

AVIAN DIVERSITY IN THE JALDAPARA NATIONAL PARK, WEST BENGAL, INDIA WITH A NOTES ON THEIR HABITAT ASSOCIATION AND FEEDING GUILD

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ABSTRACT

99 taxa of avifauna belonging to 43 families has been recorded in successive years (2013 and 2014) in a seasonal survey carried out at Jaldapara National Park located within Himalayan Terai region of North Bengal. The open forest habitat found out to be the richest in avifauna among the other habitat types. Among the feeding guilds, insectivores dominate in species strength and in the number habitat types represented. Survey shows that the landscape of Jaldapara is frequently visited by 2 Vulnerable (Lesser Adjutant and Pallas's Fish Eagle) and 1 Near Threatened species (River Lapwing). The study documented Kalij Pheasant which is probably new record from this region.

Key words: Birds of North Bengal, Jaldapara National Park, Open forest, Feeding guild, Kalij Pheasant.

Introduction

West Bengal is the only Indian state which is gifted a long coastal region in its down south and high peaks of the Himalayan range at its north with diversified forest biomes. The state has 4692 km² of forests under protected area network which is 39.50% of the state's total forest area and 5.28% of the total geographic area (Annon, 2013). The West Bengal State experiences mosaic climatic conditions from moist-tropical in south-east to dry-tropical in the south-west and from sub-tropical to temperate in the northern mountains which supports a luxuriant avian biodiversity. BirdLife International (2014) has estimated a total 1,180 bird species in India of which 82 species are globally threatened. Out of 57 Vulnerable avian species listed in India, 23 species have been recorded from West Bengal (BirdLife International, 2001). Northern parts of West Bengal, the foothill of Himalayas sustain a broad spectrum of protected areas. Jaldapara National Park (JNP) falls within Sub-Himalayan zone, is one of the most Important Bird Area (IBA) formerly under district Jalpaiguri and now under district Alipurduar of West Bengal. This National Park is virtually merged with Buxa Tiger Reserve situated at north-eastern corner of the district. The biome restricted vegetation assemblage of this National Park is mainly moist deciduous, dry deciduous, semi-evergreen, riverine and savannah forest (IBCN, 2011). This region has an immense attraction to

ornithologists due to its wide variety of local and migratory birds (Islam and Rahmani, 2004; Mandal, 2007).

Bird community have been widely considered as bioindicator as they represents wide range of feeding niches and serves functionally being pollinators or scavengers, as well as acts as indirect quantifying measures of environmental health (Bock and Jones, 2004; Padoa-Schioppa *et al.*, 2006). A range of feeding guilds available in an area is linked to the availability and quality of foraging habitats and food resources for birds (Tourenq *et al.*, 2001). Since couple of decades, many forested areas throughout the globe have been converted for agricultural, industrial and urbanization purpose (Dobson *et al.*, 1997) which affects the abundance, quality and availability of food resources for birds (Tucker, 1992). According to a recent estimate, there are 9,787 known living species of birds occurring throughout the world, of which 21% (2,055 species) are currently extinction-prone due to a wide variety of threats (Sekercioglu *et al.*, 2004).

Various workers have documented avifaunal populations in Jaldapara National Park and its adjacent forests in a scattered manner (Inglis *et al.*, 1918-1920; Allen *et al.*, 1996; Kumar, 1998; Sivakumar and Prakash, 2004; Sivakumar *et al.*, 2006; Datta, 2011; Roy *et al.*, 2012), however there were no published literature on the habitat and feeding habit association from this

The avian biodiversity inventory of Jaldapara National Park yields 99 avian species which includes Kalij Pheasant with a new record from Himalayan foothill.

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region. The objective of the present study was to document and compare the avifaunal diversity and community structure of different forest strata at Jaldapara National Park with special reference to their feeding guild structure.

Material and Methods

Description of the study sites

Jaldapara National Park (JNP) is the mosaic of grasslands-woodlands and the vegetation of this tropical region can be classified into moist and dry deciduous forest, semi-evergreen forest, riverine forest and savannah grassland (Champion and Seth, 1968). The

average temperature varies from 10°C to 21°C from November to February and adequately humid throughout the year, ranging from 80 to 100%. The soil types are alluvial, with coarse gravel and sandy clay to loam. Annual rainfall exceeds 2000 mm and natural flooding from annual monsoons varies in frequency and magnitude (Bayley, 1995). The detail description of the study site is as follows:

JNP is located in the Alipurduar district (previously Jalpaiguri) between 25° 58' N to 27° 45' N latitude and 89° 05' E to 89° 55' E longitude, in the flood plains of the River Torsha (Fig. 1) and other small rivulets like Hollong, Chirakhawa, Kalijhora, Sissamora, Sanjoy and Bhaluka

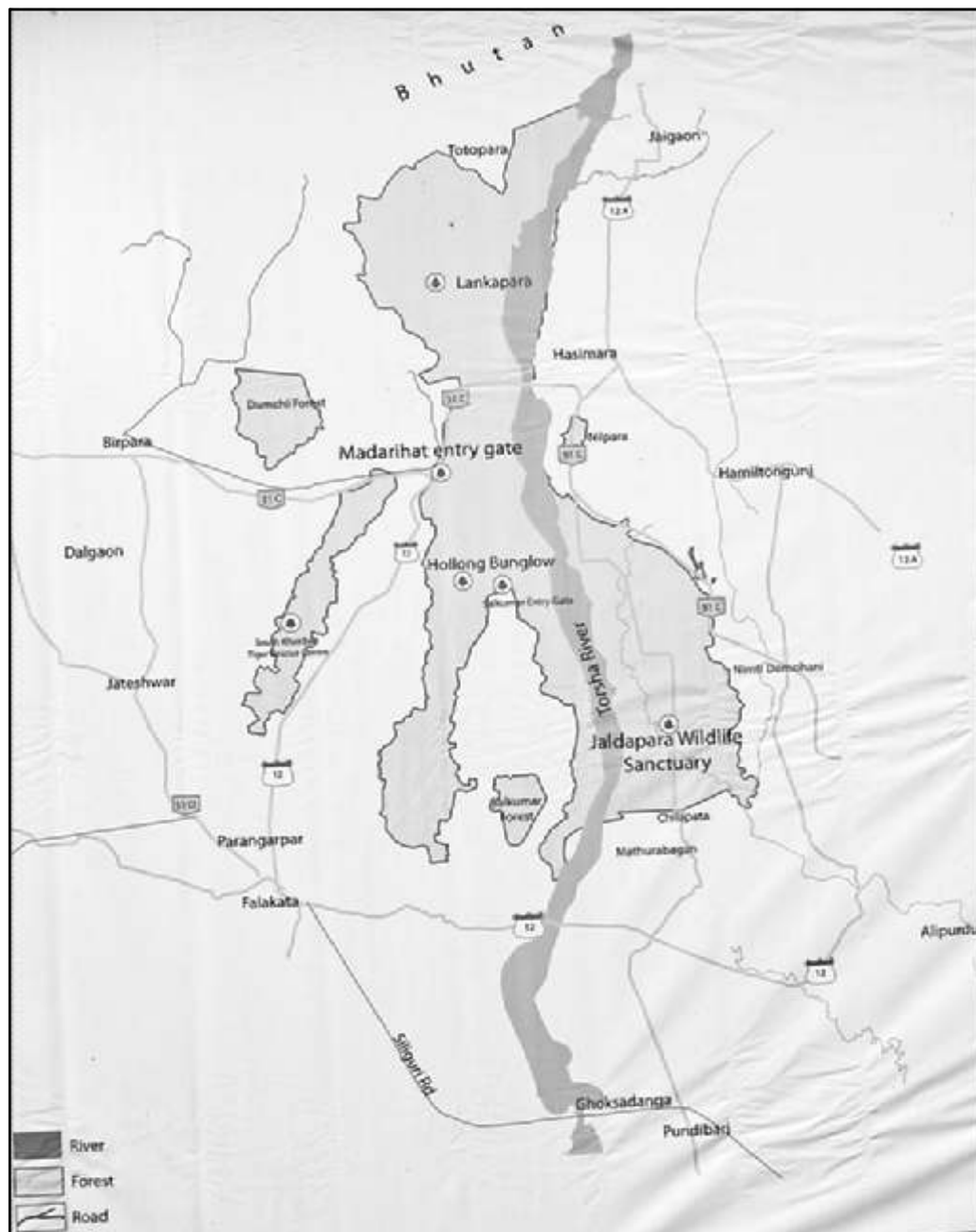


Fig. 1 : Map of Jaldapara National Park in Himalayan Terai region of West Bengal

which traverse the biome (Sudhaker *et al.*, 1996). The Torsha floodplain is representative of the Terai grasslands running as a narrow band along the foothills of the Himalayas, covering over 4,20,700 km² (Biswas *et al.*, 2014). The total geographical area of JNP is about 216.34 km² and broadly falls within the Indo-Gangetic and Brahmaputra floodplain (biogeographic zone 7B) having altitude of 60-130 m. This area under protection as Jaldapara Wildlife Sanctuary which was established in 1941 to conserve the Great Indian One-horned Rhino and recently in April 2012 it was upgraded to National Park. This protected area having IBA site code of IN-WB-03 with A1 (Globally Threatened Species) and A2 (Restricted Range Species) criteria. A small fraction of this IBA falls in Assam Plains Endemic Bird Area (EBA 131) (IBCN, 2011).

The grasslands found within the park are low alluvium savannah woodland and eastern alluvial grassland, as defined by Champion and Seth (1968). These grasslands are in various seral stages of natural succession and tend to be replaced by forest as the climax vegetation type, covered 20-30% forest area (Pandit and Yadav, 1996). The major floral compositions of the park are *Shorea robusta* (Sal), *Chukrassa tabularis* (Chikrasi), *Schima* sp. and *Amoora wallichii* etc where Sal is the dominant tree as per its representation. The forest along the river embankments consists mostly of *Acacia catechu* (Khair) associated with species of *Dalbergia sissoo* (Sissu), *Bombax ceiba* (Semul), *Albizia procera* (Siris), *Lagerstomia speciosa* (Jarul), *Gmelina arborea* (Gamari), *Albizia lebbek*, *Salmilia* and *Wrightia* etc (Biswas and Mathur, 2003). The major habitat types of the region include dry mixed forest, wet mixed forest, mixed Sal, grasslands, grasslands with Khair-Sissoo succession, grasslands with Simul-Siris succession, bamboo brakes, plantations, sandy riverbeds, and cane brakes in the existing swamps (Pandit and Yadav, 1996). Primarily dominated tall grasses are *Saccharum narenga* and *Saccharum spontaneum*. The shorter grasslands are conquered by *Imperata cylindrica* and *Cymbopogon jawarncusa*. The other grass communities were *Themadua rundinacea*, *Saccharum arundinaceum*, *S. bengalense*, *Heteropogon contortus*, *Arundo donax* etc. Apart from the key mammalian fauna, Great One-horned Indian Rhinoceros; this region sustains population of Gaur *Bos frontalis*, a few Sloth Bears *Melursus ursinus* and good numbers of Wild Boar *Sus scrofa*, Indian Muntjak or Barking Deer *Muntiacus muntjak*, Hog Deer *Axis porcinus*, Sambar *Cervus unicolor*, Hispid Hare *Caprolagus hispidus* and Pigmy Hog *Porcula salvania*. A small resident population of Asian Elephant *Elephas maximus* is also seen throughout the year and Leopard *Panthera pardus* were occasionally

found here (Bell and Oliver, 1992; Biswas and Mathur, 2000; Maheswaran, 2006). This region is a critical corridor for the wildlife moving between Bhutan and Assam.

Bird survey methodology

According to Sutherland (2006), Point Count Method (PCM) or fixed radius methodology (FRM) is the most efficient sampling technique of estimating avian density for most habitats like agricultural open forests, grasslands, orchards, plantations and human settlements. During the survey, avifaunal occurrence has been noted within a limit of 50 m beyond which the birds are not detectable. Line Transect Method (LCM) has been followed in case of denser habitats with poor visibility and to avoid double counting (Bibby *et al.*, 1992). Seasonal field surveys have been conducted at maximum of 72 point counts during the initial two hours after sunrise (0700–0900 AM), and in the afternoon (1600–1800 PM) in the maximum abundance period (3 months; November-January) for successive two years (2013 and 2014). The birds have been identified either with unaided eye or using Olympus 10 x 50 DPSI binoculars and field guides like Grimmett *et al.* (2011) and Ali (2012). The taxonomy and nomenclature has been followed as per Inskipp *et al.* (1996).

Results

During the course of study, a total 99 species of avifauna belonging to 43 Families has been recorded of which 91 % are resident (R), followed by 6 % winter visitor (WV), 2 % resident as well as winter visitor (R and WV) and 1 % belonged to resident and partial migrant (R and PM) category. Family wise species heterogeneity is conspicuous; family Columbidae, Dicruridae and Picidae have represented highest number of species (6 in each) followed by family Ardeidae and Sturnidae (5 species in each), family Psittacidae (4 species) and family Phasianidae, Motacillidae, Ramphastidae, Muscicapidae, Alcedinidae, Campephagidae, Pycnonotidae, Corvidae, Laniidae and Cuculidae (3 species in each) respectively. 11 families have contributed 2 individual species whereas 17 families were represented by single species. Details of bird species, their habitat, conservation status etc have been documented in Table 1. 13 species from 7 families (asterisks marked in Table 1) were found alongside the Indian one-horned Rhino of the grassy plains of JNP. These species rides on the Rhino's back in search of ectoparasites of their body surface look and to catch insects disturbed by the herbivore while grazing through the tall grasses.

Assemblages of birds differ between habitats where some species are widely occurring and others are

Table 1 : Avifauna recorded from Jaldapara National Park during the study period with notes on their status, habitat, feeding guild and conservation status

Sl. No.	Family and Common name	Scientific name	Status	Habitat Strata	Feeding guild	IUCN Status	WLPA, 1972
	Phasianidae						
1	Red Junglefowl	<i>Gallus gallus</i>	R	S, FG	OM	LC	IV
2	Indian Peafowl	<i>Pavo cristatus</i>	R	S, FG	OM	LC	I
3	Kalij Pheasant	<i>Lophura leucomelanos</i>	R	S, FG	OM	LC	IV
	Anatidae						
4	Lesser Whistling Duck	<i>Dendrocygna javanica</i>	R	FG	OM	LC	IV
	Ciconiidae						
5	Lesser Adjutant	<i>Leptoptilos javanicus</i>	R	WLM	CN	VU	IV
	Threskiornithidae						
6	Red-naped Ibis	<i>Pseudibis papillosa</i>	R	WLM	OM	LC	IV
	Ardeidae						
7	Striated Heron	<i>Butorides striata</i>	R	WC	PI/IN	LC	IV
8	Indian Pond Heron *	<i>Ardeola grayii</i>	R	FG, WC	PI/IN	LC	IV
9	Cattle Egret *	<i>Bubulcus ibis</i>	R	FG, P	PI/IN	LC	IV
10	Intermediate Egret	<i>Egretta intermedia</i>	R	FP	PI/IN	LC	IV
11	Little Egret *	<i>Egretta garzetta</i>	R	FP	PI/IN	LC	IV
	Phalacrocoracidae						
12	Little Cormorant	<i>Phalacrocorax niger</i>	R	WC	PI	LC	IV
	Accipitridae						
13	Oriental Honey Buzzard	<i>Pernis ptilorhynchus</i>	R	LWF	CN	LC	IV
14	Crested Serpent Eagle	<i>Spilornis cheela</i>	R	LWF	CN	LC	I
	Rallidae						
15	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	R	WLM	AF/OM	LC	IV
16	Common Moorhen	<i>Gallinula chloropus</i>	R & WV	WS	AF/OM	LC	IV
	Charadriidae						
17	Red-wattled Lapwing	<i>Vanellus indicus</i>	R	S	CN	LC	IV
	Jacaniidae						
18	Bronze-winged Jacana	<i>Metopidius indicus</i>	R	WLM	AF/OM	LC	IV
	Scolopacidae						
19	Common Sandpiper	<i>Actitis hypoleucos</i>	WV	RB	CN	LC	IV
	Columbidae						
20	Common Pigeon	<i>Columba livia</i>	R	FE, FG	GN	LC	IV
21	Oriental Turtle Dove	<i>Streptopelia orientalis</i>	R & WV	BLF	GN	LC	IV
22	Spotted Dove	<i>Streptopelia chinensis</i>	R	OF, FG	GN	LC	IV
23	Yellow Footed Green Pigeon	<i>Treron phoenicopterus</i>	R	OF	FG	LC	IV
24	Wedge-tailed Green Pigeon	<i>Treron sphenurus</i>	R	OF	FG	LC	IV
25	Green Imperial Pigeon	<i>Ducula aenea</i>	R	BLF	FG	LC	IV
	Psittacidae						
26	Alexandrine Parakeet	<i>Psittacula eupatria</i>	R	LWF	FG	LC	IV
27	Rose-ringed Parakeet	<i>Psittacula krameri</i>	R	LWF	FG	LC	IV
28	Plum-headed Parakeet	<i>Psittacula cyanocephala</i>	R	LWF	FG	LC	IV
29	Red-breasted Parakeet	<i>Psittacula alexandri</i>	R	LWF	FG	LC	IV
	Cuculidae						
30	Common Hawk Cuckoo	<i>Cuculus varius</i>	R & PM	FC	IN	LC	IV
31	Asian Koel	<i>Eudynamis scolopaceus</i>	R	FC	OM	LC	IV
32	Lesser Coucal	<i>Centropus bengalensis</i>	R	FG, S	CN	LC	IV
	Strigidae						
33	Jungle Owlet	<i>Glaucidium radiatum</i>	R	BLF	CN	LC	IV
34	Spotted Owlet	<i>Athene brama</i>	R	FE	CN	LC	IV
	Apodidae						
35	Little Swift	<i>Apus affinis</i>	R	OF	IN	LC	-
36	Asian Palm Swift	<i>Cypsiurus balasensis</i>	R	OF	IN	LC	-
	Coraciidae						
37	Indian Roller	<i>Coracias benghalensis</i>	R	OF	IN	LC	IV

	Alcedinidae						
38	Stork-billed Kingfisher	<i>Pelargopsis capensis</i>	R	WLM	PI/IN	LC	IV
39	White-throated Kingfisher	<i>Halcyon smyrnensis</i>	R	FG, WC	PI/IN	LC	IV
40	Common Kingfisher	<i>Alcedo atthis</i>	R	WLM	PI	LC	IV
	Meropidae						
41	Green Bee-eater	<i>Merops orientalis</i>	R	OF	IN	LC	-
	Meropidae						
42	Chestnut-headed Bee-eater	<i>Merops leschenaulti</i>	R	WLM	IN	LC	-
	Upupidae						
43	Common Hoopoe	<i>Upupa epops</i>	R	OF	IN	LC	-
	Bucerotidae						
44	Oriental Pied Hornbill	<i>Anthracoceros albirostris</i>	R	BLF	CN	LC	I
	Ramphastidae						
45	Lineated Barbet	<i>Megalaima lineata</i>	R	OF, BLF	FG/IN	LC	IV
46	Blue-throated Barbet	<i>Megalaima asiatica</i>	R	OF, BLF	FG	LC	IV
47	Blue-eared Barbet	<i>Megalaima australis</i>	R	OF, BLF	FG	LC	IV
	Picidae						
48	Brown-capped Pygmy Woodpecker	<i>Dendrocopos nanus</i>	R	OF, LWF	IN	LC	IV
49	Fulvous-breasted Woodpecker	<i>Dendrocopos macei</i>	R	OF, LWF	IN	LC	IV
50	Greater Yellownape	<i>Picus flavinucha</i>	R	LWF	IN	LC	IV
51	Lesser Goldenback	<i>Dinopium benghalense</i>	R	FE	IN	LC	IV
52	Greater Goldenback	<i>Chrysocolaptes lucidus</i>	R	FE	IN	LC	IV
53	Rufous Bellied Woodpecker	<i>Dendrocopos hyperythrus</i>	R	LWF	IN	LC	IV
	Aegithinidae						
54	Common Iora	<i>Aegithina tiphia</i>	R	OF	IN	LC	-
	Campephagidae						
55	Large Cuckooshrike	<i>Coracina macei</i>	R	OF, LWF	IN	LC	IV
56	Small Minivet	<i>Pericrocotus cinnamomeus</i>	R	S, OF	IN	LC	IV
57	Scarlet Minivet	<i>Pericrocotus speciosus</i>	R	S	IN	LC	IV
	Laniidae						
58	Brown Shrike	<i>Lanius cristatus</i>	WV	FE	CN	LC	-
59	Long-tailed Shrike	<i>Lanius schach</i>	R	S	CN	LC	-
60	Grey-backed Shrike	<i>Lanius tephronotus</i>	WV	S	CN	LC	-
	Oriolidae						
61	Black-hooded Oriole	<i>Oriolus xanthornus</i>	R	LWF	IN/CN	LC	IV
62	Indian Golden Oriole	<i>Oriolus (oriolus) kundoo</i>	R	OF	IN	LC	IV
	Dicruridae						
63	Black Drongo *	<i>Dicrurus macrocerus</i>	R	OF, FE	IN	LC	IV
64	Ashy Drongo	<i>Dicrurus leucophaeus</i>	R	LWF	IN	LC	IV
65	White-bellied Drongo	<i>Dicrurus caerulescens</i>	R	LWF	IN	LC	IV
66	Bronzed Drongo *	<i>Dicrurus aeneus</i>	R	BLF	IN	LC	IV
67	Lesser Racket-tailed Drongo	<i>Dicrurus remifer</i>	R	BLF	IN	LC	IV
68	Spangled Drongo	<i>Dicrurus hottentottus</i>	R	LWF	IN	LC	IV
	Rhipiduridae						
69	White-throated Fantail	<i>Rhipidura albicollis</i>	R	OF	IN	LC	-
	Corvidae						
70	Rufous Treepie	<i>Dendrocitta vagabunda</i>	R	LWF	OM	LC	IV
71	House Crow	<i>Corvus splendens</i>	R	FE	OM	LC	IV/V
72	Jungle Crow	<i>Corvus macrorhynchos</i>	R	OF	OM	LC	IV
	Hirundinidae						
73	Barn Swallow	<i>Hirundo rustica</i>	WV	OF	IN	LC	-
	Cisticolidae						
74	Zitting Cisticola	<i>Cisticola juncidis</i>	R	TG	IN	LC	IV
75	Common Tailorbird	<i>Orthotomus sutorius</i>	R	FE	IN	LC	IV

	Pycnonotidae						
76	Black-crested Bulbul *	<i>Pycnonotus flaviventris</i>	R	OF, LWF	IN	LC	IV
77	Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>	R	FE	IN	LC	IV
78	Red-vented Bulbul *	<i>Pycnonotus cafer</i>	R	FE	IN	LC	IV
	Timaliidae						
79	Jungle Babbler	<i>Turdoides striata</i>	R	FE, FG	IN	LC	IV
	Sittidae						
80	Velvet-fronted Nuthatch	<i>Sitta frontalis</i>	R	LWF	IN	LC	-
	Sturnidae						
81	Common Hill Myna	<i>Gracula religiosa</i>	R	LWF	OM	LC	IV
82	Jungle Myna *	<i>Acridotheres fuscus</i>	R	OF	OM	LC	IV
83	Common Myna	<i>Acridotheres tristis</i>	R	FE	OM	LC	IV
	Sturnidae						
84	Asian Pied Starling *	<i>Sturnus contra</i>	R	FE	OM	LC	IV
85	Chestnut-tailed Starling	<i>Sturnus malabaricus</i>	R	OF	OM	LC	IV
	Turdidae						
86	Blue Rock Thrush	<i>Monticola solitarius</i>	R	TG	IN	LC	IV
	Muscicapidae						
87	Oriental Magpie-Robin *	<i>Copsychus saularis</i>	R	S	IN	LC	IV
88	White-rumped Shama	<i>Copsychus malabaricus</i>	R	OF	IN	LC	IV
89	Indian Robin	<i>Saxicoloides fulicatus</i>	R	S	IN	LC	IV
	Nectariniidae						
90	Purple Sunbird	<i>Cinnyris asiaticus</i>	R	S	NE	LC	IV
91	Crimson Sunbird	<i>Aethopyga siparaja</i>	R	S	NE	LC	IV
	Passeridae						
92	House Sparrow	<i>Passer domesticus</i>	R	FE	GN	LC	-
93	Eurasian Tree Sparrow	<i>Passer montanus</i>	R	OF	GN	LC	-
	Ploceidae						
94	Baya Weaver	<i>Ploceus philippinus</i>	R	TG	IN	LC	IV
	Estrildidae						
95	Scaly-breasted Munia *	<i>Lonchura punctulata</i>	R	S	IN	LC	IV
96	Black-headed Munia *	<i>Lonchura malacca</i>	R	S	IN	LC	IV
	Motacillidae						
97	White Wagtail	<i>Motacilla alba</i>	WV	WLM	OM	LC	IV
98	Grey Wagtail	<i>Motacilla cinerea</i>	WV	RB	OM	LC	IV
99	Paddy Field Pipit *	<i>Anthus rufulus</i>	R	TG	IN	LC	IV

Abbreviations used:

Status = Resident: R; Winter Visitor: WV; Partial migrant: PM

Habitat strata = Broadleaved forest: BLF; Flooded grassland: FLG; Forest canopy: FC; Forest edge: FE; Forest ground: FG; Forest pool: FP; Large wood forest: LWF; Open forest: OF; pasture: P; River bank: RB; Scrubs: S; Tall Grassland: TG; Water channel: WC; Water logged marshland: WLM; Watery scrubs: WS

Feeding guild = Aquatic Feeder: AF; Carnivore: CN; Frugivore: FG; Grainivore: GR; Insectivore: IN; Nectarivore: NE; Omnivore: OM; Piscivore: PI

IUCN status = Least Concern: LC; NT: Near Threatened; VU: Vulnerable

WLPA, 1972= Wildlife protection Act, 1972

* marked species are associated with Indian One-horned Rhino

niche specialists. Overall 14 habitats have been identified within same ecological continuum profiling unique niche characteristics. Maximum bird species has been recorded in open forest zone (22%) followed by large woody habitat (16%), forest edge or transition zone and scrubs (12% in both), forest ground (9%) and broadleaved forest (8%). Tall grassland, water channel and water logged marshland have been observed to be occupied by 4% to 8% birds.

Result shows that birds frequenting in JNP used to utilize eight different feeding guilds. Throughout study

length, insectivores have been found in highest abundance (45%) followed by omnivores (16%), carnivores (13%), frugivores (9%), piscivores (8%), grainivores (5%), aquatic feeders (3%) and nectarivores birds (2%). Insectivores were dominated in all habitat types while frugivores birds have been mainly found to dominate in open forest, large wood forest, and broadleaved forest habitat. Water channel and forest pool have been observed to be dominated by piscivores. The percentage assemblage of feeding guild in different habitat strata has been depicted in Figure 2.

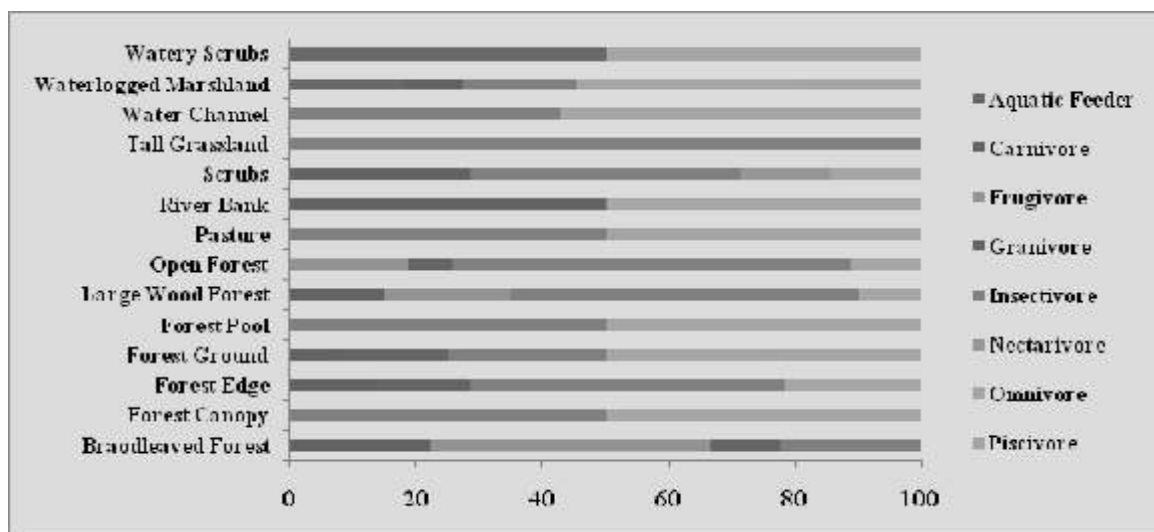


Fig. 2 : The percentage assemblage of feeding guild of avifauna in different habitat strata at Jaldapara National Park

Discussion

Short span biodiversity assessment using species checklists have been widely considered to be one of the best tools for designing long-term conservation programme. The present study has recorded 99 species of avifauna only during November to January of two consecutive years from JNP and adjoining areas. However, according to the records of the WB Forest Department, 240 species of birds are known to occur at Jaldapara (Kumar, 1998). In a recent survey, Avibase has compiled a total 173 bird species from Jaldapara (Lepage, 2014); thus is depicting a moderately healthy overall biodiversity and good forest quality available in JNP.

According to BirdLife International (2001), 9 species from threatened category (Critically Endangered and Vulnerable) and 5 species from Near Threatened category have been found here. Only 2 Vulnerable (Lesser Adjutant and Pallas's Fish Eagle) and 1 Near Threatened (River Lapwing) of them have been detected in the present study. Again, as per BirdLife International, none of the IBA factsheet of trigger species from these regions, like Bengal Florican (*Houbaropsis bengalensis*), Lesser Kestrel (*Falco naumanni*), Black-breasted Parrotbill (*Paradoxornis flavirostris*), Finn's Weaver (*Ploceus megarhynchus*), Darter (*Anhinga melanogaster*), Greater Grey-headed Fish-Eagle (*Ichthyophaga ichthyaetus*), Red-headed Vulture (*Sarcogyps calvus*), Black-bellied Tern (*Sterna acuticauda*), Great Pied Hornbill (*Buceros bicornis*) etc were spotted during the survey. During the present study period Indian Peafowl, Herons, Egrets, Green Pigeons, Parakeets, Kingfishers, Woodpeckers, Drongos, Orioles, Shrikes, Barbets, Indian Roller etc were abundantly found. However this present study documented Kalij Pheasant (*Lophura leucomelanos*) for the first time from

this region. It was recorded from moist shady dense undergrowth near to a water channel, middle position of JNP. The Kalij Pheasant is one of the pheasants recognised under genera *Lophura* found in forests and thickets, mainly in the Himalayan foothills, from the Indus River to western Thailand. The distribution range of Kalij pheasant is northwestern, western, central and eastern Himalayas (Darjeeling in West Bengal, Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, and Arunachal Pradesh) usually < 2,700 m altitudes and in the hills of north east India (Assam, Meghalaya, Manipur, Mizoram, Nagaland and Tripura). It inhabits all types of forest with dense undergrowth and thickly overgrown steep gullies, usually not far from water (Sathyakumar and Kaul, 2007).

The vegetation diversity and forest profile are important determinants of the native bird communities. Here, maximum bird abundance has been found in open forest and large woody habitat as it consists several structurally complex forest strata, offer more feeding niches. Forest edges were found to occupy 12% of total species containing habitat generalist and opportunistic bird species. This was probably due to human practises attracting good number of synanthropic birds. Among the different feeding guild, insectivorous birds have been found more abundant in different secondary forest strata because structural complexity of such forest is very suitable for insects (Chettri *et al.*, 2005). Entomofaunal abundance in grassland habitat also attracts many grassland specialist bird species. The observed abundance of frugivores in this present study indicated that fruits are sufficiently available in these forests. Most of the habitat specialist frugivorous bird species belonged to Psittacidae, Ramphastidae and Columbidae family. This group of birds is adaptable to the seasonal

availability of fruits and considered as good colonising species (Zakaria *et al.*, 2005). Noteworthy, presence of good numbers of insectivorous and frugivorous bird species directly reflected good health of forests.

Terrestrial ecosystems are presently subjected to unprecedented rates of human-induced environmental changes (Foley *et al.*, 2005). Like other forest biome of the country, the Northern part of West Bengal is facing numerous conservation challenges. Among them human-driven habitat alteration is a critical player in widespread decline of specialist organism (Vitousek *et al.*, 1997). Beside this, as per census report, the population of Jalpaiguri district, in last 10 years has undergone 13.9 % increment by 2011 (622 people per km²) since 2001 (546 people per km²). Moreover, 72.6 % population of Jalpaiguri districts has been found to live in suburbs and rural fringes close to reserve forests (Census of India, 2011) and a large proportion of them are direct and indirect forest users. JNP has always been under threat from the high densities of villages occupying the surrounding areas. Fringe villagers are often depends on Non Timber Forest Product (NTFP) and livestock grazing. Heavy traffic flow of NH-31 (national highway) also disturbs the natural continuity of this reserve. The natural heritage of North Bengal encountered 56.8 % growth in tourism inflow from 2001 to 2008. All these exert tremendous anthropogenic pressure on the forest landscape and cause qualitative degradation of natural habitat. Here, the Terai grassland get periodically flooded by monsoonal rainfall and river Torsha underwent a significant change in its course during the floods of 1968 (Sudhaker *et al.*, 1996). Studies have shown that a change

in the flooding regime alters plant communities and vegetation succession (Biswas *et al.*, 2014). Highly sensitive to climate and weather, birds are pioneer indicators of climate change (Both *et al.*, 2006). It is evident that, with 0.8°C of average temperature rise globally occurred over the past century, have strong negative impacts on avifaunal population (Berthold *et al.*, 2004). The West Bengal state experienced an increase by 0.98 °C of the mean maximum air temperature and by 1.56 °C of the mean minimum air temperature during the period 1980–2010, which predicted the average daily maximum and minimum air temperatures are both projected to rise by 2.2 °C in the 2050s (WBSAPCC, 2010). It is note that some species are adversely affected by temperature increases as small as 1°C (Hilbert *et al.*, 2004). Due to local and regional climatic warming, bird species are expected to shift their distribution range to get optimum food resources key to survival (Both *et al.*, 2006). So, all these climatic and macro-geological events along with human impacts might have a role to alter birds' ranges and abundance over time in this region.

Conclusion

The present study discusses the rich winter avifaunal diversity of JNP. We have considered the study time as high abundance period when more than half of the bird species get spotted. More rigorous study might document more species. Different habitat patches demonstrates unique community composition and open forest patch is the most bird-rich habitat patch. The climatic variability as well anthropogenic impact to bird diversity in northern West Bengal also demands further intensive studies.

जल्दापाड़ा राष्ट्रीय पार्क, पश्चिम बंगाल, भारत में, इनके आवास संयोजन एवं संभरण संघ पर एक नोट के साथ पक्षी विविधता
सौरभ कुमार दुबे, दीप चन्दन चक्रवर्ती, सान्दीपन गुप्ता, महाश्वेता मित्रा, रनीता भट्टाचार्य एवं असीत बारन नीयोगी

सारांश

उत्तरी बंगाल के हिमालयन तराई क्षेत्र के भीतर स्थित जल्दापाड़ा राष्ट्रीय पार्क में किए गए मौसमीय सर्वेक्षण में क्रमिक वर्ष (2013 और 2014) में 43 कुलों से संबंधित पक्षी प्राणिजात के 99 टेक्सा को अभिलिखित किया गया। अन्य आवास किस्मों में से खुले वन आवासों को पक्षी प्राणिजात में समृद्ध पाया गया। संभरण श्रेणियों में, कीटभोजी प्रजाति सामर्थ्य में प्रधान थे तथा कई आवास किस्मों में प्रतिनिधित्व था। सर्वेक्षण दर्शाता है कि जल्दापाड़ा भूदृश्य का 2 अतिसंवेदनशील (लेसर एडजूटेन्ट और पल्लाज फिश ईगल) तथा 1 लगभग संकटस्थ प्रजाति (रिवर लैपविंग) द्वारा बार-बार भ्रमण किया गया। अध्ययन में कालिज फीजेन्ट प्रलेखित किया गया, जो कदाचित इस क्षेत्र से नया अभिलेख है।

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