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Research Journal of Agricultural Sciences
An International Journal

P- ISSN: 0976-1675
E- ISSN: 2249-4538

Volume: 12
Issue: 06

Res. Jr. of Agril. Sci. (2021) 12: 2212–2217

CARAS

Res. Jr. of Agril. Sci. (Nov-Dec 2021) 12(6): 2212–2217
www.rjas.org

Full Length Research Article

Avifaunal Diversity in and Around Crop Fields in Taki, Hasnabad Area in West Bengal, India

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Received: 31 Aug 2021 | Revised accepted: 18 Nov 2021 | Published online: 13 Dec 2021
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ABSTRACT

Birds are considered to be very good bioindicator species as they react very promptly to minor changes in environment and hence assessment of bird diversity could be considered as an impressive indicator of ecological health of a region. This study was made in and around the crop fields of Taki, Hasnabad region of North 24 Parganas district in West Bengal, India keeping in mind the mutualistic relationship between the flora and faunal species. The point diversity estimation method was followed for a year, thrice a month in morning and evening sessions. The study revealed 40 bird species belonging to 23 families with a high value of diversity indices in the region. The birds were also classified into fairly common, common and scarce on the basis of their relative abundance in the region. Out of 40 species encountered, only 3 species were found to be resident migrants and rest as residents indicating availability of ample food and shelter in this region. The high diversity is an indicator of sound ecological health and resilience of the system. However, the increasing use of harmful agricultural chemicals, anthropogenic stress and pollution could negatively affect this precious bird population in future.

***Key words*:** Crop field, Bird diversity, Diversity estimators, Relative abundance, Ecology

Biodiversity is the variety within and among life forms on a site, ecosystem, or landscape. It is a measure that combines richness and evenness across species and high biodiversity is perceived to be synonymous with ecosystem health. In general, higher diversity can be correlated with increased stability, increased productivity, and resistance to invasion and other disturbances. Local diversity is associated with the regional species richness and can be influenced by microclimate, habitat structure, habitat heterogeneity, fertility and biotic interactions [1]. Every species are potential sources of genetic variations and plays a unique role in an ecosystem. Every species is dependent on other species in the same habitat for resources like food, shelter etc. and hence, diversity is essential for proper functioning of the ecosystem. The loss of a single species can deeply influence ecosystem as a whole.

Birds are no exception. Birds play a very important role in maintenance of the local ecosystem. Ornithological research has established that native birds interacting with the flora in an ecosystem have a mutualistic relationship. While the bird receives nectar or fruit from the tree it visits, the tree benefits by having another organism carrying out the process of pollination or seed dispersal. The insectivorous birds help in biological control of pest population in crop fields. There are approximately 10966 extant bird species recorded throughout the world [2], out of which Indian subcontinent supports 1313 (approx. 13%) species [3]. Birds could be considered as effective "bio-indicator" species as they are very sensitive to environmental changes [4] and because of their high mobility, could rapidly change their habitats [5-6] making it very good sentinel species for bioassessment of habitats. As a result of climate change and enhanced anthropogenic stresses, the global diversity of birds has been decreasing in recent years. 1375 bird species are considered to be threatened with extinction globally out of which 84 species are from Indian subcontinent [7]. The threat is even more pronounced on the farmland bird species, who have undergone drastic reduction in number all over the world [8].

Many studies were conducted in West Bengal, India to assess avifaunal diversity in different habitats ranging from forests, seaside, wetlands etc. [9-15]. However, there was hardly any study found in the crop fields of Taki, Hasnabad region of West Bengal, India. This study endeavours to gather information on community structure, diversity and abundance of indigenous bird species in and around crop fields of Taki, Hasnabad area in North 24 Parganas district in West Bengal (Fig 1), India keeping in mind the mutualistic relationship of avifauna with the floral species present.

MATERIALS AND METHODS

Taki (22˚35'13" N; 88˚54'56" E), Hasnabad (22° 34'

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16”N; 88˚54’48”E) is located at the bank of the Ichhamati river at North 24 Parganas district (Fig 1). It is a part of the Ichhamati - Raimangal plain, located at the lower Ganges delta. Numerous creeks and rivers crisscross the area and is very close to Indian Sundarbans. It has an average elevation of 5 - 7 meters. The nature of soil is found to be mature black or brownish loam to recent alluvium. Most of the crop fields are cultivated thrice a year and provides livelihood to a large rural population. Main crops of the region are paddy, jute, mustard and different types of seasonal vegetables. The region harbours a large rural population amidst small pockets of densely populated semi urban landscape. The area is prone to natural calamities, like cyclones, thunderstorms, with occasional hail and floods. The area is a popular tourist spot and very close to the international border with neighbouring Bangladesh.

Fig 1 Location map of Taki, Hasnabad region in North 24 Parganas district in West Bengal, India

Sampling: The crop fields and adjacent areas of Taki, Hasnabad were surveyed for the period of one year (March, 2019 to February, 2020). A monthly census was done in order to assess residing status and occurrence of bird species on the basis of sightings during study period. The Point survey method was adopted and conducted in two sessions: between 7am to 10am and 4pm to 6pm to note abundance of the bird species. Birds were censused thrice a month [16-17] through naked eyes and with the aid of binocular and photography was carried out with SONY ALPHA a6300 DSLR camera as and when possible. Birds were counted at their point of first detection and care was taken to ensure that same bird was not counted again. The birds were identified by referring the classical literatures and field guide books [3, 18-19]. Residential status of bird species like resident, resident migrant has been assigned strictly with reference to the study area. IUCN status of the bird species was noted as per [20].

Data Analysis: Residential status of different bird species like Resident (R), Resident-Migrant (RM) and Migrant (M) were given strictly on the basis of occurrence and sightings during study period [21]. Occurrence status was worked out as common (above 3), fairly common (1-3) and scarce (0-less than 1) on the basis of relative abundance [21]. Bird diversity were assessed with Shannon-Weaver index (H') [22], Species evenness or equitability (J) [23], Dominance index (D) [24], Species richness [25].

RESULTS AND DISCUSSION

Conservation of global biodiversity has become the need of the hour as the globe is passing through the phase of third mass extinction [26-27]. Biodiversity estimation applying short span studies are becoming more popular and in this regard preparation of checklists of birds on a wider scale has been given much importance [28-29]. Out of 10,966 extant assessed bird species, approximately 10% are already endangered [2]. In this scenario, conservation and assessment of biodiversity of this beautiful feather clad vertebrates have become extremely important. Birds occupy almost all habitat types and diversity of birds often serves as a good indicator of overall diversity of a given area [30]. The present short span study recorded 40 bird species belonging to 23 families (Table 1) and reflects a moderately healthy overall biodiversity in and around the crop fields in Taki, Hasnabad, North 24 Parganas, West Bengal, India.

Corvidae was found to be the most dominant family with 3 species (Fig 2) and highest number of birds encountered (17.63%). Aredeidae (6.58%) and Passaridae (6.71%) were the next dominant families with 3 and 2 species respectively. Cuculidae, Megalaimidae and Muscicapidae also had 3 representative species. Apart from these, Alcedinidae, Columbidae, Laniidae, Oriolidae, Phalacrocoracidae, Pycnonotidae had 2 representative species. Rest of the 11 families were represented by a single species. Families Alcedinidae (5.67%), Megalaimidae (5.55%), Sturnidae (5.5%), Cuculidae (5.42%), Muscicapidae (5.25%), Oriolidae (5.16%) and Columbidae (5.16%) are represented by over 5% of total avifauna found in this study. These were followed by Sylvidae (4.04%), Pyconotidae (3.96%), Laniodae (3.7%), Meropidae (2.88%), Dicruridae (2.71%), Psittaculidae (2.49%), Picidae (2.32%), Nectariniidae (2.32%), Phalacrocoracidae (1.16%) and Accipitridae (1.07%) having considerable share of bird diversity found in this region. However, birds belonging to Jacanidae (0.99%), Strigidae (0.6%) and Cisticolidae (0.52%) were rare. All the birds found in this area were found to belong to Least Concerned (LC) category in IUCN list.

Table 1 Checklist of birds with their residential status, IUCN status and occurrence based on relative abundance of bird species encountered at the course of study (R- resident; RM- Resident migrant, LC – Least Concerned)

S.No.	Family	Scientific name	Common name	Residential status	IUCN status	Occurrence
1	Accipitridae	*Milvus migrans*	Black Kite	R	LC	Fairly common
2	Alcedinidae	*Alcedo atthis*	Common Kingfisher	R	LC	Fairly common
3	Alcedinidae	*Halcyon smyrnensis*	White Breasted Kingfisher	R	LC	Common
4	Ardeidae	*Egretta garzetta*	Little Egret	RM	LC	Fairly common
5	Ardeidae	*Ardeola grayii*	Indian Pond Heron	R	LC	Common
6	Ardeidae	*Bubulcus ibis*	Cattle Egret	R	LC	Fairly common
7	Cisticolidae	*Orthotomus sutorius*	Common Tailor Bird	R	LC	Scarce
8	Columbidae	*Columba livia*	Blue Rock Pigeon	R	LC	Fairly common
9	Columbidae	*Spilopelia chinensis*	Spotted Dove	R	LC	Fairly common
10	Corvidae	*Corvus splendens*	House Crow	R	LC	Common
11	Corvidae	*Corvus macrorhynchous*	Jungle Crow	R	LC	Common
12	Corvidae	*Dendrocitta vagabunda*	Rufous Treepie	R	LC	Fairly common
13	Cuculidae	*Cuculus micropterus*	Indian Cuckoo	R	LC	Fairly common
14	Cuculidae	*Centropus sinensis*	Greater Coucal	R	LC	Fairly common
15	Cuculidae	*Eudynamys scolopaceus*	Asian Koel	R	LC	Fairly common
16	Dicruridae	*Dicrurus macrocercus*	Black Drongo	R	LC	Fairly common
17	Jacanidae	*Metopidius indicus*	Bronze winged jacana	R	LC	Scarce
18	Laniidae	*Lanius cristatus*	Brown shrike	M	LC	Fairly common
19	Laniidae	*Lanius schach*	Long Tailed Shrike	RM	LC	Fairly common
20	Megalaimidae	*Megalaima lineata*	Lineated Barbet	R	LC	Fairly common
21	Megalaimidae	*Megalaima asiatica*	Blue Throated Barbet	R	LC	Fairly common
22	Megalaimidae	*Megalaima haemacephala*	Coppersmith Barbet	R	LC	Scarce
23	Meropidae	*Merops orientalis*	Green Bee-Eater	R	LC	Fairly common
24	Muscicapidae	*Saxicolodies fulicatus*	Indian Robin	R	LC	Scarce
25	Muscicapidae	*Copsychus saularis*	Oriental magpie robin	R	LC	Fairly common
26	Muscicapidae	*Copsychus malabaricus*	White rumped shama	R	LC	Fairly common
27	Nectariniidae	*Nectarinia asiatica*	Purple Sunbird	R	LC	Fairly common
28	Oriolidae	*Oriolus kundoo*	Indian Golden Oriole	R	LC	Fairly common
29	Oriolidae	*Oriolus xanthornus*	Black-Hooded Oriole	R	LC	Fairly common
30	Ploceidae	*Ploceus philippinus*	Baya Weaver	R	LC	Fairly common
31	Passeridae	*Passer domesticus*	House Sparrow	R	LC	Common
32	Phalacrocoracidae	*Phalacrocorax niger*	Little Cormorant	R	LC	Scarce
33	Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	RM	LC	Scarce
34	Picidae	*Dinopium javanense*	Common Flameback	R	LC	Fairly common
35	Psittaculidae	*Psittacula krameri*	Rose ringed Parakeet	R	LC	Fairly common
36	Pycnonotidae	*Pycnonotus jocosus*	Red-Whiskered Bulbul	R	LC	Fairly common
37	Pycnonotidae	*Pycnonotus cafer*	Red-Vented Bulbul	R	LC	Common
38	Sturnidae	*Acridotheres tristis*	Common Myna	R	LC	Common
39	Sylviidae	*Turdoides striat*	Jungle Babbler	R	LC	Common
40	Strigidae	*Athene brama*	Spotted Owlet	R	LC	Scarce

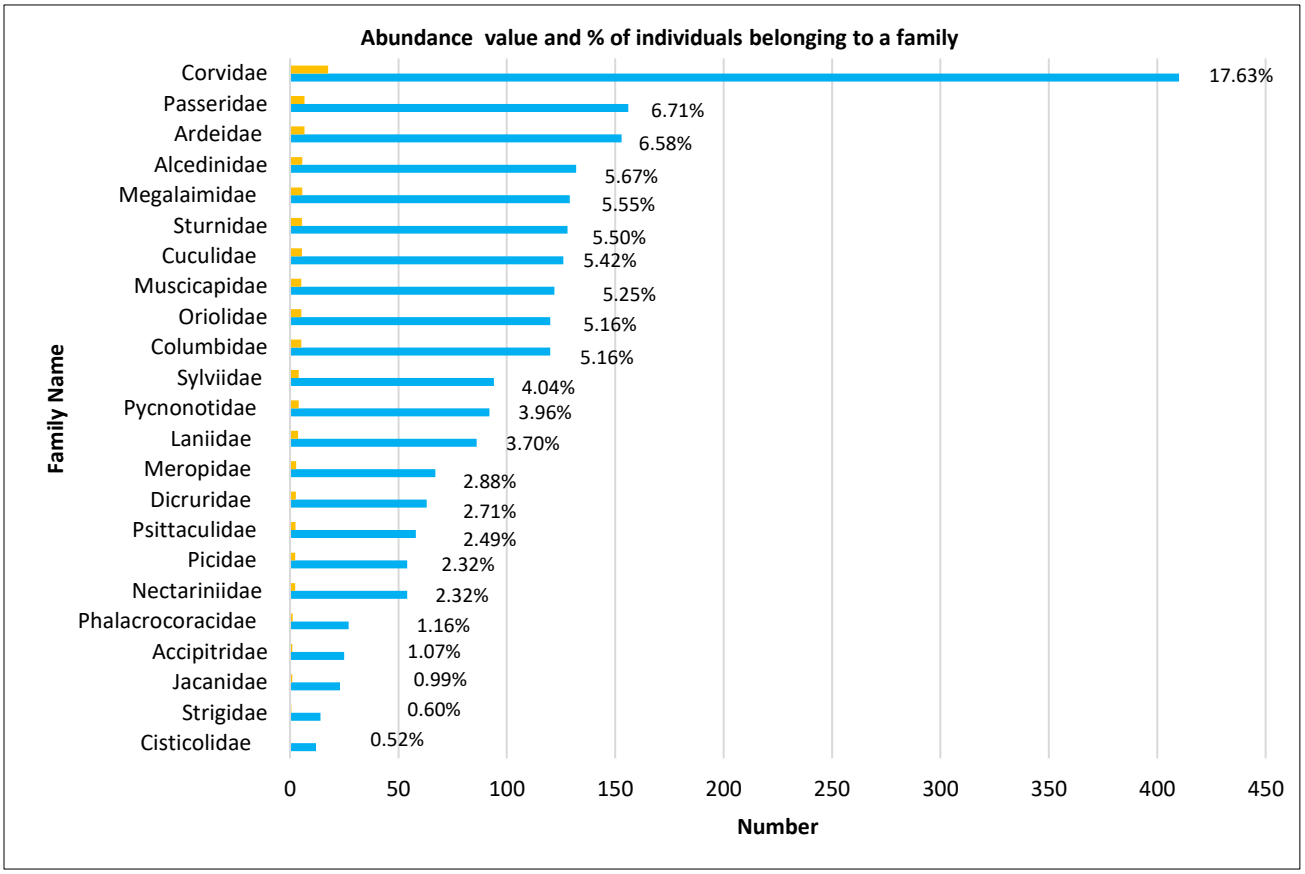

Fig 2 Family wise abundance pattern of avian fauna found

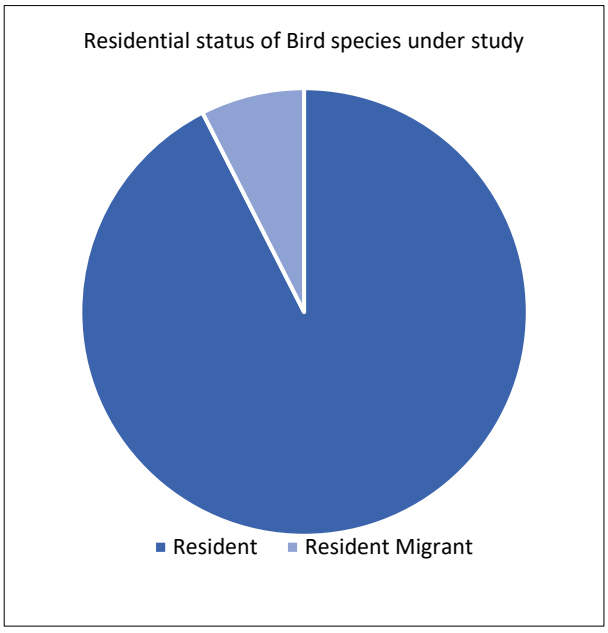

Fig 3 Proportion of resident and resident migrant bird species in the study site

The residential status of the birds was noted and found that Little Egret (*Egretta garzetta*), Long tailed Shrike (*Lanius schach*) and Great Cormorant (*Phalacrocorax carbo*) were resident migrants (Fig 3). Rest of the 37 species of birds were residents (Table 1) that signifies availability of ample avian food items in and around the crop fields in this area. The resident migrants were found in highest number in January, February months.

Among the bird species encountered (Fig 4), House Crow, House Sparrow, Common Myna, Jungle Babbler, Indian Pond Heron, Red Vented Bulbul, White breasted Kingfisher and Jungle Crow were found to be relatively abundant (>3) and hence classified as fairly common species (Table 1). On the other hand, relative abundance of Bronze Winged Jacana, Indian Robin, Coppersmith Barbet, Little Cormorant, Spotted owlet, Great Cormorant and Common Tailor Bird (Figure 4) were found to be very small (<1) and hence marked as scarce (Table 1) in this study site. The Shanon Weaver index (3.47) indicated high diversity of avifauna in the region (Table 2). The species diversity was found to be evenly distributed with a high evenness index (0.94). The Species richness index (15.1) indicated high diversity within the avifaunal assemblage studied. The house crow species was found to be most dominant one with a dominance index value of 8.49. The dominance of house crow species could be explained by the presence of patches of semi urban landscape amidst rural settlements. Although, urbanization negatively impact bird species richness [31], the mosaic pattern of rural and semi urban landscape might help the avifaunal species to find out adequate shelter, food in this region. However, the bird diversity was found to be less in summer months due to high temperature, scarcity of nutrients, inadequate water and loss of shelter in the region [32].

Birds are not only bioindicator or sentinel species but also play an important role in maintaining ecological balance like that of butterflies [33]. Many native plants are dependent on birds for pollination, successful seed dispersal and regeneration. Once a seed has passed through the digestive tract of a bird, it will often be dropped far away from the host tree, enabling it to potentially colonise a newer area. Birds also help to keep the pest population at a check acting as agents for biological control. Hence, presence of high diversity of bird species around the crop fields could be considered as a boon to the cultivators.

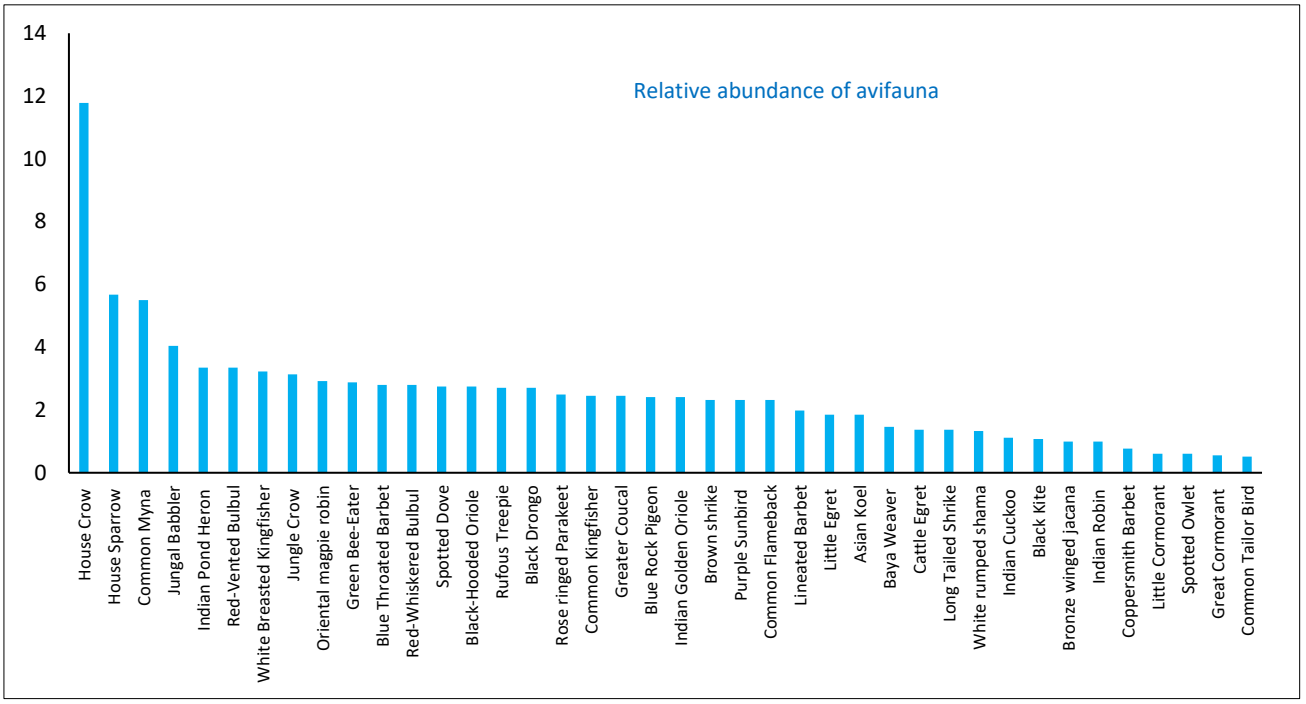

Fig 4 Species wise relative abundance of avifauna found in the study

Table 2 Diversity indices calculated based on abundance pattern of bird species encountered

Name of indices	Value
Shanon weaver diversity indices	3.47
Evenness indices	0.94
Species richness	15.1
Dominance index	8.49

The bird community in the area under study is facing anthropogenic disturbances in the forms of urbanization, tourist pressure, pollution [8, 34] and use of harmful chemicals in the crop field. The mangrove forests are cleared off and frequent natural calamities, like cyclones, hailstorms and occasional flood have disastrous effects on wild bird population. In spite of all these adversities, the avifaunal population in the Taki, Hasnabad area displayed high diversity which is indicative of ecological health. It has been noted that habitats with greater biodiversity are more resilient and hence more capable to adjust and recover from various disturbances [1]. Since different species may perform overlapping functions in a biologically diverse ecosystem, a disturbance that affects one species may have lesser impact on a biodiverse ecosystem. However, habitats with little diversity are more vulnerable, because loss of one species may disrupt the entire network of interactions, ultimately leading to collapse.

CONCLUSION

The present study establishes rich avifaunal diversity in Taki, Hasnabad area which is an indicator of sound ecological health and resilience in the face of natural calamities, anthropogenic pressure and increasing pollution. The bird population in and around crop fields in this area not only help in pollination and seed dispersal but also act as biological control agents keeping pest population at a check. However, use of hazardous agricultural chemicals at the crop fields and mixing into water bodies negatively affect this precious bird population. However, it may be noted that long term study for different aspects of avifaunal diversity in the region might identify many more facets of diversity and the impact of anthropogenic alteration of the habitats could be well understood.

Acknowledgement

The author is thankful to the Principal, Taki Government College for the facilities provided.

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