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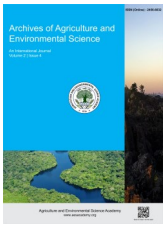

SHORT COMMUNICATION

A survey of Avifauna in aquatic habitat and their adjoining areas of Ramnagar, Uttarakhand, India

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ABSTRACT

The present study deals with the observation of avifauna in the aquatic habitat and their adjoining areas of Ramnagar, Uttarakhand, India. The present study was carried out from January 2020 to December 2020. We have recorded a total of 145 avian species belonging to the 54 families during the study period. Among this, a total of 113 residents and 32 winter visitor species were identified. The percentage of resident and winter visitor avian species was 78.08% and 21.91%. During the study period, we also reported the four avian species *viz*., River Lapwing, River tern, Great Hornbill, and Alexandrine Parakeet are under the Near Threatened (NT) category and one species, namely Red-headed vulture is critically endangered according to IUCN Red data book. Thus, the findings of this study suggest that the selected study area has avifauna diversity of utmost importance which should be conserved by implementing specific strategies.

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INTRODUCTION

Birds are one of the important groups of indicators of environmental health (Collar and Andrew, 1988). The Himalayan region supports the rich avifaunal diversity due to rich floral diversity at different altitudinal ranges (Mohan and Sondhi, 2017). Many previous studies have shown that 80 % of birds of the Indian Sub -continent found in the Himalayan region including some endemic species (Price *et al*., 2003). The Himalayan region is also known as a biological hotspot (Grimmett *et al*., 1998). Birds are good indicator species because they are ecologically versatile and thrive in all kinds of habitats as herbivores, carnivores, and omnivores. Their presence is an indication of a healthy ecosystem or habitat (Järvinen, O. and Väisänen, 1979; Jarvinen, 1983). The wetlands areas (Natural and manmade both) of Himalayan foothills provided a good habitat for long and short-distance migrants of the avian community (Saini *et al*., 2017). The Corbett Tiger Reserve and its adjoining area have different types of avian species (Bhattacharjee and Bargali, 2013). Due to the support of good food and habitat availability, approximately 40% of avian species found in India were recorded in the study area (Dhakate *et al*., 2008). The study area is listed as an important bird area (Islam and Rahmani, 2004). Many avian species migrate from a short to a very long distance every year while other species are non-migratory and spend their life cycle in a particular area (Arya *et al*., 2019). Our study area hosts many types of resident and migratory species. Most of the migratory birds perform the migration activity to migrate in the Indian sub-continent through Central Asian flyways such as Bar -Headed goose (Bhatt *et al*., 2015).

Considering the importance of avifauna in Uttarakhand, India, previously, no study has been done for assessing the avifauna survey in aquatic habitat and their adjoining areas of Ramnagar. Therefore, keeping the presence of important species in view in the study area efforts towards conservation of these species are needed. The present study was an observation attempt on avian species in and around the Ramnagar and their adjoining areas to make a new record of avian species.

Figure 1. *Showing the study area. 1. Tumria Dam B. Haripura Jalashaya. 3. Forest area of Ramnagar.*

MATERIALS AND METHODS

Study area

The present study was conducted from January 2020 to February 2020. The study was carried out in and around aquatic habitat i.e. Tumria Dam (29°19'33.2"N 78°55'57.2"E) and Haripura Jalashaya (29°07'48.0"N 79°18'52.2"E) of Ramnagar and their adjoining forest areas i.e. Corbett Tiger Reserve forest, Pawalgarh forest and Syat forest (Figure 1). The Tumria dam and Haripura Jalashaya mainly serves for irrigation purpose and fish farming. These aquatic areas are attached with many agricultural patches that attract many migratory aquatic and terrestrial birds. The forest area of Ramnagar i.e. Kyari Village forest (29°22'N; 79°11'E), Pawalgarh forest (29°21'48.3"N; 79° 11'08.5"E) and Syat forest (29°23'31.7"N; 79°20'21.0"E) are characterized by dance forest diversity and Sal (*Shorea robusta*) is a dominant forest species in all these forest areas. These forest areas are not only rich in wild animals but also the richest habitat for avian fauna.

Field survey and data collection

The field survey was conducted in and around the aquatic habitat and their adjoining forest areas from January 2020 to February 2020. The field survey was carried out by using a field binocular and Nikon point shoot camera. Identification of birds in the field was based on Grimmett *et al.* (1998). Birds are classified based on their preferred habitat by direct observation and with help of field guide books (Ali *et al.*, 1987; Grimmett *et al.*, 1998; Grimmett *et al.*, 2016). During the field, survey birds were counted by two standards methods i.e. line transect method and point count method. The survey was made from 6:00 am to 10:00 am and evening from 5:00 pm to 7:00 pm excluding rains.

RESULTS AND DISCUSSION

In the present study, we recorded a total of 145 avian species belonging to the 54 families during the study period (Table 1). Among these 113 residents and 32 winter visitor species were identified (Figure 2). The percentage of resident and winter visitor avian species was found to be 78.08% and 21.91%, respectively. The maximum number of species recorded from the family Muscicapidae (15) followed by Anatidae (10), Picidae (6). Out of these four families were recorded with 5 species each, seven families with 4 species each, Eight families with 3 species each, and thirteen families with 2 species each. The remaining Twenty families were recorded with 1 species from each family (Figure 3). These 146 species were recorded in a session. Variations in the vegetation structure have also impacted species distribution (MacArthur *et al*., 1962). Habitat quality and food availability are important factors to support the avian diversity in this particular area. Out of these 146 species, 68 insectivorous, 25 omnivorous, 24 Carnivorous, 17 Frugivorous, 10 Granivorous, and 2 Nectarivorous species were recorded according to their feeding habit (Figure 4). We recorded the maximum number of insectivorous species indicating that a particular area has a large diversity of insect species. This study showed that among the avian species, four species *viz*., River Lapwing, River tern, Great Hornbill, and Alexandrine Parakeet are under the Near Threatened (NT) category and one species namely Red-headed vulture is critically endangered according to IUCN Red data book. Vultures as scavengers have an important ecological role by maintaining equilibrium in the ecosystem. They remove animal waste like carcasses of livestock and wild animals and carrion from the environment (Singh and Bisht, 2019). The presence of globally threatened Red-headed vulture in the particular area indicates the significant habitat for this species. Some previous studies (Tanveer *et al*., 2019, Ahmed *et al*., 2019, Ghosh, *et al*., 2018, Bhattacharjee and Bargali, 2013) also indicated that aquatic habitats are best for residential as well as visiting avifauna species.

Table 1. Avian species as recorded during the study period in the different habitats of Ramnagar, Uttarakhand.

Family	Common Name	Scientific Name	Status	Status (IUCN)	Preferred Habitat	Food Guild
Accipitridae	Black Kite	*Milvus migrans*	R	LC	Forest	Carnivorous
	Red-headed Vulture	*Sarcogyps calvus*	R	CR	Forest	Carnivorous
	Crested Serpent Eagle	*Spilornis cheela*	R	LC	Forest	Carnivorous
	Changeable Hawk Eagle	*Spizaetus cirrhatus*	R	LC	Forest	Carnivorous
Alcedinidae	Common kingfisher	*Alcedo atthis*	R	LC	Forest	Carnivorous
	Crested Kingfisher	*Megaceryle lugubris*	R	LC	Forest	Carnivorous
	Pied Kingfisher	*Ceryle rudis*	R	LC	Forest	Carnivorous
Anatidae	Common Merganser	*Mergus merganser*	WV	LC	Wetland	Omnivorous
	Eurasian Teal	*Anas crecca*	WV	LC	Wetland	Omnivorous
	Gadwall	*Anas Strepera*	WV	LC	Wetland	Omnivorous
	Mallard	*Anas platyrhynchos*	WV	LC	Wetland	Omnivorous
	Northern Pintail	*Anas acuta*	WV	LC	Wetland	Omnivorous
	Red-crested Pochard	*Netta rufina*	WV	LC	Wetland	Omnivorous
	Ruddy Shelduck	*Tadorna ferruginea*	WV	LC	Wetland	Omnivorous
	Tufted Duck	*Aythya fuligula*	WV	LC	Wetland	Omnivorous
	Indian Spot-billed Duck	*Anas poecilorhyncha*	WV	LC	Wetland	Omnivorous
	Bar-headed Goose	*Anser indicus*	WV	LC	Wetland	Omnivorous
Anhingidae	Darter	*Anhinga melanogaster*	R	LC	Wetland	Carnivorous
Ardeidae	Great Egret	*Casmerodius albus*	R	LC	Wetland	Carnivorous
	Indian Pond Heron	*Ardeola grayii*	R	LC	Wetland	Carnivorous
	Little Egret	*Egretta garzetta*	R	LC	Wetland	Carnivorous
	Black-crowned Night Heron	*Nycticorax nycticorax*	WV	LC	Wetland	Omnivorous
	Cattle egret	*Bubulcus ibis*	R	LC	Agriculture	Insectivorous
Bucerotidae	Indian Grey Hornbill	*Ocyceros birostris*	R	LC	Forest	Frugivorous
	Oriental Pied Hornbill	*Anthracoceros albirostris*	R	LC	Forest	Frugivorous
	Great Hornbill	*Buceros bicornis*	R	NT	Forest	Frugivorous

Table 1. *Contd...*

Campephagidae	Scarlet Minivet	*Pericrocotus flammeus*	R	LC	Forest	Insectivorous
	Small Minivet	*Pericrocotus cinnamomeus*	R	LC	Forest	Insectivorous
	Common Woodshrike	*Tephrodornis pondicerianus*	R	LC	Forest	Insectivorous
	Large Cuckooshrike	*Corcina macei*	R	LC	Forest	Insectivorous
Certhiidae	Bar-tailed Tree- creeper	*Certhia himalayana*	WV	LC	Forest	Insectivorous
Cettiidae	Chestnut-headed Tesia	*Tesia castaneocoronata*	R	LC	Forest	Insectivorous
Charadriidae	Red-wattled Lapwing	*Vanellus indicus*	R	LC	Agriculture	Insectivorous
	River Lapwing	*Vanellus duvaucelii*	R	NT	Wetland	Omnivorous
Cisticolidae	Ashy Prinia	*Prinia socialis*	R	LC	Scrub	Insectivorous
	Zitting Cisticola	*Cisticola juncidis*	R	LC	Forest	Insectivorous
	Striated Prinia	*Prinia criniger*	R	LC	Forest	Insectivorous
	Common Tailorbird	*Orthotomus sutorius*	R	LC	Forest	Insectivorous
Columbidae	Rock Pigeon	*Columba livia*	R	LC	Forest	Granivorous
	Spotted Dove	*Streptopelia chinensis*	R	LC	Forest	Granivorous
	Emerald Dove	*Chalcophaps indica*	R	LC	Forest	Granivorous
	Eurasian collared dove	*Streptopelia decaocto*	R	LC	Forest	Granivorous
	Oriental turtle dove	*Streptopelia orientalis*	R	LC	Forest	Granivorous
Coraciidae	Indian Roller	*Coracias benghalensis*	R	LC	Forest	Carnivorous
Corvidae	Rufous Treepie	*Dendrocitta vagabunda*	R	LC	Forest	Frugivorous
	Common Green Magpie	*Cissa chinensis*	R	LC	Forest	Carnivorous
	Red-billed Blue Magpie	*Urocissa erythrorhyncha*	R	LC	Forest	Carnivorous
	Large-billed Crow	*Corvus macrorhynchos*	R	LC	Forest	Carnivorous
	Grey Treepie	*Dendrocitta formosae*	R	LC	Forest	Frugivorous
Cuculidae	Greater Coucal	*Centropus sinensis*	R	LC	Forest	Omnivorous
Dicruridae	Black Drongo	*Dicrurus macrocercus*	R	LC	Forest	Insectivorous
	Bronzed Drongo	*Dicrurus aeneus*	R	LC	Forest	Insectivorous
	Spangled Drongo	*Dicrurus hottentottus*	R	LC	Forest	Insectivorous
	Ashy Drongo	*Dicrurus leucophaeus*	WV	LC	Forest	Insectivorous
Emberizidae	Crested Bunting	*Melophus lathami*	W/S	LC	Forest	Insectivorous
Estrildidae	Scaly-breasted Munia	*Lonchura punctulata*	R	LC	Forest	Granivorous
Falcinidae	Collared Falconet	*Microhierax caerulescens*	WV	LC	Forest	Carnivorous
Halcyonidae	White-throated Kingfisher	*Halcyon smyrnensis*	R	LC	Riverine	Carnivorous
	Stork-billed Kingfisher	*Halcyon capensis*	R	LC	Riverine	Carnivorous
Hirundinidae	Barn Swallow	*Hirundo rustica*	WV	LC	Riverine	Insectivorous
Ibidorhynchidae	Ibis Bill	*Lbidorhyncha struthersii*	R	LC	Riverine	Carnivorous
Lanniidae	Long-tailed Shrike	*Lanius Schach*	R	LC	Scrub	Omnivorous
Leiothrichidae	White-crested Laughing Thrush	*Garrulax leucolphus*	R	LC	Forest	Insectivorous
	Jungle Babbler	*Turdoides striatus*	R	LC	Forest	Insectivorous
Laridae	Pallas's Gull	*Ichthyaetus ichthyaetus*	WV	LC	Wetland	Omnivorous
	Black-headed gull	*Chroicocephalus ridibundus*	WV	LC	Wetland	Omnivorous
	Brown headed gull	*Chroicocephalus brunnicephalus*	WV	LC	Wetland	Omnivorous
	River tern	*Sterna aurantia*	WV	NT	Wetland	Omnivorous

Table 1. *Contd...*

Megalaimidae	Coppersmith Barbet	*Megalaima haemacephala*	R	LC	Forest	Frugivorous
	Brown-headed Barbet	*Megalaima zeylanica*	R	LC	Forest	Frugivorous
	Blue-throated Barbet	*Megalaima asiatica*	R	LC	Forest	Frugivorous
Meropidae	Green Bee-eater	*Merops orientalis*	R	LC	Forest	Insectivorous
	Blue-bearded Bee-eater	*Nyctyornis athertoni*	R	LC	Forest	Insectivorous
Motacillidae	White-browed Wagtail	*Motacilla maderaspatensis*	R	LC	Riverine	Insectivorous
	Yellow Wagtail	*Motacilla flava*	WV	LC	Riverine	Insectivorous
	Grey Wagtail	*Motacilla cinerea*	WV	LC	Riverine	Insectivorous
	White Wagtail	*Motacilla alba*	WV	LC	Riverine	Insectivorous
Muscicapidae	Blue Whistling Thrush	*Myophonus caeruleus*	R	LC	Scrub	Insectivorous
	White-rumped Shama	*Copsychus malabaricus*	R	LC	Scrub	Insectivorous
	Indian Robin	*Saxicoloides fulicata*	R	LC	Scrub	Insectivorous
	White-capped Water Redstart	*Chaimarrornis leucocephalus*	R	LC	Riverine	Insectivorous
	Plumbeous Water Redstart	*Rhyacornis fuliginosus*	R	LC	Riverine	Insectivorous
	Blue-fronted Redstart	*Phoenicurus frontalis*	WV	LC	Riverine	Insectivorous
	Oriental Magpie Robin	*Copsychus saularis*	R	LC	Forest	Insectivorous
	Grey Bushchat	*Saxicol ferrer*	R	LC	Scrub	Insectivorous
	Pied Bushchat	*Saxicola caprata*	R	LC	Scrub	Insectivorous
	White-tailed Rubythroat	*Luscinia pectoralis*	WV	LC	Forest	Insectivorous
	Rufous-bellied Niltava	*Niltava sundara*	R	LC	Forest	Insectivorous
	Rufous-gorgeted Flycatcher	*Ficedula strophiata*	R	LC	Forest	Insectivorous
	Blue Rock Thrush	*Monticola Solitarius*	WV	LC	Forest	Insectivorous
	Small Niltava	*Niltava macgrigoriae*	WV	LC	Forest	Insectivorous
	Slaty-blue Flycatcher	*Ficedula tricolor*	W/S	LC	Forest	Insectivorous
Nectariniidae	Purple Sunbird	*Nectarinia asiatica*	R	LC	Scrub	Nectarivorous
	Crimson sunbird	*Aethopyga siparaja*	R	LC	Scrub	Nectarivorous
Oriolini	Maroon Oriole	*Oriolus traillii*	R	LC	Forest	Omnivorous
	Black-hooded Oriole	*Oriolus xanthornus*	R	LC	Forest	Omnivorous
Paridae	Great tit	*Parus major*	R	LC	Forest	Insectivorous
Passeridae	House Sparrow	*Passer domesticus*	R	LC	Human habitation	Granivorous
Pellorneidae	Puff-throated Babbler	*Pellorneum ruficeps*	R	LC	Forest	Insectivorous
Phalacrocoracidae	Little Cormorant	*Phalacrocorax niger*	R	LC	Wetland	Carnivorous
	Great Cormorant	*Phalacrocorax carbo*	R	LC	Wetland	Carnivorous
Phasianidae	Gray Francolin	*Francolinus pondicerianus*	R	LC	Forest	Omnivorous
	Red Jungle Fowl	*Gallus gallus*	R	LC	Forest	Omnivorous
	Kalij Pheasant	*Lophura leucomelanos*	R	LC	Forest	Omnivorous
	Indian Peafowl	*Pavo cristatus*	R	LC	Forest	Omnivorous
Phylloscopidae	Grey-hooded Warbler	*Seicercus xanthoschistos*	R	LC	Forest	Insectivorous
	Hume's Warbler	*Phylloscopus humei*	WV	LC	Forest	Insectivorous
	Golden-spectacled Warbler	*Seicercus burkii*	R	LC	Forest	Insectivorous
Picidae	Grey-headed Woodpecker	*Picus canus*	R	LC	Forest	Insectivorous
	Greater Flameback	*Chrysocolaptes lucidus*	R	LC	Forest	Insectivorous
	Greater Yellownape	*Picus flavinucha*	R	LC	Forest	Insectivorous
	Black-rumped Flameback	*Dinopium benghalense*	R	LC	Forest	Insectivorous
	Grey-capped Pygmy Woodpecker	*Dendrocopos canicapillus*	R	LC	Forest	Insectivorous
	Streak-throated Woodpecker	*Picus xanthopygaeus*	R	LC	Forest	Insectivorous

Table 1. *Contd...*

Psittaculidae	Rose-ringed Parakeet	*Psittacula krameri*	R	LC	Forest	Frugivorous
	Plum-headed Parakeet	*Psittacula cyanocephala*	R	LC	Forest	Frugivorous
	Alexandrine Parakeet	*Psittacula eupatria*	R	NT	Forest	Frugivorous
	Slaty headed Parakeet	*Psittacula himalayana*	R	LC	Forest	Frugivorous
Pycnonotidae	Ashy Bulbul	*Hemixos flavala*	R	LC	Forest	Frugivorous
	Himalayan Bulbul	*Pycnonotus leucogenys*	R	LC	Forest	Frugivorous
	Red-vented Bulbul	*Pycnonotus cafer*	R	LC	Forest	Frugivorous
	Black-crested Bulbul	*Pycnonotus melanicterus*	R	LC	Forest	Frugivorous
	Red-whiskered bulbul	*Pycnonotus jocosus*	R	LC	Scrub	Frugivorous
Rallidae	White-breasted Waterhen	*Amaurornis phoenicurus*	R	LC	Forest	Omnivorous
Rhipiduridae	White-browed Fantail	*Rhipidura aureola*	R	LC	Forest	Insectivorous
	White-throated fantail	*Rhipidura albicollis*	R	LC	Forest	Insectivorous
Saxicolinae	Brown rockchat	*Cercomela fusca*	R	LC	Forest	Insectivorous
	Common Stonechat	*Saxicola torquata*	WV	LC	Forest	Insectivorous
Scolopacidae	Common Sandpiper	*Actitis hypoleucos*	WV	LC	Riverine	Insectivorous
Sittidae	Chestnut-bellied Nuthatch	*Sitta castanea*	R	LC	Forest	Insectivorous
	Velvet-fronted Nuthatch	*Sitta frontalis*	R	LC	Forest	Insectivorous
	White-tailed Nuthatch	*Sitta leucopsis*	R	LC	Forest	Insectivorous
Stenostiridae	Grey-headed Canary Flycatcher	*Culicicapa ceylonensis*	WV	LC	Forest	Insectivorous
	Yellow-bellied Fantail	*Rhipidura hypoxantha*	WV	LC	Forest	Insectivorous
Strigidae	Brown Fish Owl	*Ketupa zeylonensis*	R	LC	Forest	Carnivorous
	Spotted Owlet	*Athene brama*	R	LC	Forest	Carnivorous
	Jungle Owlet	*Glaucidium radiatum*	R	LC	Forest	Carnivorous
Sturnidae	Common Myna	*Acridotheres tristis*	R	LC	Human habitation	Granivorous
	Bank myna	*Acridotheres ginginianus*	R	LC	Human habitation	Granivorous
	Asian Pied Starling	*Sturnus vulgaris*	R	LC	Human habitation	Granivorous
Tephrodornithidae	Bar-winged Flycatcher-shrike	*Hemipus picatus*	R	LC	Forest	Insectivorous
Threskiornithidae	Red-naped ibis	*Pseudibis papillosa*	R	LC	Agriculture	Insectivorous
Tichodormadidae	Wall Creeper	*Tichodroma muraria*	WV	LC	Forest	Insectivorous
Timaliidae	Black-chinned Babbler	*Stachyris pyrrhops*	R	LC	Forest	Insectivorous
Upupidae	Common Hoopoe	*Upupa epops*	R	LC	Forest	Insectivorous
Zosteropidae	Oriental White-eye	*Zosterops palpebrosus*	R	LC	Forest	Insectivorous

Avian community structure as per habitat

The aquatic habitat adjoined with forest, shrub, and agricultural patches attracts more numbers of avian species due to good sources of food and nesting shelters (Singh *et al.*, 2019). During this study period, we were able to make observations in different habitats (Figure 2-4). We tried to understand the habitat structure of avifauna in this particular area. Out of 146 species, 95 species were recorded in forest habitat, 22 species were recorded in wetland areas, and 12 species were recorded in riverine areas, 10 species were recorded in scrub type's habitat. We also observed 3 species in and around the agricultural land. Some avian species prefer to stay around the human habitation. We also recorded the four species around human habitation (Figure 5). Maximum numbers of forest birds were recorded to indicate the rich diversity of the forest in this area. Some of the photographs of bird species observed at study sites are given in Figure 6. Thus, we found that the biodiversity of birds was significantly affected by the type of habitat as revealed from our findings. Also, Tanveer *et al.* (2019) found that aquatic habitats having high nourishment resources may support the higher bird diversity in particular areas.

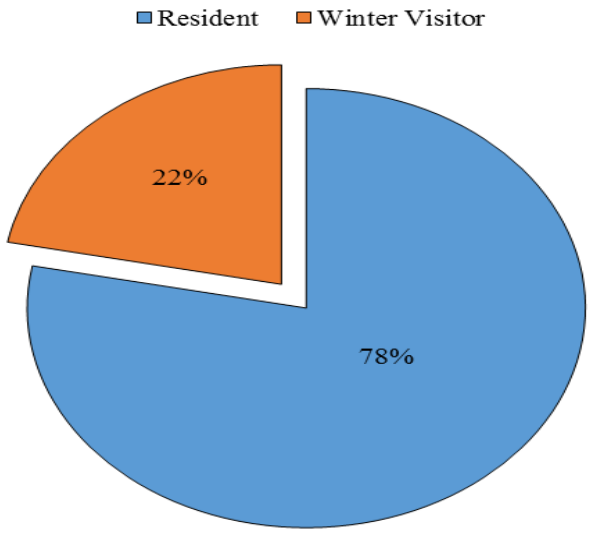

Figure 2. *Migratory and Resident avian species recorded during the study period.*

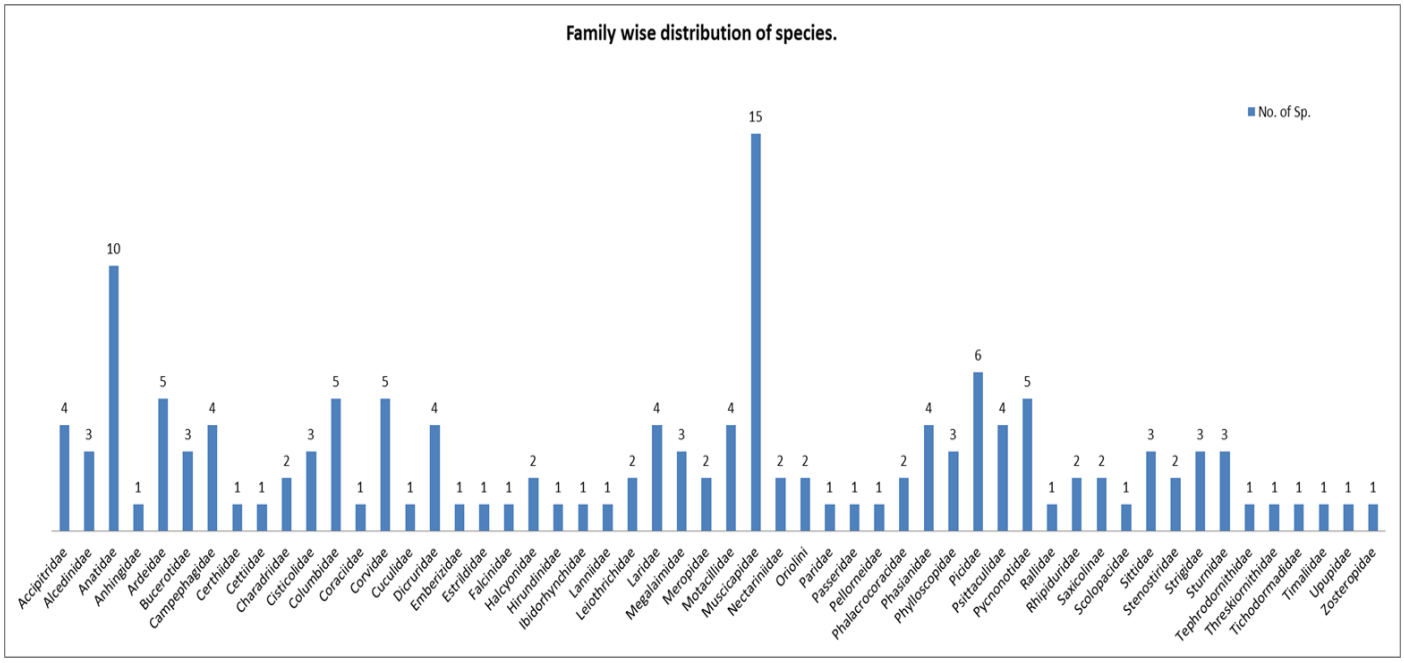

Figure 3. *Family-wise diversity of birds recorded during the study period.*

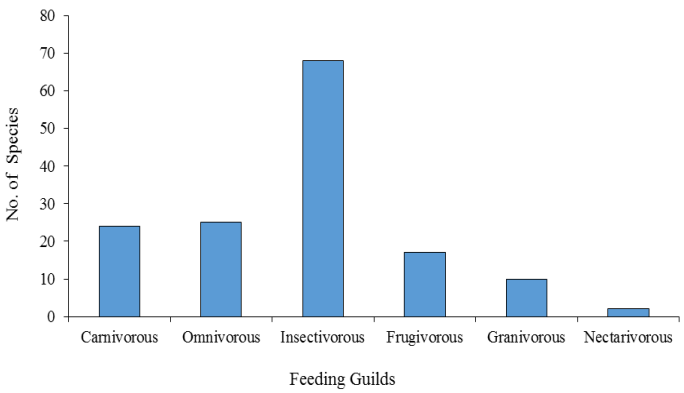

Figure 4. *Avian community structure as per different feeding Habitat of the study area.*

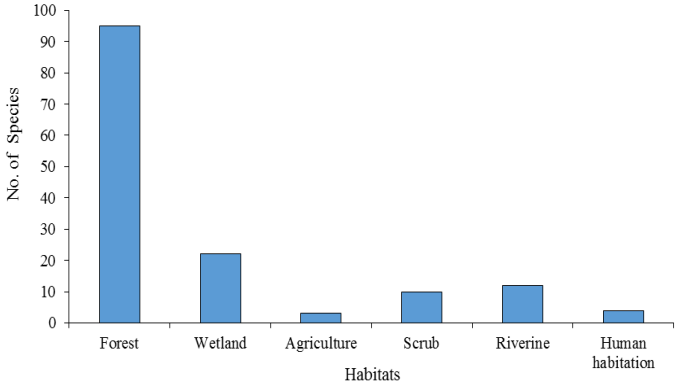

Figure 5. *Avifauna diversity classified based on different habitats of the study area.*

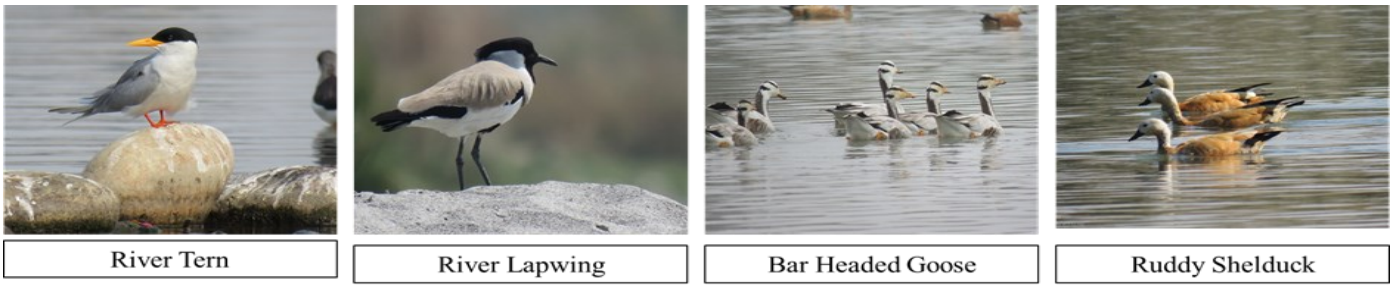

Figure 6. *Photographs of some bird species captured at study sites.*

Conclusion

From the findings of this study, we concluded that nearly 146 avian species were recorded in only two months, indicating high avian diversity in the study area. We recorded the maximum number of insectivorous avian species as a sign of the rich insect diversity in particular areas. We found the maximum number of forest birds to indicate the wide variety of forests found in particular areas. The presence of four near threatened (NT) and one critically endangered species makes it a vital area for biological diversity conservation. Thus, the findings of this study suggest implementing effective measures for conserving the residing bird species in the affected areas.

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