DIVERSITY AND SEASONAL OCCURRENCE OF VERTEBRATE WILDLIFE AT A RURAL SITE OF BANGLADESH: THREATS AND CONSERVATION ISSUE

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Abstract

Due to local people's misconceptions, a large number of wildlife species are facing threats in Bangladesh. From July 2017 to June 2021 a research work was conducted in Kashipur Union, under Barishal district of Bangladesh. In total, 191 vertebrate wildlife species were recorded. 141 species (74.35%) were bird, 18 species (9.42%) mammals, 17 species (8.90%) reptiles and 15 species (7.85 %) were amphibians. The largest diversity of animals (148 species) and their abundance (n=1477) were counted in winter. Bird species diversity was high in winter (H=4.699, Ds=0.989) with winter migrants (24 species). The summer season had the most evenness (E= 0.7652). Among them, 82 (42.93 %) species of wildlife were very common, 20 (10.47 %) common, 36 (18.32 %) uncommon and 54 (28.27 %) were few. An amphibian species *Euphlyctis kalasgramensis* had the highest (24.95 %) relative abundance; *Hemidactylus frenatus* (22.60 %) (reptile); *Turdoides striata* (3.23 %) (bird); and *Rattus rattus* (21.94 %) (mammalian) species. Among the observed wildlife species, 183 (95.81 %) were classified as least concern followed by 4 (2.09 %) near threatened, 2 (1.04%) vulnerable and only one (0.52%) endangered.

***Key words*:** Homestead forest; Seasonality; Community structure; Relative abundance; Misconception.

INTRODUCTION

Among the protected areas of the globe, 15.4% of areas are terrestrial and 7.8% marine. The diversity of animal species lives outside the protected areas face serious anthropogenic hazards (UNEP-WCMC 2021). Rural locations are safe for wildlife than urban areas (Aronson *et al.* 2017, Rebolo-Ifrán *et al.* 2017). Wildlife has better opportunities for survival in rural areas. The rural areas show high diversity and high number of species in the region (Rosin *et al.* 2016).

Due to its geographical location (intersection point of two immensely endowed bio-geographical realms; Indo-Himalayan and Indo-China sub-regions) in the oriental region, the abundance of wildlife resources is high in the small country (Bangladesh) in South Asia. Until now, 57 species of amphibians, 167 reptiles, 690 birds and 127 species of mammals are recorded from Bangladesh (Shome *et al.* 2021, Shome *et al.* 2022, Mandal *et al.* 2021). The diverse fauna playing a significant role in Bangladesh is overlooked. Wildlife in Bangladesh is threatened quickly due to anthropogenic indiscriminate activities. Natural tragedies are also causing agents. As a result, 31 species of animals have been extirpated from Bangladesh, while 125 species are classified as threatened.

Only 4.16 % of Bangladesh's terrestrial terrain is protected, which is woefully inadequate for the country's wildlife protection (UNEP-WCMC 2020). Outside the protected areas, wildlife species have more suitable habitats like homestead forest, *haor*, *baor*, ditch, canal, *beel*, pond, riverine islands, sand bars, grasslands, fallow land, and so on (Mukul 2008, Mandal *et al*. 2021). Scattered data indicate that a large number of animal species exists in Bangladesh's rural areas. They are threatened by the anthropogenic pressure (Mandal *et al.* 2021, Jaman *et al.* 2021, Shome *et al.*

2020, Islam *et al.* 2018, Rahman *et al.* 2011, Jaman *et al.* 2015). Wildlife conservation outside the protected areas needs adequate baseline data to aid future conservation planning.

The southern part (Kashipur) of Bangladesh is rich in animal resources. But no substantial work on wildlife has yet been attempted in the areas out of the protected ones. The baseline information, species composition, population status, and seasonal presence of wildlife in Kashipur union were envisaged to study in the present research work.

METERIAL AND METHODS

Study area

Kashipur is a union (22°44'00.2"N, 90°19'52.6"E) made up of eight villages in Barisal Sadar Upazila, Barisal District, with a total area of 12.191 km^2 (Fig. 1). This union has a comprehensive garden with native plant species, canal, agricultural land, ditch, pond, and grassland. In total, six survey sites were selected for research data collection and there are relatively few human disturbances in the study area.

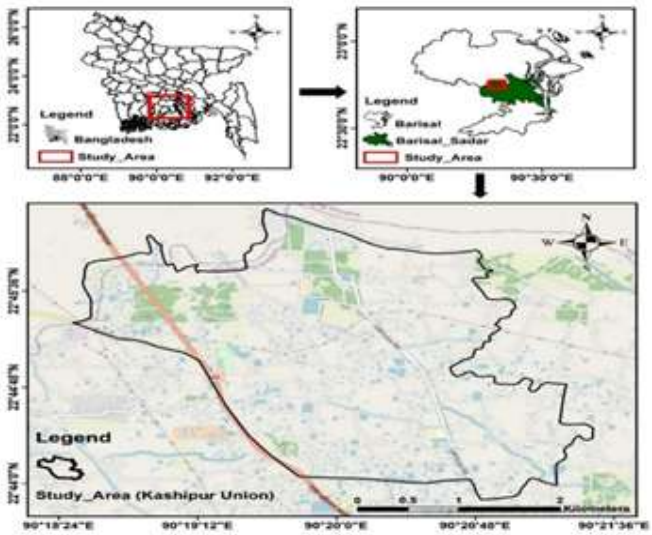

Fig. 1. Study area map of Kashipur Union, Barishal.

Data collection

A four-year long study was conducted from July 2017 to June 2021. Each year is divided into three seasons - summer (March-June), rainy (July-October) and winter (November February). At least 4 days were spent in a season (12 days in a year and 48 days in total) in the study area and following survey methods were adopted.

Transect Line Method

In each study site, 2 transect lines (total 12) were surveyed. The size of each transect was 200 m in length and 50 m in width. Each transect line was surveyed at least 1 time in a season.

Plot Count

Eight plots were made at each site (total 48), the size of the each plot being 20 m in length and 10 m in width. Amphibians and reptiles were surveyed following this method. Nocturnal wildlife was surveyed during night time. Some wildlife (hidden in the bushes, grasslands, holes, jungles) were recorded by their sound and song (Jaman *et al.* 2015).

Data analysis

The relative abundance of particular bird species was calculated following the formula given below-

$$\text{Relative abundance} = \frac{\text{Number of individual of a species}}{\text{Total number of individuals of all species}} \times 100$$

Following Whittaker's (1965) method, rank-abundance curves were constructed by graphing the total abundance against their rank in the samples. Shannon-Wiener (1949) and Simpson's (1949) diversity indices were used to compute the diversity indices. The calculation of species evenness (quantifies how numerically equal the community is) in the study area was made following the formula Evenness, $E = H/ln\ (S)$ (natural log). All statistical analyses were carried out using respective formula of MS Excel and PAST version 4.03.

RESULTS AND DISCUSSION

Species Composition and Abundance

In total, 191 species of vertebrate wildlife were observed in the study area over the course of four years, with 141 species of birds (74.35 %), 18 mammals (9.42 %), 17 reptiles (8.90 %) and 15 species of amphibians (7.85%). This species composition suggests that available natural habitat diversity and fewer disturbances in the rural sites support rich diversity of vertebrate wildlife. In total, 4178 individuals were counted during the study period; of them, birds' population was the highest in number (Fig. 2).

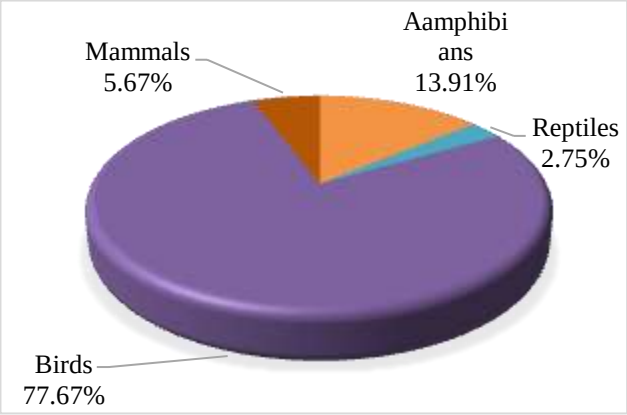

Fig. 2. Abundance of different groups of wildlife in the study area (A-Amphibian, R- Reptiles, B- Birds, M- Mammals)

In total 15 species of amphibians were sighted, of them two species were toads, and 13 species were frogs (Table 1). The highest number of amphibian species belongs to the family Dicroglossidae (8 species, 53.33%). Out of 17 species of reptiles, 8 species were snakes, 8 lizards, and only one species was turtle. Of the 141 species of birds, most of the species (113) were resident and rest was migratory (Table 1). Among the migratory birds (*Clamator jacobinus, Cuculus micropterus* and *Merops philippinus*) were summer migrant, and *Cuculus canorus* passage migrant, and the rest are winter migrant (17.02%) (Table 1). In total 18 species of mammals were reported; of them, rodents species were the highest (7 species, 38.88%) (Table 1).

Table 1. Rural vertebrate wildlife in Kashipur Union, Barishal, Bangladesh from July 2017 to June 2021

Scientific Name	**English Name**	**NI**	**RA**	**Se**	**OS**	***Scientific Name***	**English Name**	**NI**	**RA**	**Se**	**OS**
Amphibian											
Fejervarya asmati	Asmat's Cricket Frog	38	6.54	R	VC	*Duttaphrynus stomaticus*	Marbled Toad	2	0.34	R	F
Fejervarya syhadrensis	Bombay Wart Frog	5	0.86	R	UC	*Fejervarya nepalensis*	Nepal Wart Frog	25	4.30	R	VC
Duttaphrynus melanostictus	Common Toad	78	13.43	Y	VC	*Microhyla ornata*	Ornate Microhylid Frog	18	3.10	R	C
Polypedates leucomystax	Common Tree Frog	25	4.30	R	VC	*Fejervarya pierrei*	Pierre's Cricket Frog	15	2.58	R	C
Hylarana leptoglossa	Cope's Frog	17	2.93	R	C	*Euphlyctis cyanophlyctis*	Skipper Frog	115	19.79	S,R	VC
Fejervarya cancrivora	Crab-eating Frog	18	3.10	R	VC	*Fejervarya teraiensis*	Terai Wart Frog	19	3.27	R	C
Hoplobatrachus tigerinus	Indian Bullfrog	59	10.15	Y	VC	*Hylarana tytleri*	Yellow-striped Frog	2	0.34	R	F
Euphlyctis kalasgramensis	Kalasgram Skipper Frog	145	24.96	S,R	VC						
Reptile											
Varanus bengalensis	Bengal Monitor	15	13.04	Y	C	*Lycodon aulicus*	Common Wolf Snake	2	1.74	R	R
Naja naja	Binocellate Cobra	3	2.61	S, R	R	*Argyrophis diardii*	Diard's Blindsnake	13	11.30	S, R	C
Eutropis macularia	Bronze Grass Sking	2	1.74	S	R	*Gerada prevostiana*	Glossy Marsh Snake	1	0.87	R	R
Hemidactylus brookii	Brook's House Gecko	1	0.87	S	R	*Ptyas mucosa*	Indian Rat Snake	1	0.87	W	R
Calotes versicolor	Common Garden Lizard	9	7.83	Y	C	*Eutropis carinata*	Keeled Grass Skink	7	6.09	Y	UC
Hemidactylus frenatus	Common House Gecko	26	22.61	Y	VC	*Xenochrophis cerasogaster*	Painted Keelback	1	0.87	R	R
Enhydris enhydris	Common Smooth-scaled Water Snake	1	0.87	S	R	*Varanus salvator*	Ring Lizard	22	19.13	Y	VC
Ahaetulla nasuta	Common Vine Snake	8	6.96	S	UC	*Lissemys punctata*	Spotted Flapshell Turtle	2	1.74	R	R
Gekko gecko	Tokay Gecko	1	0.87	R	R						
Aves											
Malacocincla abbotti	Abbott's Babbler	20	0.62	R,W	VC	*Columba livia*	Rock Dove	33	1.02	Y	VC
*Dicrurus leucophaeus****	Ashy Drongo	2	0.06	W	F	*Psittacula krameri*	Rose-ringed Parakeet	27	0.83	Y	VC
Artamus fuscus	Ashy Woodswallow	31	0.96	Y	VC	*Chalcoparia singalensis*	Ruby-cheecked Sunbird	2	0.06	W	F
Merops orientalis	Asian Green Bee-eater	12	0.37	S,W	VC	*Dendrocitta vagabunda*	RufousTreepie	38	1.17	Y	VC
Anastomus oscitans	Asian Openbill	13	0.40	Y	VC	*Micropternus brachyurus*	Rufous Woodpecker	5	0.15	S,W	UC
Caprimulgus macrurus	Asian Palm Swift	33	1.02	Y	VC	*Mirafra assamica*	Rufous-winged Lark	7	0.22	R	UC
Sturnus contra	Asian Pied Starling	52	1.60	Y	VC	*Lonchura punctulata*	Scaly-breasted Munia	85	2.62	Y	VC
Acridotheres ginginianus	Bank Myna	85	2.62	Y	VC	*Accipiter badius*	Shikra	2	0.06	W	F
*Hirundo rustica****	Barn Swallow	42	1.29	R,W	VC	*Pericrocotus cinnamomeus*	Small Minivet	29	0.89	S,W	VC

Scientific Name	**English Name**	**NI**	**RA**	**Se**	**OS**	***Scientific Name***	**English Name**	**NI**	**RA**	**Se**	**OS**
Ploceus philippinus	Baya Weaver	78	2.40	Y	VC	*Athene brama*	Spotted Owlet	17	0.52	Y	VC
Dicrurus macrocercus	Black Drongo	85	2.62	Y	VC	*Pelargopsis capensis*	Stork-billed Kingfisher	11	0.34	Y	UC
Milvus migrans	Black Kite	9	0.28	Y	C	*Picus xanthopygaeus*	Streak-throated Woodpecker	7	0.22	Y	UC
Coracina melanoptera	Black-headed Cuckooshrike	2	0.06	W	F	*Turdoides earlei*	Striated Babbler	15	0.46	W	C
*Threskiornis melanocephalus****	Black-headed Ibis	2	0.06	R	F	*Megalurus palustris****	Striated Grassbird	1	0.03	W	F
Oriolus xanthornus	Black-hooded Oriole	42	1.29	Y	VC	*Ficedula albicilla****	Taiga Flycatcher	6	0.18	W	UC
Hypothymis azurea	Black-naped Monarch	53	1.63	Y	VC	*Lonchura malacca*	Tricoloured Munia	2	0.06	S	F
Dinopium benghalense	Black-rumped Flameback	44	1.36	Y	VC	*Eudynamys scolopaceus*	Western Koel	28	0.86	Y	VC
*Coracina melaschistos****	Black-winged Cuckooshrike	2	0.06	W	F	*Motacilla flava****	Western Yellow Wagtail	13	0.40	W	UC
Elanus caeruleus	Black-winged Kite	8	0.25	Y	UC	*Motacilla alba*	White Wagtail	27	0.83	W	VC
Alcedo meninting	Blue-eared Kingfisher	47	1.45	Y	VC	*Halcyon smyrnensis*	White-breasted kingfisher	14	0.43	Y	C
*Merops philippinus***	Blue-tailed Bee-eater	4	0.12	S	UC	*Amaurornis phoenicurus*	White-breasted Waterhen	25	0.77	Y	VC
Psilopogon asiaticus	Blue-throated Barbet	11	0.34	Y	C	*Motacilla madaraspatensis*	White-browed Wagtail	19	0.59	Y	UC
*Acrocephalus dumetorum****	Blyth's Reed-warbler	1	0.03	W	F	*Lonchura striata*	White-rumped Munia	23	0.71	Y	VC
Haliasturindus	Brahminy Kite	12	0.37	Y	C	*Rhipidura albicollis*	White-throated Fantail	81	2.50	Y	VC
Dicrurus aeneus	Bronzed Drongo	2	0.06	W	F	*Lonchura malabarica*	White-throated Munia	35	1.08	S, W	VC
Metopidius indicus	Bronze-winged Jacana	12	0.37	Y	C	*Tringa glareola****	Wood Sandpiper	19	0.59	S,W	C
Ninox scutulata	Brown Boobook	9	0.28	Y	C	*Ixobrychus sinensis*	Yellow Bittern	10	0.31	R,W	VC
Ketupa zeylonensis	Brown Fish Owl	2	0.06	R	F	*Treron phoenicopterus*	Yellow Footed Green Pigeon	3	0.09	W	F
*Lanius cristatus****	Brown Shrike	11	0.34	W	UC	*Cisticola juncidis*	Zitting Cisticola	37	1.14	Y	VC
*Larus brunnicephalus****	Brown-headed Gull	2	0.06	W	UC	*Lanius tephronotus****	Grey-backed Shrike	7	0.22	W	UC
Bubulcus ibis	Cattle Egret	95	2.93	Y	VC	*Vanellus cinereus****	Grey-headed Lapwing	8	0.25	Y	UC
Nisaetus cirrhatus	Changeable Hawk-eagle	4	0.12	R,W	UC	*Corvus splendens*	House Crow	44	1.36	Y	VC
Sturnus malabaricus	Chestnut-tailed Starling	51	1.57	Y	VC	*Passer domesticus*	House Sparrow	45	1.39	Y	VC
Ixobrychus cinnamomeus	Cinnamon Bittern	8	0.25	R	UC	*Apus nipalensis*	House Swift	35	1.08	Y	VC
Otus lettia	Collared Scops Owl	2	0.06	W	F	*Cuculus micropterus***	Indian Cuckoo	13	0.40	S,R	UC
Tyto alba	Common Barn Owl	1	0.03	W	F	*Terpsiphone paradisi*	Indian Paradise flycatcher	50	1.54	Y	VC
*Cuculus canoruS**	Common Cuckoo	1	0.03	S	F	*Ardeola grayii*	Indian Pond Heron	86	2.65	Y	VC
Hierococcyx varius	Common Hawk-Cuckoo	19	0.59	Y	C	*Coracias benghalensis*	Indian Roller	8	0.25	R,W	UC

Scientific Name	**English Name**	**NI**	**RA**	**Se**	**OS**	***Scientific Name***	**English Name**	**NI**	**RA**	**Se**	**OS**
Upupa epops	Common Hoopoe	22	0.68	Y	VC	*Phylloscopus inornatus****	Inornate Warbler	1	0.03	W	F
Aegithina tiphia	Common Iora	35	1.08	Y	VC	*Ardea intermedia*	Intermediate Egret	14	0.43	Y	UC
Falco tinnunculus	Common Kestrel	1	0.03	W	F	*Clamator jacobinus***	Jacobin Cuckoo	3	0.09	S,R	UC
Alcedo atthis	Common Kingfisher	32	0.99	Y	VC	*Turdoides striata*	Jungle Babbler	104	3.20	Y	VC
Acridotheres tristis	Common Myna	53	1.63	Y	VC	*Corvus levaillantii*	Jungle Crow	39	1.20	Y	VC
Actitis hypoleucos	Common Sandpiper	12	0.37	R,W	UC	*Acridotheres fuscus*	Jungle Myna	76	2.34	Y	VC
Gallinago gallinago	Common Snip	2	0.06	W	F	*Charadrius alexandrinus*	Kentish Plover	7	0.22	W	UC
Orthotomus sutorius	Common Tailorbird	41	1.26	Y	VC	*Coracina macei*	Large Cuckooshrike	3	0.09	W	F
Tephrodornis pondicerianus	Common Woodshrike	2	0.06	S	F	*Centropus bengalensis*	Lesser Coucal	1	0.03	W	F
Psilopogon haemacephala	Coppersmith Barbet	37	1.14	Y	VC	*Dendrocygna javanica*	Lesser Whistling Duck	43	1.33	Y	VC
Nettapus coromandelianus	Cotton Pygmy-goose	12	0.37	R	VC	*Psilopogon lineatus*	Lineated Barbet	32	0.99	Y	VC
Spilornis cheela	Crested Serpent Eagle	1	0.03	W	F	*Microcarbo niger*	Little Cormorant	55	1.69	Y	VC
*Phylloscopus fuscatus****	Dusky Warbler	4	0.12	W	UC	*Egretta garzetta*	Little Egret	60	1.85	Y	VC
Spilopelia chinensis	Eastern Spotted Dove	74	2.28	Y	VC	*Charadrius dubius*	Little Ringed Plover	23	0.71	S,W	VC
Streptopelia decaocto	Eurasian Collared Dove	2	0.06	W	F	*Arachnothera longirostra*	Little Spiderhunter	4	0.12	W	UC
*Jynx torquilla****	Eurasian Wryneck	4	0.12	W	UC	*Lanius schach*	Long-tailed Shrike	20	0.62	Y	VC
*Dendronanthus indicus****	Forest Wagtail	2	0.06	W	F	*Anthus hodgsoni****	Olive-backed Pipit	3	0.09	W	F
Dendrocopos macei	Fulvous-breasted Woodpecker	23	0.71	Y	VC	*Zoothera citrina*	Orange-headed Thrush	29	0.89	Y	VC
Prinia gracilis	Graceful Prinia	47	1.45	Y	VC	*Pernis ptilorhyncus*	Oriental Honey Buzzard	3	0.09	R,W	F
Ichthyophaga ichthyoetus	Gray-headed Fish Eagle	2	0.06	R	F	*Copsychus saularis*	Oriental Magpie-robin	49	1.51	Y	VC
*Phalacrocorax carbo****	Great Cormorant	12	0.37	W	UC	*Zosterops palpebrosus*	Oriental White-eye	31	0.96	S,W	VC
Parus major	Great Tit	53	1.63	Y	VC	*Pandion haliaetus****	Osprey	2	0.06	W	F
Ardea alba	Great White Egret	10	0.31	Y	C	*Pluvialis fulva*	Pacific Golden Plover	3	0.09	W	F
Centropus sinensis	Greater Coucal	11	0.34	R,W	UC	*Anthus rufulus*	Paddyfield Pipit	33	1.02	Y	VC
Chrysocolaptes guttacristatus	Greater Flameback	3	0.09	W	F	*Acrocephalus agricola****	Paddyfield Warbler	1	0.03	W	F
Rostratula benghalensis	Greater Painted Snipe	3	0.09	R,W	F	*Dicaeum erythrorhynchos*	Pale-billed Flowerpecker	24	0.74	Y	VC
*Tringa ochropus ****	Green Sandpiper	1	0.03	W	F	*Phylloscopus trochiloides****	Greenish Warbler	1	0.03	W	F
Phaenicophaeus tristis	Green-billed Malkoha	9	0.28	Y	UC	*Motacilla cinerea****	Grey Wagtail	1	0.03	W	F
Nectarinia zeylonica	Purple-rumped Sunbird	54	1.66	Y	VC	*Ceryle rudis*	Pied Kingfisher	7	0.22	Y	UC

Scientific Name	**English Name**	**NI**	**RA**	**Se**	**OS**	***Scientific Name***	**English Name**	**NI**	**RA**	**Se**	**OS**
Streptopelia tranquebarica	Red Turtle Dove	8	0.25	S,W	UC	*Prinia inornata*	Plain Prinia	23	0.71	Y	VC
Falco chicquera	Red-headed Falcon	1	0.03	S	F	*Cacomantis merulinus*	Plaintive Cuckoo	3	0.09	S	F
Pycnonotus cafer	Red-vented Bulbul	48	1.48	Y	VC	*Nectarinia asiatica*	Purple Sunbird	60	1.85	Y	VC
Vanellus indicus	Red-wattled Lapwing	40	1.23	S	VC						
Mammal											
Suncus murinus	Asian House Shrew	52	21.94	Y	VC	*Herpestes edwardsii*	Indian Grey Mongoose	10	4.22	Y	C
Canis aureus	Asiatic Jackel	31	13.08	Y	VC	*Pipistrellus coromandra*	Indian Pipistrelle	7	2.95	Y	UC
Rattus norvegicus	Brown Rat	24	10.13	R	VC	*Felis chaus*	Jungle Cat	7	2.95	R, W	UC
Rattus rattus	Common House Rat	22	9.28	Y	VC	*Bandicota indica*	Large Bandicoot Rat	3	1.27	Y	VC
Paradoxurus hermaphroditus	Common Palm Civet	21	8.86	R	VC	*Bandicota bengalensis*	Lesser Bandicoot Rat	3	1.27	Y	R
Megaderma lyra	Greater False Vampire Bat	19	8.02	S, W	VC	*Mus booduga*	Little Indian Field Mouse	2	0.84	W	R
Hystrix brachyura	Himalayan Crestless Porcupin	13	5.49	R	C	*Semnopithecus entellus*	Northern Plains Sacred Langur	1	0.42	R	R
Mus musculus	House Mouse	10	4.22	Y	C	*Viverricula indica*	Small Indian Civet	1	0.42	S	R
Pteropus giganteus	Indian Flying Fox	10	4.22	Y	UC	*Herpestes auropunctatus*	Small Indian Mongoose	1	0.42	Y	R

(Note: RA- Relative abundance; OS- Observation Status; NI- Number of Individuals; VC- Very Common, C-Common, UC-Uncommon, Few- F; Se- Season, W-Winter, S- Summer and R- Rainy Season, Y- Year round; *** - Winter migrant Bird, **-Summer Migrant Bird, *- Passage Migrant).

This study found the highest number of species diversity in amphibians and birds, and the second highest in reptiles and mammals compared to any other recently studied area by different authors in different parts of Bangladesh (Table 2). So, these findings indicate that Kashipur Union, Barishal is enriched with different group of vertebrate wildlife species than any other rural area in outside protected areas of Bangladesh. The study period of others study was shorter than the present study, and this result also indicates that long term study helps to find more species from an area. Besides the seasonal data of wildlife was also collected from the study area in this study which also aided in discovering more species from the study area.

Table 2. Species diversity of vertebrate wildlife in different rural areas in Bangladesh (A-Amphibian, R-Reptiles, B- Birds, M- Mammals).

Location	**A**	**R**	**B**	**M**	**Reference**
Sreepur Upazila, Magura	8	13	84	18	Mandal *et al.* 2021
Kahimpur, Gazipur	6	14	72	18	Islam *et al.* 2018
Keshabpur, Jessore	8	15	105	**25**	Jaman *et al.* 2015
Char Land of Padma River, Rajshahi	5	**20**		**25**	Rahman *et al.* 2011
Pashukhali and Gajdhar village,Netrokona	-	-	101	-	Khan *et al.* 2014
Adjacent to the Dharala and Brahmaputra rivers in Kurigram	-	-	105	-	Khan and Nahar 2009
Charkishoreganj, Munshiganj	3	13	58	12	Chowdhury *et al.* 2007
Shoipara Beel of Mohanpur Upazilla, Rajshahi	-	-	96	-	Hasan *et al.* 2017
Chapadal, Shree Rampur *beel*, Mithapur, Paharpur, Jogodishpur, Kastogaree *beel* and Asranga of Joypurhat	-	-	89	-	Amin *et al.* 2020
Atrai, Raninagar and Naogan Sadar, Naogaon			105		Amin and Hasan 2019
Kashipur Union, Barishal	**15**	17	**141**	18	Present Study

Seasonal variation

Overall, the highest number of wildlife species (148 species) and population (n=1477) of wildlife was observed in the winter season. Diversity indices were also the highest during this period (H=4.699, Ds=0.989). Evenness was the highest in the summer season (E= 0.7652). Whereas the population and species richness of amphibians, reptiles and mammals was the highest in the rainy season. Rainy season is the breeding period of amphibians. Due to the shrinkage of terrestrial land during the flood, the sighting of terrestrial snakes is more in this season. Burrowing mammals also lost their living place during the rainy season. They became exposed to humans. The post summer and early rainy season is the fruiting period, (Jackfruit, Mango) at the home state forest. This creates an assemblage of some frugivore mammals (e.g., bat, civet) (Table 3). Due to the presence of winter migratory birds (24 species) in the study area, bird species diversity was the highest during winter (H=4.515, Ds=0.9869).

Table 3. Diversity indices in terms of seasons

	Season	SR	S%	A	A%	Ds	H	E
Amphibians	R	15	100	478	82.27	0.8768	2.324	0.6814
	S	4	26.66	90	15.49	0.6719	1.221	0.8476
	W	2	13.33	13	2.23	0.4734	0.6663	0.9735
Reptiles	R	12	70.58	47	40.86	0.8692	2.211	0.7605
	S	11	64.70	46	40	0.8422	2.068	0.7191
	W	6	35.29	22	19.13	0.7893	1.649	0.8668
Aves	R	87	61.70	926	28.53	0.9816	4.177	0.7494
	S	87	61.70	961	29.61	0.982	4.193	0.7609
	W	127	90.07	1387	42.74	0.9869	4.515	0.7196
Mammals	R	15	83.33	87	36.70	0.8635	2.31	0.6716
	S	12	66.66	79	33.33	0.8842	2.281	0.8157
	W	13	72.22	71	29.95	0.8939	2.374	0.826
Total	R	129	67.53	1538	36.81	0.9815	4.415	0.6411
	S	113	59.16	1163	27.83	0.9859	4.46	0.7652
	W	148	77.48	1477	35.35	0.989	4.699	0.742

Note- Shannon-Weiner Index (H); evenness (E); Simpson's Index (D_s); species richness (SR), Number of Individuals (A); Summer (S), Winter (W), Rainy (R).

Relative abundance, observation status and rank abundance curve

Among the total wildlife species, 82 (42.93%) species were very common, 20 (10.47%) common, 36 (18.32%) uncommon and 54 (28.27%) species were few (Table 1 and Fig. 3). Among amphibians, most of the species (58.82%) were very common, whereas most of the reptilians were rare (62.50%) (Fig. 3). Of the birds, most of the species were very common (38.87%), and the highest number of mammalian species was very common (43.16%), which were mainly dominated by rodents. This might be due to the high feeding and foraging opportunity at the household and market places of the rural area. It was noted that only two (13.33%) species of mammals were the most dominant species, which constituting 44.75% of total individuals, whereas three (20%) species were the least dominant, constituted only 1.54%. This signifies a highly uneven distribution of species in the community, which is explained in the rank abundance plot (Fig. 4 a).

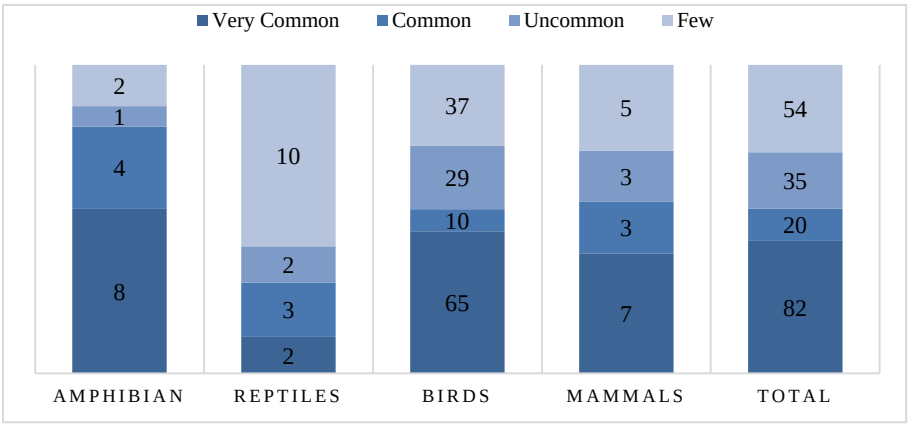

Fig. 3. Relative abundance of different groups of wildlife in the study area

Hemidactylus frenatus showed the highest relative abundance (22.60%) among all recorded reptilians and mostly occurs around human settlement area (Hasan *et al.* 2014). The population of reptiles showed highly uneven distribution of species in the community (Fig. 4 b). Most of the bird species of this study were passerines (n= 1966, 60.58%), perhaps due to the presence of suitable habitats, such as busy areas and cultivated lands those habitats are important sources of insect foods, grains and seeds (David 1999, Siddique *et al.* 2008). In the study area the mostly dominated 10 species of birds were constituted 26.16% population of total birds and less dominated 50 species constituted 4.09% of total bird population which indicates the distribution in the community of the study site is also uneven (Fig. 4 b).

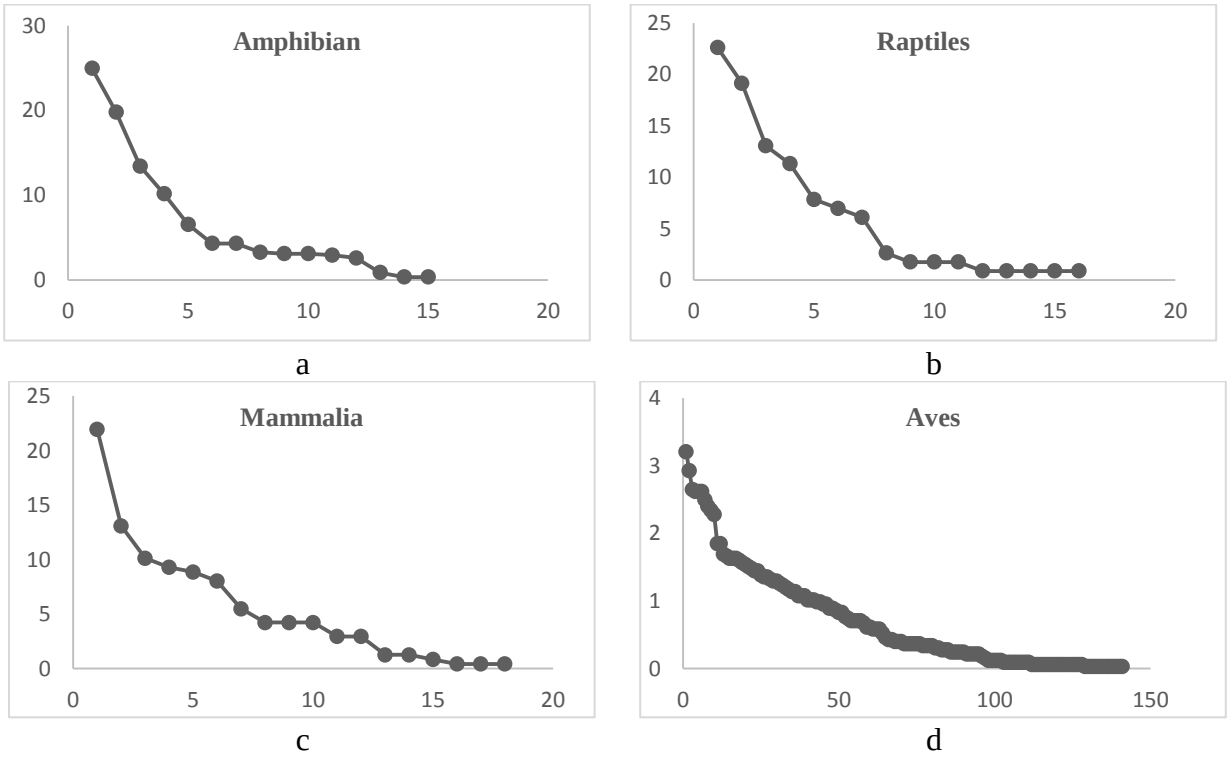

Fig. 4. Rank-abundance curves of the four groups of wildlife a. Amphibia; b. Reptilia; c. Aves; and d. Mammalia. The y-axis shows the relative abundance and the x-axis ranks the species in order of their abundance from the highest to the lowest.

Threatened status and conservation issue

Among the sighted wildlife, 183 (95.81%) species categorized under the Least Concern, 4 (2.09%) Near Threatened (*Varanus bengalensis, Ichthyophaga ichthyoetus, Felis chaus, Viverricula indica*), 2(1.04%) Vulnerable (*Varanus salvator, Threskiornis melanocephalus*), 1 (0.52%) Endangered (*Semnopithecus entellus*) and only one (0.52%) are not assessed (*Euphlyctis kalasgramensis*) according to IUCN Bangladesh (2015). People are not aware of the importance of wildlife and wildlife conservation in general. Misconception and superstition about wildlife are influencing to increase the human-wildlife conflict. In total 17 incidents were recorded on human-wildlife conflict, of them 12 (70.58%) conflict occurred with reptiles and in most of the cases, local people killed them on the spot, perticularly in rainy season (Table 4).

Table 4. List of wildlife killed by local people during human-wildlife conflict

Name of Species	NI	Season	Cause
Lycodon aulicus	1	Rainy	From fear on snake
Ptyas mucosa	3	Summer, Rainy	From fear on snake
Xenochrophis cerasogaster	4	Summer, Rainy, Winter	From fear on snake
Varanus salvator	2	Rainy	This species hunts poultry
Naja naja	1	Summer	From fear on snake
Varanus bengalensis	1	Summer	This species hunts poultry
Viverricula indica	1	Rainy	This species damage fruits in homestead garden
Herpestes auropunctatus	2	Summer	This species hunts poultry
Felis chaus	2	Winter	This species hunts poultry

The influence of snake charmers on local people is playing an important factor in this conflict by enforcement of believing on misconception and superstations. Nestlings and eggs of birds are sometimes captured and destroyed by local people, especially by the children. Three vagrant *Semnopithecus entellus* individuals were observed in the study area, and unfortunately, one was killed by local people for destroying the crops of them. Carnivore mammals are facing more existential crises in the study area and conflict of carnivore mammals with humans is frequently occurred in the study area. In total five human carnivore interactions were noted while these carnovores predates poultry chicks.

Hydrophylax leptoglossus

Euphlyctis cyanophlyctis

Fejervarya cancrivora

Fig. 5. Three amphibian spp. of the recording wildlife species from the studied field area.

For the first time this study provides the scenario of wildlife in the rural area of southern Bangladesh which will play an important role for taking future conservation initiative in rural area. The conservation of wildlife in rural area is important and this baseline data have provided the total

cenario of the study area. Extensive research work on wildlife is essential in the southern region of Bangladesh for conserving the wildlife of the study area. The Government authority should give emphasis on the conservatoin of wildlife of rural area. In addition to this, awareness campaign is essential especially in rural area for the protection of wildlife. Increasing homestate forest and native plants are necessary to increase the assamblage of rural wildlife. Finally, wildlife education at primary school level may play a vital role for the conservation of rural wildlife.

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