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Avifaunal Diversity of Bibhutibhushan Wildlife Sanctuary, West Bengal, India

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ABSTRACT

Birds are found in a variety of habitats, performing various functions. They are highly sensitive to even minor perturbation in ecosystems. Documentation of avian assemblages in different ecosystems is, therefore, becoming increasingly important from environmental monitoring perspective. In absence of comprehensive account of birds of Bibhutibhushan Wildlife Sanctuary, West Bengal, India, we made an attempt to document the birds thriving in this protected area. A total of 102 species of birds belonging to 13 orders and 46 families were recorded during the study period (June 2013 – May 2016). Maximum number of species belong to the order Passeriformes (49 species) and minimum under order Anseriformes (1 species). Among the total bird species, 83 species (81.37%) were resident, 15 species (14.71%) were winter visitor, three species (2.94%) were summer visitor and one species (0.98%) was passage migrant. We noted 38 species of birds (including 36 residents and two summer visitors) to breed within the sanctuary. Analysis of feeding guild data revealed that 46.08% were insectivore, 22.55% were carnivore, 15.69% were omnivore, 6.86% were granivore, 5.88% were frugivore, 1.96% were nectarivore and 0.98% were herbivore. Grey-headed Fish Eagle (*Ichthyophaga ichthyaetus*) and Red-breasted Parakeet (*Psittacula alexandri*) are two Near Threatened (NT) species designated by IUCN. Present study is the first scientific documentation of avian assemblage of this protected area and will serve as a baseline data for future avifaunal research, as well as, will be useful in the preparation of Peoples' Biodiversity Register (PBR) of this area.

Keywords: Avifauna, species richness, feeding guild, Bibhutibhushan Wildlife Sanctuary, Parmadan

1. INTRODUCTION

Birds are ubiquitous, execute varied functional roles and provide many ecosystem services (Wellan *et al.*, 2008). Indian subcontinent, a part of the vast Oriental Biogeographic regions, is very rich in biodiversity. With highly varied climatic conditions, diverse habitat and long stretch of vegetation, this region supports over 13% of the world's birds (Grimmett *et al.*, 1998, Ali, 2002). Despite of being present worldwide in nearly all habitats, they are very sensitive to environmental changes (Taper *et al.*, 1995; Olechnowski, 2009). Therefore, avian species assemblages are considered as key indicators for assessing the status of ecosystem health and functioning (Turner *et al.*, 1990; Newton, 1995; Padoa-Schioppa *et al.*, 2006). Thus, exploration of richness and diversity of bird communities have been considered as an efficient tool to monitor various habitats, both qualitatively and quantitatively (Bilgrami, 1995).

Unfortunately global diversity of birds is decreasing incessantly primarily due to anthropogenic disturbances (Rapoport, 1993) and climate change (Chen *et al.*, 2011; Sekercioglu *et al.*, 2012). IUCN Red List of endangered birds has already recognized 1226 bird species as threatened globally and India with 88 threatened bird species (Bird Life International, 2010). Forests attract a large number of avifauna because they provide suitable habitats for most birds. But, even in tropical forests 1800 individuals of birds are decimated per hour while 16 million are killed annually on an average (Hughes *et al.*, 1997). In such an alarming situation, protected areas are also known to serve as important refuge for many avian communities and increasingly recognized as critical in supporting biodiversity. They also play key roles in essential ecological functions, such as ecosystem services, climatic stabilization, carbon sequestration, groundwater recharge, nutrient retention, and natural disaster prevention (Heal, 2000; DeFries *et al.*, 2007).

So, understanding the diversity and structure of bird communities is essential to delineate their importance in avian conservation (Kattan & Franco, 2004). Therefore, documentation of avian assemblages along with the diversity of other key taxa of various protected areas has become very important. Although, avian species richness of some of the well known protected areas of West Bengal is documented (Inglis 1919; Mukherjee, 1959; Spillett 1967; Shahi, 1983; Allen *et al.*, 1992; Anonymous 1993; Kumar, 1998; Prakash *et al.*, 2001; Delany & Scott, 2002; Sanyal, 2002; Lobo, 2003; Shivakumar & Prakash, 2004; Gopal & Chauhan, 2006; Pramanik *et al.*, 2010; Roy *et al.*, 2012), yet studies on avian diversity of Bibhutibhusan Wildlife Sanctuary is almost non-existent. In view of these, the objective of the study was to prepare an up to date checklist of birds of this protected area for monitoring and conservation planning.

2. MATERIAL & METHODS

2. 1. Study Area

Bibhutibhusan Wildlife Sanctuary (23.18°N, 88.77°E; 0.64 sq km, henceforth BBWLS), locally known as *Parmadan* forest, is located in North 24 Parganas Forest Division, West Bengal, India on the banks of the *Ichhamati* river (Fig. 1). The forest land is bounded on all its three sides (i.e. north, south and east) by *Ichhamati* river while the eastern side is bounded by rural settlements (namely *Parmadan* and *Jhupa*

villages). Natural vegetation of this protected area is comprised of varied assemblage of deciduous and non-deciduous trees, while the undergrowth is thick and dense, comprising mostly ferns, tall grasses and bushes. Floral biodiversity of the study area includes about 209 species of angiosperms including 59 trees, 98 herbs, 34 shrubs, 15 climbers and 3 creepers (Talukdar & Sanyal, 2013). Main trees of this forest are *Terminalia arjuna*, *Albizia saman*, *Senna siamea*, *Morus* sp., *Bombax ceiba*, and several species of bamboo.

This forest is known to harbour more than 200 deer, birds, rabbit and a large number of langurs. The core area of the forest is fenced off and visitors are permitted to walk along the road by the fence. The climate is tropical, dry during winter (mid - November to mid-February) and humid during summer. Annual rainfall is 1,579 mm, temperature ranges between 41 °C (in May) and 10 °C (in January) and relative humidity varies between 50 % and 90 % (Talukdar & Sanyal, 2013).

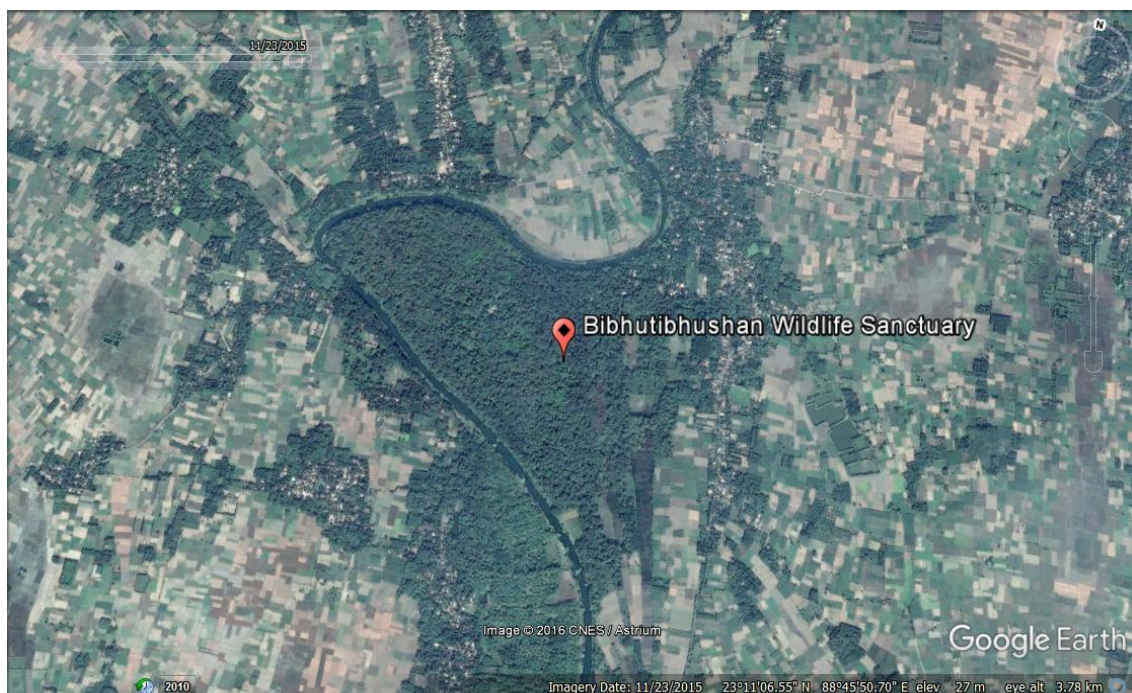


Fig. 1. The map of the study area, BBWLS, West Bengal, India

2. 2. Methods

Fortnightly avifaunal surveys were carried out for three years (June 2013 -May 2016) in the study area. Field surveys were carried out during 0730-1030 hrs and 1500–1700 or 1800 hrs depending on the day length and morning and evening counts was altered between sites. During each visit, fixed-radius (25 m) point count method was carried out to record the species richness of avifauna at each count station (Bibby *et al.*, 2000; Sutherland, 2006). Observation points were randomly placed throughout the study area. We recorded bird species (seen or heard) in 25 m radius around each of those point count stations in 360° arc for 10 minutes. Besides, opportunistic observation of birds during other times and other places were also included to prepare a comprehensive

checklist of avifauna of the study area. Field visits were carried out on foot only on days with ambient weather conditions (i.e., in the absence of rain or strong wind).

Birds were observed using a binocular (Olympus 7 x 35 DPS I) and were identified following Grimmett *et al.*, (1998). Photographs were taken with a digital camera (Nikon P600 / Canon EOS 7D Mark II) for documentation.

Birds were classified based on their seasonal dispersal pattern and were classified as resident (R), summer visitor (SV), winter visitor (WV) and passage migrants (P) following Grimmett *et al.* (1998). We also assigned a local status for each species following Khan & Naher (2009) where very common (Vc) are bird species which were recorded on 80–100 % of field visits, common (Co) are noted on 50–79 % of field visits, fairly common (Fc) are seen on 20–49 % of field visits and rare (Ra) are avian species which were recorded on less than 20 % of field visits. The study of avian feeding guilds is also important for understanding the complexity of ecosystem structure (Azman *et al.*, 2011). So, we classified the avian species into seven guilds, viz. carnivore (Ca), omnivore (O), frugivore (F), herbivores (H), nectarivore (N), granivore (G) and insectivore (I). Systemic position (Order and Family), common name and scientific name of each species was accorded following Praveen *et al.*, (2016).

3. RESULTS

A total of 102 species of birds belonging to 13 orders and 46 families were recorded during the study period (Table 1), out of which order Passeriformes (49 species) dominated the avifauna in this area, followed by the orders Pelecaniformes (8 species), Piciformes (7 species), Accipitriformes, Coraciiformes, Cuculiformes (6 species each), Columbiformes (5 species), Strigiformes (4 species), Caprimulgiformes, Psittaciformes (3 species each), Charadriiformes, Gruiformes (2 species each) and Anseriformes (1 species).

Table 1. The bird species observed in Bibhutibhushan Wildlife Sanctuary, North 24 Parganas, West Bengal, India, along with respective feeding guild, seasonality and local status

Sl. No.	Family	Common Name (Scientific Name)	Feeding Guild	Seasonality	Local Status
Order: Accipitriformes					
A1	Accipitridae	Oriental Honey Buzzard (<i>Pernis ptilorhynchus</i>)	Ca	R	Co
A2		Crested Serpent Eagle (<i>Spilornis cheela</i>)	Ca	R	Fc
A3		Changeable Hawk Eagle (<i>Nisaetus cirrhatus</i>)	Ca	R	Co
A4		Booted Eagle (<i>Hieraaetus pennatus</i>)	Ca	WV	Ra
A5		Shikra	Ca	R	Fc

Sl. No.	Family	Common Name (Scientific Name)	Feeding Guild	Seasonality	Local Status
		<i>(Accipiter badius)</i>			
A6		Grey headed Fish Eagle <i>(Ichthyophaga ichthyaetus)</i>	Ca	R	Co
Order: Anseriformes					
B1	Anatidae	Lesser Whistling-Duck <i>(Dendrocygna javanica)</i>	O	R	Vc
Order: Caprimulgiformes					
C1	Apodidae	Asian Palm Swift <i>(Cypsiurus balasiensis)</i>	I	R	Co
C2	Caprimulgidae	Large-tailed Nightjar <i>(Caprimulgus macrurus)</i>	I	R	Fc
C3		Indian Nightjar <i>(Caprimulgus asiaticus)</i>	I	R	Fc
Order: Charadriiformes					
D1	Charadriidae	Red-wattled Lapwing <i>(Vanellus indicus)</i>	Ca	R	Fc
D2	Scolopacidae	Green Sandpiper <i>(Tringa ochropus)</i>	I	WV	Fc
Order: Columbiformes					
E1	Columbidae	Rock Pigeon <i>(Columba livia)</i>	G	R	Vc
E2		Red Collared Dove <i>(Streptopelia tranquebarica)</i>	G	R	Co
E3		Spotted Dove <i>(Streptopelia chinensis)</i>	G	R	Vc
E4		Yellow-legged Green Pigeon <i>(Treron phoenicopterus)</i>	G	R	Co
E5		Emerald Dove <i>(Chalcophaps indica)</i>	G	R	Fc
Order: Coraciiformes					
F1	Alcedinidae	Common Kingfisher <i>(Alcedo atthis)</i>	Ca	R	Vc
F2		Stork-billed Kingfisher <i>(Pelargopsis capensis)</i>	Ca	R	Co
F3		White-throated Kingfisher <i>(Halcyon smyrnensis)</i>	Ca	R	Vc

Sl. No.	Family	Common Name (Scientific Name)	Feeding Guild	Seasonality	Local Status
F4	Coraciidae	Indian Roller (<i>Coracias benghalensis</i>)	I	R	Co
F5	Meropidae	Green Bee-eater (<i>Merops orientalis</i>)	I	R	Co
F6.		Chestnut-headed Bee-eater (<i>Merops leschenaultia</i>)	I	R	Ra
Order: Cuculiformes					
G1	Cuculidae	Greater Coucal (<i>Centropus sinensis</i>)	O	R	Vc
G2		Pied Cuckoo (<i>Clamator jacobinus</i>)	I	SV	Fc
G3		Chestnut-winged Cuckoo (<i>Clamator coromandus</i>)	I	P	Ra
G4		Asian Koel (<i>Eudynamys scolopaceus</i>)	O	R	Vc
G5		Common Hawk Cuckoo (<i>Hierococyx varius</i>)	I	R	Co
G6		Indian Cuckoo (<i>Cuculus micropterus</i>)	I	R	Ra
Order: Gruiformes					
H1	Rallidae	White-breasted Waterhen (<i>Amaurornis phoenicurus</i>)	O	R	Co
H2		Watercock (<i>Gallicrex cinerea</i>)	H	R	Ra
Order: Passeriformes					
I1	Aegithinidae	Common Iora (<i>Aegithina tiphia</i>)	I	R	Co
I2.	Artamidae	Ashy Woodswallow (<i>Artamus fuscus</i>)	Ca	R	Co
I3	Campephagidae	Small Minivet (<i>Pericrocotus cinnamomeus</i>)	I	R	Co
I4		Rosy Minivet (<i>Pericrocotus roseus</i>)	I	WV	Ra
I5		Black-headed Cuckoo-Shrike (<i>Lalage melanoptera</i>)	O	R	Fc
I6	Cisticolidae	Plain Prinia (<i>Prinia inornata</i>)	I	R	Co

Sl. No.	Family	Common Name (Scientific Name)	Feeding Guild	Seasonality	Local Status
I7		Common Tailorbird (<i>Orthotomus sutorius</i>)	I	WV	Vc
I8	Corvidae	Rufous Treepie (<i>Dendrocitta vagabunda</i>)	I	R	Vc
I9		House Crow (<i>Corvus splendens</i>)	O	R	Vc
I10		Large-billed Crow (<i>Corvus macrorhynchos</i>)	O	R	Co
I11	Dicruridae	Black Drongo (<i>Dicrurus macrocercus</i>)	I	R	Vc
I12		Bronzed Drongo (<i>Dicrurus aeneus</i>)	I	R	Fc
I13		Hair-crested Drongo (<i>Dicrurus hottentottus</i>)	I	R	Ra
I14	Estrildidae	White-rumped Munia (<i>Lonchura striata</i>)	G	R	Co
I15		Scaly-breasted Munia (<i>Lonchura punctulata</i>)	G	R	Fc
I16	Hirundinidae	Barn Swallow (<i>Hirundo rustica</i>)	I	WV	Co
I17	Irenidae	Jerdon's Leafbird (<i>Chloropsis jerdoni</i>)	O	R	Co
I18	Laniidae	Brown Shrike (<i>Lanius cristatus</i>)	I	WV	Co
I19		Long-tailed Shrike (<i>Lanius schach</i>)	I	R	Co
I20	Leiothrichidae	Jungle Babbler (<i>Turdoides striata</i>)	O	R	Vc
I21	Monarchidae	Black-naped Monarch (<i>Hypothymis azurea</i>)	I	R	Fc
I22		Indian Paradise Flycatcher (<i>Terpsiphone paradise</i>)	I	SV	Co
I23	Motacillidae	Paddyfield Pipit (<i>Anthus rufulus</i>)	I	R	Co
I24		White Wagtail (<i>Motacilla alba</i>)	I	WV	Co
I25	Muscicapidae	Oriental Magpie-Robin (<i>Copsychus saularis</i>)	I	R	Vc
I26		Brown-breasted Flycatcher (<i>Muscicapa muttui</i>)	I	WV	Ra

Sl. No.	Family	Common Name (Scientific Name)	Feeding Guild	Seasonality	Local Status
I27		Blue-throated Flycatcher (<i>Cyornis rubeculoides</i>)	I	WV	Co
I28		Verditer Flycatcher (<i>Eumyias thalassinus</i>)	I	WV	Ra
I29		Taiga Flycatcher (<i>Ficedula albicilla</i>)	I	WV	Co
I30		Siberian Stonechat (<i>Saxicol maurus</i>)	I	WV	Fc
I31	Nectariniidae	Purple Sunbird (<i>Cinnyris asiaticus</i>)	N	R	Vc
I32		Purple-rumped Sunbird (<i>Leptocoma zeylonica</i>)	N	R	Co
I33	Oriolidae	Black-hooded Oriole (<i>Oriolus xanthornus</i>)	O	R	Co
I34		Indian Golden Oriole (<i>Oriolus kundoo</i>)	I	R	Fc
I35	Paridae	Cinereous Tit (<i>Parus cinereus</i>)	I	R	Fc
I36	Passeridae	House Sparrow (<i>Passer domesticus</i>)	O	R	Vc
I37	Pellorneidae	Abbott's Babbler <i>Malacocincla abbotti</i>	I	R	Co
I38	Phylloscopidae	Greenish Leaf Warbler (<i>Seicercus trochiloides</i>)	I	WV	Co
I39	Pittidae	Hooded Pitta (<i>Pitta sordid</i>)	I	SV	Co
I40	Pycnonotidae	Red-vented Bulbul (<i>Pycnonotus cafer</i>)	O	R	Vc
I41	Sturnidae	Asian Pied Starling (<i>Gracupica contra</i>)	O	R	Vc
I42		Chestnut-tailed Starling (<i>Sturnia malabarica</i>)	I	R	Co
I43		Common Myna (<i>Acridotheres tristis</i>)	O	R	Vc
I44		Jungle Myna (<i>Acridotheres fuscus</i>)	O	R	Vc
I45	Turdidae	Scaly Thrush (<i>Zoothera dauma</i>)	I	WV	Ra
I46		Orange-headed Thrush (<i>Geokichla citrina</i>)	I	R	Co

Sl. No.	Family	Common Name (Scientific Name)	Feeding Guild	Seasonality	Local Status
I47		Tickell's Thrush (<i>Turdus unicolor</i>)	I	WV	Ra
I48	Vangidae	Common Woodshrike (<i>Tephrodornis pondicerianus</i>)	O	R	Co
I49	Zosteropidae	Oriental White-eye (<i>Zosterops palpebrosus</i>)	I	R	Fc
Order: Pelecaniformes					
J1	Ardeidae	Yellow Bittern (<i>Ixobrychus sinensis</i>)	Ca	R	Fc
J2		Indian Pond-Heron (<i>Ardeola grayii</i>)	Ca	R	Vc
J3		Cattle Egret (<i>Bubulcus ibis</i>)	Ca	R	Vc
J4		Intermediate Egret (<i>Ardea intermedia</i>)	Ca	R	Co
J5		Little Egret (<i>Egretta garzetta</i>)	Ca	R	Vc
J6	Ciconiidae	Asian Openbill (<i>Anastomus oscitans</i>)	Ca	R	Co
J7	Phalacrocoracidae	Little Cormorant (<i>Microcarbo niger</i>)	Ca	R	Vc
J8		Indian Cormorant (<i>Phalacrocorax fuscicollis</i>)	Ca	R	Fc
Order: Piciformes					
K1	Picidae	Lesser Golden-backed Woodpecker (<i>Dinopium benghalense</i>)	I	R	Co
K2		Streak-throated Woodpecker (<i>Picus xanthopygaeus</i>)	I	R	Fc
K3		Greater Golden-backed Woodpecker (<i>Chrysocolaptes lucidus</i>)	I	R	Ra
K4		Fulvous-breasted Pied Woodpecker (<i>Dendrocopos macei</i>)	I	R	Co
K5	Ramphastidae	Lineated Barbet (<i>Psilopogon lineatus</i>)	F	R	Fc
K6		Blue-throated Barbet (<i>Psilopogon asiaticus</i>)	F	R	Vc
K7		Coppersmith Barbet (<i>Psilopogon haemacephalus</i>)	F	R	Fc

Sl. No.	Family	Common Name (Scientific Name)	Feeding Guild	Seasonality	Local Status
Order: Psittaciformes					
L1	Psittaculidae	Red-breasted Parakeet (<i>Psittacula alexandri</i>)	F	R	Ra
L2		Alexandrine Parakeet (<i>Psittacula eupatria</i>)	F	R	Co
L3		Rose-ringed Parakeet (<i>Psittacula krameri</i>)	F	R	Co
Order: Strigiformes					
M1	Strigidae	Brown Hawk Owl (<i>Ninox scutulata</i>)	Ca	R	Ra
M2		Spotted Owlet (<i>Athene brama</i>)	Ca	R	Co
M3		Collared Scops Owl (<i>Otus bakkamoena</i>)	Ca	R	Ra
M4	Tytonidae	Brown Fish Owl (<i>Ketupa zeylonensis</i>)	Ca	R	Fc

Cuculidae, Accipitridae and Muscicapidae were three richest families each of which were represented by 6 species, followed by Columbidae (4 species), Sturnidae (4 species), Picidae (4 species), Alcedinidae (3 species), Campephagidae (3 species), Corvidae (3 species), Dicruridae (3 species), Turdidae (3 species), Rhamphastidae (3 species), Psittaculidae (3 species), Strigidae (3 species), Caprimulgidae (2 species), Meropidae (2 species), Rallidae (2 species), Cisticolidae (2 species), Estrildidae (2 species), Laniidae (2 species), Monarchidae (2 species), Motacillidae (2 species), Nectarinadae (2 species), Oriolidae (2 species), Phalacrocoracidae (2 species) and one species belonged to each of the Anatidae, Apodidae, Charadriidae, Scolopacidae, Coraciidae, Aegithiniidae, Artamidae, Hirundinidae, Irenidae, Leiothrichidae, Paridae, Passeridae, Pellorneidae, Phylloscopidae, Pittidae, Pycnonotidae, Vangidae, Zosteropidae, Ciconiidae and Tytonidae families (Table 1).

Analysis of their local abundance indicated that 24 species were Vc (very common), 41 species were Co (common), 22 species were Fc (fairly common), and 15 species were Ra (rare). Analysis of feeding guild data revealed that 46.08% were insectivore, 22.55% were carnivore, 15.69% were omnivore, 6.86% were granivore, 5.88% were frugivore, 1.96% were nectarivore and 0.98% were herbivore (Fig. 2). Seasonal dispersal pattern of the avian assemblage in the study area revealed that 81.37% birds were resident (83 species), 14.71% (15 species) were winter visitor, 2.94% (3 species) were summer visitor and 0.98% (1 species) was passage migrant (Fig. 3). We noted 38 species of birds (including 36 residents and 2 summer visitors) to breed within the sanctuary. Of all avian species, two species viz. Grey-headed Fish Eagle (*Ichthyophaga*

ichthyaetus) and Red-breasted Parakeet (*Psittacula alexandri*) fall under Near Threatened (NT) category of IUCN (Fig. 4). All the remaining species (n = 100) are placed in the Least Concern (LC) category.

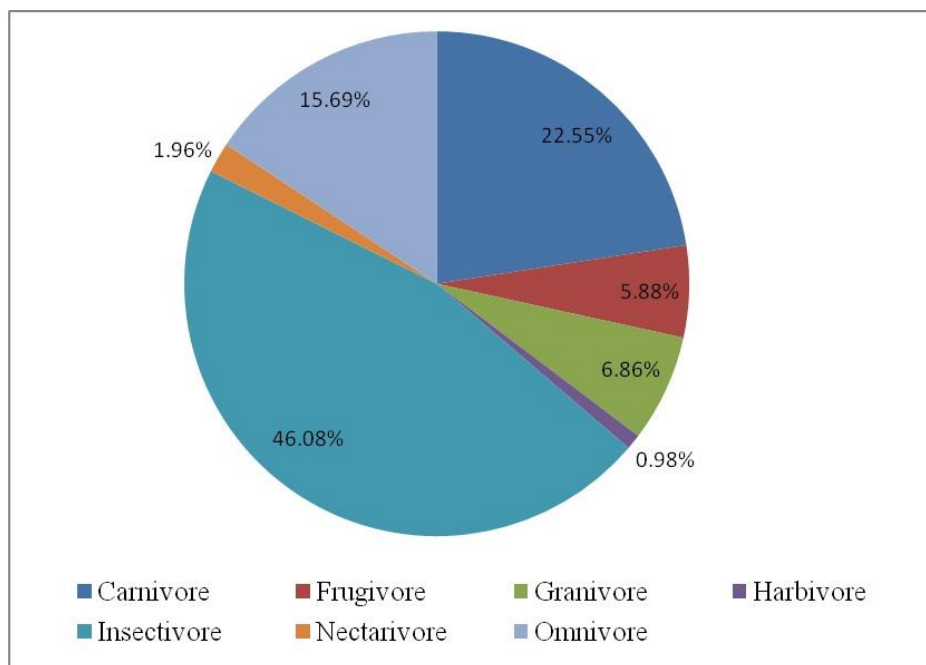


Fig. 2. Percentage of Feeding guilds

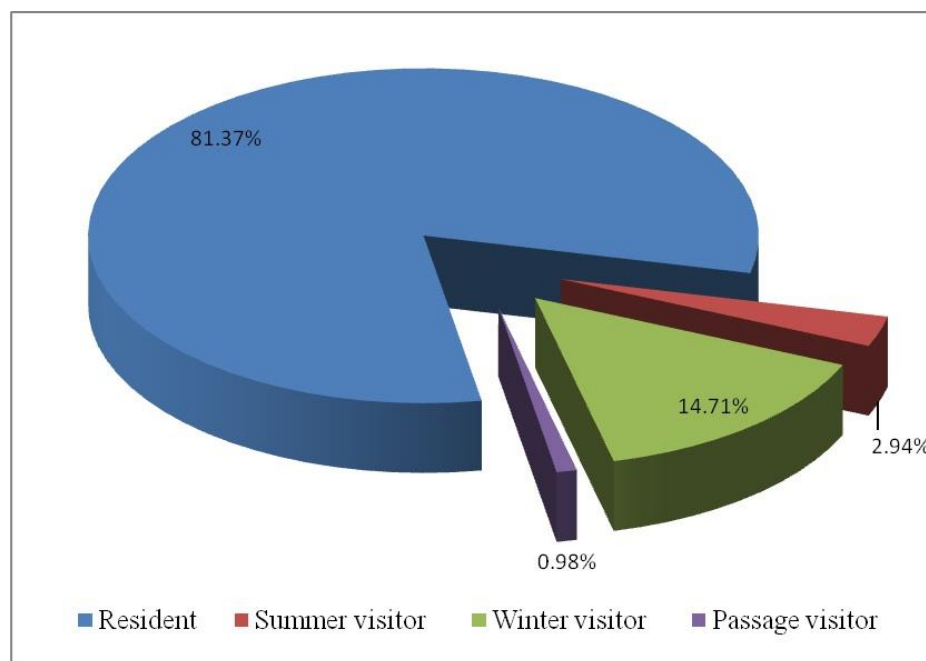


Fig. 3. Percentage of Seasonality.

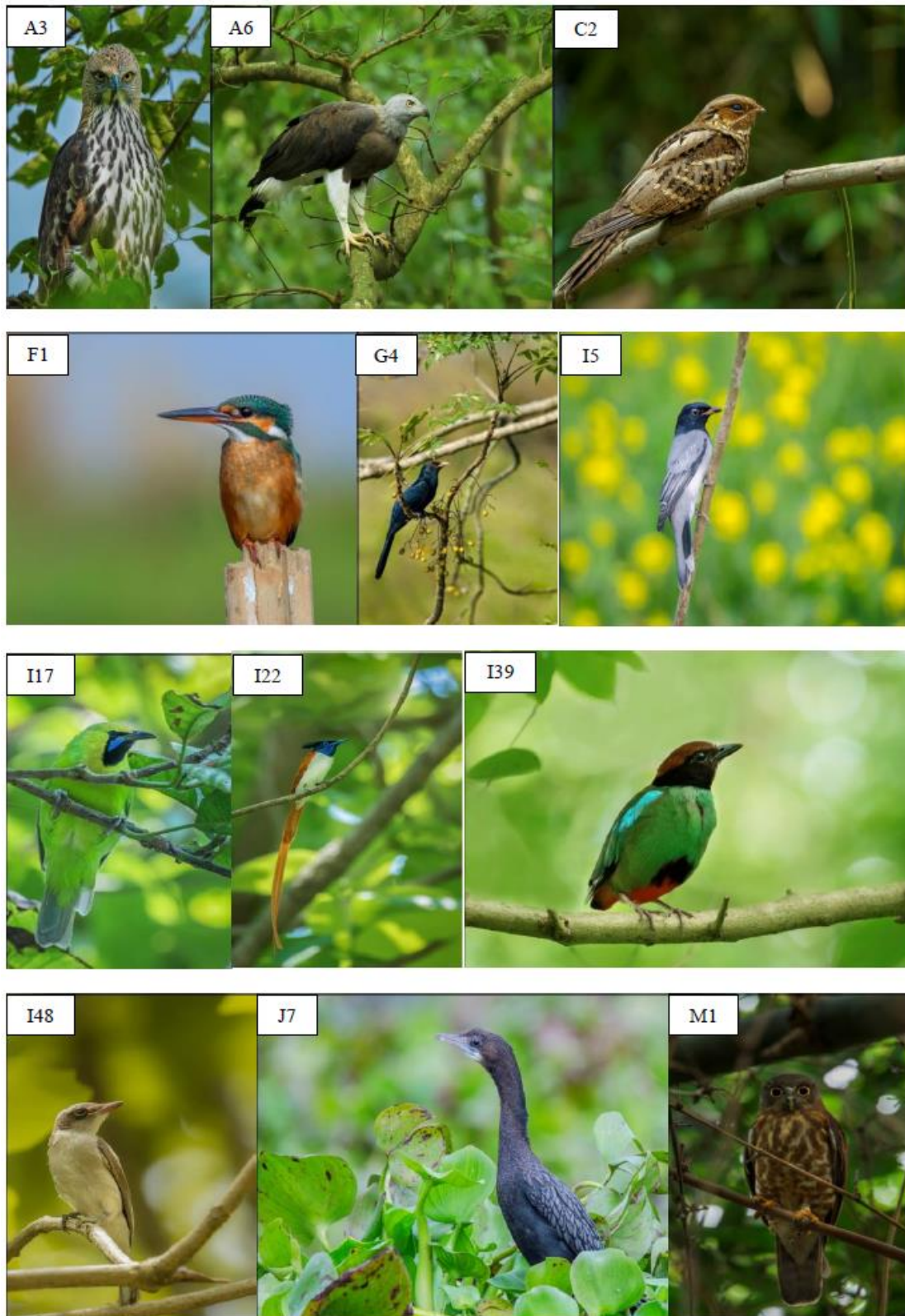


Fig. 4. Photographs of representative bird species (see Table 1 for symbols and corresponding names)

4. DISCUSSION & CONCLUSIONS

Ecologically, birds are of tremendous importance to the human society. They act as a good medium for dispersing seeds, pollinating plants, biological control and they are important to continue the ecological cycle. (3-2-2). Despite small in size, this protected area supports diverse bird community and 10.89% of total avian species of this state (N = 937) are recorded here. Although we did not record the relative abundance of each species, still the avian diversity is comparable with many other protected areas of this state. For instance, Roy *et al.*, (2011) studied avifaunal diversity in three different national parks and reserve forest in North Bengal and recorded 117 bird species belonging to 42 families; Dubey *et al.*, (2015) noted 99 species belonging to 43 families, Pramanik *et al.*, (2010) reported 29 bird species of 20 families from Kulik Bird Sanctuary Raigang, and Patra & Chakrabarti (2014) observed 86 bird species belonging 10 orders and 35 families in Digha coast of West Bengal. Species composition of birds in an area is related to the type of vegetation, height above the sea level, availability of microhabitats and various other factors (Pramanik *et al.*, 2010). Perhaps heterogeneity of habitat in the study area augments availability of diverse resource, which in turn sustains different bird species with characteristic species richness.

Availability of food and suitable habitat attract resident and migrant birds to visit the sanctuary throughout the year. However, the species richness varies seasonally. This small protected area harbours 19 migratory species which include 15 winter visitors, 3 summer visitors and 1 passage migrant. Migratory birds displayed a definite species specific pattern for arrival at and departure from the study site. The basic requirements of migratory birds at their wintering ground are adequate food supply and safety (Lakshmi, 2006), which are fulfilled by BBWLS, nearby agricultural fields and also by river *Ichhamati*. This sanctuary also serve as important breeding habitat for 38 species (36 resident and 2 summer visitors) who construct nest within this wildlife sanctuary. This protected area serves as a regular breeding site for 'Near Threatened' (IUCN) Grey-headed Fish Eagle (*Ichthyophaga ichthyaetus*). Hooded Pitta (*Pitta sordida*), a summer visitor to the region, recorded after 80 years from southern West Bengal (Law, 1938; Chakraborty *et al.*, 2016), also found to breed here.

Species assemblage within BBWLS also reflects possible variation in their functional roles, feeding habits and resource utilization pattern. The diverse feeding habit of the avifauna suggests that the study area provides a rich source of a variety of food resources. Insectivore species were highest in the study area, indicating rich abundance and easy availability of insects in this forested habitat. These insectivorous birds also play very important role in the biocontrol of insect pest thriving in the agriculture, horticulture, and forests (Mahabal *et al.*, 2005; Thakur *et al.*, 2010) of adjoining areas. But indiscriminate use of pesticides in surrounding paddy fields might lead to drastic decline in the insect abundance of these areas, leading to the lack of food for the insectivorous birds. If these birds forage on the insects exposed to such chemicals, then being in the higher trophic level they are at potential risk of decline suffering from toxic effects of bioaccumulation of chemical pesticides. So, monitoring insectivorous species of BBWLS might reflect the impact of pesticide use this avian guild.

Birds in different habitats are under threat due to increased anthropogenic activities resulting in habitat destruction and fragmentation (Baral & Inskipp, 2005, Datta, 2011,

Gautam & Kafle, 2007). Moreover, changes in climatic conditions in recent decades have been unanimously reported to influence bird diversity most negatively (Sekercioglu *et al.*, 2012). In spite of the fact that conservation of global biodiversity has become the issue of prime importance in recent decades (Turner *et al.*, 1990; Ehrlich & Wilson, 1991), still most of the protected areas are presently inflicted with some major anthropogenic disturbances like urbanization, tourist pressure, livelihood dependence (mainly in the form of cattle grazing and fuel wood collection) and pollution (Islam & Rahmani, 2004; Mallick, 2010; Karmakar, 2011) and BBWLS is no exception. Presence of several villages around the sanctuary poses potentially high risk of encroachment, as well as, overexploitation of resources from this protected area. It has been observed during the course of this study that (legal or illegal) influx of large number of people within the sanctuary disturbed many shy and secretive bird species.

Condition get even worse during mid winter (particularly during December and January), while large number of people enter BBWLS for picnic, play loudspeakers and litter the area with leftover food, plastic and other materials. All these activities within any protected area are violation of the provisions of Wildlife (Protection) Act. These activities need to be urgently called off to protect the avifauna and other wildlife of BBWLS from sheer stress of habitat disturbance. Legislations should be more strictly implemented to prevent random human entry inside the sanctuary. Notifying a buffer area around the existing PA, if possible through community involvement, will ultimately decrease human pressure on the natural resources of the sanctuary.

This is the first scientific documentation of avian species richness in BBWLS, which supports a good number of birds. From the present study, the basic information of bird diversity and abundance patterns can be used for further ecological assessment & comparative research. Regular monitoring of avifauna is an excellent means of monitoring forest health, and it will also help to foster a sustainable improvement of the habitat. Monitoring avian community of this protected area might also provide an early indication if this ecosystem suffer from any detrimental change.

This area constitutes a promising region for ecological and behavioural research of avifauna. In depth studies on population abundance, habitat use, nesting breeding and foraging behaviour and assessment of threats and conservation issues might be useful to bridge the gap of existing knowledge on avifauna of this study area.

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