Baseline Survey of Existing Flora and Fauna-Package-06

"Preparation of Development Plan for Mirsharai Upazila, Chittagong District: Risk Sensitive Landuse Plan" Project under Urban Development Directorate (UDD).

Final Report

August 2018

Table of Contents

LIST OF FIGURES

LIST OF TABLES

LIST OF MAPS

EXECUTIVE SUMMARY

- The project was primarily focused on to prepare a baseline of the existing flora and fauna of Mirsarai upazila and also to know the condition of threatened flora and fauna of that region. Another focus of the project was to identify the ecologically critical areas of the project area.

- Standard Scientific methods were used for the study.

- Field works were conducted in different seasons to accommodate maximum possibilities of encountering flora and fauna.

- A total of 375 species of plants of seven different categories, viz. tree, shrub, herb, climber, fern, epiphyte and parasites were recorded. Among them, 116 species of tress, 100 species of herbs, 90 species of shrubs, 46 species climbers, 11 species ferns, 7 species epiphytes and 5 species were parasites.

- Mirsarai upazila is very rich in wildlife species. During the survey period, a total of 306 species of wild animals have been recorded.

- A total of 30 species of amphibians in 6 families have been recorded from Mirsarai upazila.

- Mirsarai upazila support 40 species of reptiles. Among them 2 species are turtles and tortoise (5%), 17 species of lizards (45%) and 21 species are snakes (50%).

- A total of 200 species of birds were recorded from Mirsarai upazila of which 165 species were resident and 35 species were migratory.

- A total of 36 species of mammals were recorded from Mirsarai upazila. Among these mammals, about 31% were rare, 19% uncommon, 36% common and remaining 14% were very common.

- Three habitats have been categorized as critical habitats for wild animals in this area. The critical habitats are (i) coastal mangrove, (ii) coastal mudflats and (iii) hill forest of Baraiyadhala National Park.

- The forest area of Mirsarai Upazila supports at least 26 species of nationally threated wild animals of which 4 species of amphibians, 10 reptiles, 1 bird and 11 species of mammals.

- The coastal mangrove is the habitats for around 5000 spotted deer. If the mangrove patches are occupied due to the developmental purposes, the deer will loose their habitat. Immediate action should be taken to determine the fate of these Spotted Deer.

- The coastal mud flats are the habitats for migratory birds as well as for the resident shore birds. The mud flats should be kept as undisturbed as possible.

- The hill forests should be kept undisturbed to save the globally threatened species as well to conserve water shade.

- Mass tourism should be discouraged; controlled eco-tourism should be developed. Visitors should not be allowed everywhere.

- Detailed feasibility study should be carried out by determining the carrying capacity of the area before going for any developmental activities.

1. Introduction

The total area of Mirsharai upazila (Chittagong district) is 482.88 sq km (BBS), 509.80 sq km (GIS Data), located in between 22°39' and 22°59' north latitudes and in between 9I°27' and 91°39' east longitudes. It is, bounded by Trippura state of India, Chhagalnaiya and Feni Sadar upazilas on the north, Sitakunda upazila and Bay of Bengal on the south, Fatikchhari upazila on the east, Sonagazi and Companiganj upazilas on the west.

Mirsharai, the combination of lake and hilly area contains attractive scenic beauty on the southernmost part of Bangladesh. The most important attraction of the upazila is that one can travel MohamayaChara Lake by speed boat and explore hilly area and can enjoy Khoiyachora, Baghbiani, Napitachora, Sonaichora, Mithachora and Boyalia waterfalls. This area is located 192.2 km far from Dhaka and 4.5 hour bus journey. Anyone can travel by rail and it is 197 km of rail journey and it takes 4.5 hour from Dhaka to Mirsharai Upazila. 56 km from the Chittagong Divisional headquarters and takes 1.5 hours travel by bus. The Bangladesh Road Transport Corporation introduced a direct bus service from Dhaka to Mirsharai via Comilla (Banglapedia, 2012)

The Feni is the main river of Mirsharai Upazila; Sandwip Channel is also notable. There are 30 canals present in this area some of those are Feni Nadi, Isakhali, Mahamaya, Domkhali, Hinguli, Moliaish, Koila Govania and Mayani Khal. The hills range on the northern and eastern side of this upazila along the bank of the Feni River extended up to Chittagong and the Chittagong hill tracts (Map 1).

1.2 Description of the Project Area

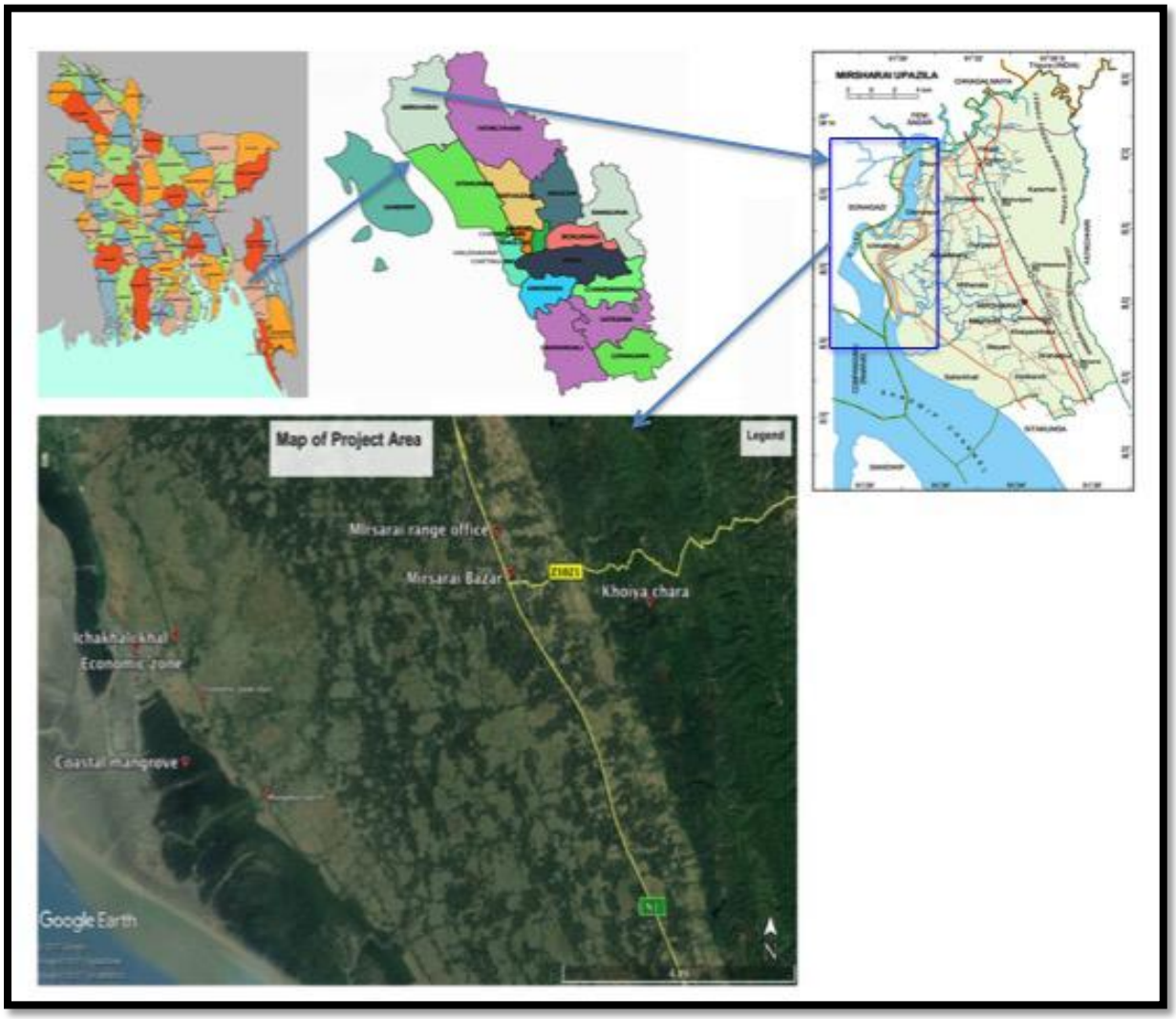
A detailed description of the Project Area is given below:

Table 1 Area, Population and Density of the Project Area:

Municipality	Union	Mouza	Village	Population		Density (persq km)	Literacy Rate (%)
				Urban and Other Urban	Rural		
2	16	103	208	31206	367510	826	55.1

Source: BBS, 2011

Mirsharai sea beach, hilly area, Mohamaya Chara Lake, Khaiya Chara region has the greater potential for tourism development as there are abundant resources to attract tourists. Mirsharai is developing in an unplanned and haphazard manner very rapidly due to the ample opportunity for tourism development, which is acting as pull factor for private sector developers. Hence, this project has been under taken to protect the region from depletion of its natural resources and character and tourism development as well.



Map 1. Project area at Mirsarai Upazila (Source: Google earth and Google Map).

1.3 Objectives the baseline survey of existing flora and fauna:

Some of the specific objectives of the baseline survey of existing flora and fauna were as follows.

- To prepare an inventory on existing flora and fauna of Mirsarai Upazila.
- To identify threatened species of wild plants and animals.
- To identify critical ecosystem and wildlife habitats in this area.
- To prepare habitat map of existing flora and fauna.
- To determine the potentiality of natural resources for ecotourism development.
- To determine potential threats to the wild plants, animals and their critical habitats and also on the critical ecosystems due to the developmental activities.
- To prepare a strategic and management plan to mitigate the potential impacts on the ecosystem or species.

2. Methodology

2.1 An Inventory of the Flora and Fauna

Habitat types were categorized after the reconnaissance field survey and the survey sites were selected based on different habitats. Survey points were selected randomly but ensuring to cover all types of habitats and also covering most of the area of the Upazila. Survey sites were plotted on the map using GPS coordinates.

2.1.1 Survey areas are broadly divided into 8 Sub-categories.

2.1.1.1 Forest areas

Mirsarai Upazila covers a large area of Korer Hat Forest Range and a part of Baraiyadhala National Park. Regular surveys were conducted there.

2.1.1.2 Hill streams

Many of the hill streams are active throughout the year. This habitat is suitable for many cryptic species of amphibians and reptiles.

2.1.1.3 Coastal mangroves

Coastal mangroves are good habitat for shore birds and introduced spotted deer.

2.1.1.4 Agricultural land

Agricultural lands provide support to many insectivore and grain eater birds and also to rodents.

2.1.1.5 River banks

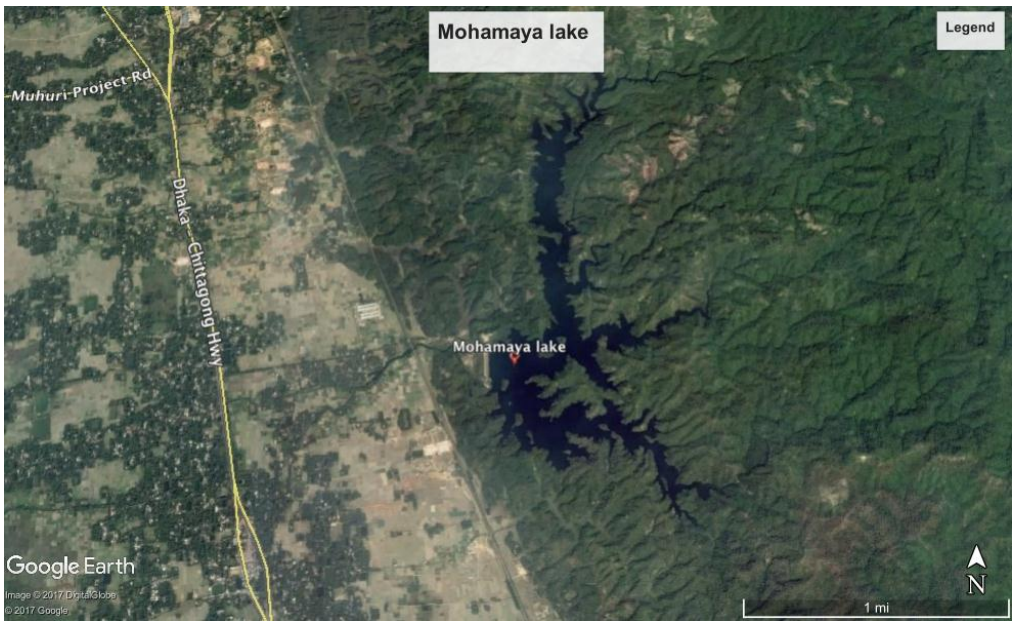
Habitat for many wader birds, freshwater fish and turtles.

2.1.1.6 Homestead vegetation: Habitat for birds as well as hiding places for many nocturnal mammals and birds.

2.1.1.7 Development areas: Developing areas were also surveyed to know the impact of developing activities on existing wild animals (Map 2).

Map 2. Location of economic zone in Mirsarai upazila.

2.1.1.8 Tourist spots: Tourist sports were surveyed to see the impact of tourists on wildlife habitats and ecosystem (Map 3).



Map 3. Mohamaya Lake in Mirsarai Upazila.

2.1.2 Survey methods for flora

Plant community was studied by following different methods. Parameters like frequency, density, abundance, presence, absence and dominance, diversity index will be quantified.

2.1.2.1 Transect survey

Transect survey was used to explore the existing floristic composition of Mirsharai upazila. Sample of the plant species were collected to prepare herbarium in order to identify the plant species wherever necessary. The floristic composition includes the occurred species of under trees, shrubs, herbs, climbers, epiphytes, parasites and ferns.

2.1.2.2 Quadrat survey

The quadrat survey was used for assessing plant community structure, tree species diversity and their regeneration status. The estimate of species contents of a habitat was determined by observing the plant species at different sample areas.

In the quadrates, trees of ≥5cm diameter were counted. Moreover, total height and diameter of the trees individuals of different species were also recorded. The parameters that were commonly used to characterize the structure of the plant communities were:

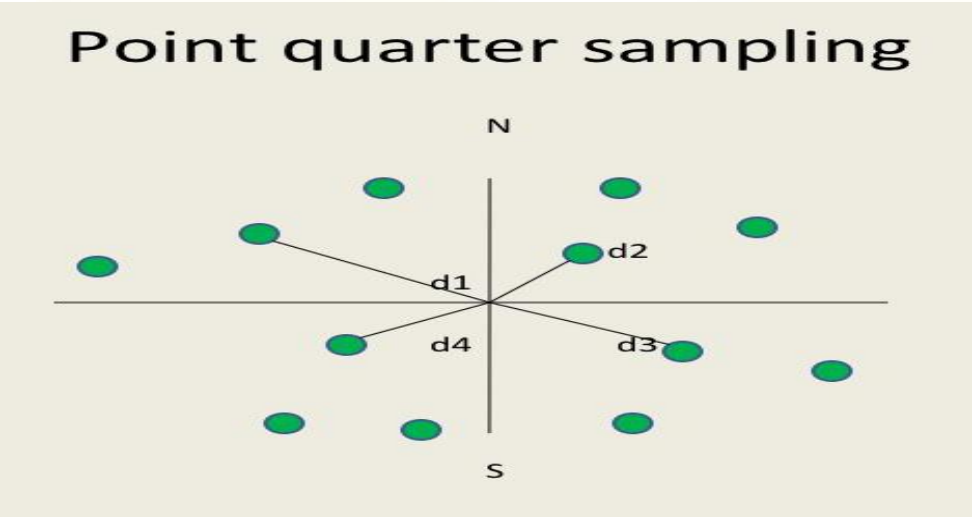
Density, Frequency, Abundance, Vegetation Coverage, Basal area, Dominance, Species richness index, Similarity index, Shannon-Wiener diversity index, Index of similarity etc.

Quadrate survey for plants

2.1.2.3 Point Quarter Method

The point quarter sampling method is a method that is quick and very useful to field biologist.

The method relies on using a series of randomly determined points that may be distributed along a transect line or throughout a habitat to be described. Each point represents the centre from which four compass directions north, south, east and west) divided the sampling point into four quarters.



In each quarter the distance (d1 to d4) from the point to the centre of the nearest plant with a predefined size (>10 cm dbh) is measured. So the calculation is-

Mean distance from the point d=mean (d1 to d4)

So, density of plants per unit area $=A/d^{2,}$

Where A= total area.

2.1.3 Survey methods for fauna

A combination of different methods was applied for the project work. Some of the methods were as follows.

2.1.3.1 Line Transect Sampling

Both temporary and permanent transect line were set randomly covering all types of habitat. Visual encounter survey was conducted on foot both in day and night. All the wild animals were recorded from the both side of transect. GPS coordination was used to calculate the total transect area covered for survey.

During river habitat survey, the river was considered as a transect line.

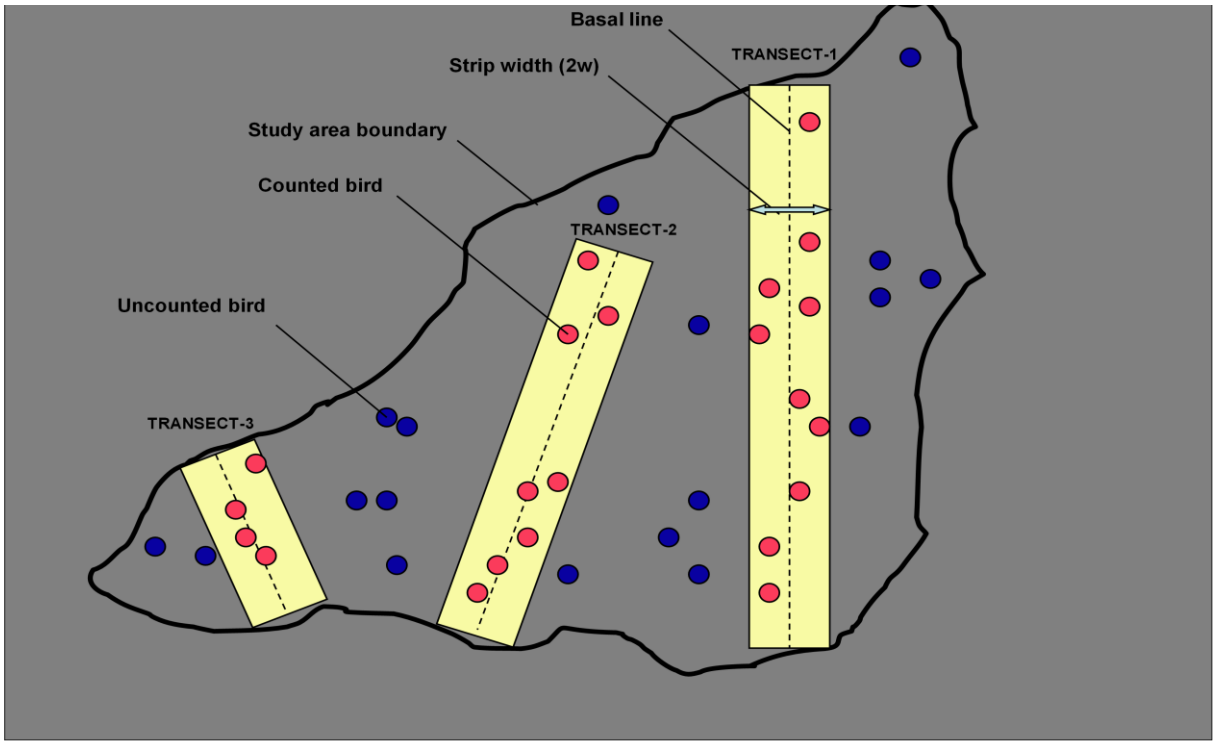


Diagram of the line transect.

2.1.3.2 Quadrate Sampling

Randomly selected quadrates with fixed (10m × 10m) or variable size were taken in different habitats. Small sized wild animals like amphibians and reptiles were quantified using quadrat sampling.

2.1.3.3 Use of different types of traps

Pit fall trap, tube trap and box trap was used to capture cryptic species. All these traps were designed to capture live animals. Appropriate baits were used wherever necessary.

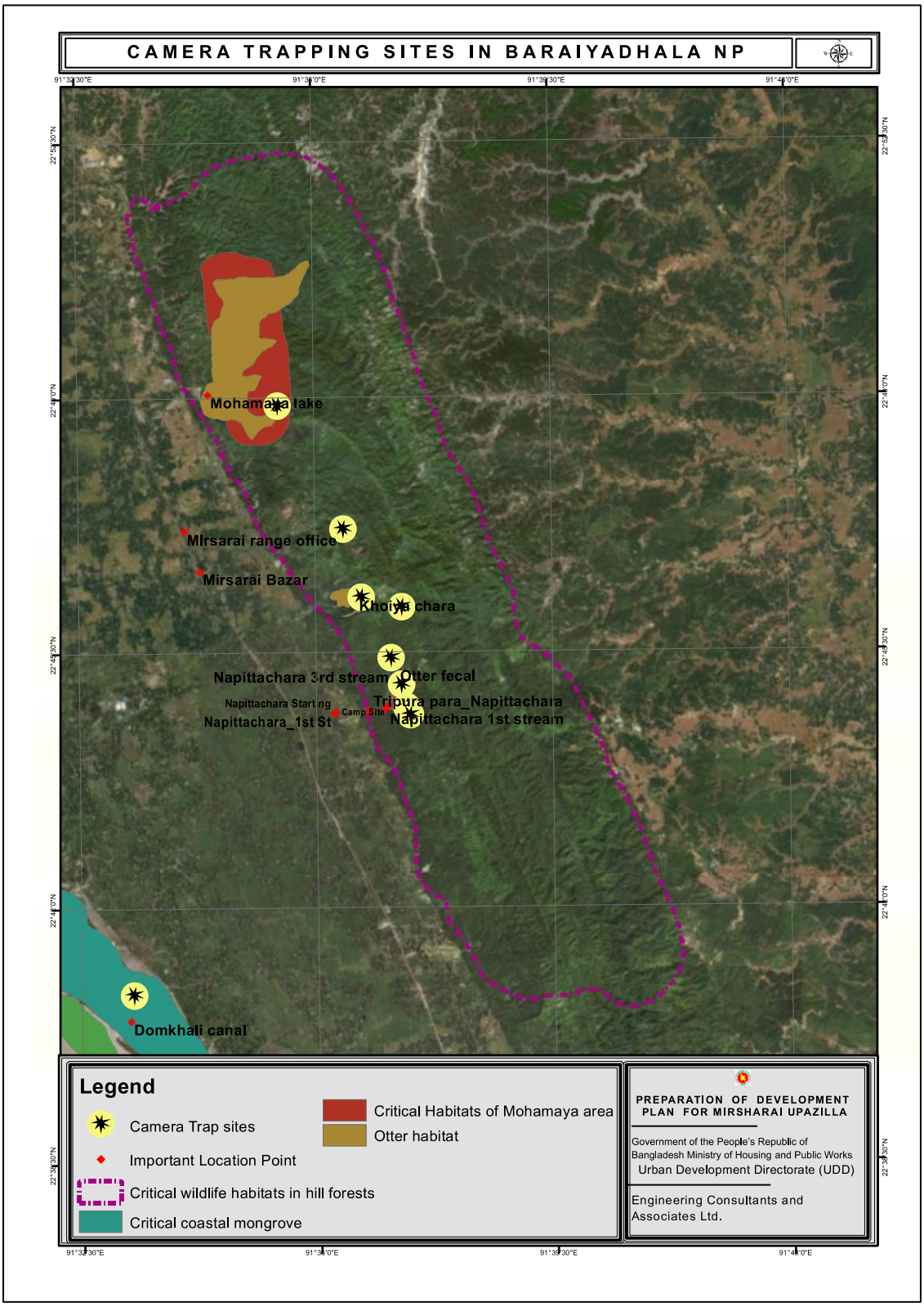
2.1.3.4 Night survey

Night survey was conducted with the aid of high power flashlight. Nocturnal wild animals were encountered during night survey.

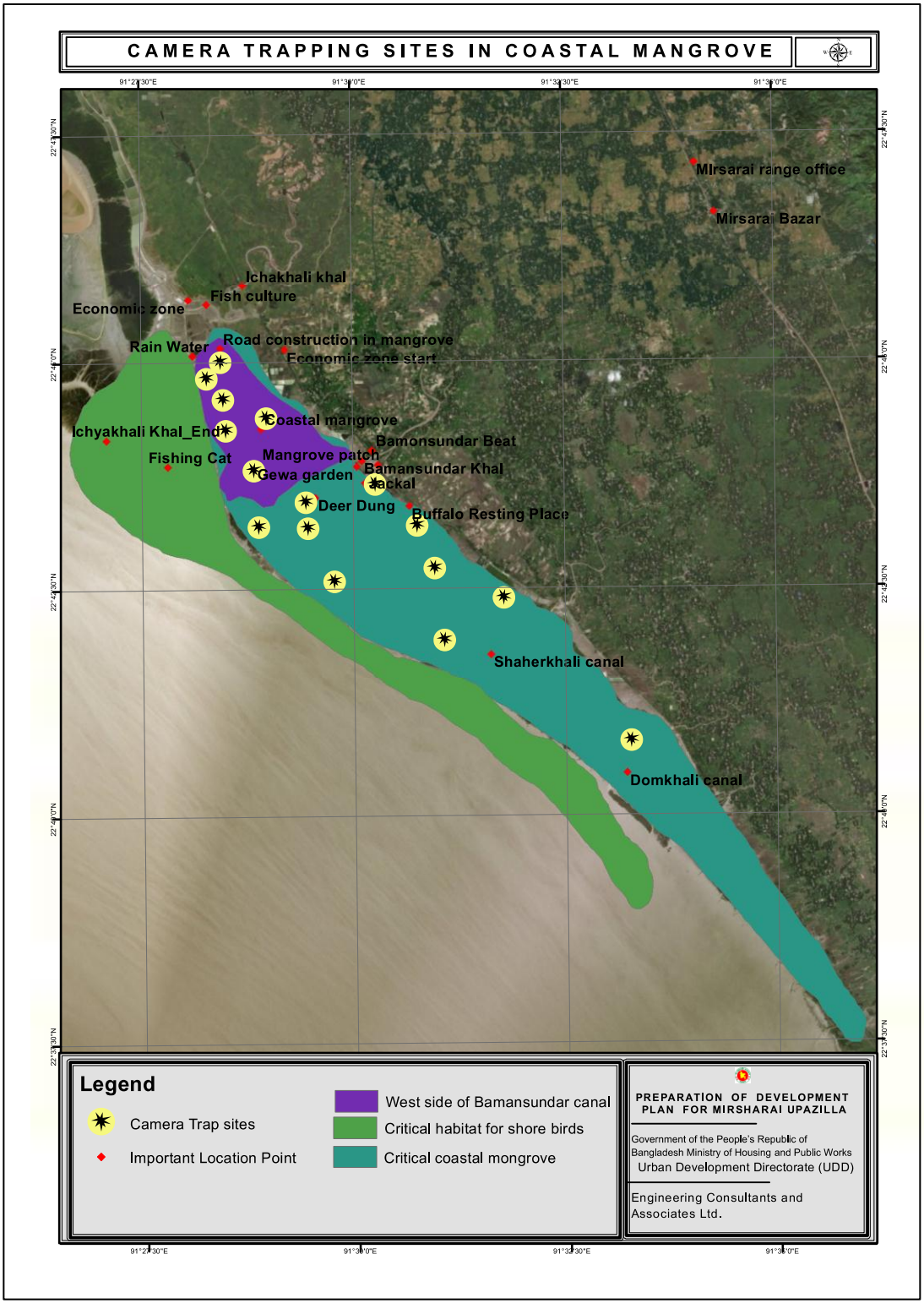
2.1.3.5 Camera trapping

Automatic digital camera traps were used to survey nocturnal and crepuscular animals. These camera traps were operated by motion sensor. The camera was automatically activated and captured photos if anything moved in front of it. Camera trapping was conducted both in hill forest areas and in coastal mangroves (Map 4 and 5).

Camera Trapping



Map 4. Camera trapping sites in hill forests.



Map 5. Camera trapping sites in coastal mangrove.

2.1.3.6 Pellet count

Pellet count method was specifically used for deer survey. Counting pellet groups (deer defecations) is used to determine population size and distribution. This method was based on the assumption that periodic accumulations of animal defections are related to population density. Quadrat of specific size was set in deer habitat, counting of pellet was carried out in the morning and afternoon.

2.1.3.7 Questionnaire survey

A pre-designed questionnaire was used to know the status of wild animals and plants in this Upazila based on the experience of the local people.

Questionnaire survey

2.1.3.8 FGD

Focal Group Discussion (FGD) was conducted among the local inhabitants to assess historical status of animals and plants in this area.

2.1.3.9. Relative abundance

Relative abundance of different species in Mirsarai upazila were expressed under four categories.

Very Common (VC): Species with 76-100 percent chance of being encountered in its habitats at its most active time.

Common (C): Species with 51-75 percent chance of being encountered in its habitats at its most active time.

Uncommon (UC): Species with 26-50 percent chance of being encountered in its habitats at its most active time.

Rare (R): Species with 25 percent or less chance of being encountered in its habitats at its most active time.

Field Activities

2.2 The Comparative Assessment of the Plant and Animal Communities of the Study Area

Different types of habitats were categorized like hilly area, plain lands, wetlands, homestead vegetation, riverbanks, agricultural fields etc. Same survey methods were repeated in all

types of habitats so a comparison would be made. Comparison of plant and animal diversity were justified using different diversity indices from the data. Critical ecosystem or habitats were identified by considering the number of species presents there, number of threatened species and the ecosystem services of the ecosystem.

2.3 Indicator species monitoring

Species, which indicate the health of the environment by their presence, absence or any abnormalities of change in their population, health or behavior. Indicator species ere selected from all the groups based on the habitat or target of monitoring. Indicator species from amphibians, reptiles, birds and mammals are selected. Each of the indicator species was finally selected after the initial field visit. Population status of all the indicator species will be monitored.

From the reconnaissance survey and literature we selected 13 species from 4 major groups as indicator species for long term monitoring of the project area (Table 2).

Table 2 Indicator species used for the monitoring of habitats

Sl. No.	Name of the species	Role / indication in the ecosystem
Amphibians		
2.3.1	Painted Ballon frog 	Its presence indicates deposition of good leaf litter on forest floor
2.3.2	Cope's Frog	Presence in rainy season indicates capacity of rain water conservation in forest

		
2.3.3	Cascade frog 	Indicates the health of hill stream
Reptiles		
2.3.4	Tokay Gecko 	Its presence on tree indicates the maturation of habitat
2.3.5	Emma Gray's Forest Lizard 	It is only found in good quality forest.

2.3.6	Ring Lizard 	Indicates the quality of marshy areas in a forest
2.3.7	Spot-tailed Pit viper 	Presence of it indicates the availability of small prey on lower canopy of forest.
Birds		
2.3.8	Red Jungle Fowl 	Indicator of forest floor health
2.3.9	Red-headed Trogon 	Only found in good quality dense forest
2.3.10	Red-breasted Parakeet	Indicates the presence of tall trees and

		breeding habitat of tree-hole nesting birds.
2.3.11	Racket-tailed Drongo 	Indicator of good quality woodland with huge insect production.
Mammals		
2.3.12	Barking deer 	Indicates the presence of dense undergrowth of the forest and also indicates the suitable habitat for other ground dwelling mammals
2.3.13	Fishing cat 	Indicates the health of water bodies

2.4 Identification of critical ecosystem and wildlife habitats

Habitats with high species diversity, population density of rare or threatened species was determined from the field survey. Ecosystem services will also be determined from field observation and also by questionnaire survey and FGD. Critical ecosystem or habitats were plotted on the maps using GPS coordinates.

2.5 Characterizing Impacts and Mitigation

To illustrate how significant impacts (adverse or beneficial) that might occur due to tourism development and establishment of Mirsharai Economic zone, BISIC industry and salinity of water as well, in the absence of mitigation and compensation measures were quantified and characterized in the following way:

- determine the value of existing flora and fauna affected, through survey and study;
- assess impacts affecting those flora and fauna, which meet or exceed a defined threshold value, with reference to ecological processes and functions as appropriate;
- quantify the extent, magnitude, duration, timing and frequency of the impacts;
- assess impact reversibility;
- explain the level of confidence in these predictions; and
- Identify likely significant impacts in the absence of any mitigation.

2.8 Mapping of the Site

The site of the flora and fauna were mapped in ARC GIS and present at a scale in consultation with PD.

3. Field Activities

3.1 Field visits

The research team has been conducted five field visits including reconnaissance survey in different habitats of the study area and collected necessary data (Table 3).

Table 3 Schedule of the field visits during the study period

Field visit / Duration	Team composition	Man-days spent	Major activities
Reconnaissance survey 27 November 2017	1. Professor Dr. Md. Kamrul Hasan (Team leader) 2. Mr. Md. Jamal Uddin 3. Mr. Anik Saha	3	• Assess field situation • Selected field sampling sites • Met stakeholders
Field visit 1 Jan 21 to Jan 28, 2018	1. Professor Dr. Md. Kamrul Hasan (Team leader) 2. Md. Taukir Hasan Hridoy 3. Md. Tarikul Islam 4. Mr. Koushik Aich	32	• Set up survey transects and sampling points. • Surveyed plants in different habitats • Conducted survey on wild animals from amphibian to mammals. • Identified critical habitats for wildlife
Field visit 2 Feb 18 to Feb 24, 2018	1. Professor Dr. Md. Kamrul Hasan (Team leader) 2. Md. Taukir Hasan Hridoy 3. Mr. Anik Saha	21	• Surveyed plants in different habitats • Data acquired for tree density estimation. • Conducted survey on wild animals from amphibian to mammals. • Data acquired for critical ecosystem and critical wildlife habitat identification.
Field visit 3 April 18 to April 24 2018	1. Professor Dr. Md. Kamrul Hasan (Team leader) 2. Md. Taukir Hasan Hridoy 3. Mr. Anik Saha	21	• Surveyed plants and wild animals in different habitats. • Took photographic documents for rare species. • Identified critical habitats for both flora and fauna.
Field visit 4 08 May 2018 to 13 May 2018	1. Professor Dr. Md. Kamrul Hasan (Team leader) 2. Md. Taukir Hasan Hridoy 3. Mr. Anik Saha 4. Mr. Touhidur Rahman	22	• Filled up the gaps of data collection. • Took photographic documents for rare species. • Identified critical habitats for both flora and fauna.

4. Results and Discussion

4.1 Flora of Mirsarai Upazila

Mirsarai Upazila consists of both evergreen forest patches as well coastal mangroves. Besides homestead vegetation is common in the semi-urban and rural areas. However, this area supports 375 species of plants of seven different categories, viz. tree, shrub, herb, climber, fern, epiphyte and parasites. Among them tress are the major category having 116 species (31%), then herbs 100 species (27%), shrubs 90 species (24%), climbers 46 species (12%), ferns 11 species (3%), epiphytes 7 species (2%) and parasites 5 species (1%) (Fig. 1 & 2).

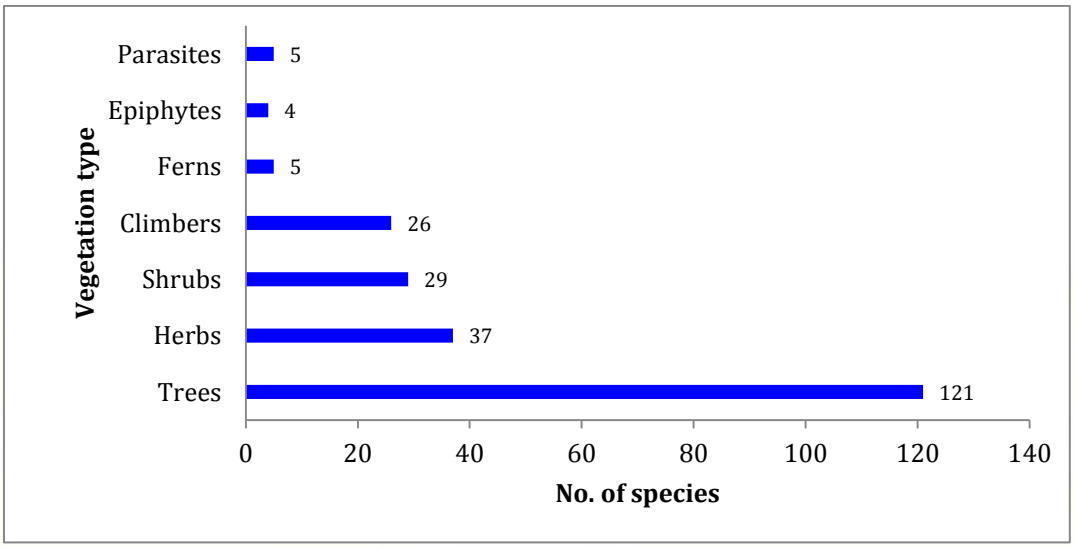


Fig. 1 Number of plant species in different categories in Mirsarai upazila.

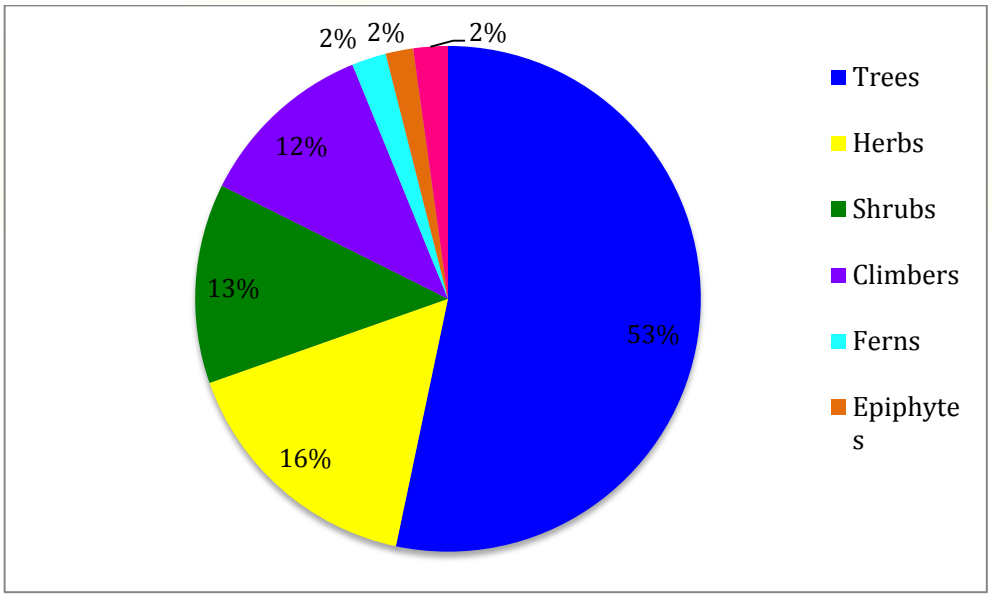


Fig. 2 Percentage of different types of vegetation in Mirsarai Upazila.

4.1.1 Trees

A total of 121 tree species belonging to 43 families are found in the forest as well as homestead vegetation. Among them, Moraceae is the dominant family consisting 12 species over the area. Myrtaceae is also a significant family containing 10 species (Fig. 3). The most common tree species are *Albizia chinensis, Albizia odoratissima, Anogeissus acuminata, Artocarpus chama, Dillenia scabrella, Dipterocarpus costatus, Dipterocarpus turbinatus, Elaeocarpus varunua, Ficus hispida, Ficus racemosa, Garcinia cowa* etc (Table 4).

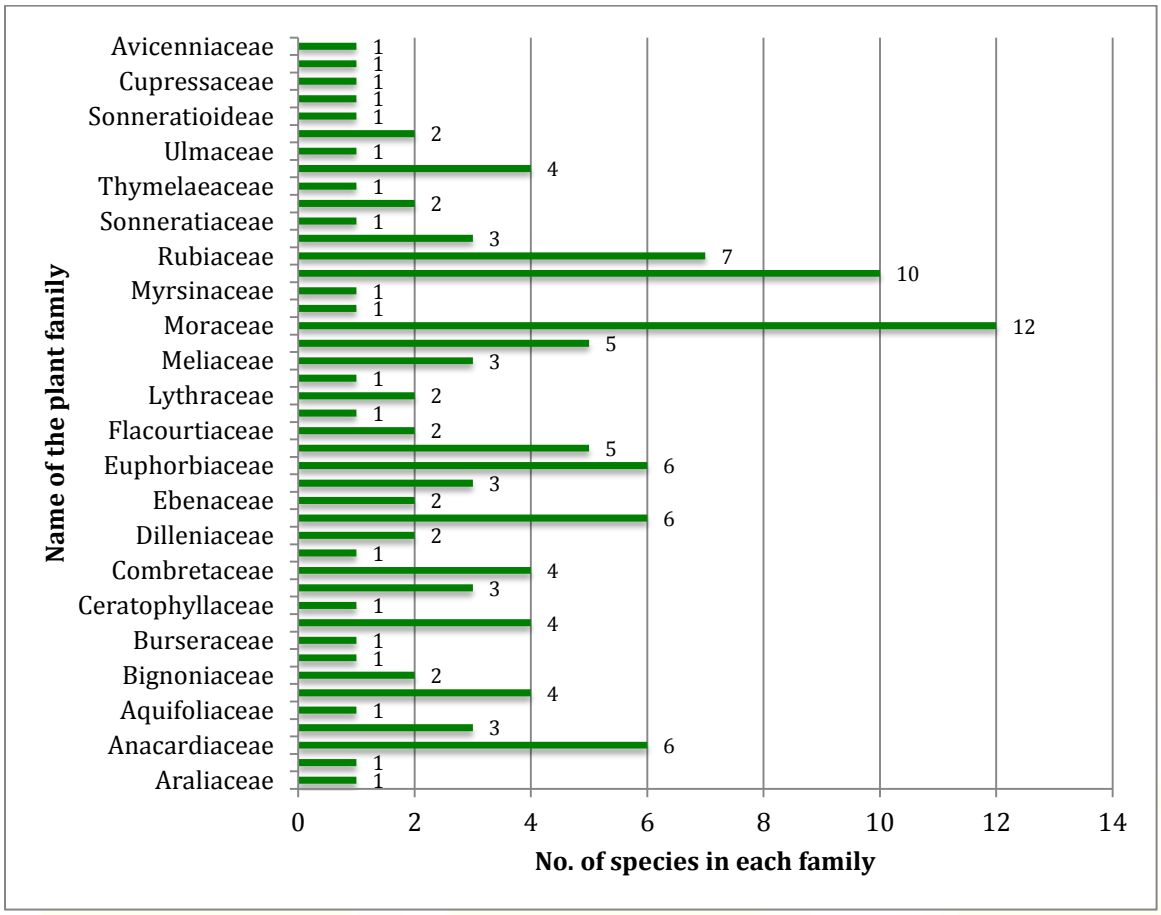


Fig. 3 Number of plant species in different families of plants.

Table 4 List of Trees in Mirsarai Upazila

Habitat code: HF= Hill forest, MF= Mangrove forest, HV= Homestead vegetation, RV= Road-side vegetation

Sl. No.	Botanical Name	Family	Local Name	Habitats / Recorded sites
1	*Acacia auriculiformis*	Mimosaceae	Akashmoni	HV, RV
2	*Acacia mangium*	Mimosaceae	Mangium	HV, RV
3	*Aegle marmelos*	Rutaceae	Bel	HV
4	*Alangium chinense*	Alangiaceae	Marleza Gachh	HF
5	*Albizia chinensis*	Mimosaceae	Chakua Koroi	HV, HF
6	*Albizia odoratissima*	Mimosaceae	Tetoya Koroi	HV

Sl. No.	Botanical Name	Family	Local Name	Habitats / Recorded sites
7	*Albizia procera*	Mimosaceae	Sada Koroi	HV, RV
8	*Alstonia scholaris*	Apocynaceae	Chatim	HF
9	*Anisoptera scaphula*	Dipterocarpaceae	Boilam	HF
10	*Anogeissus acuminate*	Combretaceae	Seori, Chakwa	HF
11	*Aquilaria agallocha*	Thymelaeaceae	Agar	HF
12	*Artocarpus heterophyllus*	Moraceae	Kanthal	HV
13	*Artocarpus chama*	Moraceae	Chapalish	HF
14	*Artocarpus lacucha*	Moraceae	Borta	HF
15	*Baccaurea ramiflora*	Euphorbiaceae	Lotkon	HF
16	*Berrya cordifolia*	Tiliaceae	Chavandalai	HF
17	*Bombax insigne*	Bombacaceae	Bon shimul, Bon tula	HF
18	*Brassaiopsis glomerulata*	Araliaceae	Kurila	HF
19	*Bridelia retusa*	Euphorbiaceae	Kata Kushui, Kata Koi	HF
20	*Brownlowia elata*	Tiliaceae	Moos, Mass	HF
21	*Caesalpinia pulcherrima*	Caesalpiniaceae	Radhachura	HV
22	*Cassia fistula*	Caesalpiniaceae	Sonalu	RV, HF
23	*Cassia nodosa*	Caesalpiniaceae	Bon-sonalu	HF
24	*Ceriscoides campanulata*	Rubiaceae	Boilem	HF
25	*Chukrasia tabularis*	Meliaceae	Chickrassi	HF
26	*Cocos nucifera*	Arecaceae	Narikel	HV
27	*Derris robusta*	Fabaceae	Jangaria, Jhamurja	HF
28	*Didymosperma gracilis*	Arecaceae	Bon Supari	HF
29	*Dillenia indica*	Dilleniaceae	Chalta	HV, HF
30	*Dillenia scabrella*	Dilleniaceae	Hargeza	HF
31	*Diospyros malabarica*	Ebenaceae	Deshi gab	HF, HV
32	*Diospyros toposia*	Ebenaceae	Katgula, Toposi	HF
33	*Dipterocarpus alatus*	Dipterocarpaceae	Gorjon (Sada)	HF
34	*Dipterocarpus costatus*	Dipterocarpaceae	Baitta gorjon	HF
35	*Dipterocarpus turbinatus*	Dipterocarpaceae	Tellia gorjon	HF
36	*Drimycarpus racemosus*	Anacardiaceae	Nala-amshi, Lau-barela	HF
37	*Duabanga grandiflora*	Sonneratiaceae	Bandarhola	HF
38	*Elaeocarpus floribundus*	Elaeocarpaceae	Sada Jalpai, Belpoi	HF
39	*Elaeocarpus tectorius*	Elaeocarpaceae	Jolpai	HV, HF
40	*Elaeocarpus varunua*	Elaeocarpaceae	Bon Jalpai, Titpai	HF
41	*Ficus benghalensis*	Moraceae	Bot	RV, HF
42	*Ficus fistulosa*	Moraceae	Bot	HF
43	*Ficus hispida*	Moraceae	Dumur	HV, RV, HF
44	*Ficus lamponga*	Moraceae	Jig bot, Katgularia	HF
45	*Ficus nervosa*	Moraceae	Battrella, Panidumur	HF
46	*Ficus racemosa*	Moraceae	Dumur, Jagyadumur	HF
47	*Ficus semicordata*	Moraceae	Chokorgola	HF
48	*Ficus variegata*	Moraceae	Dumur	HF
49	*Flacourtia jangomas*	Flacourtiaceae	Painnagola	HF
50	*Garcinia cowa*	Clusiaceae	Kao	HF
51	*Garcinia morella*	Clusiaceae	Moigga Kao	HF
52	*Garcinia xanthochymus*	Clusiaceae	Tamal, Dephal	HF
53	*Gardenia coronaria*	Rubiaceae	Bankamal, Painnaphul	HF
54	*Glochidion velutinum*	Euphorbiaceae	Matachhar, Painnatora	HF
55	*Gluta elegans*	Anacardiaceae	Kabita	HF
56	*Gmelina arborea*	Verbenaceae	Gamar	HF
57	*Grewia nervosa*	Tiliaceae	Assar	HF
58	*Grewia tiliifolia*	Tiliaceae	Pholsa, Dhomoni	HF
59	*Haldina cordifolia*	Rubiaceae	Haldu, Dakrum	HF
60	*Holarrhena antidysenterica*	Apocynaceae	Kurchi, Kuruj	HF
61	*Hopea odorata*	Dipterocarpaceae	Telsur	HF
62	*Hydnocarpus laurifolius*	Flacourtiaceae	Hiddigach	HF

Sl. No.	Botanical Name	Family	Local Name	Habitats / Recorded sites
63	*Ilex godajam*	Aquifoliaceae	Jangligewa, Raktim	HF
64	*Lagerstroemia macrocarpa*	Lythraceae	Bansua Jarul	HF
65	*Lagerstroemia speciosa*	Lythraceae	Painna Jarul	HF
66	*Licuala peltata*	Arecaceae	Chhata Pat, Kurud	HF
67	*Lithocarpus acuminata*	Fagaceae	Kali Batna	HF
68	*Lithocarpus elegans*	Fagaceae	Booro-batna, Tal batna	HF
69	*Lithocarpus pachyphylla*	Fagaceae	Kanta Batna	HF
70	*Lithocarpus polystachya*	Fagaceae	Sada Batna	HF
71	*Litsea glutinosa*	Lauraceae	Karjuki menda	HF
72	*Maesa indica*	Myrsinaceae	Romjani	HF
73	*Mangifera sylvatica*	Anacardiaceae	Uri-Am	HF
74	*Mallotus tetracoccus*	Euphorbiaceae	Kumaribura, Moinbura	HF
75	*Mangifera indica*	Anacardiaceae	Am	HV, RV
76	*Michelia baillonii*	Magnoliaceae	Bol-miring	HF
77	*Micromelum minutum*	Rutaceae	Dulia	HF
78	*Mitragyna diversifolia*	Rubiaceae	Phul Kadom	HF
79	*Mitragyna parvifolia*	Rubiaceae	Tobba, Phuti Kadom	HF
80	*Mitragyna rotundifolia*	Rubiaceae	Dakurum	HF
81	*Myristica linifolia*	Myristacaceae	Am Barela	HF
82	*Neolamarckia cadamba*	Rubiaceae	Kadam	HV, HF
83	*Phoenix sylvestris*	Arecaceae	Khejur	RV, HV
84	*Phyllanthus emblica*	Euphorbiacceae	Amloki	HF
85	*Protium serratum*	Burseraceae	Gotgutia	HF
86	*Psidium guajaba*	Myrtaceae	Payara	HV
87	*Pterospermum acerifolium*	Sterculiaceae	Muli Udal, Muskanda	HF
88	*Siphonodon celastrineus*	Ceratophyllaceae	Beljam	HF
89	*Spondias pinnata*	Anacardiaceae	Bon-Amra, Piala	HF
90	*Sterculia villosa*	Sterculiaceae	Chandul	HF
91	*Stereospermum colais*	Bignoniaceae	Dharmara	HF
92	*Steteospermum suaveolens*	Bignoniaceae	Kam Sonalu, Parul	HF
93	*Streblus asper*	Moraceae	Sheora/Harba	HF
94	*Swintonia floribunda*	Anacardiaceae	Civit	HF
95	*Syzygium balsameum*	Myrtaceae	Buti Jam	HF
96	*Syzygium claviflorum*	Myrtaceae	Lamba Nali Jam	HF
97	*Syzygium cumini*	Myrtaceae	Kalo Jam	HV
98	*Syzygium cymosum*	Myrtaceae	Khudi Jam	HF
99	*Syzygium firmum*	Myrtaceae	Dhaki jam	HF
100	*Syzygium fruticosum*	Myrtaceae	Puti Jam	HF
101	*Syzygium ramosissimum*	Myrtaceae	Khorjam	HF
102	*Syzygium syzygioides*	Myrtaceae	Kharijam, Jonkijam	HF
103	*Syzygium tetragonum*	Myrtaceae	Pholda jam, Lal Pholda	HF
104	*Tamarindus indica*	Caesalpiniaceae	Tentul	HV
105	*Terminalia arjuna*	Combretaceae	Arjun	RV, HF
106	*Terminalia bellirica*	Combretaceae	Bohera	HF
107	*Terminalia chebula*	Combretaceae	Haritaki	HF
108	*Tetrameles nudiflora*	Datiscaceae	Chandul, Maina Kat	HF
109	*Toona ciliata*	Meliaceae	Chondon Suruj	HF
110	*Trema orientalis*	Ulmaceae	Jiban, Naricha	RV, HF
111	*Trewia nudiflora*	Euphorbiaceae	Latim gach, Pitali	HF
112	*Vatica lanceaefolia*	Dipterocarpaceae	Sutagola, Mohal	HF
113	*Vitex glabrata*	Verbenaceae	Goda arsol	HF
114	*Walsura robusta*	Meliaceae	Bon Litchi	HF
115	*Wrightia arborea*	Apocynaceae	Dudhi, Dudh kurus	HF
116	*Zanthoxylum rhetsa*	Rutaceae	Bajna, Bazinali	HF
117	*Sonneratia apetala*	Sonneratioideae	Keora	MF
118	*Excoecaria agallocha*	Euphorbiaceae	Gewa	MF

Sl. No.	Botanical Name	Family	Local Name	Habitats / Recorded sites
119	*Thuja* sp.	Cupressaceae	Jhaw	MF
120	*Tamarix dioica*	Tamaricaceae	Nonajhaw	MF
121	*Avicennia* sp.	Avicenniaceae	Bain	MF

4.1.2 Shrubs

Shrubs in Mirsarai Upazila formed a significant proportion of the plant community. A total of 31 species belonging to 21 families were found in the study area where Family Poaceae possess the highest number of species (5 species) followed by Apocynaceae (4 species) (Table 5).

Table 5 Shrubs in Mirsarai Upazila
Habitat code: HF= Hill forest, MF= Mangrove forest, HV= Homestead vegetation, RV= Road-side vegetation

Sl. No.	*Botanical name*	Family	Local name	Habitats / Locations
1	*Barleria strigosa*	Acanthaceae	Banmali	HF
2	*Deeringia amaranthoides*	Amaranthaceae	Gholemouni	HF
3	*Desmos chinensis*	Annonaceae	Joke lata	HF
4	*Uvaria cordata*	Annonaceae	Gagh-ranga	HF
5	*Ichnocarpus frutescens*	Apocynaceae	Paralia Lata	HF
6	*Tabernaemontana crispa*	Apocynaceae	Jangli Tagor	HF, HV
7	*Tabernaemontana divaricata*	Apocynaceae	Tagar, Dudh phul	HF, HV
8	*Vallaris solanacea*	Apocynaceae	Hadpur	HF
9	*Gymnema acuminatum*	Asclepiadaceae	Khara Lata	HF, HV
10	*Wattakaka volubilis*	Asclepiadaceae	Madhumalati	HF
11	*Senna alata*	Caesalpiniaceae	Dadmardon	HF, RV
12	*Ipomoea fistulosa*	Convolvulaceae	Dhol Kolmi	RV
13	*Mallotus philippensis*	Euphorbiaceae	Sinduri	HF
14	*Ziziphus rugosa*	Euphorbiaceae	Jangli Boroi	HF
15	*Litsea salicifolia*	Lauraceae	Pania-mula	HF
16	*Leea indica*	Leaceae	Kurkur Jihwa	HF
17	*Lagerstroemia indica*	Lythraceae	Choto Jarul	HF, RV
18	*Urena lobata*	Malvaceae	Ban-okra, Congo pat	HF
19	*Ochna pumila*	Ochnaceae	Bhui Champa	HF
20	*Jasminum sambac*	Oleaceae	Beli (Flower)	HV
21	*Pandanus minor*	Pandanaceae	Choto Keya	HF, RV

22	*Bambusa burmanica*	Poaceae	Mirtinga Bans	HF, HV
23	*Bambusa tulda*	Poaceae	Mitinga, Mirtinga	HF, HV
24	*Bambusa vulgaris*	Poaceae	Ora Bansh	HF
25	*Melocanna baccifera*	Poaceae	Muli	HF
26	*Schizostachyum dullooa*	Poaceae	Dolu Bansh	HF
27	*Ziziphus oenoplia*	Rhamnaceae	Bonboroi	HF
28	*Citrus aurantifolia*	Rutaceae	Lebu	HV
29	*Lantana camara*	Verbenaceae	Lantana	RV
30	*Nypa fruticans*	Aracaceae	Golpata	MF
31	*Acanthus ilicifolius*	Ananthaceae	Hargoja	MF

4.1.3 Herbs

In this upazila, herbs constitute a significant proportion of total plant communities. A total of 37 species under 20 families were recored from the study area. Family Poaceae was represented by the highest number of species and genera (7 species) followed by Amaranthaceae family (5 species). *Centella asiatica, Rauvolfia serpentine, Pistia stratiotes, Cyperus cyperoides, Solanum americanum, Musa ornate*, *Zingiber capitatum,* etc. are the most common among the recorded herbs of Mirsarai Upazila (Table 6).

Table 6 Herbs in Mirsarai Upazila

Habitat code: HF= Hill forest, MF= Mangrove forest, HV= Homestead vegetation, RV= Road-side vegetation

Sl. No.	Botanical name	Family	Local name	Habitats / Locations
1	*Justicia diffusa*	Acanthaceae	Pitapapra	HF
2	*Rungia pectinata*	Acanthaceae	Pindi	HF
3	*Sagittaria sagittifolia*	Alismataceae	Muyamuya,	HF
4	*Achyranthes aspera*	Amaranthaceae	Apang, Upatlengra	HF
5	*Alternanthera philoxeroides*	Amaranthaceae	Helencha	HF, HV
6	*Amaranthus spinosus*	Amaranthaceae	Kanta-nutia	HV, RV
7	*Amaranthus viridis*	Amaranthaceae	Ban-nate, Notay	HV, RV
8	*Celosia cristata*	Amaranthaceae	Morogphul	HV
9	*Centella asiatica*	Apiaceae	Thankuni	HV, RV
10	*Rauvolfia serpentina*	Apocynaceae	Sarpagandha	HF
11	*Aponogeton echinatus*	Aponogetonace	Ghechu	HV, RV

Sl. No.	Botanical name	Family	Local name	Habitats / Locations
12	*Amorphophallus bulbifer*	Araceae	Jongle Ol.	HV, HF
13	*Colocasia esculenta*	Araceae	Katchu	HV
14	*Pistia stratiotes*	Araceae	Topapana	HF
15	*Chromolaena odorata*	Asteraceae	Assamlata	RV, HF
16	*Eclipta alba*	Asteraceae	Kesaraj, Bhimraj	HF
17	*Sphaeranthus indicus*	Asteraceae	Chagul-nadi	HF
18	*Heliotropium indicum*	Boraginaceae	Hatisur	RV, HV
19	*Amischophacelus*	Commelinaceae	Baghanulla	HF
20	*Costus speciosus*	Cymodoceaceae	Bonroi, Khustha	HF
21	*Cyperus cyperoides*	Cyperaceae	Kucha, Kusha	HF
22	*Cyperus difformis*	Cyperaceae	Behua	HF
23	*Crotalaria pallida*	Fabaceae	Jhun-jhuni	HF
24	*Hyptis suaveolens*	Lamiaceae	Tokma	HF, RV
25	*Sida cordifolia*	Malvaceae	Berela	HF
26	*Musa ornata*	Musaceae	Kola	HV
27	*Brachiaria distachya*	Poaceae	Cori Ghas	RV
28	*Cymbopogon citratus*	Poaceae	Dhan Sabarang	RV, HV
29	*Cynodon dactylon*	Poaceae	Durba grass	RV
30	*Imperata cylindrica*	Poaceae	Chhan, Chau, Kash	RV
31	*Imperata cylindrica*	Poaceae	Sungrass	RV
32	*Saccharum spontaneum*	Poaceae	Kash, Kaichch	RV
33	*Setaria palmifolia*	Poaceae	Urodhan	RV
34	*Scoparia dulcis*	Scrophulariacea	Bondhone	HV
35	*Solanum americanum*	Solanaceae	Tit-begun	RV, HV
36	*Zingiber capitatum*	Zingiberaceae	Jongli Ada	HF
37	*Zingiber zerumbet*	Zingiberaceae	Bon Ada	HF

4.1.4 Climbers

Like all the natural forest patches, wide varieties of climbers are common in foerest area of Mirsarai Upazila. A total of 26 species of climbers belonging to 15 families were found in the study area. Family Fabaceae, Convolvulaceae and Arecaceae each have the highest number of species (4 species) followed by Cucurbitaceae (2 species) (Table 7).

Table 7 List of Climbers in Mirsarai Upazila

Habitat code: HF= Hill forest, MF= Mangrove forest, HV= Homestead vegetation, RV= Road-side vegetation

Sl. No.	Botanical name	Family	Local name	Habitats / Locations
1	*Scindapsus officinalis*	Araceae	Gaj-pipul.	HF
2	*Calamus guruba*	Arecaceae	Jali Bet, Kejuni Bet	HF
3	*Calamus latifolius*	Arecaceae	Budum bet, Korak bet	HF
4	*Calamus viminalis*	Arecaceae	Bara Bet	HF
5	*Daemonorops*	Arecaceae	Golla, Golak Bet	HF
6	*Mikania cordata*	Asteraceae	Assam lata	RV, HF
7	*Bauhinia scandens*	Caesalpiniaceae	Nagpat, Gendi-lata	HF, RV
8	*Caesalpinia bonduc*	Caesalpiniaceae	Nata, Lal kanta	HF
9	*Ipomoea maxima*	Convolvulaceae	Ban Kalmi	HF
10	*Merremia hederacea*	Convolvulaceae	Kaladana	HF
11	*Merremia umbellata*	Convolvulaceae	Sada Kalmi	RV
12	*Operculina turpethum*	Convolvulaceae	Dudh Kalmi	RV
13	*Coccinia grandis*	Cucurbitaceae	Telakucha	RV
14	*Trichosanthes*	Cucurbitaceae	Makal	HF
15	*Dioscorea bulbefera*	Dioscoreaceae	Pagla Alu	HF
16	*Tragia involucrata*	Euphorbiaceae	Chotra pata, Bichuti	HF, HV
17	*Abrus precatorius*	Fabaceae	Kuch, Ratti	HF
18	*Spatholobus acuminatus*	Fabaceae	Tarjanlata,	HF
19	*Spatholobus parviflorus*	Fabaceae	Goalia lata, Pan lata.	HF
20	*Vigna adenantha*	Fabaceae	Bon Barboti	HF
21	*Entada rheedii Spreng.*	Mimosaceae	Gilalata	HF
22	*Piper hamiltonii*	Piperaceae	Jangali Pan	HF
23	*Paederia cruddasiana*	Rubiaceae	Gandha-bhadali Pata	HF
24	*Smilax ocreata*	Smilacaceae	Kumarilata	HF
25	*Byttneria pilosa*	Sterculiaceae	Harbanga lata, harjora	HF
26	*Cissus adnata*	Vitaceae	Painna lata, Bhatia lata	HF

4.1.5 Ferns

Basically the forest floor of the Mirsarai was moderately rich in fern communities. There were 5 species of ferns belonging to 5 families recorded from the study area. Family Adiantaceae, Athyraceae, Angiopteridaceae, Gleicheniaceae and Stenochlaenaceae represented only one species each. *Angiopteris evecta* was the most common fern of the study area. Among the recorded ferns, Dhekia Shak (*Angiopteris evecta*) has been used as vegetables by the local people (Table 8).

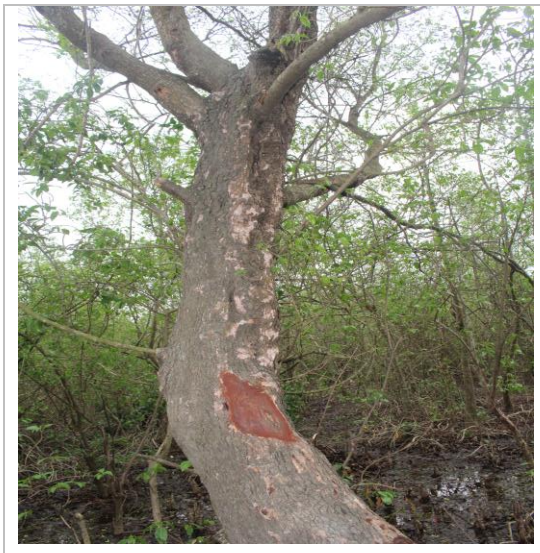
	
Keora Tree	Gewa Tree
	
Golpata	Hargoja
	
Lona Jhaw	Jhaw

Table 8 List of Ferns in Mirsarai Upazila
Habitat code: HF= Hill forest, MF= Mangrove forest, HV= Homestead vegetation, RV= Road-side vegetation

Sl. No.	Botanical name	Family	Local name	Habitats/Locations
1	*Adiatum incisum*	Adiantaceae	Biddapata	HF
2	*Angiopteris evecta*	Angiopteridaceae	Dhekia Shak	HV, HF, RV
3	*Dicranopteris linearis*	Gleicheniaceae	Lomba, Dhekia	HF
4	*Diplazium esculentum*	Athyriaceae	Dhekia, Dhekia Shak	HF, HV
5	*Stenochlaena palustris*	Stenochlaenaceae	Lata Dhekia	HF

4.1.6 Epiphytes

Epiphytes in the Mirsarai represent a signifiecant proportion of total plant communities. A total of 4 species of epiphytes under 4 genera and 3 families were recorded from the study area. *Aerides multiflora* and *Robiquetia succisa* are the common epiphytes in the forest areas of Mirsarai upazila.. Among the recorded epiphytes, *Aerides multiflora, Robiquetia succisa, Staurochilus ramosum* and *Pothos scandens* (Hatilata) has good medicinal value (Table 9).

Table 9 List of Epiphytes in Mirsarai Upazila
Habitat code: HF= Hill forest, MF= Mangrove forest, HV= Homestead vegetation, RV= Road-side vegetation

Sl. No.	Botanical Name	Family	Local Name	Habitats / Locations
1	*Aerides multiflora*	Orchidaceae	-	HF
2	*Dischidia major*	Asclepiadaceae	-	HF
3	*Pothos scandens*	Araceae	Hatilata, Batilata	HF
4	*Robiquetia succisa*	Orchidaceae	-	HF

Parasites
A total of 5 species of parasites belonging to 4 genera and 3 families were recorded from the Mirsarai Upazila. Family Loranthaceae and Cuscutaceae represented by 2 species of parasites each. *Hoya parasitica* was common in Mirsarai upazila (Table 10).

Table 10 List of Plant Parasites in Mirsarai

Habitat code: HF= Hill forest, MF= Mangrove forest, HV= Homestead vegetation, RV= Road-side vegetation

Sl. No.	Botanical name	Family	Local name	Habitats / Locations
1	*Cuscuta chittagongensis*	Cuscutaceae	Pahari Swarnalata	HF
2	*Cuscuta reflexa*	Cuscutaceae	Swarnalata	HV, RV
3	*Hoya parasitica*	Asclepiadaceae	Pargacha	HF, HV
4	*Macrosolen cochinchinensis*	Loranthaceae	Choto Banda, Rema	HF, HV
5	*Scurrula gracilifolia*	Loranthaceae	Pargacha	HF, HV

4.2 Fauna

Mirsarai upazila is very rich in wildlife species. During the survey period, a total of 306 species of wild animals have been recorded. Among the recorded species, 30 species are amphibians, 40 species of reptiles, 200 species of birds and 36 species of mammals (Fig. 4)

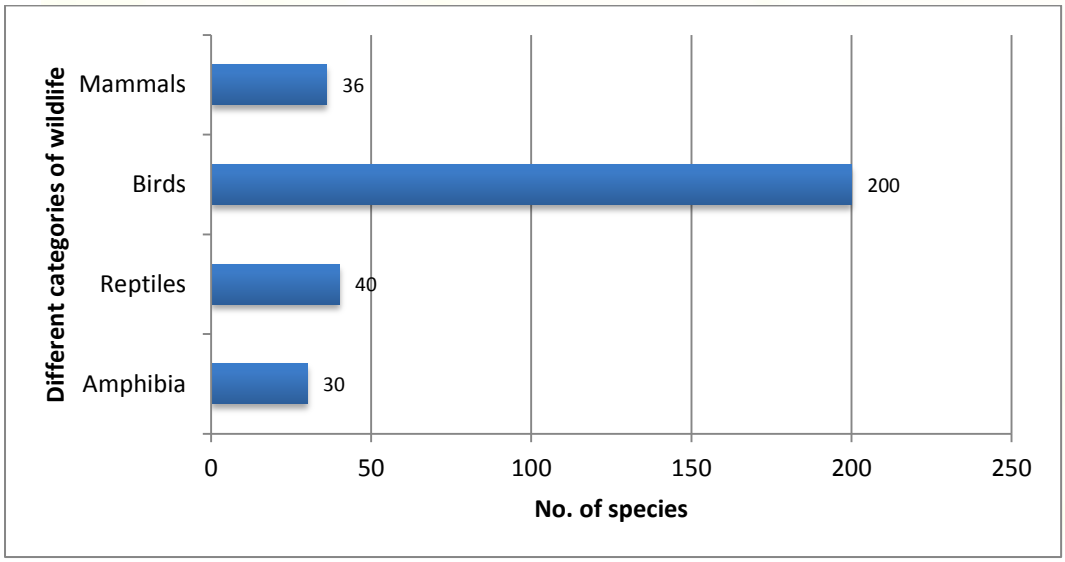


Fig. 4 Number of species in different categories of animals.

4.2.1 Amphibians

Amphibians require aquatic environment to complete their reproductive purposes although some lay their eggs on land and have developed various means of keeping them moist. However, many frog species do not need any water for breeding. They reproduce via direct development (*e.g. Philautus* spp.), which allows them to be completely independent from freestanding water. The reproductive success of many amphibians is dependent on the quantity and timing of seasonal rainfall (Hogan, 2010). In anurans, males usually arrive at the

breeding sites before females and the vocal chorus they produce may stimulate ovulation in females (Hogan, 2010). Amphibians possess diverse patterns of parental care. Parental care includes formation of nests, carrying and guarding eggs from the environmental extremities as well as from the predators.

In Bangladesh a total of 49 amphibians have been recorded in the order Anura and Gymnophiona (Hasan *et al.*, 2014). Among the eight amphibian families, Dicroglossidae has the highest number of species (14), followed by Ranidae and Rhacophoridae (10 species each). Most of the amphibians of the country (61%) are confined to the forested areas. Most of the amphibians inhabit in different types of habitats but some are habitat specific. Thus the habitat specific amphibians are more sensitive to any environmental change. Any alteration or modification to the habitat of these animals affect more severely than other species.

A total of 30 species of amphibians in 6 families have been recorded from Mirsarai upazila. Family Dicroglossidae comprised the highest number of species (11 species), which was about 36.63% of the total amphibian community of this area. Family Rhacophoridae ranked second position supporting 7 species (23.33%) followed by Ranidae 20% (6 species), Microhylide 10% (3 species) and Megophoridae 6.67% (2 species) while family Bufonidae had only 1 species (Fig.5) (Table 11).

Among these species, most of them (13species) were rare (43%), 8 species very common (27%), 3 common (10%) and 6 were uncommon (20%) (Fig. 6).

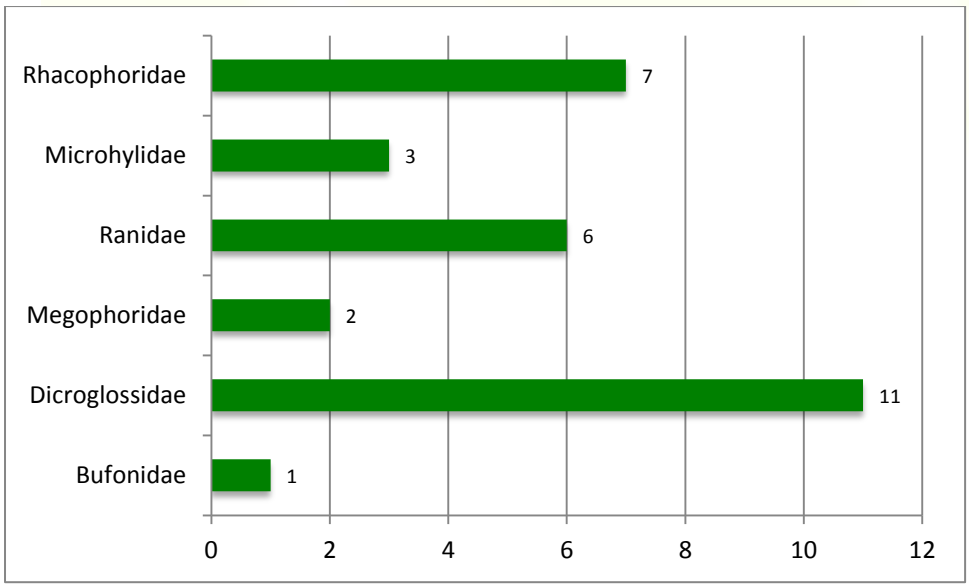


Fig. 5 Number of species in each family of amphibians of Mirsarai upazila.

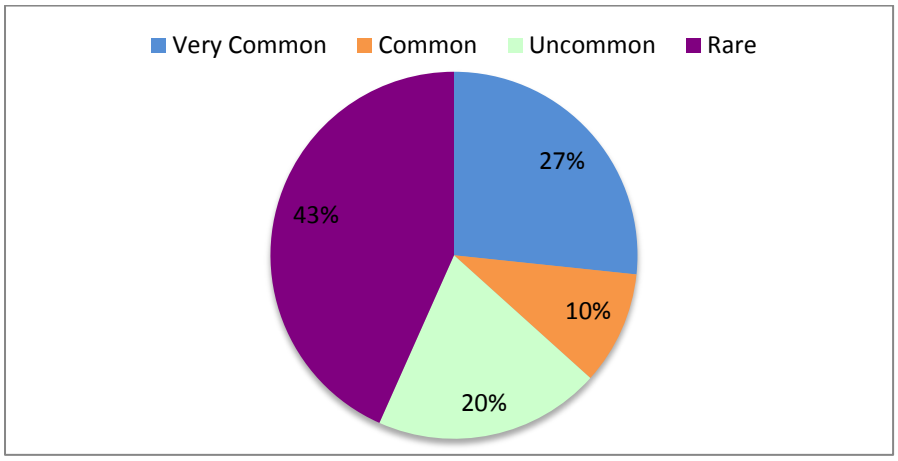


Fig. 6 Status of amphibians in Mirsarai upazila.

The forest areas of Mirsarai upazila support thirteen rare frog species of the country. *Occidozyga lima* and *Occidozyga borealis* are two rare in this forest. The first one is often found in stagnant shallow rain water during monsoon and the second one inhabits rotten leaf litters closer to the creek and water bodies. Breeding population of *Occidozyga lima* was found in some areas of this forest. *Occidozyga borealis* was rarer than *Occidozyga lima* n this forest. *Kaloula pulchra* and *Leptobrachium smithi* are two fossorial and usually found in leaf litters close to water bodies. They spend most of the time under the leaf litter or in burrows. During the monsoon they come out for breeding. Males are as loud as to hear from a very distant. Two-striped Pigmy Tree Frog (*Chiromantis vittatus*) is common all over the Sanctuary but AnnandaleTree Frog (*Chiromantis simus*), Dwarf Bush Frog (*Philautus parvulus*), Anderson's Bush Frog (*Philautus andersoni*) are rarely found. The breeding population of *Chiromantis vittatus* and *Chiromantis simus* are usually found in bushes hanging over the water bodies. Twin-spotted Tree Frog (*Rhacophorus bipunctata*) was recorded from the understory of natural forest patch. Breeding population of Point-nosed Frog (*Clinotarsus alticola*) aggregates near the water pools in many of the streams in this forest. This species is dimorphic and male individuals are significantly smaller than the females. Males invite breeding females by emitting breeding call sound like the call of a chick. Marbled cascade frog (*Amolops marmoratus*) and the newly discovered Green Cascade frog (*Odorrana livida*) are confined to the fast moving part of the stream.

Pierre's Cricket Frog (*Fejervarya pierrei*), Asmat's Cricket Frog (*Fejervarya asmati*), Terai Cricket Frog (*Fejervarya teraiensis*) and Common toad (*Duttaphrynus melanostictus*) are very common in all types of terrestrial habitats in this forest, including near human

settlements and water bodies, forest floors, bushy areas and cultivated lands. Coastal Bull Frog (*Hoplobatrachus litoralis*) is another bull frog species discovered for the first time to science from costal area (Hasan *et al.* 2012) is also found in Inani Forest area. Skipper frog (*Euphlyctis cyanophlyctis*) is very common in all types of water bodies including permanent and seasonal water bodies; creeks (chara), ponds, paddy fields, and road side ditches. Cope's frogs (*Hylarana leptoglossa*) are common in water bodies close to the forest edge. The breeding males and females aggregate to the breeding pool in many sites of this forest. The continuous crocking of Cope's frogs from the breeding pools is very common in this forest during monsoon evening. Five species of cricket frogs (*Fejervarya* spp.) are found in this forest. All the cricket frog species in this forest primarily prefer marshy grassland but also common in other types of habitats.

4.2.1.1 Habitat Preference of Amphibians

Among the recorded 30 species of amphibians 20 species are found in hill forests. Thirteen species are confined to the hill forest habitats and not found in any other habitats. Mangrove forest patch supports 8 species of frogs. Homestead and agricultural lands support 11 species of frogs each. Four species of frogs are found in hill streams of which two species are strictly confined to this habitat. Road-side habitats also supports 12 species of frogs (Fig. 7).

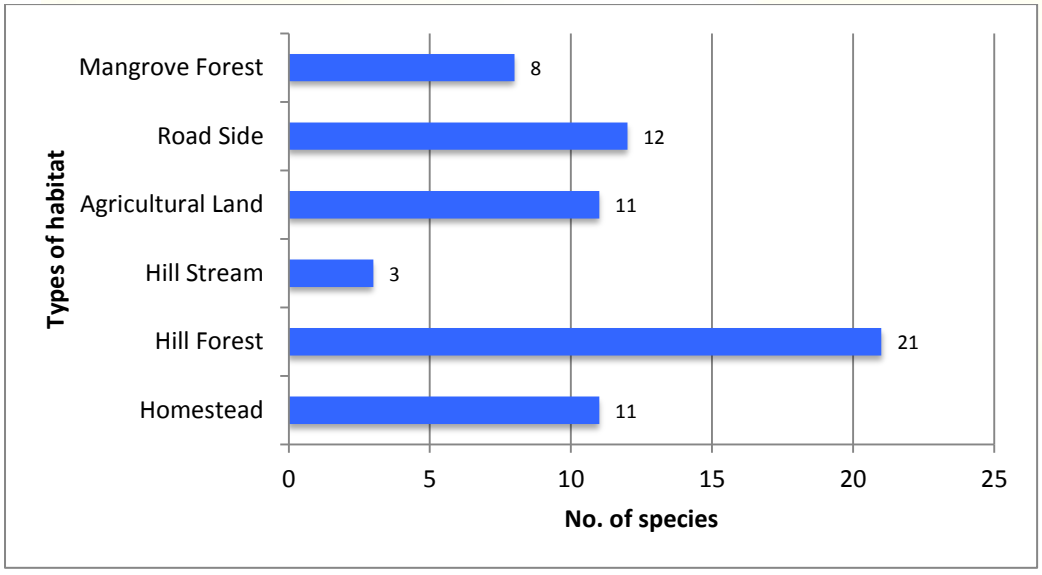


Fig. 7 Amphibian species in different habitats of Mirsarai Upazila.

Table 11 Status of Amphibians in Mirsarai upazila

Status code: VC- Very Common, C-Common, UC- Uncommon, R-Rare
Habitat code: HF= Hill forest, HS= Hill stream, MF= Mangrove forest, H= Homestead, R= Road-side, AL=Agricultural land

English Name	Local Name	Scientific Name	Status	Habitats
Common Toad	Kuno Bang	*Duttaphrynus melanostictus*	VC	H, AL, R, MF
Skipper Frog	Kotkoti Bang	*Euphlyctis cyanophlyctis*	VC	H, AL, R, MF, HF
Coastal Bull Frog	Upokulio Sona Bang	*Hoplobatrachus litoralis*	UC	HF, AL, R, MF, H
Indian Bull Frog	Sona Bang	*Hoplobatrachus tigerinus*	C	HF, AL, R, MF, H
Jerdon's Bull Frog	Ramchagod-daka Bang	*Hoplobatrachus crassus*	R	HF, AL, R, MF, H
Pierre's Cricket Frog	Pierre's Jhi-jhi Bang	*Fejervarya pierrei*	VC	AL, R, MF, H
Asmat's Cricket Frog	Ashmater Jhi-Jhi Bang	*Fejervarya asmati*	C	AL, R, MF, H
Terai Cricket Frog	Torai Jhi-Jhi Bang	*Fejervarya teraiensis*	VC	AL, R, MF, H
Syhadra Cricket Frog	Jhi-jhi Bang	*Fejervarya syhadrensis*	VC	AL, R, MF, H
Crab-eating Frog	Kakrabhuk Bang	*Fejervarya cancrivora*	C	AL, R, MF, H
Puddle Frog	---	*Occidozyga lima*	R	HF
Northern Frog	---	*Occidozyga borealis*	R	HF
Two-striped grass frog	Pata Bang	*Hylarana taipehensis*	R	HF, H
Marbled Cascade Frog	Jharna Sundari Bang	*Amolops marmoratus*	UC	HS
Green Cascade Frog	Sobuj Jharnabashi Bang	*Odorrana livida*	R	HS
Cope's Frog	Murgi Daka Bang	*Hylarana leptoglossa*	UC	HF
Bhamo Frog	---	*Humerana humeralis*	UC	HF
Point-nosed Frog	Soru-matha Bang	*Clinotarsus alticola*	UC	HF
Ornate Micrhylid Frog	Laubichi Bang	*Microhyla ornata*	VC	HF, AL, H
Berdmore's Microhylid Frog	Boro Laubichi Bang	*Microhyla berdmorei*	VC	HF
Painted Bull Frog	Venpu Bang	*Kaloula pulchra*	R	HF
Smith's Litter Frog	Holde chokha Bang	*Leptobrachium smithi*	R	HF, HS
Crown Frog	Mukut Bang	*Xenophrys parva*	R	HF, HS
Indian Tree Frog	Gecho Bang	*Polypedates maculatus*	R	HF, H, R
Six-lined Tree Frog	Dorakata Gechho Bang	*Polypedates leucomystax*	VC	HF, H, R, MF
Two-striped Pigmy Tree Frog	---	*Chiromantis vittatus*	UC	HF
AnnandaleTree Frog	Choto Gecho Bang	*Chiromantis simus*	R	HF
Dwarf Bush Frog		*Philautus parvulus*	R	HF
Anderson's Bush Frog	Andersoner Gecho Bang	*Philautus andersoni*	R	HF
Twin-spotted Tree Frog		*Rhacophorus bipunctata*	R	HF

Indian Bull Frog

Coastal Bull Frog

Crab-eating Cricket Frog

Sehydra Cricket Frog

Asmat's cricket Frog	Terai Cricket Frog
	
Skipper Frog	Two-stripe Grass Frog
	
Puddle Frog	Northern Trickle Frog
	
Ornate Microhylid Frog	Berdmorei's Microhylid Frog

Marbled Cascade Frog

Green Cascade Frog

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4.2.2 Reptiles

Reptiles are cold-blooded or ectothermic which means they do not generate their own, internal heat. That's why they bask in the sun during the day and seek shelter at night to avoid cold. Reptiles also must avoid overheating, so if daytime temperature climbs too high, they must seek shelter to avoid absorbing too much heat. Other than snakes and some lizards, they have two pairs of limbs. Eggs are usually laid, but retained in female body for development in some species. They never depend on aquatic medium for growth and development, which is prerequisite for amphibians.

Many reptilian fauna such as snakes and lizards act as important biological agents through feeding harmful rodents and insects. But due to high demand for skin and meat some magnificent reptilian species are in the verge of extinction worldwide.

Forests of Mirsarai upazila support 40 species of reptiles. Among them 2 species are turtles and tortoise (5%), 17 species of lizards (45%) and 21 species are snakes (50%) (Fig. 8 & 9). Forty percent (16 species) reptiles in this area are rare, while 9 (23%) species are uncommon, 10 species (25%) common and only 5 (12%) species are very common in Mirsarai area (Fig. 10) (Table 12).

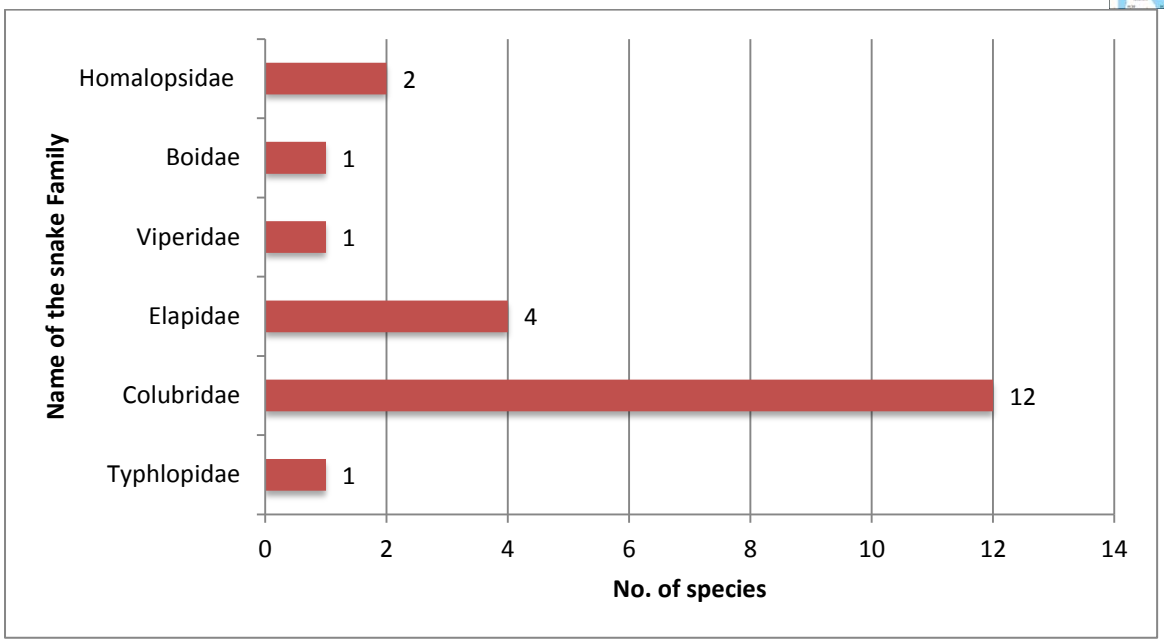


Fig. 8 Status of reptiles in Mirsarai upazila.

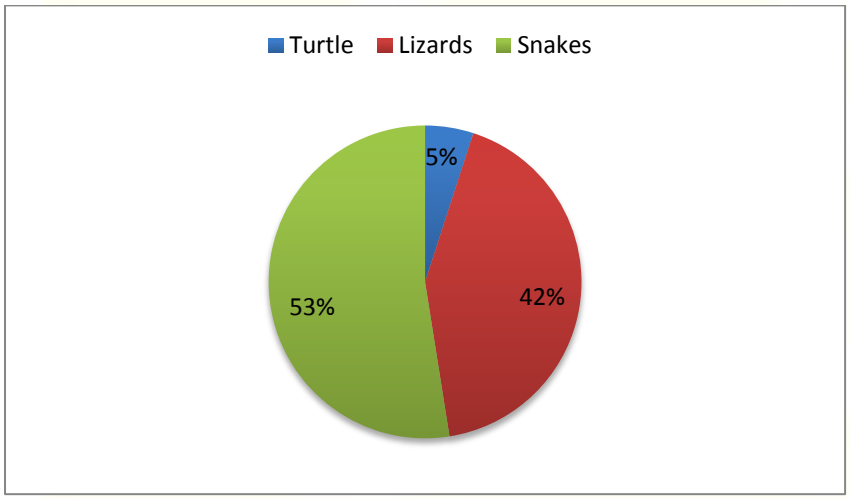


Fig. 9 Comparative view of reptiles in Mirsarai upazila.

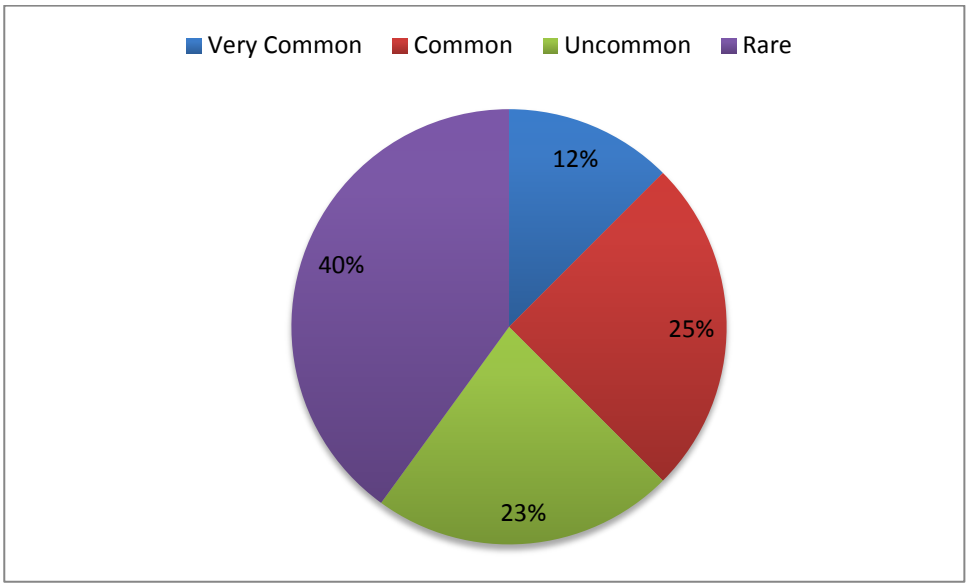


Fig. 10 Status of Reptiles in Mirsarai upazila.

Two species of turtles and tortoise are found in the forest areas of Mirsarai upazila. Elongated Tortoise (*Indotestudo elongata*), is rare and inhabits forest floor. Spotted Flap Shell Turtle (*Lissemys punctata*) is commonly seen in in water bodies of Mirsarai upazila.

A total of 19 species of snakes in five families were recorded from Mirsarai upazila. Family Colubridae comprised the highest number of snakes (12 species) followed by Elapidae (4 species), Typhlopidae, Viperidae and Boidae (1 species each) (Fig. 11). Among these 19 species of snakes recorded, 6 species are venomous and remaining 13 species are non-venomous.

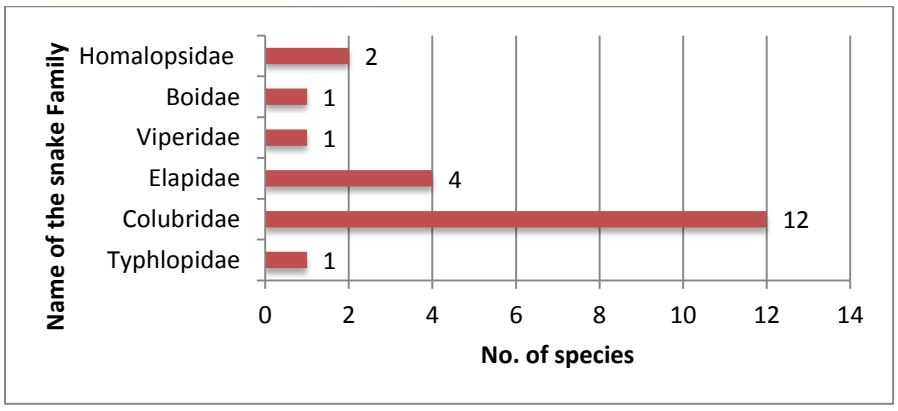


Fig. 11 Snake community in Mirsarai upazila.

	
Striped Keelback	Blind Snake
	
Spotted Litter Skink	Bronze Grass Skink
	
Tokey Gecko	House Gecko

Table 12 Status of Reptiles in Mirsarai upazila

Status code: VC- Very Common, C-Common, UC-Uncommon, R-Rare
Habitat code: HF= Hill forest, HS= Hill stream, MF= Mangrove forest, H= Homestead, R= Road-side, AL=Agricultural land, FW=Freshwater ponds, lakes and rivers.

English Name	Local Name	Scientific Name	Status	Habitats
Elongated Tortoise	Halud Pahari Kasim	*Indotestudo elongata*	R	HF
Spotted Flap Shell Turtle	Shundi Kasim	*Lissemys punctata*	R	HS, FW
Common House Gecko	Tiktiki	*Hemidactylus frenatus*	VC	H
Bowring's House Gecko	Tiktiki	*Hemidactylus bowringii*	C	H, HF
Brook's House Gecko	Tiktiki	*Hemidactylus brookii*	C	H
Flat-tailed Gecko	Chapta-leji Tittiki	*Hemidactylus platyurus*	UC	HF
Tokay Gecko	Tokkhak	*Gekko gecko*	C	H, HF
Khasi Hills Bent-Toed Gecko		*Cyrtodactylus ayeyarwadyensis*	R	HF, HS
Common Garden Lizard	Rokto-chusha	*Calotes versicolor*	VC	R, HF
Emma Gray's Forest Lizard	Rokto-chusha	*Calotes emma*	UC	HF
Green Fan-throated Lizard	Nil-gola Girgiti	*Ptyctolaemus gularis*	R	HF
Spotted Flying lizard	Uranta Tiktiki	*Draco maculatus*	R	HF
Bronze Grass Skink	Anjon	*Eutropis macularia*	VC	HF, R, H
Many-lined Grass Skink	Anjon	*Mabuya multifasciata*	R	HF, R, H
Spotted Litter Skink	Chiti-bon Anjoni	*Sphenomorphus maculatus*	C	HF
Khasi Hills Long-tailed Lizard	Anjon	*Takydromus khasiensis*	R	HF
Bowring's Supple Skink	Anjon	*Lygosoma bowringii*	R	HF
Bengal Monitor	Gui Shap	*Varanus bengalensis*	C	H, R, HF
Yellow Monitor	Sona Gui	*Varanus flavescens*	R	H, FW, AL
Common Blind Snake	Dumukha Shap	*Ramphotyphlops braminus*	UC	HF, H, R
Rock Python	Ajogar	*Python molurus*	R	HF
Common Vine Snake	Laodoga Shap	*Ahaetulla nasuta*	UC	HF
Tawny Cat Snake	Khoiri Phonimonosha	*Boiga ochracea*	R	HF
Striped Keelback	Dora Shap	*Amphiesma stolatum*	C	FW
Common Bronzeback Tree Snake	Badami Gechho Shap	*Dendrelaphis tristis*	R	HF
Indian Rat Snake	Daraj	*Coluber mucosus*	C	H, R, AL, HF
Indo-Chinese Rat Snake	Daraj	*Ptyas korros*	R	HF, MF
Common Trinket Snake	Dudhraj	*Coelognathus helenus*	UC	HF, AL, R

Common Smooth Water Snake	Paina Shap	*Enhydris enhydris*	VC	FW, HF, H, R, MF
White-barred Kukri Snake	--	*Oligodon albocinctus*	R	HF
Common Wolf Snake	Gharginni Shap	*Lycodon aulicus*	C	HF, H
Checkered Keelback	Dhora Shap	*Xenochrophis piscator*	VC	FW, HF, H, R, MF
Red-necked Keelback	Laldhora Shap	*Rhabdophis subminiatus*	UC	HF
Banded Krait	Shankhini Shap	*Bungarus fasciatus*	UC	HF, H
Spectacled Cobra	Khoia Gokhra Shap	*Naja naja*	UC	HF,HS, H, FW, AL,R
Monocled Cobra	Gokhra Shap	*Naja kaouthia*	UC	HF,HS, H, FW, AL,R
King Cobra	Raj Gokhra	*Ophiophagus hannah*	R	HF, MF
White-lipped Pit Viper	Viper Sobuj-bora	*Trimeresurus albolabris*	R	HF
Dog-faced Water Snake	Jal Bora Shap	*Cerberus rynchops*	C	MF
Glossy Marsh Snake	Paraboner Shap	*Gerada prevostiana*	C	MF

4.2.2.1 Habitat Preference of Reptiles

Most of the reptile species (32 species) are found in hill forests of Mirsarai upazila. Among these 32 species, 14 species of reptiles are only confined to the hill forests. Eleven species of reptiles are recorded form homestead. Mangrove forest patch supports 7 species of reptiles. Only four species of reptiles were recorded from the agricultural lands. Freshwater lakes, ponds and rivers support seven species of reptiles. Roadside habitats also support 10 species of reptiles (Fig. 12).

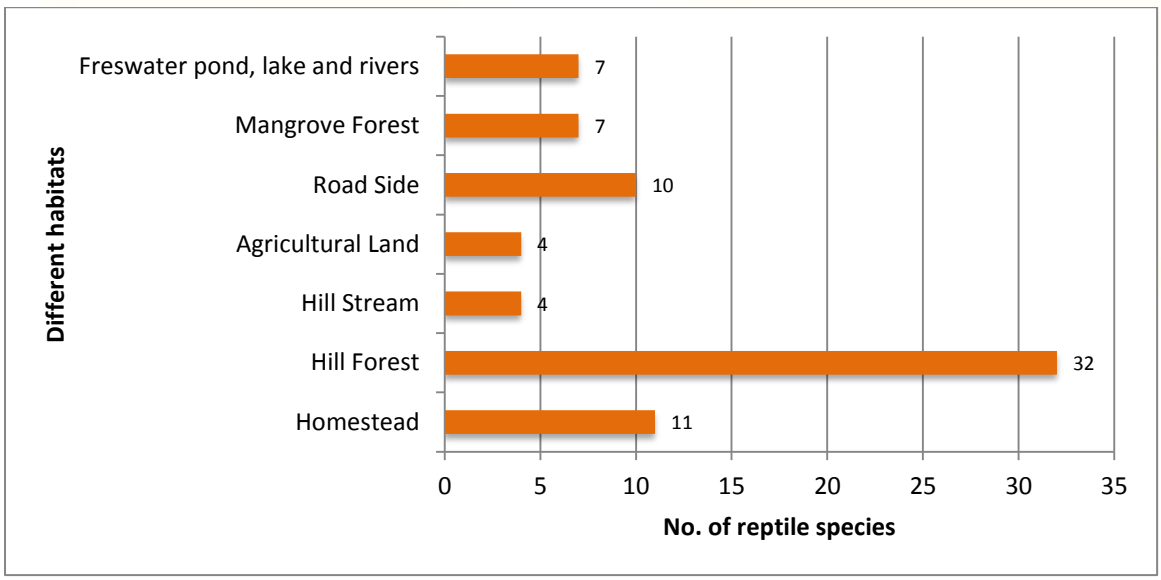


Fig. 12 Reptiles in different habitats of Mirsarai upazila.

	
Checkered Keelback	Indo-chinese Rat Snake
	
Common Wolf Snake	White-barred Kukri Snake
	
Red-necked Keelback	Common Garden Lizard

	
Bengle Monitor Lizard	Gular-pouched Gecko
	
Bent-toed Gecko	Forest Lizard

4.2.3 Birds

A total of 200 species of birds were recorded from Mirsarai upazila of which 165 species were resident and 35 species were migratory (Table 13 and 14). Among the resident birds 18% were rare, where 37% were uncommon, 37% were common and only 8% were very common (Fig. 13). Among the migratory birds 40% were rare and 20% were uncommon while 31% were common and only 9% were very common (Fig. 14).

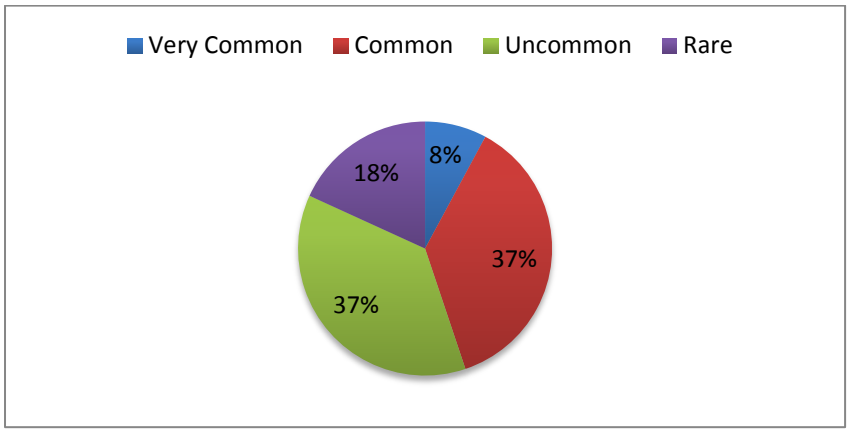


Fig. 13 Status of resident birds in Mirsarai upazila.

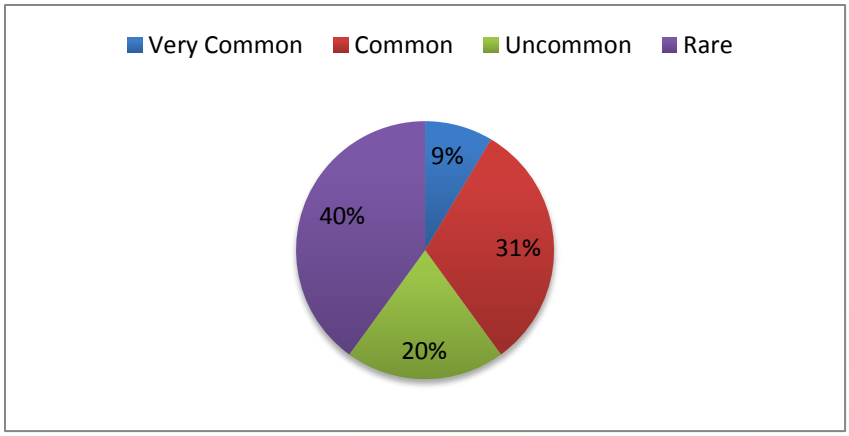
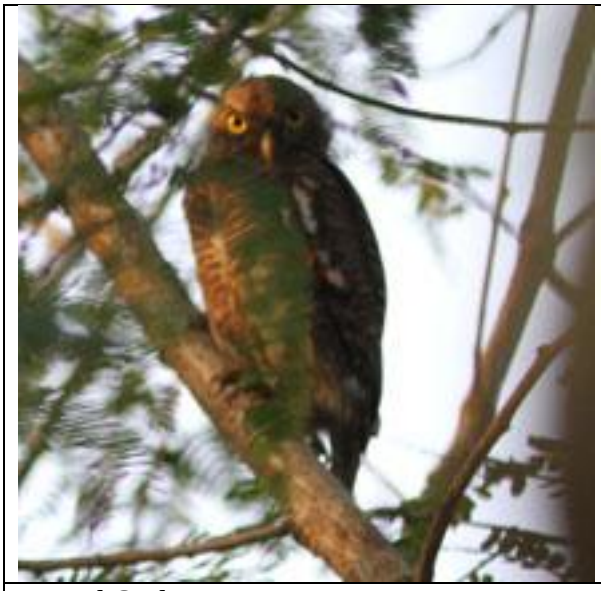


Fig. 14 Status of migratory birds in Mirsarai upazila.

	
Barred Owlet	Spotted Owlet

	
Black-headed Ibis	Pied Avocet

Table 13 Status of resident birds in Mirsarai upazila

Status code: VC- Very Common, C-Common, R-Rare
Habitat code: HF= Hill forest, HS= Hill stream, MF= Mangrove forest, Mud Flats, H= Homestead, R= Road-side, AL=Agricultural land, FW=Freshwater ponds, lakes and rivers.

English Name	Local Name	Scientific Name	Status	Habitats
Red Junglefowl	Bon Morog	*Gallus gallus*	C	HF
Kalij Pheasant	Mothura	*Lophura leucomelanos*	R	HF
Rufous Woodpecker	Lalchey Kaththokra	*Celeus brachyurus*	R	HF, MF, H
Greater Flameback	Boro Kaththokra	*Chrysocolaptes lucidus*	UC	HF, H
Grey-capped Pygmy Woodpecker	Dhushar Matha Baman Kaththokra	*Dendrocopos canicapillus*	UC	HF, MF
Fulvous-breasted Woodpecker	Pakra Kaththokra	*Dendrocopos macei*	C	HF, MF, H
Streak-Throated Woodpecker	Kaththokra	*Picus xanthopygaeus*	R	HF, MF, H
Black-rumped Flameback	Kaththokra	*Dinopium benghalense*	C	HF, MF, H
Greater Yellownape	Boro Holdekurali	*Picus flavinucha*	R	HF
Blue-throated Barbet	Basanta Bauri	*Megalaima asiatica*	C	HF, MF, H
Coppersmith Barbet	Chhoto Basanta Bauri	*Megalaima haemacephala*	C	HF, MF, H
Lineated Barbet	Beghbou	*Megalaima lineata*	C	HF, MF, H
Oriental Pied Hornbill	Pakhra Dhanesh	*Anthracoceros albirostris*	R	HF
Common Hoopoe	Hudhud	*Upupa epops*	C	HF, MF, H, AL, R
Red-headed Trogon	Lal Trogon	*Harpactes erythrocephalus*	R	HF
Indian Roller	Nilkantha	*Coracias benghalensis*	C	HF, AL, R
Dollar Bird	Pahari Nilkantha	*Eurystomus orientalis*	UC	HF
Common Kingfisher	Choto Machh-ranga	*Alcedo atthis*	C	MF, FW, AL

Stork-billed Kingfisher	Megh-hao	Halcyon capensis	UC	MF, FW
White-throated Kingfisher	Machh-ranga	*Halcyon smyrnensis*	C	MF, FW, AL
Pied Kingfisher	Pakra Machh-ranga	*Ceryle rudis*	UC	MF, FW
Chestnut-headed Bee-eater	Khoirematha Shuichora	*Merops leschenaulti*	C	HF
Green Bee-eater	Suichora	*Merops orientalis*	C	HF, H, AL, R
Plaintive Cuckoo	Chatak	*Cacomantis merulinus*	R	HF, H
Banded Bay Cuckoo	Dora Tamapapiya	*Cacomantis sonneratii*	R	HF
Lesser Coucal	Kukka	*Centropus bengalensis*	UC	HF, MF, H
Greater Coucal	Kanakua	*Centropus sinensis*	C	HF, MF, H
Pied Cuckoo	Papiya	*Clamator jacobinus*	UC	HF, H
Indian Cuckoo	Bau-kotha-kou	*Cuculus micropterus*	UC	HF, H, AL, MF
Chestnut-winged Cuckoo	Lalpakha kokil	*Clamator coromandus*	R	HF
Asian Koel	Kokil	*Eudynamys scolopacea*	C	HF, H
Common Hawk Cuckoo	Chokhgelo Pakhi	*Hierococcyx varius*	C	HF, H, AL
Large Hawk Cuckoo	Boro chokgelo	*Hierococcyx sparverioides*	R	HF
Green-billed Malkoha	Sabuj Kokil	*Phaenicophaeus tristis*	C	HF
Vernal Hanging Parrot	Lotkan	*Loriculus vernalis*	R	HF
Red-breasted Parakeet	Tuta	*Psittacula alexandri*	C	HF
Rose-ringed Parakeet	Tia	*Psittacula krameri*	UC	HF, H, AL
House Swift	Ababil	*Apus affinis*	C	H
Asian Palm Swift	Nakkati	*Cypsiurus balasiensis*	C	HF, H
Barn Owl	Laxmi Pencha	*Tyto alba*	UC	HF, H
Spotted Owlet	Khuruley Pencha	*Athene brama*	C	HF, H, MF
Asian Barred Owlet	Eshio Dagipencha	*Glaucidium cuculoides*	UC	HF
Brown Fish Owl	Bhutum Pencha	*Ketupa zeylonensis*	UC	HF, H, MF
Collared Scops Owl	Nimpokh	*Otus bakkamoena*	R	HF, H
Brown Boobok	Khoira shikrepecha	*Ninox scutulata*	R	HF
Large-tailed Nightjar	Lenja Ratchara	*Caprimulgus macrurus*	UC	HF, H
Emerald Dove	Sabuj Ghughu	*Chalcophaps indica*	UC	HF, H
Rock Pigeon	Jalali Kobutar	*Columba livia*	C	H
Spotted Dove	Tila Ghughu	*Streptopelia chinensis*	VC	H, AL
Eurasian Collared Dove	Raj Ghughu	*Streptopelia decaocto*	UC	H, AL
Red Collared Dove	Lal Ghughu	*Streptopelia tranquebarica*	C	H, AL
Orange-breasted	Horial	*Treron bicinctus*	R	HF

Green Pigeon				
Thick-billed Green Pigeon	Thotmota Horial	*Treron curvirostra*	R	HF
Yellow-footed Green Pigeon	Horial	*Treron phoenicoptera*	UC	HF
Pompadour Green Pigeon	Choto Horial	*Treron pompadora*	R	HF
White-breasted Waterhen	Dahuk	*Amaurornis phoenicurus*	C	HF, MF, H, FW
Greater Painted-snipe	Rongila Chaga	*Rostratula benghalensis*	UC	M, FW
Red-wattled Lapwing	Lal-lotika Hot-ti-ti	*Vanellus indicus*	C	FW, M, MF
Shikra	Toorkey Baj	*Accipiter badius*	UC	HF, MF
Besra	Bosra Shikrey	*Accipiter virgatus*	R	HF
Crested Goshawk	Jhutial Godashikrey	*Accipiter trivirgatus*	UC	HF
Black Baza	Kalo Baj	*Aviceda leuphotes*	UC	HF
Jerdon's Baza	Baro Baza	*Aviceda jerdoni*	R	HF
Black-shouldered Kite	Sada Chil	*Elanus caeruleus*	UC	HF, R, MF, AL
White-rumped Vulture	Shakun	*Gyps bengalensis*	R	HF, AL
Brahminy Kite	Shankho Cheel	*Haliastur 58ordi*	C	FW, M, MF
Black Kite	Bhubon Cheel	*Milvus migrans*	UC	FW, M, MF
Crested Serpent Eagle	Tila Baj	*Spilornis cheela*	C	HF, FW, M, MF
Changeable Hawk Eagle	Jhutial Shikrey Eegol	*Spizaetus cirrhatus*	R	HF
Grey-headed Fish Eagle	Metematha Kura-eagle	*Ichthyophaga ichthyaetus*	R	HF, MF
Little Cormorant	Paan-kowri	*Phalacrocorax niger*	C	FW
Grey Heron	Dhushor Bok	*Ardea cinerea*	UC	FW, M
Indian Pond Heron	Kani Bok	*Ardeola grayii*	VC	FW, M, MF, AL
Cattle Egret	Go-Bok	*Bubulcus ibis*	VC	AL, SW, M, MF
Little Heron	Sabuj Bok	*Butorides striata*	UC	AL, SW, M, MF
Great Egret	Jathua	*Casmerodius albus*	UC	AL, SW, M, MF

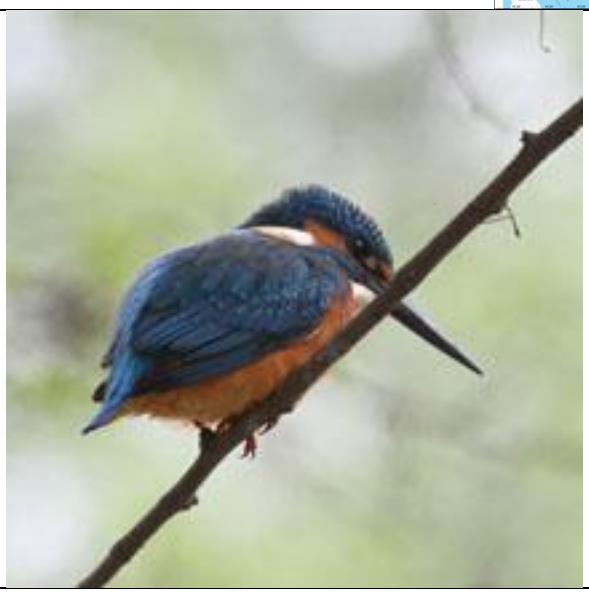
Little Egret	Chhoto Bok	*Egretta garzetta*	VC	AL, SW, M, MF
Cinnamon Bittern	Lal Bok	*Ixobrychus cinnamomeus*	UC	AL, SW, MF
Intermediate Egret	Maijhla Bok	*Mesophoyx intermedia*	C	AL, SW, M, MF
Black-crowned Night Heron	Waak	*Nycticorax nycticorax*	UC	SW, M, MF
Asian Openbill	Shamuk-bhanga	*Anastomus oscitans*	R	AL, SW, M, MF
Blue-naped Pitta	Nilpakhi	*Pitta nipalensis*	R	MF, HF
Golden-fronted Leaf Bird	Pata Bulbuli	*Chloropsis aurifrons*	C	HF
Long-tailed Shrike	Bagha Tiki	*Lanius schach*	VC	HF, AL, MF
Bar-winged Flycatcher-Shrike	DorapakhaChotolatora	*Hemipus picatus*	UC	HF
Common Green Magpie	Sabuj Harichacha	*Cissa chinensis*	UC	HF
Jungle Crow	Dar Kak	*Corvus macrorhynchos*	C	HF, H
House Crow	Panti Kak	*Corvus splendens*	C	H, R
Rufous Treepie	Harichacha	*Dendrocitta vagabunda*	C	HF, H, MF
Common Iora	Fatikjal	*Aegithina tiphia*	C	HF, H, R, MF
Eurasian Golden Oriole	Beney Bou	*Oriolus oriolus*	R	HF, H, MF
Black-hooded Oriole	Holdey Pakhi	*Oriolus xanthornus*	C	HF, H, R, MF
Bronzed Drongo	Choto Fingey	*Dicrurus aeneus*	C	HF, MF
Spangled Drongo	Keshraj	*Dicrurus hottentottus*	C	HF
Black Drongo	Fingey	*Dicrurus macrocercus*	VC	HF, H, R, MF
Greater Racket-tailed Drongo	Bhimraj	*Dicrurus paradiseus*	UC	HF
Lesser Racket-tailed Drongo	Choto Bhimraj	*Dicrurus remifer*	UC	HF
Ashy Wood swallow	Latora	*Artamus fuscus*	C	HF
Large Cuckooshrike	Gudhuka	*Coracina macei*	UC	HF
Black-headed Cuckooshrike	Kalomatha Kabashi	*Coracina melanoptera*	UC	HF
Small Minivet	Sat Saili	*Pericrocotus cinnamomeus*	C	HF, MF, H
Scarlet Minivet	Lal Satsaili	*Pericrocotus*	C	HF

		flammeus		
Rosy Minivet	-	*Pericrocotus roseus*	C	HF
Common Woodshrike	Choto Bonlatora	*Tephrodornis pondicerianus*	UC	HF, H
Large Woodshrike	Boro Bonlatora	*Tephrodornis gularis*	UC	HF
Black-naped Monarch	Kaloghar Rajon	*Hypothymis azurea*	UC	HF
White-throated Fantail	Lejnachani	*Rhipidura albicollis*	C	HF, H
Asian Paradise-flycatcher	Sada Sipahi	*Terpsiphone paradisi*	UC	HF, H
White-rumped Shama	Shama	*Copsychus malabaricus*	UC	HF
Oriental Magpie Robin	Doel	*Copsychus saularis*	VC	HF, H, AL, R
Grey-headed Canary Flycatcher	Footfuti	*Culicicapa ceylonensis*	C	HF
Pale-chinned Flycatcher	Shadagola Chotok	*Cyornis poliogenys*	UC	HF
Black-backed Forktail	Kalopith Cheralej	*Enicurus immaculatus*	R	HS
Orange-headed Thrush	Komla Dama	*Zoothera 60itrine*	C	HF, H
Jungle Myna	Jhuti Shalik	*Acridotheres fuscus*	VC	HF, MF, H, R, AL
Common Myna	Bhat Shalik	*Acridotheres tristis*	VC	HF, MF, H, R, AL
Hill Myna	Moyna	*Gracula religiosa*	C	HF
Asian Pied Starling	Gobrey Shalik	*Sturnus contra*	VC	HF, MF, H, R, AL
Chestnut-tailed Starling	Kath Shalik	*Sturnus malabaricus*	C	HF, MF, H, R, AL
Great Tit	Tit Pakhi	*Parus major*	C	HF, MF, H, R, AL
White-throated Bulbul	Shadagola Bulbuli	*Alophoixus flaveolus*	R	HF
Olive Bulbul	Jolpaironga Bulbuli	*Iole virescens*	R	HF
Black-headed Bulbul	Kalo Bulbuli	*Pycnonotus atriceps*	C	HF
Red-vented Bulbul	Bulbuli	*Pycnonotus cafer*	VC	HF, MF, H, R, AL
Red-whiskered Bulbul	Sipahi Bulbuli	*Pycnonotus*	C	HF

		jocosus		
Black-crested Bulbul	Kalojhuti Bulbuli	*Pycnonotus melanicterus*	C	HF
Ashy Bulbul	Kalchey Bulbuli	*Hemixos flavala*	R	HF
Zitting Cisticola	Bhomra Soton	*Cisticola juncidis*	UC	HF, MF, H, R, AL
Grey-breasted Prinia	Metebook Prinia	*Prinia hodgsonii*	UC	HF, MF, H, R, AL
Plain Prinia	Nirol Prinia	*Prinia inornata*	C	HF, MF, H, R, AL
Rufescent Prinia	Lalche Prinia	*Prinia rufescens*	C	HF, MF, H, R, AL
Oriental White-eye	Shet-ankhi	*Zosterops palpebrosus*	C	HF, MF, H, R, AL
Nepal Fulvetta	Nepali Fulveta	*Alcippe nipalensis*	UC	HF, MF, H, R, AL
Lesser Necklaced Laughingthrush	Choto Panga	*Garrulax monileger*	C	HF
Greater Necklaced Laughingthrush	Boro Panga	*Garrulax pectoralis*	UC	HF
Rufous-necked Laughingthrush	Lalghar Panga	*Garrulax ruficollis*	UC	HF, MF
Blue Whistling Trush	Neel sheeshdama	*Myophonus caeruleus*	UC	HS, HF
Scaly Thrush	Ashtey dama	*Zoothera dauma*	R	HF, MF
Abbott's Babbler	Aboter Satarey	*Malacocincla abbotti*	UC	HF
Puff-throated Babbler	Golafola Satarey	*Pellorneum ruficeps*	UC	HF
Jungle Babbler	Satbhaila	*Turdoides striatus*	C	HF, H
Grey Throated Babbler	Meteygola satarey	*Stachyris nigriceps*	UC	HF
Rufous-fronted Babbler	Lalkopal Satarey	*Stachyris rufifrons*	UC	HF
Striated Babbler	Dora Satbhaila	*Turdoides earlei*	UC	HF
Bengal Bushlark	Bharat Pakhi	*Mirafra assamica*	C	HF, H, AL
Pied Bushchat	Pakra Jharfidda	*Saxicoa caprata*	UC	HF
White-tailed Stonechat	Sadalej Shilafidda	*Saxicola leucurus*	UC	HF
Common Tailorbird	Tuntuni	*Orthotomus sutorius*	VC	HF, H, AL, R
Little Spiderhunter	Choto Makormar	*Arachnothera longirostra*	UC	HF
Streaked Spiderhunter	Dora Makormar	*Arachnothera*	UC	HF

		magna		
Crimson Sunbird	Shidurey Moutushi	*Aethopyga siparaja*	C	HF, H, MF
Ruby-cheeked Sunbird	Chunimukhi Moutushi	*Anthreptes singalensis*	C	HF
Purple Sunbird	Niltuni	*Cinnyris asiaticus*	C	HF, H
Purple-throated Sunbird	Begunigola Moutushi	*Leptocoma sperata*	C	HF
Purple-rumped Sunbird	Moutushi	*Leptocoma zeylonica*	UC	HF, H
Thick-billed Flowerpecker	Thotmota Fuljhuri	*Dicaeum agile*	UC	HF, H, MF
Pale-billed Flowerpecker	Fuljhuri	*Dicaeum erythrorhynchos*	UC	HF, MF, H
Scarlet-backed Flowerpecker	Lalpith Fuljhuri	*Dicaeum cruentatum*	UC	HF, MF
Indian Silverbill	Chandithot Munia	*Lonchura malabarica*	UC	HF, H, AL
Black-headed Munia	Kalomatha Munia	*Lonchura malacca*	R	HF, H
Scaly-breasted Munia	Tila Munia	*Lonchura punctulata*	C	HF, H, AL
White-rumped Munia	Shadakomor Munia	*Lonchura striata*	UC	HF
House Sparrow	Charui	*Passer domesticus*	VC	H, AL, R
Baya Weaver	Babui	*Ploceus philippinus*	C	AL, R,
Black-headed Ibis	Kalamatha Kasteychora	*Threskiornis melanocephalus*	UC	FW, M

Stork-billed Kingfisher



Common Kingfisher

4.2.3.1 Habitat Preference of resident birds

The highest number of resident bird species was recorded from the hill forest (139 species) followed by 65 species from homestead and 63 species from the mangrove forest patch. Agricultural land supports 41 species of resident birds. Freshwater lakes, ponds, rivers and canals support 13 species of birds; mostly waders. Twenty four species of birds were recorded from the roadside habitats (Fig. 15).

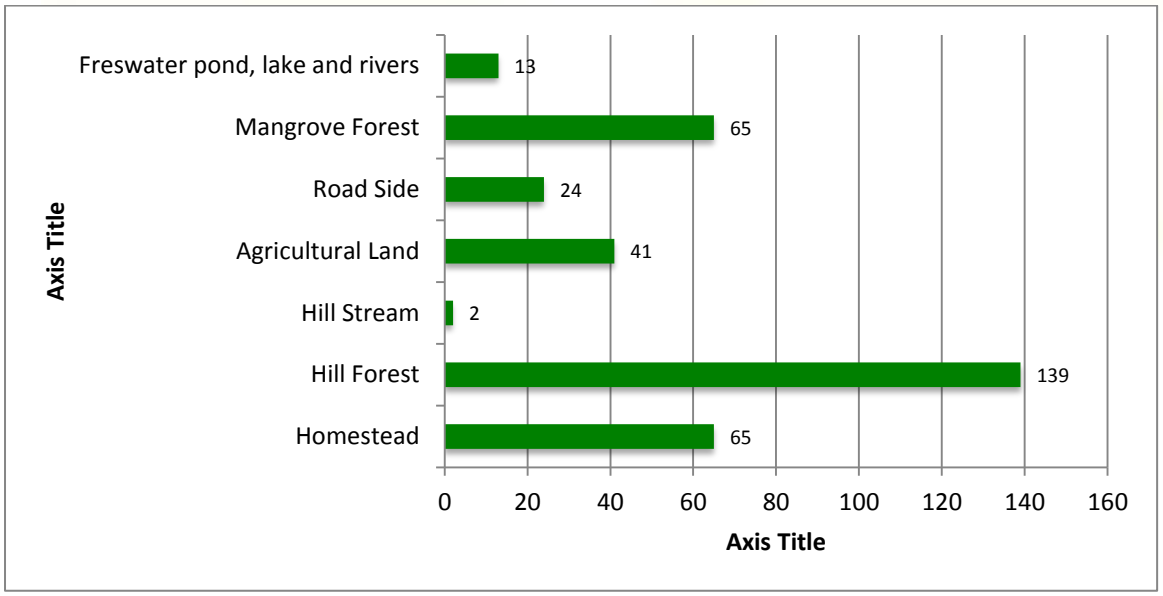


Fig. 15 Resident birds in different habitats of Mirsarai upazila.

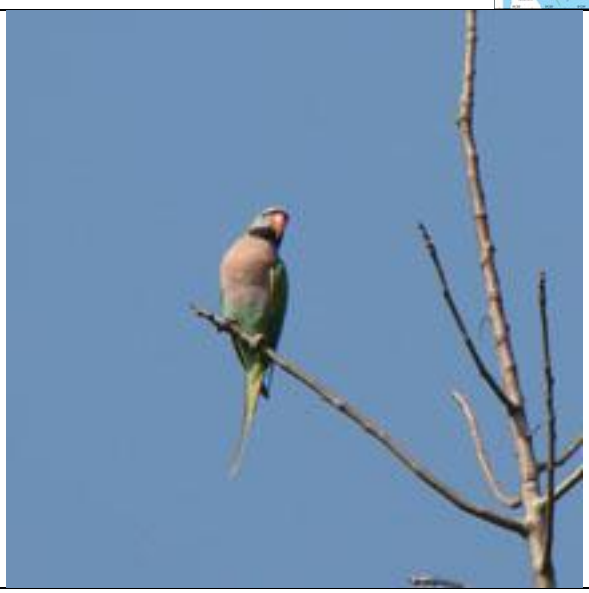
	
Green Bee Eater	Red-Breasted parakeet

Table 14 Status of migratory birds in Mirsarai upazila

Status code: VC- Very Common, C-Common, R-Rare
Habitat code: HF= Hill forest, HS= Hill stream, MF= Mangrove forest, Mud Flats, H= Homestead, R= Road-side, AL=Agricultural land, FW=Freshwater ponds, lakes and rivers.

English Name	Local Name	Scientific Name	Status	Habitats
Eurasian Wryneck	Metho Kaththokra	*Jynx torquilla*	R	MF, H, MF
Chestnut-winged Cuckoo	Lalpakha Kokil	*Clamator coromandus*	R	MF, H
Large Hawk Cuckoo	Boro Chokgelo	*Hierococcyx sparverioides*	R	MF, H, MF
Oriental Turtle Dove	Ghughu	*Streptopelia orientalis*	UC	MF, H, MF, AL, R
Common Sandpiper	Pati Batan	*Actitis hypoleucos*	C	M
Common Snipe	Kada-khucha/Chaga	*Gallinago gallinago*	C	M
Pintail Snipe	Kada-khucha/Chaga	*Gallinago stenura*	UC	M
Wood Sandpiper	Bon Batan	*Tringa glareola*	UC	M
Green Sandpiper	Shobuj Batan	*Tringa ochropus*	C	M
Marsh Sandpiper	Jalar Cha-pakhi	*Tringa stagnatilis*	UC	M
Little Ringed Plover	Choto Nothjiria	*Charadrius dubius*	C	M
Steppe Eagle	Nepali Eegol	*Aquila nipalensis*	R	MF
Common Kestrel	Kestrel	*Falco tinnunculus*	R	MF

Black-naped Oriole	Kajolchokh Benebou	*Oriolus chinensis*	R	HF, H, MF
Pied Harrier	Pakra Kapashi	*Circus melanoleucos*	R	HF, MF
Ashy Drongo	Kalche Fingey	*Dicrurus leucophaeus*	UC	MF, H
Verditer Flycatcher	Nil Katkatia	*Eumyias thalassina*	UC	HF, MF, H
Red-throated Flycatcher	Lalbook Chotok	*Ficedula albicilla*	C	HF, MF, H
Blue-throated Flycatcher	Neelgola Chotok	*Cyornis rubeculoides*	R	HF, MF
Asian Brown Flycatcher	Badami Chotok	*Muscicapa dauurica*	C	HF, MF
Common Stonechat	Pati Shilafidda	*Saxicola torquatus*	C	HF, MF
Barn Swallow	Ababil	*Hirundo rustica*	UC	HF, MF
Brown Shrike	Badami Koshai Pakhi	*Lanius cristatus*	VC	HF, MF, H, R, AL
Grey-backed Shrike	Metepith Latora	*Lanius tephronotus*	VC	HF, MF, H, R, AL
Dusky Warbler	Kalchey Fotok	*Phylloscopus fuscatus*	C	HF, MF, H, R, AL
Greenish Warbler	Shobje Fotok	*Phylloscopus trochiloides*	R	HF, MF
Golden-spectacled Warbler	Shobujchandi Fotok	*Seicercus burkii*	R	HF
Olive-backed Pipit	Jolpaipith Tulika	*Anthus hodgsoni*	C	HF, MF, H, R, AL
Paddyfield Pipit	Dhani Tulika	*Anthus rufulus*	C	HF, MF, H, R, AL
Forest Wagtail	Ban Khonjan	*Dendronanthus indicus*	R	HF, MF, H, R, AL, M
White Wagtail	Khanjana	*Motacilla alba*	R	HF, MF, H, R, AL, M
Citrine Wagtail	Holdeymatha Khonjan	*Motacilla citreola*	R	HF, MF, H, R, AL, M
White-browed Wagtail	Pakra khonjan	*Motacilla maderaspatensis*	VC	HF, MF, H, R, AL, M
Grey-headed Lapwing	Metematha Titi	*Vanellus cinereus*	R	HF, MF, H, R, AL, M

Tidal Mudflats are important habitats for migratory birds.

4.2.3.2 Habitat Preference of migratory birds

The highest number of migratory bird species was recorded from the mangrove forest patch (26 species) followed by 20 species from the hill forest. Homestead supports 18 species of migratory birds. Roadside habitats and agricultural lands also support 11 migratory birds species each (Fig. 16).

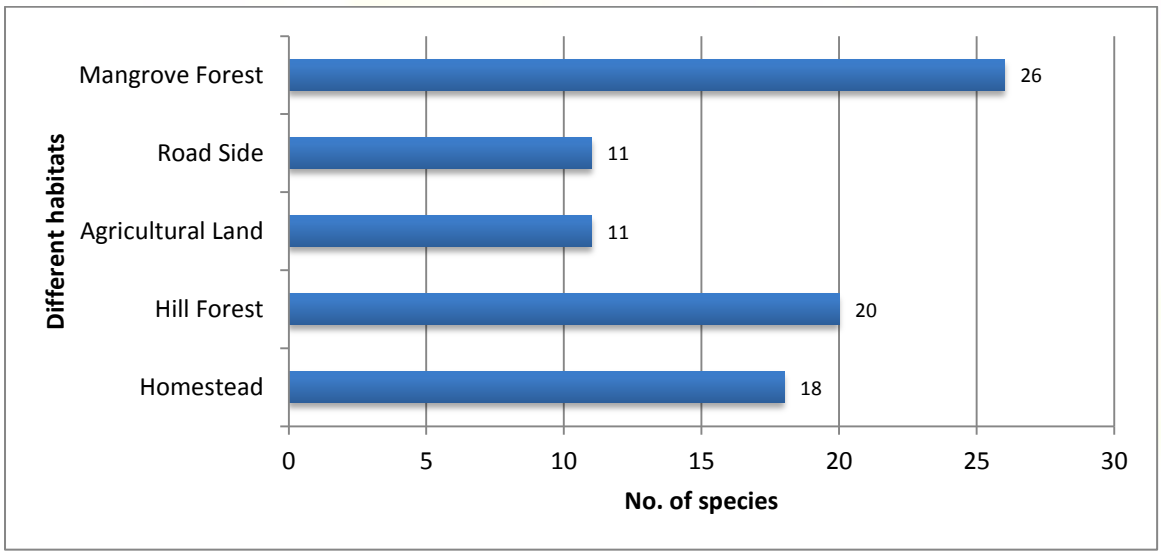


Fig. 16 Migratory birds in different habitats of Mirsarai upazila.

	
Red Jungle Fowl	Creasted Serpent Eagle
	
Grey Heron	Greater Eagret

4.2.4 Mammals

A total of 36 species of mammals were recorded from Mirsarai upazila (Table 15). Among these mammals, about 31% were rare, 19% uncommon, 36% common and remaining 14% were very common (Fig. 17).

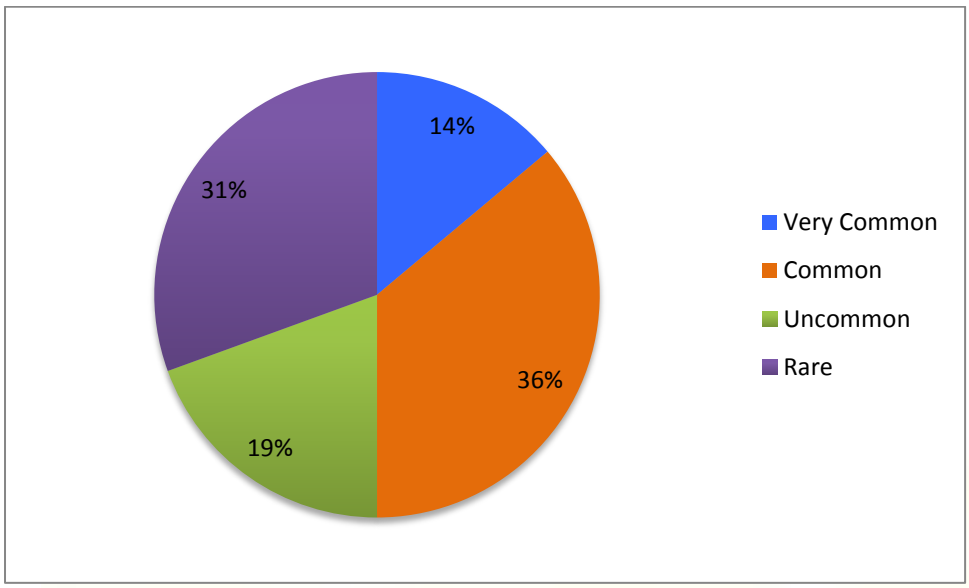


Fig. 17 Status of mammals in Mirsarai upazila.

	
Small Indian Mongoose	Golden Jackel

	
Short-nosed Fruit Bat	Common Pipistrelle

Table 15 Status of mammals in Mirsarai upazila

Status code: VC- Very Common, C-Common, R-Rare
Habitat code: HF= Hill forest, HS= Hill stream, MF= Mangrove forest, H= Homestead, R= Road-side, AL=Agricultural land, FW=Freshwater ponds, lakes and rivers.

English Name	Local Name	Scientific Name	Status	Habitats
House Shrew	Chika	*Suncus murinus*	C	H, R, AL
Short-nosed Fruit Bat	Bocha Kola Badur	*Cynopterus sphinx*	C	H, HF
Indian Flying Fox	Badur	*Pteropus giganteus*	C	H, HF
Greater False Vampire	Daini Badur	*Megaderma lyra*	UC	HF, H, HS
Indian Pipistrelle	Khudey Chamchika	*Pipistrellus coromandra*	C	H, HF, HS
Greater Asiatic Yellow Bat	Boro Rongila Chamchika	*Scotophilus heathii*	UC	HF, H
Assamese Macaque	Ashami Banor	*Macaca assamensis*	UC	HF
Phayre's Langur	Chosmapora Hanuman	*Trachypithecus phayrei*	R	HF
Capped Langur	Mukhpora Hanuman	*Trachypithecus pileatus*	R	HF
Golden Jackal	Pati Shial	*Canis aureus*	VC	H, HF, MF, AL, R
Asiatic Wild Dog	Ram Kutta	*Cuon alpinus*	R	HF
Jungle Cat	Ban Biral	*Felis chaus*	C	H, HF, MF, AL, R
Leopard Cat	Chita Biral	*Felis bengalensis*	UC	HF
Fishing Cat	Mechho Bagh	*Felis viverrina*	VC	HF. HS, MF, FW
Crab-eating Mongoose	Goaf-wala Benji	*Herpestes urva*	R	HF
Small Indian Mongoose	Benji	*Herpestes auropunctatus*	C	H, AL, R

Smooth-coated Otter	Bhodor	*Lutra perspicillata*	R	HF, HS, FW
Binturong	Gach Bhalluk	*Arctictis binturong*	R	HF
Hog Badger	Gor-khodok	*Arctonyx collaris*	UC	HF, H
Common Palm Civet	Gandho Gokul	*Paradoxurus hermaphroditus*	C	HF, H
Large Indian Civet	Bagdash	*Viverra zibetha*	C	HF, H
Small Indian Civet	Gandho Gokul	*Viverricula indica*	UC	HF, H
Wild Boar	Buno Shukar	*Sus scrofa*	R	HF
Barking Deer	Maya Harin	*Muntiacus muntjak*	R	HF
Spotted Deer	Chitra Harin	*Axix axis*	C	MF
Mainland Serow	Bon chagal	*Capricornis rubidus*	R	HF
Hoary-bellied Himalayan Squirrel	Badami Kathbirali	*Callosciurus pygerythrus*	VC	HF, H
Pallas's Squirrel	Lalche-buk Kathbirali	*Callosciurus erythraeus*	UC	HF
Lesser Bandicoot Rat	Indur	*Bandicota bengalensis*	VC	HF, AL, R, H
Large Bandicoot Rat	Dhari Indur	*Bandicota indica*	C	HF, H, AL, FW, MF
House Mouse	Nengti Indur	*Mus musculus*	C	H
Little Indian Field Mouse	Metho Indur	*Mus booduga*	C	AL
Common House Rat	Indur	*Rattus rattus*	VC	H, AL
Asiatic Long-tailed Climbing Mouse	Gecho Indur	*Vandeleuria oleracea*	C	HF, H
Indian Crested Porcupine	Shojaru	*Hystrix indica*	R	HF
Rufous-tailed Hare	Khargosh	*Lepus nigricollis*	R	HF

The diverse habitats of Mirsarai upazila supports at least 11 species of nationally and globally threatened mammals. Mainland Serow (*Capricornis rubidus*) is Globally Vulnerable species Endangered in Bangladesh is still found in Baraiyadhala National Park of Mirsarai upazila. Another Globally Endangered mammal Wild Dog (*Cuon alpinus*) is also Endangered in Bangladesh is also found here. Smooth-coated otter (*Lutra perspicillata*) is a nationally critically endangered species found in the hill streams of Baraiyadhala National Park. Barking Deer (*Muntiacus muntjak*) and Fishing cat (*Felis viverrina*) also found in the forest areas of Mirsarai upazila.

Assamese macaque

4.2.4.1 Habitat Preference of mammals

The highest number of mammals has been recorded from hill forest (28 species) of Mirsarai. Among these hill forest mammals, 12 species are confined to forests and not found in any other habitats. Homestead supports 16n species of mammals. Roadside habitats and agricultural land support 5 species of mammals each. A total of 4 species of mammals were recorded from the mangrove forest patch. Four species of mammals also found in hill streams (Fig. 18).

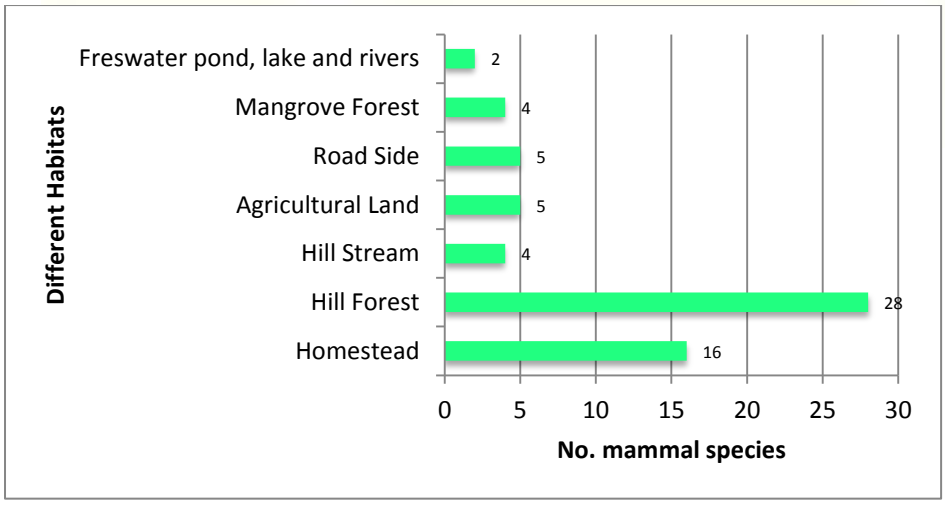


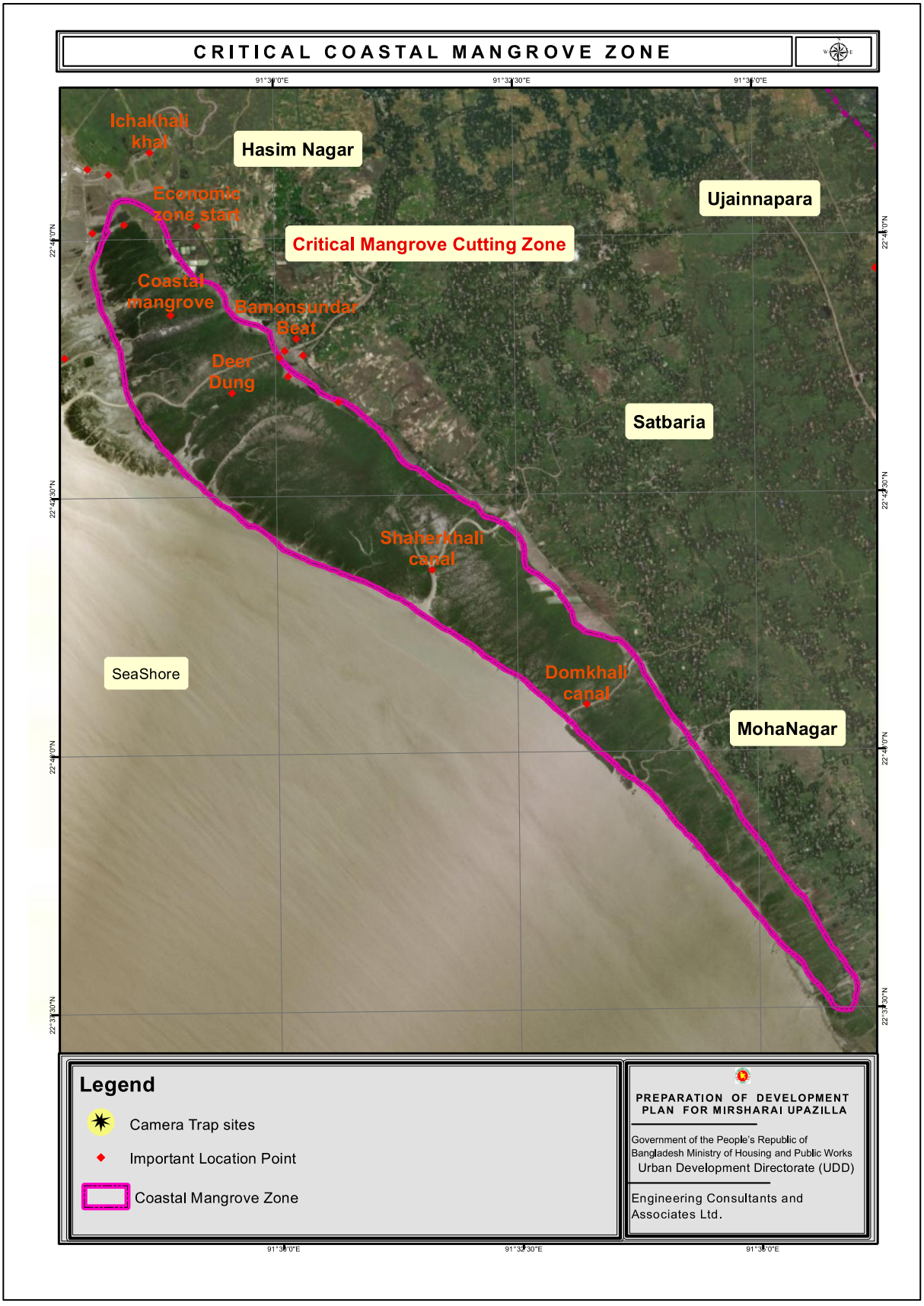
Fig. 18 Mammals in different habitats of Mirsarai upazila.

4.3 Critical Habitats

Three habitats have been categorized as critical habitats for wild animals in this area. The critical habitats are (i) coastal mangrove, (ii) coastal mudflats and (iii) hill forest of Baraiyadhala National Park.

4.3.1 Coastal mangrove

The major plants of coastal mangrove are Gewa, Keora, Goran, Bain and Hargoja. Some patches of Golpata also found. This mangrove is the habitat for around 5000 Spotted deer (Map 6). Due to the developmental activities, habitat of the spotted deer has already been squired (Map 7). Deer moved from the north-western part of the forest to the south-eastern part. No fresh track and deer pellet were found between Ischakhali canal and Bamansundar canal. Movement of the deer was recorded only in the eastern part of the Bamansundar canal. If the developmental process continues in coastal mangroves, deer will be forced to come out from the mangroves and poaching rate will be increased.



Map 6. Critical habitats for Spotted Deer in coastal mangrove.

Old pellet of spotted deer in west side of Bamansundar canal

If the BEPZA cut down all the mangrove patches, spotted deer will loss their habitat and will be wiped out from this region. A special program is needed to conserve the deer.

Map 7. Degreded habitat of spotted deer in coastal mangrove.

Fresh pellet of spotted deer in the east side of Bamansundar canal.

Captured fawn of spotted deer at the village near the coastal mangrove.

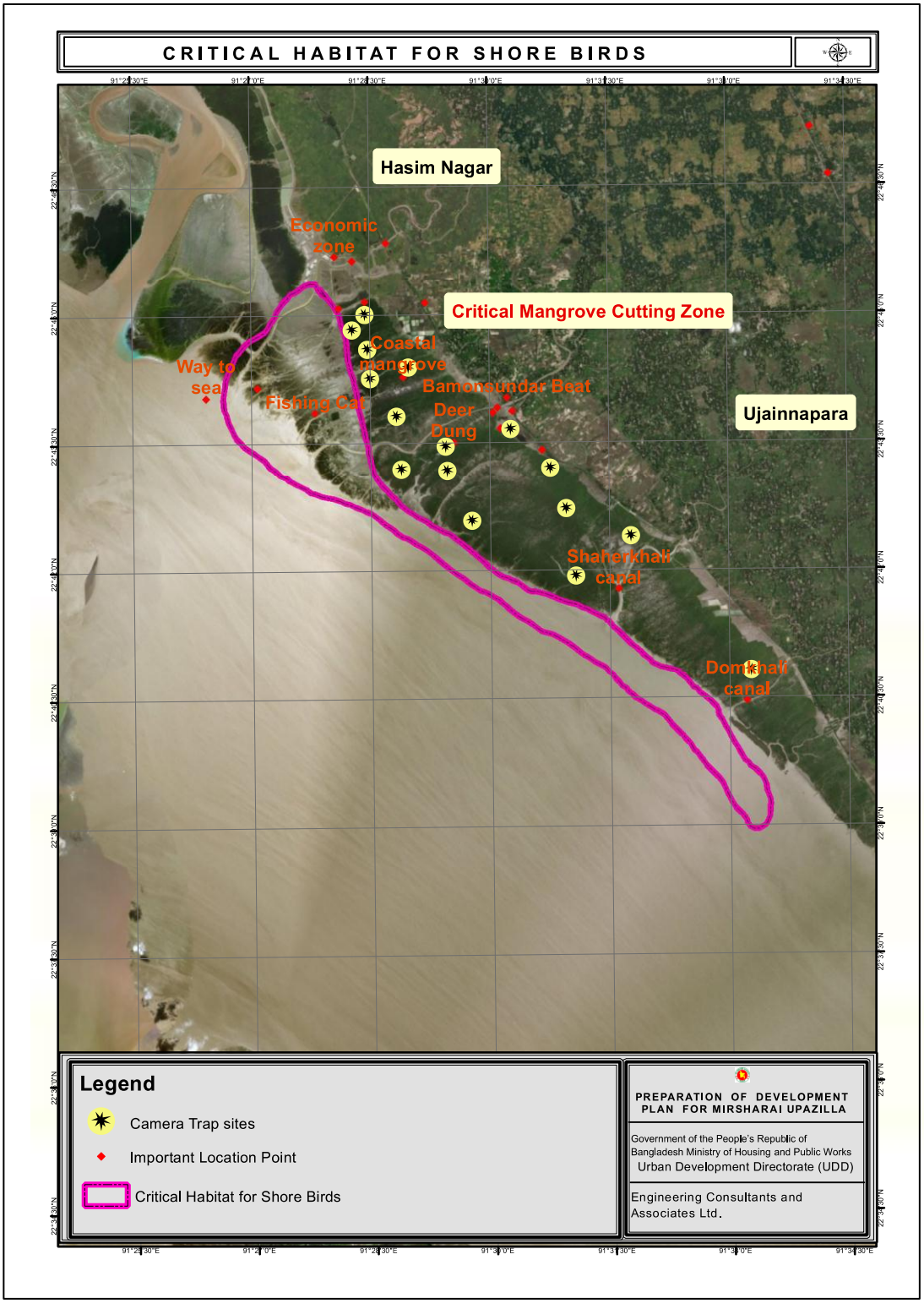
Construction of road in coastal mangroves.

Freshwater ditch within the coastal mangrove, which has been serving the purpose of drinking water for spotted deer and other mammals.

Coastal trees are market to cut down for developmental activities.

4.3.2 Coastal Mudflats

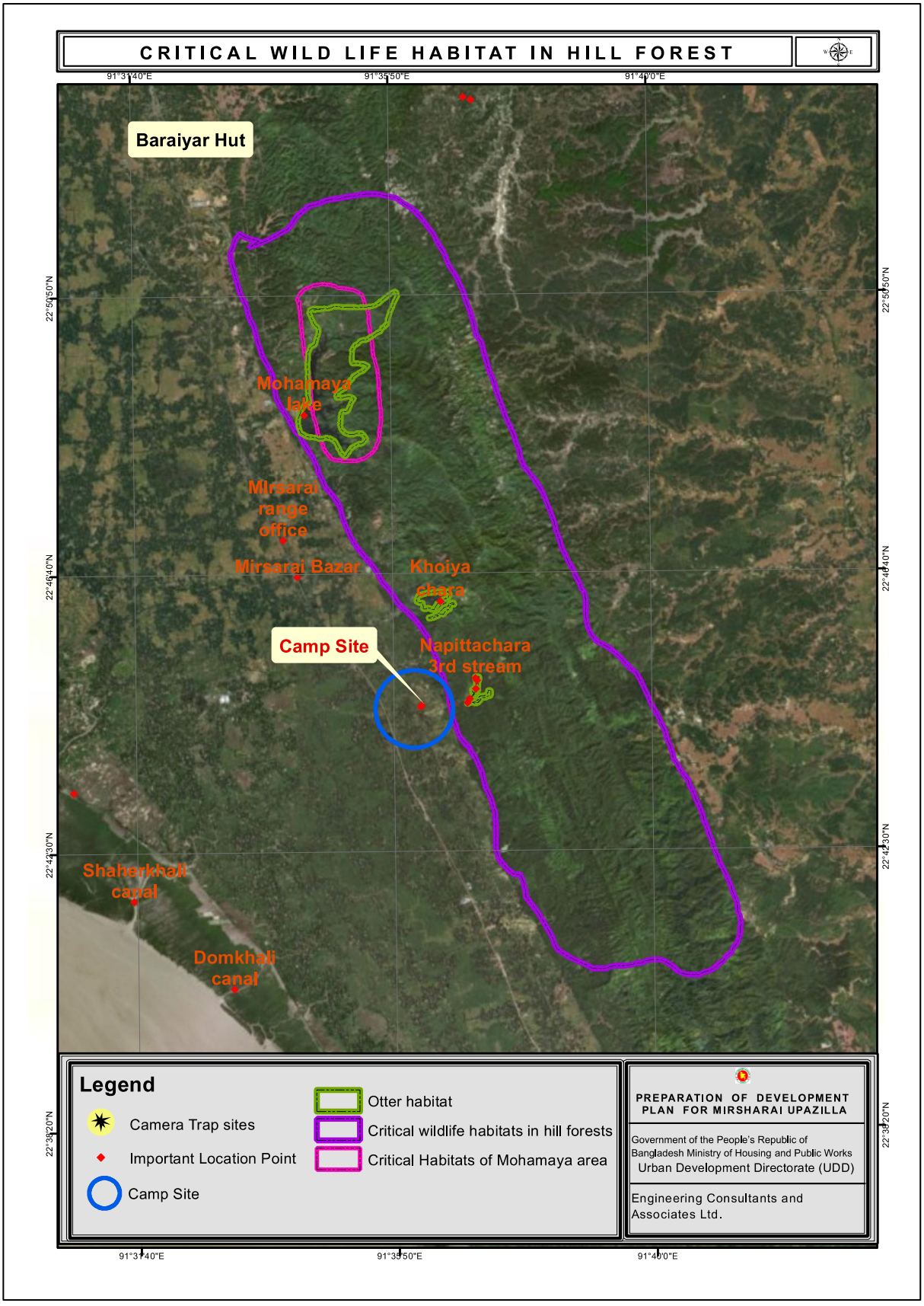
A huge coastal mudflat is located at the southwestern part of the coastal mangrove. The area of the mudflat is about 1804 hectares (Map 8). Most of the part of the mudflat inundates during high tide but emerges at low tide. This mudflat is very rich in crustaceans, worms and small fishes, which attract shore birds. During winter months a large number of migratory shore birds visit this mudflats. At the same time the resident shore birds of the country also visit the mudflat for their feeding ground.



Map 8. Critical habitat for shore birds located at the southwestern part of the mangrove.

4.3.3 Hill Forests

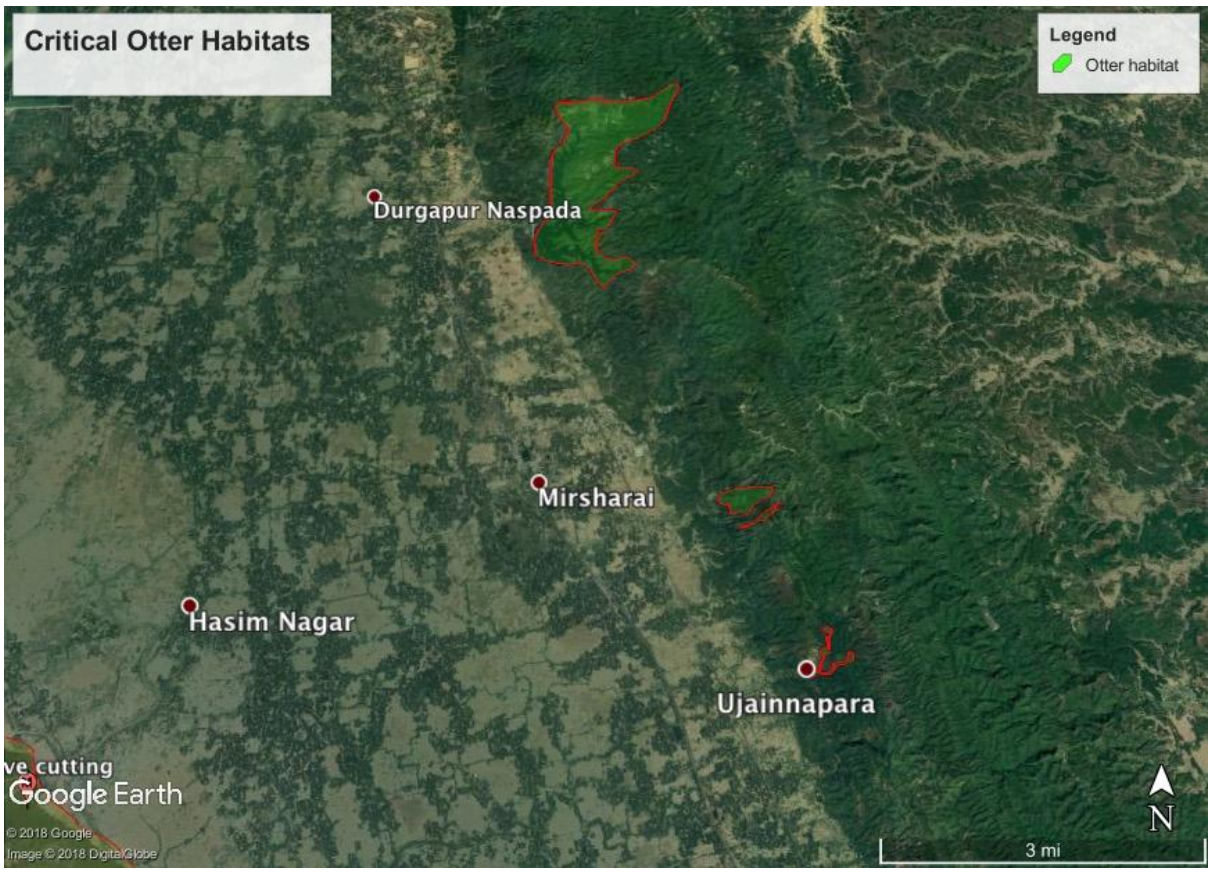
Hill forests in Baraiyadhala National is very diverse. The waterfalls in this forest are the lifeline for many rare wild animals. Some of the notable animals are Mainland Serow, Barking Deer, Black Bear, Phayre's langur, many rare species of birds, amphibians and reptiles. The streams of this forest also serve as breeding ground for many threatened amphibians (Map 9).



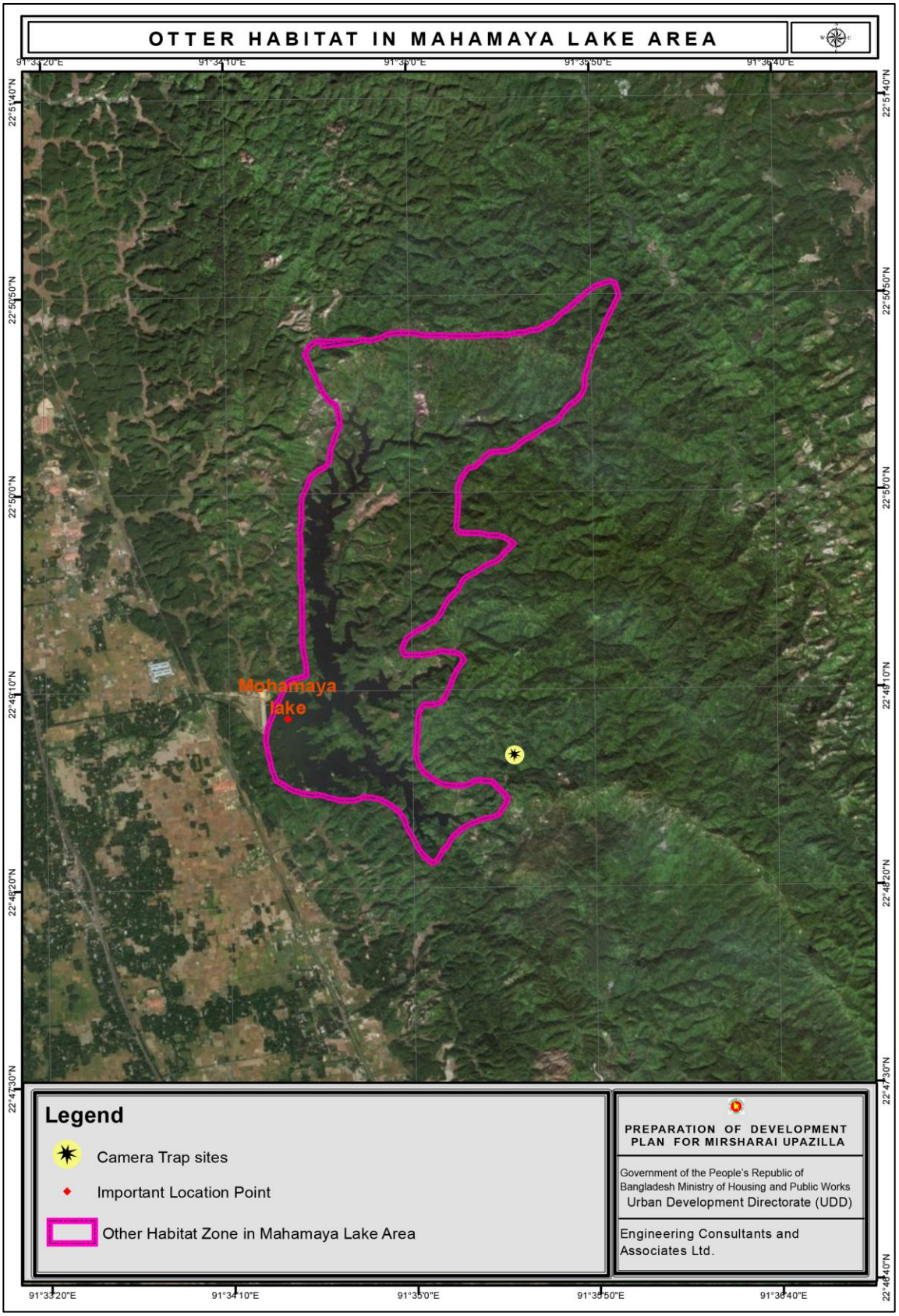
Map 9. Ecologically critical hill forests in Baraiyadhala National Park.

4.3.3.1 Critical Otter Habitats

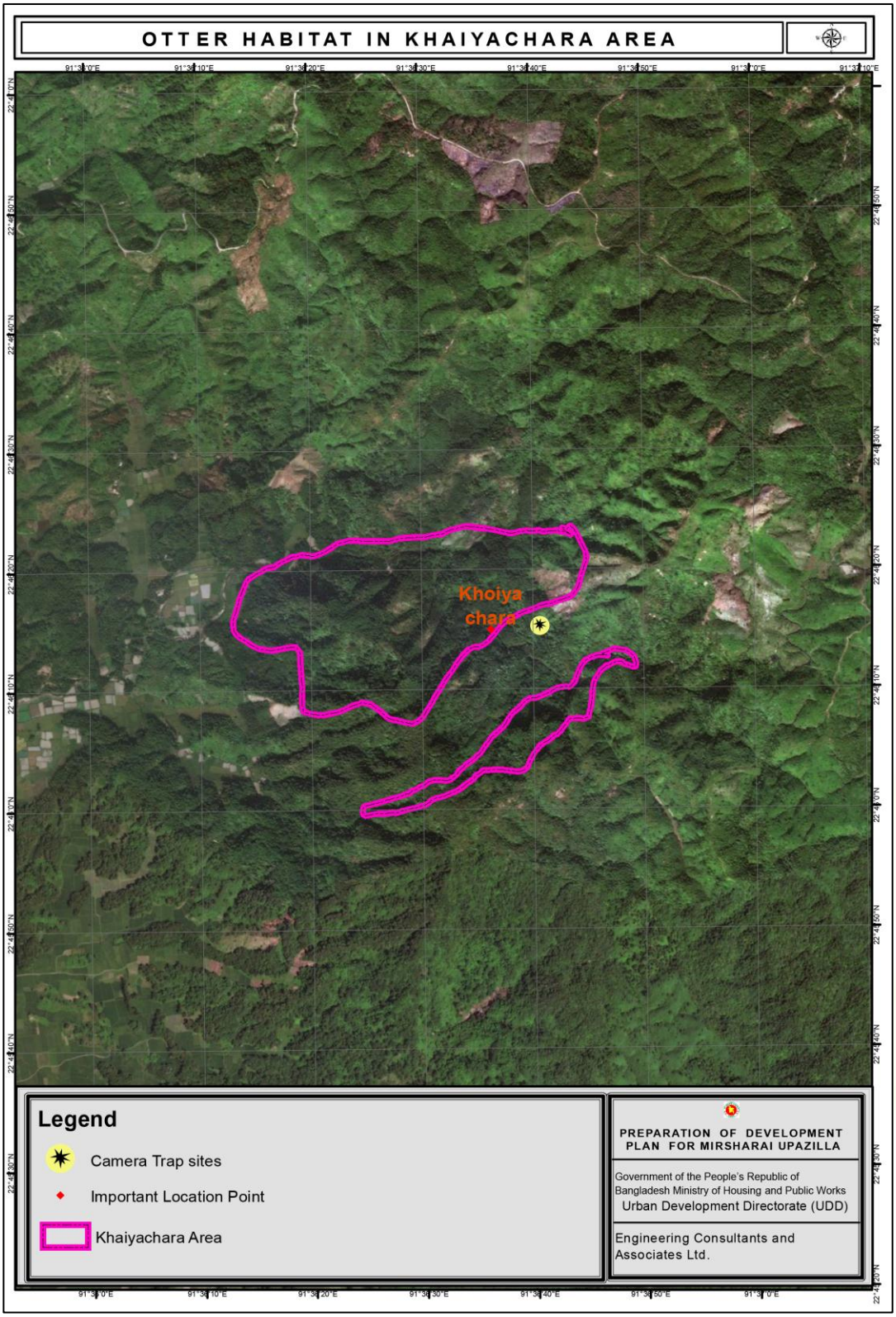
The smooth-coated otter (*Lutrogale perspicillata*) is the only extant representative of the genus *Lutrogale*. It is found in most of the Indian subcontinent and eastwards to Southeast Asia. It is nationally Critically Endangered and globally Vulnerable species. In Bangladesh it was common in wetlands throughout the country. Now a day it is confined to some selected areas of the country. The hill forest of Baraiyadhala National park area of Mirsarai upazila has many hill streams and good quality water bodies in the forest. This comparatively undisturbed water bodies in the forest support a good number of Smooth-coated otter. During the field survey some of the spots in the hill forests have been identified as habitats for otters (Map 10, 11, 12 and 13).



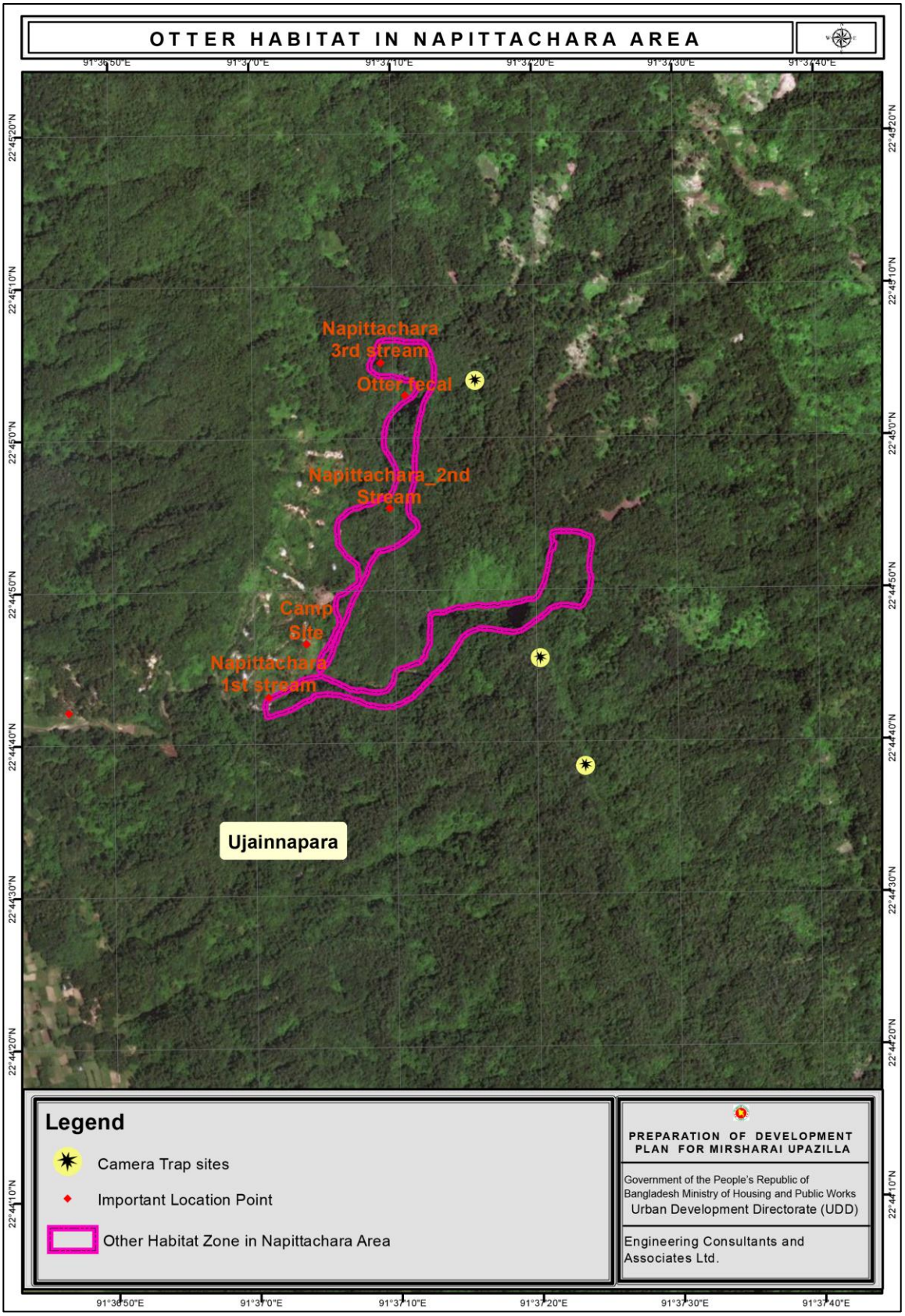
Map 10. Otter habitats in hill forest of Baraiyadhala national Park.



Map 11. Otter habitat in Mohamaya lake area.



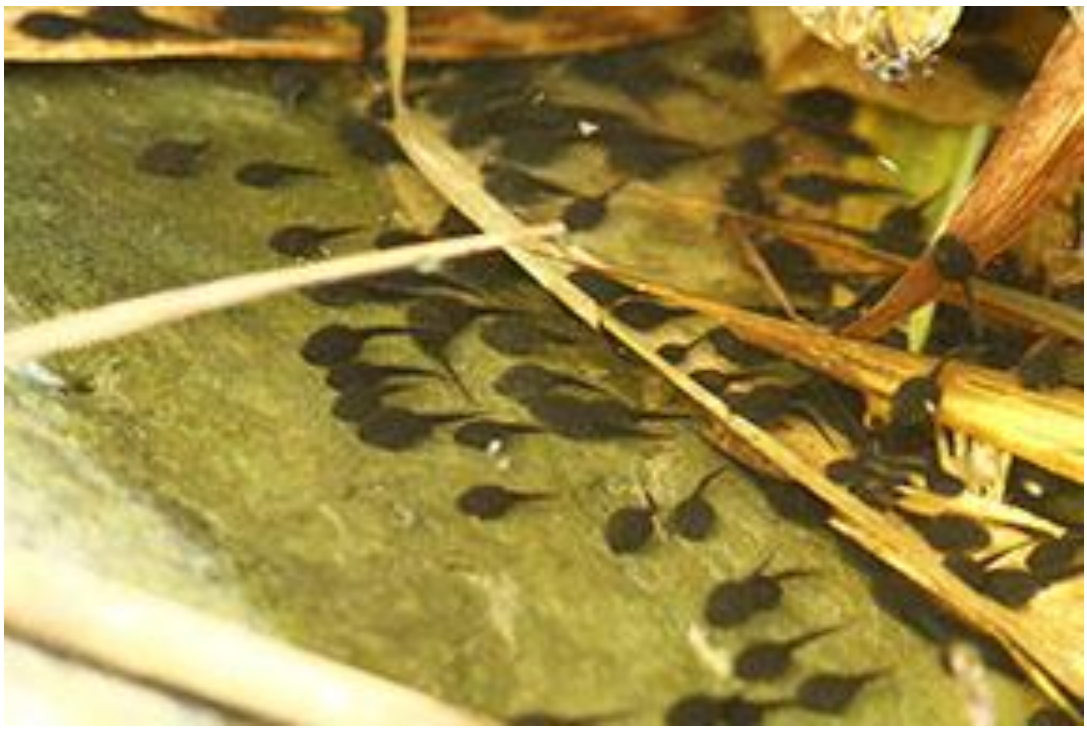
Map 12. Otter habitats in Khoiyachara area.



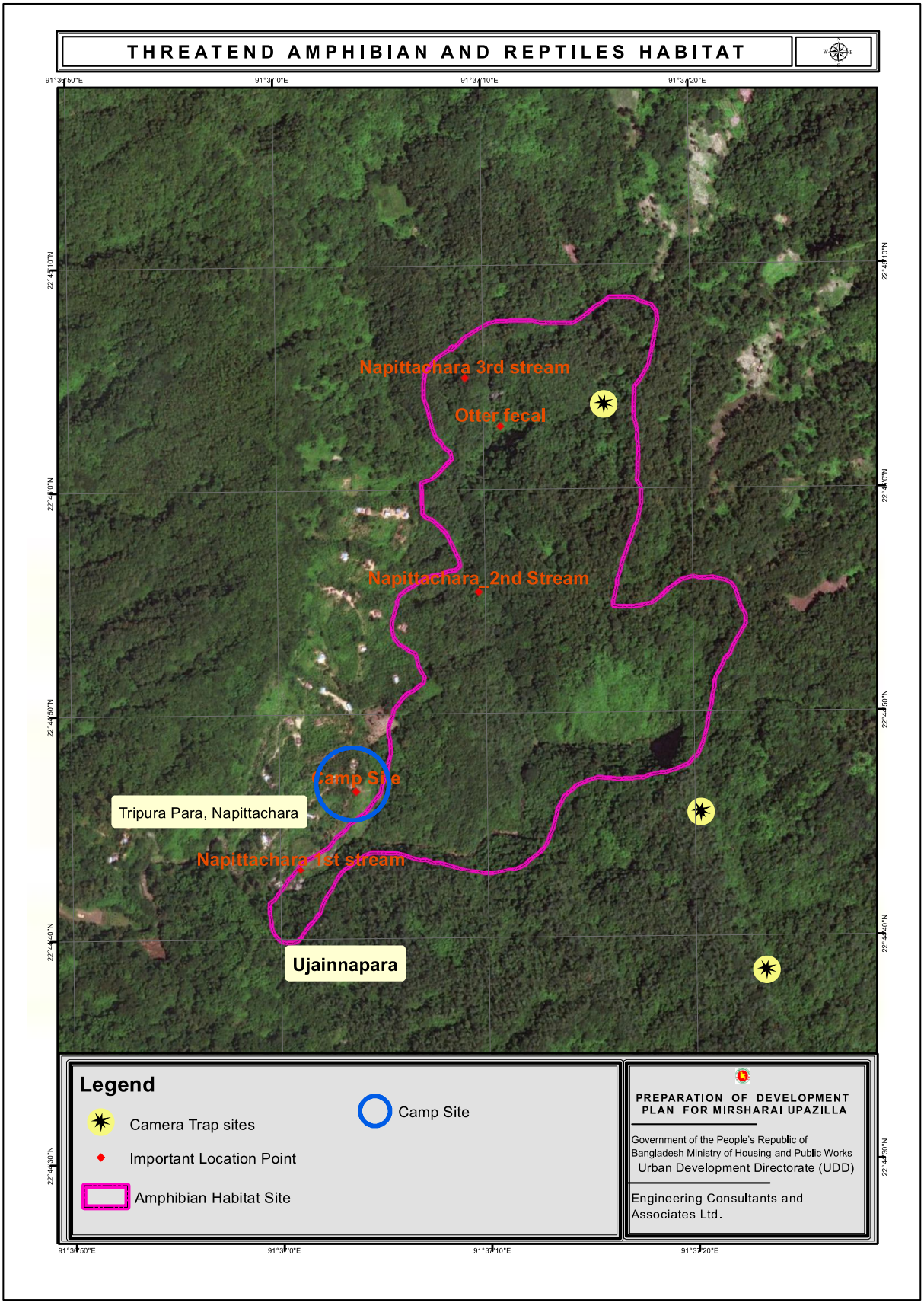
Map 13. Otter habitats in Napittachara area.

4.3.3.2 Critical Amphibians and Reptiles Habitat

Hill forest of Mirsarai upazila supports about 60% of the total amphibian and 30% of reptile species of the country. The diverse habitats of this area provide feeding and breeding ground for the amphibian and reptile community of this area. The steep hill streams of this area ensure quality habitat for cascade frog and snakes. A new frog species for the country, Green Casade Frog (*Odorrana livida*) was recorded for the first time from here. The pockets of this hill streams provide breeding pools for many species of amphibians. Some of the amphibian species create foam nest on the hanging bushes on the water pool. Cascade frogs are nocturnal and they hide inside the clefts of steep hill streams. The streams are habitats for turtles (Map 14).



Tadpoles in the pocket of hill streams at Baraiyadhala national park.



Map 14. Critical amphibians and reptiles habitat in the hill forests of Mirsarai upazila.

4.3.3.3 Critical Habitat of Other Mammals

Wild Dog (*Cuon alpinus*) and Mainland Serow (*Capricornis rubidus*) are two Globally threatened species reside in the steep hills of Mirsarai area. Wild Dogs are group living animals and they go for group hunting. They mostly prey upon wild boar, deer and other mammals even larger than the body size of the wild dog. We observed a troop of wild dog in the forest of Baraiyadhala National Park.

Mainland Serow or Wild Goat prefers the habitat of steep hills, probably due to avoid predators. We found fresh pellet of wild goat in many spots of the steep hill forest. Detailed study is needed to estimate population of these two elusive species.

Pellet of Mainland Shrew (Wild Goat) at Baraiyadhala National Park.

Assamese macaque (*Macaca assamensis*) is an Endangered species in Bangladesh. This species has a very limited distribution in hilly areas. A group of about 40 individuals of Assamese macaque has been recorded from Baraiyadhala National Park of Mirsarai upazila. The steep hill forest of this area provides a good habitat for this species.

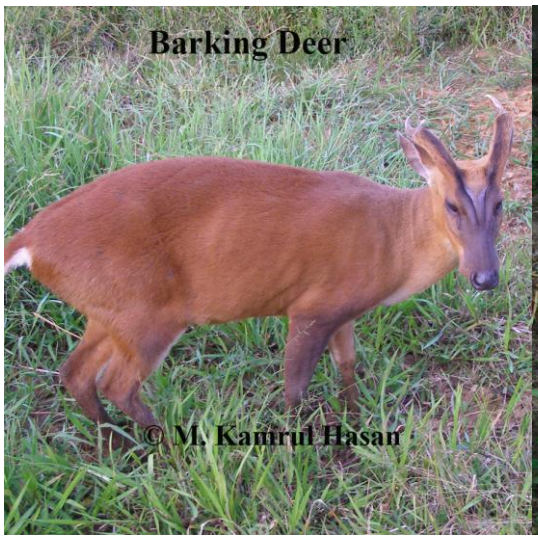
4.3.4 Threatened Wildlife of Mirsarai Upazila

Mirsarai upazial is very rich in biodiversity. The wildlife habitats of this upazila consist of hill forests, water streams, freshwater lakes, canals, ponds, ditches, coastal mangroves, homestead vegetation and so on. The diverse habitats of this upazila have developed a complex ecosystem, which supports a diverse group of flora and fauna; many of them are threatened nationally as well as globally. The surrounding hill forests of this upazila is very dense and hold diverse group of wild animals. The hill streams and lake serve as a feeding and breeding ground for many threatened species. The forest area supports at least 26 species of nationally threated wild animals of which 4 species of amphibians, 10 reptiles, 1 bird and 11 species of mammals (Table 16).

Table 16 List of threatened wild animals found in Mirsarai upazila

Animal Group	Name of the species	National Status	Global Status	Habitat / Habitat Use in Mohamaya Lake Area
Mammals	Barking Deer	EN	LC	Hill forest
	Mainland Serow	EN	VU	Step hills and hill forest
	Smooth-coated Otter	CR	VU	Stream, nearby water bodies and lake
	Assamese Macaque	EN	NT	Step hill forest
	Rhesus Macaque	VU	LC	Forest areas
	Asiatic Wild Dog	EN	EN	Hill forest
	Fishing Cat	EN	EN	Stream and nearby water bodies
	Hog Badger	VU	NT	Hill forest
	Binturong	VU	VU	Hill forest
	Jungle Cat	NT	LC	Forest and adjacent areas
	Large Indian Civet	NT	NT	Forest and adjacent areas
Birds	Kalij Pheasant	VU	LC	Forest Floor
Reptiles	Spotted Flying Lizard	EN	LC	Mature large trees in hill forest
	Blue Throated Lizard	EN	NE	Forest floor and bushes in mature forest
	Asian Leaf Turtle	VU	NE	Streams in hill forest
	Himalayan Keelback	VU	NE	Forest floor and near the stream
	King Cobra	VU	VU	Forest floor
	Bengal Monitor Lizard	NT	LC	Periphery of the forest
	Tawny Cat Snake	NT	LC	Mature trees and bushes
	Red-necked Keelback	NT	LC	Forest floor and near the stream
	Monocleeate Cobra	NT	LC	Forest floor and near the stream
	Binocleeate Cobra	NT	NE	Forest floor and periphery
Amphibians	Anderson's Bush Frog	EN	LC	Bushes of the mature forest
	Cascade Frog	VU	LC	Stream
	Crown Frog	NT	LC	Near the stream
	Green Cascade Frog	Newly discovered		Stream

Any degradation or alteration in the habitats of these threatened species may cause the decline of their population, which will ultimately create threat to their extinction.


Barking Deer
© M. Kamrul Hasan


Wild Goat
© M. Kamrul Hasan


Smooth-coated Otter
© M. Kamrul Hasan


Assamese Macaque
© M. Kamrul Hasan


Blue throated lizard
© M. Kamrul Hasan


Tawny Cat Snake
© M. Kamrul Hasan

5.1 Recommendations

Table 17 Recommendations for the critical habitats of Mirsarai Upazila

COASTAL MANGROVE		
Topic	**Recommendations**	**Remarks**
1. Fate of spotted deer	1. Coastal mangrove should be kept undisturbed and unaltered to save the habitat of ~5000 spotted deer.	If possible
	2. Gradual occupation of mangrove forest to get time for the translocation / movement of spotted deer.	If un-alteration (1) is not possible.
	3. Effective discussion with the Forest Department and other stakeholders to determine the strategy for translocation of these spotted deer.	Detailed study is needed to select suitable site and strategy for doing the work.
2. Habitats for birds and other animals	1. Habitat for other animals will be destroyed if there is no mangrove.	The fate of other animals in mangrove is related to the fate of spotted deer.
COASTAL MUDFLATS		
1. Migratory shore bird habitat	1. The coastal mudflats should be kept as undisturbed as possible.	If possible
	2. If any intervention needed, assess the critical habitat, choose less critical area and try to minimize its effects on biodiversity.	Need detailed study for the assessment of the quality of habitat and to find out possible alternate habitats.
HILL FORESTS		
1. Critical habitats of terrestrial forest mammals (Wild Goat, Black Bear, Barking Deer, Binturong etc.)	1. The existing forest habitat must be protected and should be kept as it is to support natural regeneration.	Natural forest will regenerate if disturbance is minimized.
	2. Tourist activities must be restricted to only assigned areas. Tourists should not be allowed everywhere in the forest.	Controlled tourism must be practiced.
2. Critical Otter habitats	1. Tourist activities should be restricted in hill streams.	Tourists should be allowed up to a certain point of the stream.
	2. None of the activities should be allowed in core areas of otter habitats.	No access should be provided to invade core areas of otter habitats.
	3. Pollution in hill streams must be prevented	Policy should be

	to conserve fish diversity in hill streams.	taken to prevent pollution in hill stream.
3. Critical amphibian and reptile habitats	1. Tourists should not be allowed to take bath or doing any other activities in hill streams (particular portion of the stream).	Tourist activities in water destroy eggs tadpoles of threatened amphibians.
	2. Access of tourists must be sized before sun set.	Most of the amphibians and reptiles are nocturnal.
	3. Awareness building is needed among the local inhabitants to conserve threatened amphibians and reptiles and their habitats.	Beneficial roles of these species should be focused among the local people.
4. Development of ecotourism	1. None of the intervention should be conducted in critical wildlife habitats as well as in the core area of threatened species.	Detailed study is needed to find out comparatively less impact areas for intervention if necessary.
	2. If necessary, intervention should be allowed only in the periphery or start point of the trail.	Impact of the intervention will be minimized.
	3. In Mohamaya lake, infrastructure development (if necessary) must be restricted to the western side of the lake. It should not be allowed in the eastern side-which is continuous with the hill forest.	Many threatened animals live in the eastern side of the Mohamaya lake.
	4. Water based entertainment should be encouraged in Mohamaya lake rather than hiking in hill forests.	It will reduce pressure on hill forests.
	5. In hill streams, like Khoiyachara and Napittachara, controlled ecotourism should be practiced. Visitors and their activities must be restricted to the first portion of the stream; should not allowed any activities in the upper portion of the streams.	Critical habitats for amphibians and reptiles as well as otters will be saved.

Annex 1

Questionnaire

Baseline Survey of Existing Flora and Fauna-Package-06 of "Preparation of Development Plan for Mirsharai Upazila, Chittagong District: Risk Sensitive Land use Plan" Project under Urban Development Directorate (UDD).

Location: Date & Time:

Respondent Name: Address:

Age: Sex: Religion/Cast: Education:

Livelihood status

1. How long have you been staying in this village / area?
2. Do you collect any resource (like fish, shell etc.) from the project area?
3. If yes then how frequent?
4. Do you or your family member go for hunting? Y / N
5. If yes, what are the species that you usually hunt for?
6. How frequent do you go for hunting? Daily / weekly / monthly / seasonally / yearly / ……..
7. Does any one in your village destroy bird nest / disturb / catch animals? If yes what kind of animals?
8. What do you do when you/ family members got sick? Use traditional medicine / go to K*abiraj or Boidda* / Buy medicine from shop / go to doctor.
9. Do you see following animals in your village / surrounding areas (show the color plate). If yes, how often you see or when did you see last time?

   Jungle cat…… Fishing Cat …….. Civets …….

Jackal ……. …… Hog Badger…….…….. Porcupine …….

Monkey ……. …. Deer …….. Others ……

10. Do you think biodiversity (forest, plants, animals) in your area decreasing? Y / N. if yes why?

11. Do you think proposed economic zone may harm biodiversity in your area? If yes how?

12. What should do to conserve biodiversity in your area?

13. Do you know about Wildlife Act / other law? Y / N.

14. Miscellaneous Information (if any):

Name and signature of the Interviewer: