Bee-eater <i>Merops philippinus</i> *	i	u	co, R	WI
36	Chestnut-headed Bee-eater <i>Merops leschenaulti</i> *	i	u	vc, R	WI
<b>ORDER: CUCULIFORMES</b>					
<b>Family: Cuculidae</b>					
37	Pied Cuckoo <i>Clamator jacobinus</i>	i	m	ra, S	WI
38	Chestnut-winged Cuckoo <i>Clamator coromandus</i> *	i	m	ra, V	L, S, RK
39	Common Hawk Cuckoo <i>Hierococcyx varius</i>	i	m	vc, R	WI

*NSP Bird Survey: Final Year Report*

40	Indian Cuckoo <i>Cuculus micropterus</i>	i	m	co, S	WI
41	Plaintive Cuckoo <i>Cacomantis merulinus</i>	i	m	co, R	WI
42	Asian Emerald Cuckoo <i>Chrysococcyx maculatus</i> *	i	m	ra, S	S
43	Violet Cuckoo <i>Chrysococcyx xanthorhynchus</i> *	i	m	ra, S	S
44	Drongo Cuckoo <i>Surniculus lugubris</i> *	i	u	co, R	L, S, RK, T
45	Asian Koel <i>Eudynamys scolopacea</i>	i	m	vc, R	WI
46	Green-billed Malkoha <i>Phaenicophaeus tristis</i> *	i	m	vc, R	WI
<b>Family: Centropodidae</b>					
47	Greater Coucal <i>Centropus sinensis</i>	i	gr	vc, R	WI
48	Lesser Coucal <i>Centropus bengalensis</i> *	i	u	co, R	WI
<b>ORDER: PSITTACIFORMES</b>					
<b>Family: Psittacidae</b>					
49	Vernal Hanging Parrot <i>Loriculus vernalis</i> *	g	m	uc, R	L, S, RK, T
50	Rose-ringed Parakeet <i>Psittacula krameri</i>	f	u	co, R	WI
51	Blossom-headed Parakeet <i>Psittacula roseata</i> *	f	u	uc, R	L, S, RK
52	Red-breasted Parakeet <i>Psittacula alexandri</i> *	f	m	vc, R	WI
<b>ORDER: APODIFORMES</b>					
<b>Family: Apodidae</b>					
53	Asian Palm Swift <i>Cypsiurus balasiensis</i>	i	u (mid-air)	co, R	C, T, RK
54	Fork-tailed Swift <i>Apus pacificus</i>	i	u (mid-air)	ra, W	T
<b>ORDER: STRIGIFORMES</b>					
<b>Family: Strigidae</b>					
55	Oriental Scops Owl <i>Otus sunia</i> *	i	m	ra, R	L, S, RK
56	Collared Scops Owl <i>Otus bakkamoena</i>	i	m	ra, R	WI
57	Spot-bellied Eagle Owl <i>Bubo nipalensis</i> *	c	m	ra, R	T
58	Dusky Eagle Owl <i>Bubo coromandus</i> *	c	m	ra, R	RK
59	Brown Fish Owl <i>Ketupa zeylonensis</i>	c	m	ra, R	WI
60	Tawny Fish Owl <i>Ketupa flavipes</i> *	c	m	ra, R	RK, T
61	Brown Wood Owl <i>Strix leptogrammica</i> *	c	m	ra, R	L, RK
62	Asian Barred Owlet <i>Glaucidium cuculoides</i> *	i	m	co, R	WI
63	Spotted Owlet <i>Athene brama</i>	i	m	vc, R	WI
64	Brown Hawk Owl <i>Ninox scutulata</i>	i	m	co, R	WI
<b>Family: Caprimulgidae</b>					
65	Large-tailed Nightjar <i>Caprimulgus macrurus</i> *	i	m (mid-air)	co, R	WI
<b>ORDER: COLUMBIFORMES</b>					
<b>Family: Columbidae</b>					
66	Rock Pigeon <i>Columba livia</i>	g	gr	co, R	WI
67	Green Imperial Pigeon <i>Ducula aenea</i> *	f	u	ra, R	L, S, RK
68	Oriental Turtle Dove <i>Streptopelia orientalis</i> *	g	m	ra, R	L, S, RK
69	Spotted Dove <i>Streptopelia chinensis</i>	g	gr	vc, R	WI
70	Red Collared Dove <i>Streptopelia tranquebarica</i>	g	gr	co, R	WI
71	Eurasian Collared Dove <i>Streptopelia decaocto</i>	g	gr	co, R	WI

***NSP Bird Survey: Final Year Report***

72	Barred Cuckoo Dove <i>Macropygia unchall</i> *	g	m	ra, R	S
73	Emerald Dove <i>Chalcophaps indica</i> *	g	gr	vc, R	WI
74	Orange-breasted Green Pigeon <i>Treron bicincta</i> *	f	m	ra, R	L, S, RK
75	Pompadour Green Pigeon <i>Treron pompadora</i> *	f	m	co, R	WI
76	Thick-billed Green Pigeon <i>Treron curvirostra</i> *	f	m	ra, R	L, S, RK
77	Yellow-footed Green Pigeon <i>Treron phoenicoptera</i>	f	m	co, R	WI
78	Wedge-tailed Green Pigeon <i>Treron sphenura</i> *	f	u	ra, R	L, S, RK
<b>ORDER: GRUIFORMES</b>					
<b>Family: Rallidae</b>					
79	White-breasted Waterhen <i>Amaurornis phoenicurus</i>	i	gr	uc, R	RK, C, T
<b>ORDER: CICONIIFORMES</b>					
<b>Family: Scolopacidae</b>					
80	Pintail Snipe <i>Gallinago stenura</i>	i	gr	ra, W	RK, C, T
81	Common Snipe <i>Gallinago gallinago</i>	i	gr	ra, W	RK, C, T
82	Green Sandpiper <i>Tringa ochropus</i>	i	gr	ra, W	RK, C, T
83	Wood Sandpiper <i>Tringa glareola</i>	i	gr	co, W	RK, C, T
84	Common Sandpiper <i>Actitis hypoleucos</i>	i	gr	co, W	RK, C, T
<b>Family: Rostratulidae</b>					
85	Greater Painted Snipe <i>Rostratula benghalensis</i>	i	gr	uc, R	RK, C, T
<b>Family: Jacanidae</b>					
86	Bronze-winged Jacana <i>Metopidius indicus</i>	g	gr	uc, R	C
<b>Family: Charadriidae</b>					
87	Little Ringed Plover <i>Charadrius dubius</i>	i	gr	ra, W	C
88	Red-wattled Lapwing <i>Vanellus indicus</i>	i	gr	uc, R	RK, C, T
<b>Family: Laridae</b>					
89	Little Tern <i>Sterna albifrons</i>	c	gr (water)	uc, R	T
90	Whiskered Tern <i>Chlidonias hybridus</i>	c	gr (water)	uc, W	T
<b>Family: Accipitridae</b>					
91	Osprey <i>Pandion haliaetus</i>	c	gr (water)	ra, W	T
92	Jerdon's Baza <i>Aviceda jerdoni</i> *	c	u	ra, R	L, S, RK
93	Black Baza <i>Aviceda leuphotes</i> *	c	u	uc, R	L, S, RK, T
94	Oriental Honey-buzzard <i>Pernis ptilorhynchus</i>	i (while feeding honey-comb)	m	uc, R	W
95	Black-shouldered Kite <i>Elanus caeruleus</i>	i	gr	uc, R	C, T, RK
96	Black Kite <i>Milvus migrans</i>	c	gr	uc, R	C, T, RK, S
97	Brahminy Kite <i>Haliastur indus</i>	c	gr	co, R	WI
98	White-rumped Vulture <i>Gyps bengalensis</i>	c (carrion)	gr	uc, R	RK, C, T
99	Himalayan Griffon <i>Gyps himalayensis</i>	c (carrion)	gr	ra, V	RK
100	Crested Serpent Eagle <i>Spilornis cheela</i> *	c	m	vc, R	WI
101	Shikra <i>Accipiter badius</i> *	c	m	uc, R	WI
102	Besra <i>Accipiter virgatus</i> *	c	m	uc, R	WI
103	Changeable Hawk Eagle <i>Spizaetus cirrhatus</i> *	c	m	ra, R	L, S, RK



*NSP Bird Survey: Final Year Report*

<b>Family: Falconidae</b>					
104	Common Kestrel <i>Falco tinnunculus</i>	i	gr	uc, W	WI
105	Amur Falcon <i>Falco amurensis</i>	i	u (mid-air)	ra, W	L, RK
<b>Family: Phalacrocoracidae</b>					
106	Little Cormorant <i>Phalacrocorax niger</i> Ψ	c	gr (water)	ra, R	T
<b>Family: Ardeidae</b>					
107	Little Egret <i>Egretta garzetta</i>	c	gr	uc, R	C, T, RK
108	Cattle Egret <i>Bubulcus ibis</i>	c	gr	uc, R	C, T, RK
109	Indian Pond Heron <i>Ardeola grayii</i>	c	gr	vc, R	C, T, RK, L
110	Black-crowned Night Heron <i>Nycticorax nycticorax</i>	c	gr	ra, R	RK, C, T
111	Malayan Night Heron <i>Gorsachius melanolophus</i> *	c	gr	ra, V	L, RK
112	Yellow Bittern <i>Ixobrychus sinensis</i>	c	gr	ra, R	T, C
113	Cinnamon Bittern <i>Ixobrychus cinnamomeus</i>	c	gr	uc, R	RK, C, T
<b>Family: Ciconiidae</b>					
114	Asian Openbill <i>Anastomus oscitans</i>	c (snail)	gr	ra, R	RK
115	Lesser Adjutant <i>Leptoptilos javanicus</i>	c	gr	ra, R	RK
<b>ORDER: PASSERIFORMES</b>					
<b>Family: Pittidae</b>					
116	Blue-naped Pitta <i>Pitta nipalensis</i> *	i	gr	ra, R	RK, L, S, T
117	Hooded Pitta <i>Pitta sordida</i> *	i	gr	ra, S	S, L, RK
<b>Family: Irenidae</b>					
118	Asian Fairy Bluebird <i>Irena puella</i> *	f	m	co, R	L, S, RK, T
119	Blue-winged Leafbird <i>Chloropsis cochinchinensis</i> *	i	m	ra, R	L, T
120	Golden-fronted Leafbird <i>Chloropsis aurifrons</i> *	i	m	vc, R	WI
<b>Family: Laniidae</b>					
121	Brown Shrike <i>Lanius cristatus</i>	i	b	co, W	WI
122	Long-tailed Shrike <i>Lanius schach</i>	i	b	co, R	WI
123	Grey-backed Shrike <i>Lanius tephronotus</i>	i	b	uc, W	WI
<b>Family: Corvidae</b>					
124	Common Green Magpie <i>Cissa chinensis</i> *	o	m	ra, R	S, L, T
125	Rufous Treepie <i>Dendrocitta vagabunda</i>	o	m	co, R	WI
126	Grey Treepie <i>Dendrocitta formosae</i> *	o	m	uc, R	L, S, RK, T
127	House Crow <i>Corvus splendens</i>	o	gr	uc, R	C, T, RK
128	Large-billed Crow <i>Corvus macrorhynchos</i>	o	gr	co, R	WI
129	Ashy Woodswallow <i>Artamus fuscus</i>	i	u (mid-air)	uc, R	WI
130	Black-naped Oriole <i>Oriolus chinensis</i> *	o	m	ra, W	L, S, RK
131	Black-hooded Oriole <i>Oriolus xanthornus</i>	o	m	vc, R	WI
132	Maroon Oriole <i>Oriolus traillii</i> *	o	u	ra, R	L, S, RK
133	Large Cuckooshrike <i>Coracina macei</i>	o	m	co, R	WI
134	Black-winged Cuckooshrike <i>Coracina melaschistos</i> *	o	m	ra, W	L, S, RK
135	Black-headed Cuckooshrike <i>Coracina melanoptera</i>	o	m	ra, R	RK
136	Rosy Minivet <i>Pericrocotus roseus</i> *	i	u	ra, R	L, S, RK
137	Ashy Minivet <i>Pericrocotus divaricatus</i> *	i	u	ra, R	L, RK
138	Small Minivet <i>Pericrocotus cinnamomeus</i> *	i	u	vc, R	WI
139	Scarlet Minivet <i>Pericrocotus flammeus</i> *	i	u	co, R	WI

*NSP Bird Survey: Final Year Report*

140	Bar-winged Flycatcher-shrike <i>Hemipus picatus</i> *	i	m	uc, R	L, S, RK
141	White-throated Fantail <i>Rhipidura albicollis</i>	i	b	co, R	WI
142	Black Drongo <i>Dicrurus macrocercus</i>	i	m	vc, R	WI
143	Ashy Drongo <i>Dicrurus leucophaeus</i>	i	m	ra, W	WI
144	Bronzed Drongo <i>Dicrurus aeneus</i> *	i	m	vc, R	WI
145	Lesser Racket-tailed Drongo <i>Dicrurus remifer</i> *	i	u	ra, W	L, S, RK
146	Spangled Drongo <i>Dicrurus hottentottus</i> *	i	m	co, R	WI
147	Greater Racket-tailed Drongo <i>Dicrurus paradiseus</i> *	i	u	co, R	WI
148	Black-naped Monarch <i>Hypothymis azurea</i> *	i	b	co, R	WI
149	Common Iora <i>Aegithina tiphia</i>	i	m	vc, R	WI
150	Large Woodshrike <i>Tephrodornis gularis</i> *	i	u	co, R	L, S, RK
151	Common Woodshrike <i>Tephrodornis pondicerianus</i> *	i	m	co, R	WI
<b>Family: Muscicapidae</b>					
152	Blue Rock Thrush <i>Monticola solitarius</i>	i	gr	uc, W	WI
153	Blue Whistling Thrush <i>Myophonus caeruleus</i> *	i	gr	ra, R	T
154	Orange-headed Thrush <i>Zoothera citrina</i>	i	gr	ra, R	WI
155	Red-throated Flycatcher <i>Ficedula parva</i>	i	m	vc, W	WI
156	Verditer Flycatcher <i>Eumyias thalassina</i> *	i	u	uc, W	WI
157	Pale-chinned Flycatcher <i>Cyornis poliogenys</i> *	i	m	ra, R	RK, L, S
158	Grey-headed Canary Flycatcher <i>Culicicapa ceylonensis</i>	i	m	c, R	WI
159	Oriental Magpie Robin <i>Copsychus saularis</i>	i	gr	vc, R	WI
160	White-rumped Shama <i>Copsychus malabaricus</i> *	i	gr	co, R	WI
161	Black Redstart <i>Phoenicurus ochruros</i>	i	b	ra, W	RK, C, T
162	Black-backed Forktail <i>Enicurus immaculatus</i> *	i	gr	ra, R	RK, T
163	Common Stonechat <i>Saxicola torquata</i>	i	b	co, W	RK, C, T
164	Pied Bushchat <i>Saxicola caprata</i>	i	b	ra, R	C, T
<b>Family: Sturnidae</b>					
165	Asian Glossy Starling <i>Aplonis panayensis</i> *	f	m	ra, W	T
166	Chestnut-tailed Starling <i>Sturnus malabaricus</i>	f	m	vc, R	WI
167	Asian Pied Starling <i>Sturnus contra</i>	o	gr	vc, R	WI
168	Common Myna <i>Acridotheres tristis</i>	o	gr	vc, R	WI
169	Bank Myna <i>Acridotheres ginginianus</i>	o	gr	ra, R	RK, C, T
170	Jungle Myna <i>Acridotheres fuscus</i>	o	m	vc, R	WI
171	Hill Myna <i>Gracula religiosa</i> *	o	u	co, R	WI
<b>Family: Sittidae</b>					
172	Velvet-fronted Nuthatch <i>Sitta frontalis</i> *	i	m	uc, R	RK, L, S
<b>Family: Paridae</b>					
173	Great Tit <i>Parus major</i>	i	m	vc, R	WI

*NSP Bird Survey: Final Year Report*

<b>Family: Hirundinidae</b>					
174	Barn Swallow <i>Hirundo rustica</i>	i	u (mid-air)	co, W	WI
<b>Family: Pycnonotidae</b>					
175	Black-headed Bulbul <i>Pycnonotus atriceps</i> *	o	m	uc, R	WI
176	Black-crested Bulbul <i>Pycnonotus melanicterus</i> *	o	m	co, R	WI
177	Red-whiskered Bulbul <i>Pycnonotus jocosus</i>	o	m	vc, R	WI
178	Red-vented Bulbul <i>Pycnonotus cafer</i>	o	m	vc, R	WI
179	White-throated Bulbul <i>Alophoixus flaveolus</i> *	o	m	co, R	WI
180	Olive Bulbul <i>Iole virescens</i> *	o	m	ra, R	RK, L, S
181	Ashy Bulbul <i>Hemixos flavala</i> *	o	m	ra, R	L, RK
<b>Family: Cisticolidae</b>					
182	Grey-breasted Prinia <i>Prinia hodgsonii</i>	i	b	co, R	WI
183	Plain Prinia <i>Prinia inornata</i>	i	b	uc, R	C, T, RK
184	Zitting Cisticola <i>Cisticola juncidis</i>	i	b	co, R	WI
<b>Family: Zosteropidae</b>					
185	Oriental White-eye <i>Zosterops palpebrosus</i>	i	m	vc, R	WI
<b>Family: Sylviidae</b>					
186	Blyth's Reed Warbler <i>Acrocephalus dumetorum</i>	i	b	co, W	WI
187	Striated Grassbird <i>Megalurus palustris</i>	i	b	uc, R	C, T
188	Common Tailorbird <i>Orthotomus sutorius</i>	i	b	vc, R	WI
189	Dark-necked Tailorbird <i>Orthotomus atrogularis</i> *	i	b	uc, R	T, C
190	Dusky Warbler <i>Phylloscopus fuscatus</i>	i	b	uc, W	WI
191	Tickell's Leaf Warbler <i>Phylloscopus affinis</i>	i	m	uc, W	WI
192	Yellow-browed Warbler <i>Phylloscopus inornatus</i>	i	m	co, W	WI
193	Greenish Warbler <i>Phylloscopus trochiloides</i>	i	m	uc, W	WI
194	Blyth's Leaf Warbler <i>Phylloscopus reguloides</i>	i	m	uc, W	L, S, RK
195	Yellow-vented Warbler <i>Phylloscopus cantator</i>	i	m	uc, W	L, RK
196	Golden-spectacled Warbler <i>Seicercus burkii</i>	i	m	ra, S	L, RK
197	Grey-hooded Warbler <i>Seicercus xanthoschistos</i>	i	m	ra, W	L, RK
198	White-crested Laughingthrush <i>Garrulax leucolophus</i> *	i	b	ra, R	C, T
199	Lesser Necklaced Laughingthrush <i>Garrulax moniliger</i> *	i	m	ra, R	RK, L, C
200	Greater Necklaced Laughingthrush <i>Garrulax pectoralis</i> *	i	m	co, R	WI
201	Rufous-necked Laughingthrush <i>Garrulax ruficollis</i> *	i	b	co, R	WI
202	Abbott's Babbler <i>Malacocincla abbotti</i> *	i	b	vc, R	WI
203	Puff-throated Babbler <i>Pellorneum ruficeps</i> *	i	b	co, R	WI

*NSP Bird Survey: Final Year Report*

204	Large Scimitar Babbler <i>Pomatorhinus hypoleucos</i> *	i	m	ra, R	L, RK, T
205	White-browed Scimitar Babbler <i>Pomatorhinus schisticeps</i> *	i	b	ra, R	L, S, RK
206	Grey-throated Babbler <i>Stachyris nigriceps</i> *	i	b	ra, R	C, T
207	Striped Tit Babbler <i>Macronous gularis</i> *	i	b	co, R	WI
208	Chestnut-capped Babbler <i>Timalia pileata</i> *	i	b	ra, R	C, T
209	Yellow-eyed Babbler <i>Chrysomma sinensis</i> *	i	b	ra, R	C, T
210	Brown-cheeked Fulvetta <i>Alcippe poiocephala</i> *	i	m	ra, R	L
211	Nepal Fulvetta <i>Alcippe nipalensis</i> *	i	m	ra, R	RK
<b>Family: Alaudidae</b>					
212	Rufous-winged Bushlark <i>Mirafra assamica</i>	g	gr	co, R	WI
<b>Family: Nectariniidae</b>					
213	Thick-billed Flowerpecker <i>Dicaeum agile</i>	o	m	uc, R	RK, C, T
214	Yellow-vented Flowerpecker <i>Dicaeum chrysorrheum</i> *	o	m	ra, R	L, RK, T
215	Orange-bellied Flowerpecker <i>Dicaeum trigonostigma</i> *	o	m	ra, R	T
216	Pale-billed Flowerpecker <i>Dicaeum erythrorynchos</i>	o	m	co, R	WI
217	Plain Flowerpecker <i>Dicaeum concolor</i>	o	m	co, R	L, RK, T
218	Scarlet-backed Flowerpecker <i>Dicaeum cruentatum</i> *	o	m	vc, R	WI
219	Ruby-cheeked Sunbird <i>Anthreptes singalensis</i> *	n	m	uc, R	WI
220	Purple-rumped Sunbird <i>Nectarinia zeylonica</i>	n	m	uc, R	RK, L, C, T
221	Purple-throated Sunbird <i>Nectarinia sperata</i> *	n	m	co, R	WI
222	Purple Sunbird <i>Nectarinia asiatica</i>	n	m	vc, R	WI
223	Crimson Sunbird <i>Aethopyga siparaja</i> *	n	m	vc, R	WI
224	Little Spiderhunter <i>Arachnothera longirostra</i> *	n	m	vc, R	WI
225	Streaked Spiderhunter <i>Arachnothera magna</i> *	n	m	ra, R	T
<b>Family: Passeridae</b>					
226	House Sparrow <i>Passer domesticus</i>	g	gr	co, R	WI
227	Forest Wagtail <i>Dendronanthus indicus</i> *	i	gr	co, W	WI
228	White Wagtail <i>Motacilla alba</i>	i	gr	co, W	RK, L, C, T
229	White-browed Wagtail <i>Motacilla maderaspatensis</i>	i	gr	co, R	RK, L, C, T
230	Citrine Wagtail <i>Motacilla citreola</i>	i	gr	ra, W	RK, C, T
231	Grey Wagtail <i>Motacilla cinerea</i>	i	gr	uc, W	RK, C, T
232	Paddyfield Pipit <i>Anthus ruficollis</i>	i	gr	co, R	RK, C, T
233	Olive-backed Pipit <i>Anthus hodgsoni</i> *	i	gr	co, W	WI
234	Rosy Pipit <i>Anthus roseatus</i>	i	gr	ra, W	RK
235	Baya Weaver <i>Ploceus philippinus</i>	i	gr	co, R	WI
236	Indian Silverbill <i>Lonchura malabarica</i>	g	gr	ra, R	RK, C, T
237	White-rumped Munia <i>Lonchura striata</i> *	g	gr	uc, R	WI

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238	Scaly-breasted Munia <i>Lonchura punctulata</i>	g	gr	co, R	RK, C, T
239	Black-headed Munia <i>Lonchura malacca</i>	g	gr	ra, R	RK, C, T

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\* Primarily forest species.

Ψ Mainly trespassing species.

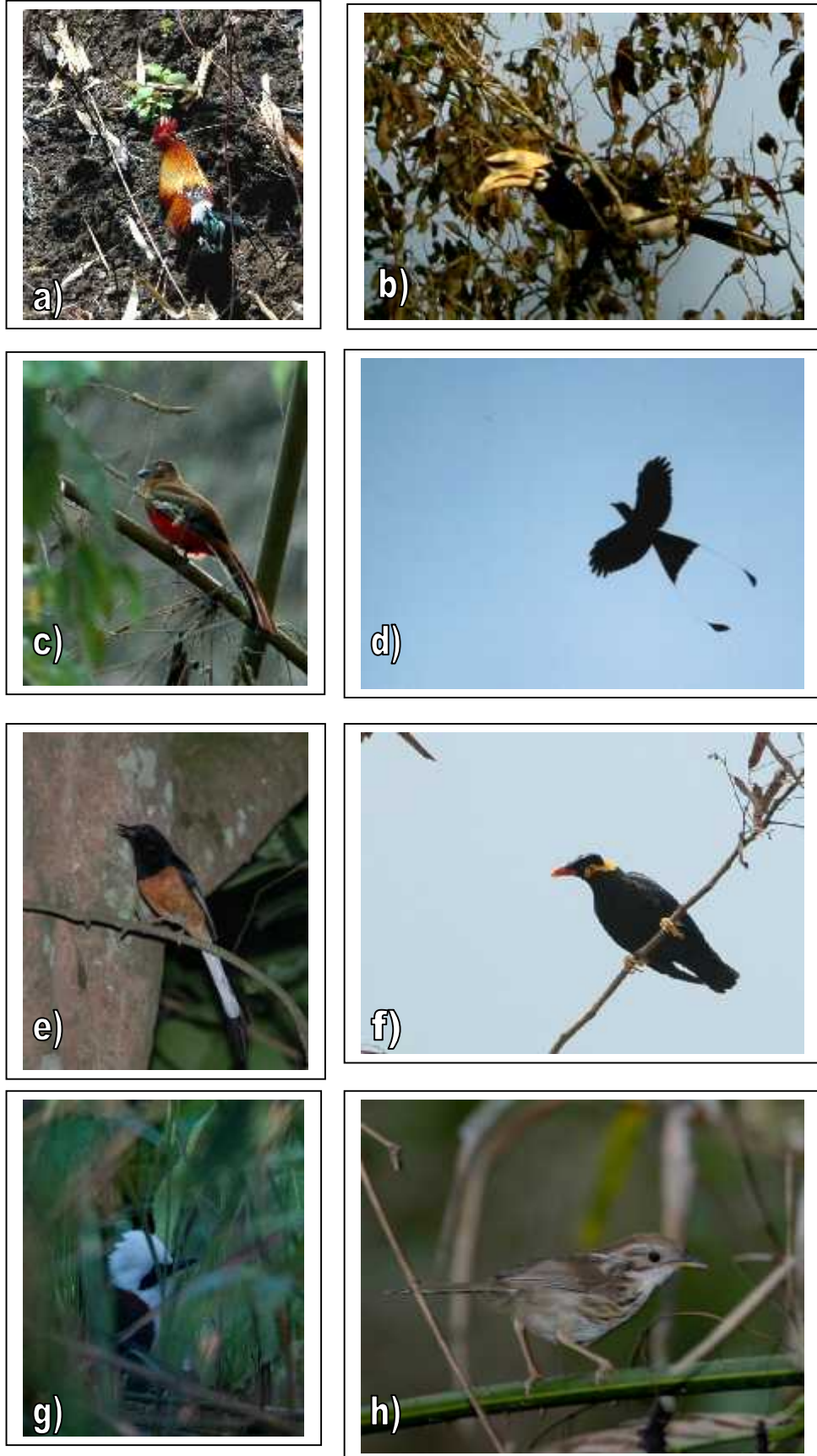
### 4.3 Threats to the Birds and Their Habitats

Habitat loss remains as the main threat to the birds in all the five NSP sites. Like in the previous years, illegal felling of trees and bamboo and conversion of natural forests to monoculture plantations and agricultural fields were witnessed during this year's survey (2008). The natural forest patches that we observed in the Toynga Hill and Kudum areas of Teknaf during our first year's (2005) survey have been destroyed very badly in the last four years. Steps should be taken urgently to preserve the remnants of the natural forests in Teknaf. In Lawachara, Satchari and Rema-Kalenga, there was no sign of large-scale deterioration of the forests, and to some parts, the forest condition has been improved. The excessive number of visitors, particularly in Lawachara, Satchari and Teknaf, is another serious threat to the wilderness of those areas.

Hunting and trapping of birds, together with nestling-theft for selling as cage birds, is the second-most severe threat to the birds. Moreover, large-scale illegal harvest of forest fruits, particularly 'chupalish' (*Artocarpus chaplasha*) and 'latkan' (*Bixa* sp.), is a growing threat to the frugivorous birds and mammals.

The above-mentioned threats should be reduced in order to maintain healthy status of birds in five NSP sites. Despite tremendous efforts, the rate of loss of tree cover is still very alarming in some areas, together with the conversion of lands. The local communities should be motivated and alternative livelihoods (including ecotourism) should be made available in order to reduce the consumptive use of the forest products. Depending on the capacity of the area the number of visitors to the NSP sites must be controlled. Necessary steps have already been taken by NSP to achieve these, but these have a lot more to implement in the field, and expand in wider dimension. The network of poachers and corrupt custodians has

to be broken down by making the local young people, conservationists and journalists more aware and vigilant. If these could be done the forests might remain intact, or even improve in the future. However, this is a slow process, so similar projects should continue for longer period of time. The participatory bird survey should be repeated in the future in order to assess the overall trend of the condition of five NSP sites over the long-term.



**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 Laughinathrush. and h) Puff-throated Babbler**



Some birds of NSP sites other than indicators: a) Grey-breasted Prinia, b) Common Iora, c) Coppersmith Barbet, d) Scarlet Minivet, e) Yellow-footed Green Pigeon, and f) Rose-ringed Parakeet





**Threats to the birds and their habitats: a) illegal logging in Teknaf, b) pollution in Lawachara as a result of too many visitors at a time, and c) hill-cutting for supplying soil in the brick field in Chunati**

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**REFERENCES AND APPENDICES**

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**APPENDICES**

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

 <p style="font-size: small; margin: 0;">Nishorgo Support Project</p>	<p><b>Nishorgo Support Project (NSP)</b></p> <p><b>Participatory Bird Survey</b> to Assess Protected Area Management Impacts</p>
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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	Red Junglefowl			
2	Oriental Pied Hornbill			
3	Red-headed Trogon			
4	Greater Racket-tailed Drongo			
5	White-rumped Shama			
6	Hill Myna			
7	White-crested Laughing-thrush			
8	Puff-throated Babbler			

**Appendix II.** Names and addresses of the bird survey team members who frequently attended the surveys

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