SPECIES DIVERSITY AND POPULATION STATUS OF WILDLIFE IN KESHABPUR, BANGLADESH

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Abstract

Species diversity and population are important indicators of the quality of a particular habitat. This study was conducted from September 2012 to June 2015 on species diversity and population status of wildlife in the Keshabpur Upazila, Jessore. The study was done through direct field observations and interviewing the local people. A total of 153 species of wildlife was recorded belonging to 67 families under 23 orders. Among these, 5.23% species were amphibians, 9.80% reptiles, 68.62% birds and 16.33% mammals. The highest number of individuals among amphibians was the common Asian toad (*Duttaphrynus melanostictus*) and the lowest number was the red microhylid frog (*Microhyla rubra*). Of the reptiles, 3.92% species were lizards, 3.92% snakes and 1.96% tortoises. Regarding the reptilians, house lizard (*Hemidactylus flaviviridis*) was the highest and the common vine snake (*Ahaetulla nasuta*) and diard's blind snake *(Typhlops diardii*) were the lowest in number. In case of birds, 86.76% species were resident and the rest 13.24% were migrants. Common myna (*Acridotheres tristis*) was the highest in number and Indian rollor (*Coracius bengalensis*) was the lowest. Of the observed mammals, one species was langur, two squirrels, four rats, two mice, one porcupine, one shrew, five bats, two cats, three civets, two mongooses, one fox and one jackal. Large bandicot rat (*Bandicota bengalensis*) was the highest and Indian crested porcupine (*Hystrix indica*) was the lowest in number. Relative abundance shows that 5.88% species of the recorded wild animals were very common, 13.07% common, 32.68% fairly common and 48.36% species were few. The highest number of species was recorded in December (79 species) followed by November (71 species) and January (60 species) and the lowest number was recorded in April (23 species). According to diversity indices, the diversity of birds was higher than the other groups, and the herpetofauna was more evenly distributed in comparison to birds and mammals.

Key words: Biodiversity, population, wildlife, Keshabpur.

INTRODUCTION

Biodiversity possesses enormous dimension of different values and it is essential in producing food, medicine, wood and timber. It gives services in conserving ecological foundations needed to sustain people's livelihood (Mukul 2007). It is characterized by the species richness in an area that started from the lower living being up to the climax species. According to the Wildlife Conservation and Security Act 2012, "Wild animals mean different types and species of animals or different stages of their life cycle, the source of which is considered as wild". It is estimated that over 50% of the world's species are found in the tropical moist forests, which cover only 5-7% of earth's land area. Depending upon such condition, the Indian subcontinent possesses a diverse avian fauna (Ali and Ripley 1989, Ali 1972) and the number of larger mammals in the Indian peninsula is remarkable (Krishnan 1972).

Bangladesh has been endowed with a rich plant and animal diversity because of its fertile alluvial land and a warm and moderate climatic condition. Hasan *et al.* (2014) found 45 species of amphibians, 92 of reptiles in Bangladesh. A total of 690 species of birds (380 residents, 209 winter visitors, 11 summer visitors and 90 vagrants) and 121 species of mammals have been recorded from Bangladesh (Khan 2008). Of the total wildlife of the world, about 3.5% of species are found to occur in Bangladesh (Khan 2008).

However, people are stretching their hands to the environment for grasping their own interest without considering the interest of wild animals, so that wild animals are losing their habitat tremendously (Prater 1971, Sarket *et al*. 2000, Hossain *et al*. 2004). In Bangladesh, humans have extensively modified aquatic and terrestrial ecosystems through agricultural expansion, human settlements and habitat fragmentation. Wherever the impact has been long-lasting and sustained, the wildlife diversity and their habitats have become so different that it is no longer possible to treat the ecosystem with any of the known natural resources.

Therefore, a comprehensive study on species diversity and population status of wildlife was made in order to prepare baseline data together with some notes on their habitat and feeding habits in Keshabpur Upazila, the only site that supports Northern Plains Sacred Langur of the country.

MATERIAL AND METHODS

Study area

This study was conducted in Keshabpur (22°54'29.71"N, 89°13'9.18"E) Upazila of Jessore District located in the southwest of Bangladesh. The upazila covers an area of about 258.53 sq km. Average temperatures in the study area ranged between 24.74^{0}C in January and 38.37^{0}C in April (Bangladesh Meteorological Department). Annual rainfall during the study period was 1537mm.

The topography of Keshabpur is basically open plains. Vegetation in the area is dominated by economically important crops and plantations including homestead gardens and naturally occurring forests. There are fragmented patches of natural vegetation like herbs and shrubs, found mostly in fallow lands. Various types of water bodies, such as river, pond, *gher* (shallow depression of water body where various types of fish are cultivated), marsh, canal and *beel* exist in the study area.

Observation technique

Data were collected through direct field observations from September 2012 to June 2015. Field observations and data collection were made from 5 to 8 days per month. The observations were started in the morning and had continued till sunset. Sometimes observation was made again after sunset for collecting data on herpetofauna. During the study period, a pair of binoculars (Bushnell Power view 10×42) was used. For the identification of birds, Grimmett *et al.* (1999) and Halder (2010) were followed. In many cases, photographs were taken with a digital semi-SLR camera (Canon SX 40HS) in order to confirm the identification. The study period was divided into three seasons, viz. summer (March-June), rainy (July-

October) and winter (November-February). The relative abundance was estimated following Khan (1982) as very common (VC) 80-100%, common (C) 50-79%, fairly common (FC) 20-49% and few (F) 10-19%. The data was calculated based on total sighting.

The Shannon-Wiener Index (1949) and Simpson's index (1949) of diversity and evenness (quantifies how numerically equal the community is) of species in the study area were also calculated using following formulas:

Simpson's index of diversity, $D = 1–sum\ (P_i^2)$

Shannon-Wiener Index, $H = –sum\ (P_i ln[P_i])$ (natural log)

Evenness, $E = H/ln(S)$ (natural log)

(where, P_i = number of individuals of a species/ total number of individuals of all species from the same group, and S = number of species from the same group observed)

Line sampling method

The data regarding different species available in the study areas were recorded by following the line sampling method. In total, 108 line samples (12 line samples×3 seasons×3 years=108) were conducted during the whole study period. The size of the line samples varied from 700m to 1000m in length and 50m in both sides. When any species was observed, population was counted along with habitat type and food habit.

Plot counting

Plot counting method was used for estimating amphibian species. A total of 50 plots was selected during the study period for amphibian species observation. Each plot size was 20×20 m^2.

Calls and Songs

Some avifauna and some amphibian fauna, which were normally hidden in the bushes, jungles and branches of trees, were recorded by receiving their song and call sound.

Interviewing local people

All animals were not visible in all the year round and nocturnal animals were not easy to observe. In this regard, some questionnaires were distributed among the inhabitants of the study area for collecting more information on wild animals. Some local people of the area were asked about the presence of species showing their photographs available in the field pictorial guide.

RESULTS AND DISCUSSION

A total of 153 species of wildlife, belonging to 67 families under 23 orders (viz. one amphibian, three reptilian, forteen bird and five mammalian orders) was observed. Of them, 5.23% species were amphibians, 9.80% reptiles, 68.62% birds and 16.33% species were mammals (Tables 1-4).

Faunal Composition

The amphibians sampled were grouped into two types: toad and frog. Only one species *Duttaphrynus melanostictus* represented toad and the rest of them belong to frogs. Among the amphibians, the frequently observed species (n=8) was the common Asian toad (*Duttaphrynus melanostictus*) and the less frequent was the red microhylid frog (*Microhyla rubra*) (Table 1). Hussain *et al.* (1974) reported 12 species, Khan *et al.* (1980) 19 species, Sarker and Sarker (1988) 23 species and Hasan *et al.* (2014) 45 species of amphibians in Bangladesh. In the present study, eight species of amphibians were recorded from Keshabpur upazila.

In case of reptiles, 3.92% species were lizards, 3.92% snakes and 1.96% species tortoises. The individual of house lizard (*Hemidactylus* sp.) were the highest whereas common vine snake (*Ahaetulla nasuta*) and diard's blind snake *(Typhlops diardii*) was the lowest in number (Table 2). We found only one species of Bengal monitor (*Varanus bengalensis*) which feeds mainly on rodents. Thus, the population of rodents and the pest of agricultural crops can be controlled by this monitor lizard (Hossain *et al.* 2004 and Jaman *et al.* 2007). Khan (1982) cited 25 species of turtles and tortoises, 18 species of lizards and skinks, 88 species of snakes, two species of crocodiles and only one species of gharial in Bangladesh. Hasan *et al.* (2014) reported 92 species of reptiles from Bangladesh. During the present study, 15 species of reptiles were recorded in the study area. Therefore, this result suggests that the area can be good abodes for these reptilians if their habitats, foods and breeding ground are to be kept undisturbed.

In the study area, 105 species of birds were observed and recorded. 53.40% species were being passerine and 46.60% non-passerines. The highest number of birds belonged to the common myna (*Acridotheres tristis*) and the lowest number to the Indian roller (*Coracius benghalensis*) (Table 3). Khan (2015) recorded a total of 650 species of birds in Bangladesh. Availability of foods, such as fruits from the homestead garden, insects and grains from the crop field along with proper resting and breeding sites made the study area suitable for birds.

A total of 25 species of mammals was recorded during the study. There were one species of primate, two squirrels, four rats, two mice, one porcupine, one shrew, five bats, two cats, three civets, two mongooses, one fox and one jackal. Five species belonged to the bats. Of the mammals, the large bandicote rat (*Bandicota indica)* had the highest individual number and the Indian crested porcupine (*Hystrix indica*) had the lowest figure (Table 4).

Khan (1982) recorded 119 species of mammals while Sarker and Sarker (1988) listed 123 species of mammals from Bangladesh. Sarker *et al.* (2000) recorded five species of bats, six species of mice and one species of shrew in the St. Martins Island. Hossain *et al.* (2004) recorded 38 species of mammals from Hatiya Island, Bangladesh. The Northern plains sacred langur is the representative of primates found in the Keshabpur (Khan 1982).

Monthly variation of wildlife species composition

Species composition and population number varied from month to month. The highest number of species was recorded in December (79 species) followed by November (71 species) and January (60 species). The lowest number (23 species) was recorded in April. From

December, species diversity decreased gradually and depletion was continued till April (Fig. 1). The highest number of wildlife (128 species) was recorded in winter followed by summer (67 species) and rainy season (53 species). Bird diversity was remarkably higher in comparison to the diversity of other groups observed.

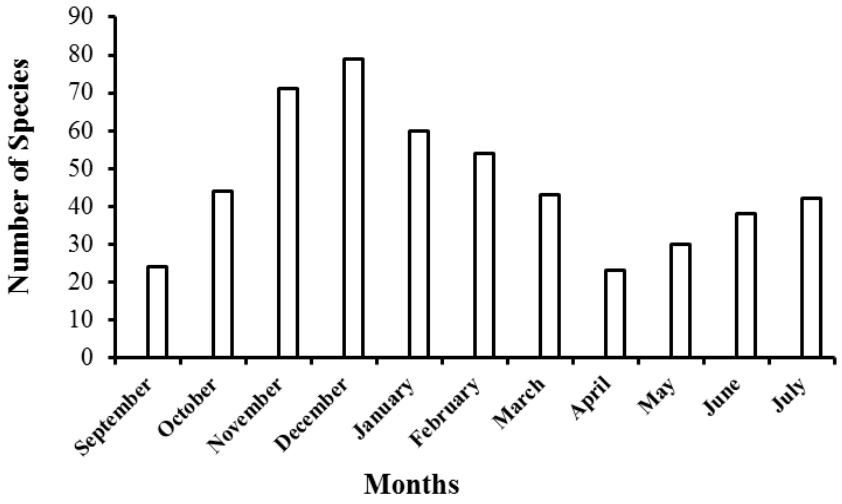

Fig. 1. Monthly variation of wildlife species composition.

As the study area was a man-made ecosystem, so there were plenty of paddy and other crops in most of the areas from October to December. Insects were available in the paddy fields and other crop fields. Due to food-source richness, insectivorous wildlife was noted in these three months. Besides, December is the early month of winter. So, large number of migratory birds visited the study area, whereas various seasonal fruits were available in summer and they attracted frugivorous birds in this season. Furthermore, in Bangladesh summer is the season of heat, storm, cyclone, tornado and many other natural calamities. Probably these natural calamities might affect bird species due to loss of their habitats and paucity of foods in the month of April and May. In rainy season, due to excessive rainfall most of the crop fields and other open areas were inundated with water resulting difficulties to find out the wildlife species in the harsh environment. Therefore, species diversity of wildlife in this season was lower than the other seasons.

Status and relative abundance of wildlife

Overall relative abundance showed that 5.88% species of wild animals were very common, 13.07% common, 32.68% fairly common and 48.36% few (Fig. 2). Among the observed amphibians, 3.92% species were fairly common and 1.31% was few. Of the reptilians, 0.65% species was common, 1.96% fairly common and 7.18% few in number. Of the birds, 4.57% species were very common, 9.15% common, 20.91% fairly common and 33.98% few. Of the mammalian species, 1.31% were very common, 3.26% common, 5.88% fairly common and 5.88% few (Tables 1-4).

Table 1. List of amphibian species observed in Keshabpur from September 2012 to June 2015.

Order	Family	Scientific Name	English Name	Individuals observed	Pop^n status (Local*)	CS (Global*)	MH
Anura	Dicroglossidae	*Euphlyctis cyanophlyctis*	Skipper Frog	3	FC	LC	Pond
		Euphlyctis hexadactylus	Green Frog	4	FC	LC	Pond
		Fejervarya limnocharis	Cricket Frog	5	FC	LC	Marsh
		Hoplobatrachus tigerinus	Indian Bull Frog	6	F	LC	Water body
	Microhylidae	*Microhyla ornata*	Ornate Microhylid Frog	4	FC	LC	Forest
		Microhyla rubra	Red Microhylid Frog	3	F	LC	Forest
	Rhacophoridae	*Polypedates leucomystax*	Common Tree Frog	6	FC	LC	Tree
	Bufonidae	*Duttaphrynus melanostictus*	Common Asian Toad	8	FC	LC	Soil

(FC-Fairly Common, F-Few and LC-Least Concern, Pop^n- Population, MH- Microhabitat and CS- Conservation status, Local*- Study site and Global*: Version 2015-3. *www.iucnredlist.org*).

Table 2. List of Reptilian species recorded in Keshabpur from September 2012 to June 2015.

Order	Family	Scientific Name	English Name	Individuals observed	Pop^n Status (Local*)	CS (Global*)	FH	MH
Squamata	Agamidae	*Calotes versicolor*	Common Garden Lizard	10	FC	NA	I	Tree
	Gekkonidae	*Hemidactylus* spp.	House Lizard	20	C	NA	I	House
		Gekko gecko	Tokay Gecko	4	F	NA	I	Hole
		Hemidactylus brooki	Brook's House Gecko	5	FC	NA	I	House
	Scincidae	*Eutrophis carinata*	Keeled Grass Skink	6	F	NA	MF	Water body
	Varanidae	*Varanus bengalensis*	Bengal Monitor	3	F	LC	C	Soil
Serpentes	Elapidae	*Naja naja*	Spectacled Kobra	3	F	LC	C	Soil
	Typhlopidae	*Typhlops diardii*	Diard's Blindsnake	2	F	LC	I	Debris
	Colubridae	*Amphiesma stolatum*	Stripped Keelback	3	FC	NA	C	Bush
		Ptyas mucosa	Indian Rat Snake	3	F	NA	C	Forest
		Ahaetulla nasuta	Common Vine Snake	2	F	NA	C	Tree
		Xenocrophis piscator	Checkered Keelback	15	F	NA	C	River
Testudines	Geoemydiae	*Pangshura tecta*	Indian Roofed Turtle	4	F	LC	H	Pond
		Pangshura tentoria	Indian Tent Turtle	5	F	LC	H	Pond
	Trionichidae	*Nilssonia hurum*	Indian Peacock Softshell Turtle	3	F	VU	C	Pond

(FC-Fairly Common, F-Few, LC-Least Concern, VU-Vulnerable, NA-Not assessed, Pop^n–Population, MH-Microhabitat, CS-Conservation status, Local*-Study site and FH-Feeding Habit: I-Insectivorous, H-Herbivorous, C-Carnivorous, MF-Mixed Feeder).

Table 3. List of Avian species recorded in Keshabpur from September 2012 to June 2015.

Order	Family	Scientific Name	English Name	Individuals observed	Pop^{n} Status (Local*)	R/M status	CS (Global*)	Group	FH
Passeriformes	Pycnonotidae	*Pycnonotus cafer*	Red-vented Bulbul	599	VC	R	LC	Pa	G
		Copsychus saularis	Oriental Magpie Robin	168	VC	R	LC	Pa	I
	Muscicapidae	*Copsychus malabaricus*	White-rumped Shama	3	F	R	LC	Pa	I
		Cyornis poliogenys	Pale-chined Flycatcher	4	F	UR	LC	Pa	I
		Ficedula albicilla	Taiga Flycatcher	4	FC	R	LC	Pa	I
		Cyornis rubeculoides	Blue-throated Flycatcher	1	FC	CWV	LC	Pa	I
		Saxicola caprata	Pied Bushchat	4	F	UR	LC	Pa	I
		Saxicola insignis	White-throated Bushchat	12	F	VAG	VU	Pa	I
		Monticola solitarius	Blue Rock Thrush	4	F	UWV	LC	Pa	I
	Corvidae	*Corvus macrorhynchos*	Large-billed Crow	159	C	R	LC	Pa	SC
		Corvus splendens	House Crow	35	VC	R	LC	Pa	SC
		Passer domesticus	House Sparrow	155	VC	R	LC	Pa	I
		Dendrocitta vagabonda	Rufous Treepie	92	FC	R	LC	Pa	I
	Leiothrichidae	*Turdoides striata*	Jungle Babbler	2	C	R		Pa	I
	Pellorneidae	*Malacocincla abbotti*	Abbott,s Babbler	7	F	R	LC	Pa	I
		Pellornium ruficeps	Puff-throated Babbler	3	F	R	LC	Pa	I
	Dicruridae	*Dicrurus macrocercus*	Black Drongo	460	C	R	LC	Pa	I
		Dicrurus aeneus	Bronzed Drongo	4	F	UR	LC	Pa	I
	Sturnidae	*Acridotheres fuscus*	Jungle Myna	223	FC	R	LC	Pa	F
		Acridotheres tristis	Common Myna	686	VC	R	LC	Pa	F
		Sturnus contra	Asian Pied Starling	334	VC	R	LC	Pa	F
		Sternus malabaricus	Chestnut-tailed Starling	33	FC	R	LC	Pa	I
	Oriolidae	*Oriolus xanthornus*	Black-hooded Oriole	45	FC	R	LC	Pa	I
		Oriolus oriolus	Eurasian Golden Oriole	45	F	UR	LC	Pa	MF
	Estrilidae	*Lonchura punctulata*	Scaly-breasted Munia	2	FC	R	LC	Pa	S
		Lonchura malacca	Tricoloured Munia	9	FC	R	LC	Pa	S
		Lonchura Striata	White-rumped Munia	4	F	R	LC	Pa	S
		Lonchura malabarica	Indian Silverbil	8	F	UR	LC	Pa	S
	Laniidae	*Lanius schach*	Long-tailed Shrike	5	F	R	LC	Pa	I
		Lanius cristatus	Brown Shrike	12	FC	CWV	LC	Pa	I
		Lanius tephronotus	Grey-backed Shrike	15	F	UR	LC	Pa	I
		Lanius collurioides	Burmese Shrike	12	F	CWV	LC	Pa	I
	Tephrodornithidae	*Tephrodornis pondicerianus*	Common Wood shrike	24	F	R	LC	Pa	I
	Campephagidae	*Coracina melanoptera*	Black-headed Woodshrike	7	F	R	LC	Pa	I
Passeriformes		*Coracina macei*	Large Cuckoo shrike	45	F	R	LC	Pa	I

		Pericrocotus cinnamomeus	Small Minivet	7	F	R	LC	Pa	I
	Nectarinidae	*Nectarinia asiaticus*	Purple Sunbird	10	FC	R	LC	Pa	NF
		Nectarinica zeylonica	Purple-rumped Sunbird	3	FC	R	LC	Pa	NF
	Cisticolidae	*Orthotomus sutorious*	Common Tailorbird	23	C	R	LC	Pa	I
		Prinia inornata	Plain Prinia	6	F	R	LC	Pa	I
	Aegithinidae	*Aegithina tiphia*	Common Iora	6	C	R	LC	Pa	I
	Zosteropidae	*Zosterops palpebrosus*	Oriental white-eye	4	FC	R	LC	Pa	NF
	Paridae	*Parus major*	Great Tit	27	FC	R	LC	Pa	I
	Decaidae	*Dicaeum erythrorhynchos*	Pale-bellied Flowerpecker	2	F	R	LC	Pa	NF
		Dicaeum trigonostigma	Orange-bellied Flowerpecker	16	FC	UR	LC	Pa	NF
	Motacillidae	*Anthus rufulus*	Paddyfield Pipit	10	F	R	LC	Pa	I
		Motacilla alba	White Wagtail	6	F	CWV	LC	Pa	I
		Motacilla madaraspatensis	White-browned Wagtail	7	F	RR	LC	Pa	I
	Phylloscopidae	*Phylloscopus fuscatus*	Dusky Warbler	8	F	CWV	LC	Pa	I
		Acrocephalus dumetorum	Blyths Reed Warbler	2	FC	CWV	LC	Pa	I
		Phylloscopus affinis	Tickelle's Leaf Warbler	2	FC	RWV	LC	Pa	I
	Acrocephalidae	*Acrocephalus agricola*	Paddyfield Warbler	6	F	RWV	LC	Pa	I
	Turdoidae	*Zoothera citrina*	Orange-headed thrush	6	F	UR	LC	Pa	I
	Sittidae	*Sitta frontalis*	Velvet-fronted Nuthach	15	F	UR	LC	Pa	I
	Artamidae	*Artamus fuscus*	Ashy Woodswallow	10	VC	R	LC	Pa	I
Passeriformes	Chloropseidae	*Chloropsis aurifrons*	Golden-fronted Leafbird	6	F	R	LC	Pa	NF
	Acciptridae	*Milvus migrans*	Black Kite	6	FC	R	LC	NP	C
Acciptriformes		*Haliastur indus*	Brahminy Kite	15	FC	R	LC	NP	C
		Hieraaetus pennatus	Booted Eagle	6	F	RWV	LC	NP	C
	Apodidae	*Apus affinis*	House Swift	268	C	R	LC	NP	I
Apodiformes		*Apus pacificus*	Fork-tailed Swift	2	F	RWV	LC	NP	I
		Cypciurus balasiensis	Palm Swift	4	FC	R	LC	NP	I
Buceroformes	Upupidae	*Upupa epops*	Eurasian Hoopoe	4	F	UR	LC	NP	I
	Alcedinidae	*Alcedo atthis*	Common Kingfisher	34	FC	R	LC	NP	P
	Halcyonidae	*Halcyon smyrnensis*	White-throat Kingfisher	20	C	R	LC	NP	P
Coraciformes	Meropidae	*Merops orientalis*	Green Bee-eater	15	FC	R	LC	NP	I
		Merops philippinus	Blue-tailed Bee-eater	8	FC	SM	LC	NP	I
	Coracidae	*Coracius benghalensis*	Indian Roller	1	F	R	LC	NP	I
	Cuculidae	*Cacomantis merulinus*	Plaintive Cuckoo	10	F	R	LC	NP	I
		Clamator coromandus	Chestnut-winged Cuckoo	5	F	UWV	LC	NP	I
		Hierococcyx varius	Common Hawk Cuckoo	8	F	R	LC	NP	I
		Cuculus micropterus	Indian Cuckoo	12	C	R	LC	NP	S
		Clamator jacobinus	Pied Cuckoo	10	FC	SM	LC	NP	I
		Eudynamys scolopacea	Asian Koel	4	FC	R	LC	NP	I

Cuculiformes		*Centropus Sinensis*	Greater Coucal	250	FC	R	LC	NP	I
		Centropus bengalensis	Lesser Coucal	4	F	R	LC	NP	I
	Columbidae	*Streptopelia chinesis*	Spotted Dove	72	C	R	LC	NP	G
Colunbiformes		*Streptopelia tranquebarica*	Red Turtle Dove	5	FC	R	LC	NP	G
Ciconiformes	Ciconidae	*Anastomus oscitans*	Asian Openbill Stork	12	F	R	LC	NP	MF
	Megalaimidae	*Megalaima haemacephala*	Coppersmith Barbet	10	F	R	LC	NP	F
		Megalaima asiatica	Blue-throated Barbet	4	C	R	LC	NP	F
Piciformes		*Megalaima lineata*	Lineated Barbet	8	FC	R	LC	NP	F
	Picidae	*Dinopium benghalense*	Black-rumped Flameback	51	C	R	LC	NP	I
		Chrysocolaptes lucidus	Greater Flameback	9	C	R	LC	NP	I
		Dinopium javanense	Common Flameback	385	FC	R	LC	NP	I
		Dendrocopos masei	Fulvus-breasted Woodpecker	53	FC	R	LC	NP	I
		Celeus brachyurus	Rufous Woodpecker	18	F	R	LC	NP	I
		Picus canus	Grey-headed Woodpecker	8	F	UR	LC	NP	I
		Dendrocopos	Gray-capped Pigmy	7	F	RR	LC	NP	I
Piciformes		*canicapillus*	Woodpecker						
		Picus xanthopygaeus	Streak-throated Woodpecker	6	F	UR	LC	NP	I
		Picus viridanus	Streak-breasted Woodpecker	21	F	RR	LC	NP	I
	Ardeidae	*Ardeola grayii*	Indian Pond Heron	117	FC	R	LC	NP	P
		Ardea cinerea	Grey Heron	4	F	R	LC	NP	P
		Nycticorax nycticorax	Black-crowned Night Heron	36	F	R	LC	NP	P
		Ardeola bacchus	Chinese Pond Heron	12	F	VAG	LC	NP	P
Pelecaniformes		*Casmerodius albus*	Great Egret	10	F	R	LC	NP	P
		Mesophoyx intermedia	Intermediate Egret	13	F	R	LC	NP	P
		Egretta garzetta	Little egret	5	F	R	LC	NP	P
		Bubulcus ibis	Cattle Egret	20	FC	R	LC	NP	P
	Psittaculidae	*Psittaculla kramari*	Ring-rose Parakeet	6	C	R	LC	NP	F
Psittaciformes		*Loriculus vernalis*	Vernal Hanging Parrot	4	F	UR	LC	NP	F
Suliformes	Phalacrocoracidae	*Phalacrocorax niger*	Little Cormorant	8	F	R	LC	NP	P
Strigiformes	Tytonidae	*Tyto alba*	Barn Owl	4	F	R	LC	NP	C
	Strigidae	*Otus bakkamoena*	Collared Scops Owl	8	FC	R	LC	NP	C
		Athene brama	Spotted Owlet	19	C	R	LC	NP	C

(VC-Very common, C-Common, FC-Fairly Common, F-Few, LC-Least Concern, VU-Vulnerable, R/M- Resident and migration status, R-Resident, UR-Uncommon resident, RR-Rare Resident, SM-Summer migrant, VAG-Vagrant, CWV-Common winter visitor, UWV-Uncommon winter visitor, RWV-Rare winter visitor, Pa-Passerine, NP-Non-Passerine, CS-Conservation status, Local*-Study site and FH-Feeding Habit: I-Insectivorous, F-Frugivorous, C-Carnivorous, P-Picivorous, G-Granivorous, S-Seedivorous, SC-Scanvenger, NF-Necter Feeder, MF-Mixed Feeder).

Table 4. List of Mammalian species recorded in Keshabpur from September 2012 to June 2015.

Order	Family	Scientific Name	English Name	Individuals observed	Pop^n Status (Local*)	CS (Global*)	FH	MH
Primate	Cercopithicidae	*Semnopithecus entellus*	Northern Plain Sacred Langur	119	FC	LC	H	Tree
Rodentia	Sciuridae	*Callosciurus pygerythrus*	Irrawaddy squirrel	90	C	LC	F	Tree
		Funambulus pennantii	Five Stripped Palm Squirrel	85	F	LC	F	Tree
	Muridae	*Bandicota bengalensis*	Lesser Bandicote Rat	15	FC	LC	C	Store house
		Bandicota indica	Greater Bandicote Rat	200	VC	LC	O	Store house
		Mus booduga	Little Field Mouse	12	FC	LC	S	Crop field
		Mus musculus	House Mouse	12	C	LC	C	Crop field
		Rattus Rattus	Common House Rat	7	VC	LC	C	Store house
		Rattus norvegicus	Brown Rat	5	FC	LC	C	Tree
	Hystricidae	*Hystrix indica*	Indian Crested Porcupine	1	F	LC	H	Crop field
Insectivora	Soricidae	*Suncus murinus*	Asian House Shrew	16	C	LC	I	Crevices
Chiroptera	Pteropodidae	*Cynopterus Sphinx*	Greater Shortnosed Fruit Bat	4	FC	LC	F	Tree
		Pteropus giganteus	Indian Flying Fox	5	FC	LC	F	Tree
	Megademartidae	*Megaderma lyra*	Greater False Vampire	8	FC	LC	C	Cave
	Vespertilionidae	*Pipistrellus coromandra*	Coromandel Pipistrelle	6	C	LC	I	Crevices
		pipistrellus tenuis	Least Pipistrelle	12	FC	LC	I	Crevices
Carnivora	Felidae	*Felis chaus*	Jungle Cat	2	F	LC	C	Jungle
		Prionailurus Viverrinus	Fishing Cat	2	F	EN	C	Jungle
	Viverridae	*Paradoxurus hermaphroditus*	Asian Palm Civet	3	F	LC	C	Forest
		Viverra zibetha	Large Indian Civet		F	LC	C	Forest
		Viverricula indica	Small Indian Civet	1	F	LC	C	Thicket
	Herpestidae	*Herpestes edwardsii*	Indian Grey Mongoose	12	C	LC	C	Bush
		Herpestes auropunctatus	Small Indian Mongoose	11	FC	LC	C	Bush
	Canidae	*Canis aureus*	Asiatic Jackal	4	F	LC	C	Forest
		Vulpes bengalensis	Bengal Fox	3	F	LC	C	Cultivated land

(VC-Very common, C-Common, FC-Fairly common, F-Few, LC-Least concern and EN-Endangered, Pop^n–Population, MH-Microhabitat, CS-Conservation status, Local*-Study site and FH-Feeding Habit: I-Insectivorous, F-Frugivorous, H-Herbivorous, O-Omnivorous, C-Carnivorous, S-Seedivorous).

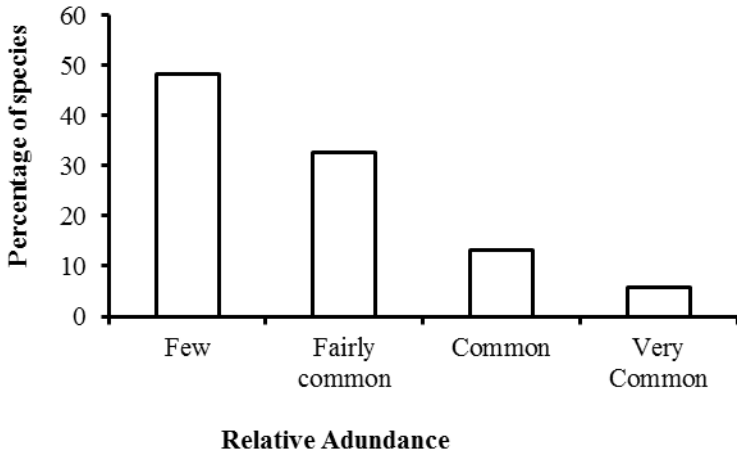

Fig. 2. Relative abundance of recorded wildlife in the study area.

Amphibians need both aquatic and terrestrial habitats. Due to excessive cultivation and modification of the habitat, their population supposed to be decreased. Most of the reptilians need bushy, fallow, undisturbed forest or jungle areas for their living. The study area was mostly covered with the cultivated land where every sphere of area is now ploughed for agricultural purposes and some areas are converted for human settlements and other human interests, so the quality of habitat for reptilian species has been decreasing. Although, the species of avifauna was rich, population was poor probably due to the high disturbance. A good number of mammalian species was found perhaps due to their favorable habitats. Hossain *et al.* (2004) reported that rapid growth of human population, settlements and habitat destruction are mainly responsible for the declination of wildlife.

Species diversity indices

The calculated values indicate that the diversity of birds (Simpson's index of diversity=0.936 and Shannon-Wiener Index=3.315) was higher than the other groups observed (viz. amphibians, reptilians and mammalians). However, the herpetofauna was more evenly distributed (amphibians=0.974 and reptilians=0.89) in comparison to birds and mammals (Table 5). Sarker *et al*. (2000) reported that avifaunal diversity was more in the cultivated and bushy lands in the northern part of Uttarpara and southern part of Daskhinpara. The study area is enriched with homestead forest and garden, cultivated land, fallow land, water bodies and bushy land. This habitat attracted the birds more than the other groups observed in the study area.

Table 5. Species diversity indices according to wildlife groups.

Parameter	Amphibia	Reptiles	Birds	Mammals
Simpson's index of diversity (D)	0.861	0.882	0.936	0.825
Shannon-Wiener Index (H)	2.026	2.41	3.315	2.18
Evenness (E)	0.974	0.89	0.712	0.677

Resident and migrant status of birds

Among the birds, 86.76% species were resident and 13.24% were migrant. Regarding their resident status, 82.02% species were common, 14.64% uncommon and 3.37% species rare residents. Of the 16 species of migratory birds, 75% were winter migrants, 12.5% vagrants and 12.5% summer migrants (Table 3). Sarker *et al.* (2000) recorded 78 species of birds as residents and 42 species as migrants from the St. Martins Island. So, the resident and migrant status of the birds in the present study depicts that the area might be suitable habitats for birds.

Keshabpur can be considered as a place with diverse species composition of wild animals. However, some threats, such as clearing of vegetations, filling up or commercial use of water bodies and use of agrochemicals were observed in the study area that might be affecting the wildlife in the study area. Attention should be given immediately for the future existence of wildlife including immediate conservation measures oriented towards the protection of wildlife in the area.

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