A preliminary survey on the avian community of Dalma Wildlife Sanctuary, Jharkhand, India

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The importance of local landscapes for avian conservation can only be understood by knowing the structure of the bird community of that region (Kattan & Franco 2004). Bird diversity of both temperate and tropical forests has been studied by many workers from time to time (MacArthur & MacArthur 1961; Terborgh et al. 1990; Thiollay 1994; Robinson et al. 2000; Latta et al. 2003; Blake 2007). Valuable information on factors influencing population dynamics, interactions, community structure, and conservation can be gathered by monitoring seasonal changes of avifauna (Ornelas et al. 1993). Seasonal fluctuations in abundance and number of species have been studied in several temperate (Anderson et al. 1981; Best 1981), as well as in tropical avian communities (Karr 1981; Blake 1992; Blake & Loiselle 2000).

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Very few studies (Ball 1874; Lopez & Mundkar 1997; Gupta 2004) have been made on the species composition of birds in different parts of Jharkhand (India) and no attempt has been made to study the avifauna of Dalma Wildlife Sanctuary. The present study investigates the bird community of this sanctuary, their seasonal variations and also highlights conservation challenges. A comprehensive checklist of birds along with their status is also presented in this document.

Study Area

The Dalma Wildlife Sanctuary which extends over 193km^2 in the thick forest of the Dalma Mountain range is located 10km from Jamshedpur in Jharkhand (India). This wildlife sanctuary is blessed with a nearby flowing river called Subarnarekha. Dimna Lake, which is located down the Dalma Hills, provides an excellent habitat for resident aquatic birds. Several migratory birds visit this lake every year during winter. An image of the study area was downloaded from the internet with the help of Google earth software (Image 1).

Climatic conditions in Dalma are typical of Indian sal forest and its natural vegetation comprises a combination of Sal forest and tropical dry deciduous types. The hottest months are May and June in which the temperature may rise up to 44^{0}C. The period from November to February is comparatively cool with an average temperature of 10^{0}C. The maximum rainfall is received during the months of July and August from the south west monsoon. The luxuriant forest of this sanctuary offers excellent habitat for its inhabitants. These forests contain a large number of wild birds that are ecologically specialized and extremely sensitive to habitat loss. Deforestation, pollution, and the introduction of cattle are seriously threatening these forests.

Methods

Bird Sampling: The bird community of Dalma Wildlife Sanctuary, Jharkhand was studied during September 2006 to November 2008. A combination of variable radius point count method (Bibby et al. 2000) and transect method (Emlen 1971) was used for the sampling of birds. Four transects (2km length and

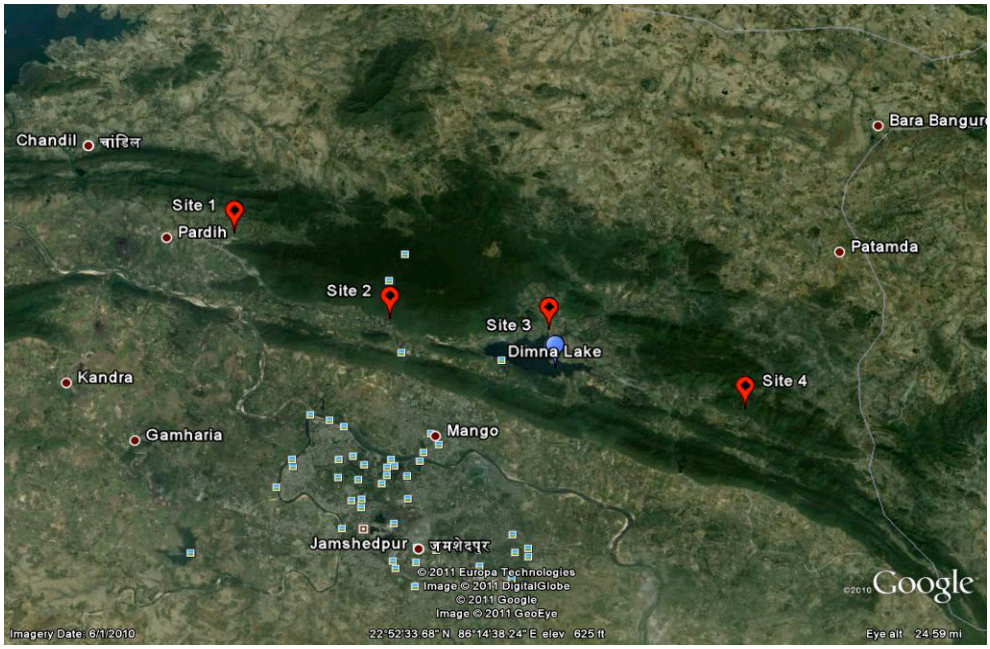

Image 1. Dalma Wildlife Sanctuary downloded from Google Earth showing the four different sampling sites where transects were laid.

100m width) were laid within the sanctuary at different sites (Table 1). Five permanent sampling points were established in each transect and a distance of 100m was maintained between them. Seasonal variation was determined by dividing each year into four seasons. These seasons were (1) spring—February and March, (2) summer—April to June, (3) rainy season (monsoon)—July to September and (4) winter (post monsoon)—October to January. For each year a data matrix was constructed which recorded the species and their abundance in each season. Sampling was conducted, mostly in the morning (0700–0900 hr) and in the evening (1600–1900 hr). Each bird seen was recorded at every point distributed along each transect. Each point was sampled three times a season making a total of 240 point counts.

Data analysis: The cumulative number of species observed in each site was considered as the species richness for that site. Based on the present investigations a bird list was compiled (Table 5). Shannon-Wiener diversity index ($H = -\Sigma\ p^i \ln p^i$) was calculated for each site. Seasonal variation in the abundance of birds was also calculated using the Shannon-Weiner formula. Similarity between sites was determined by Sorensen's index of similarity as given below:

$IS = 2j / (a + b)$

Table 1. Details of transects laid in the Dalma Wildlife Sanctuary, Jharkhand, India for bird sampling.

Transects (Sites)	Geographical parameters	
	Latitude	Longitude
1	22°54'54.96"N	86°07'31.93"E
2	22°52'42.28"N	86°11'44.86"E
3	22°52'25.39"N	86°16'02.44"E
4	22°50'23.43"N	86°21'19.61"E

Table 2. Sorensen's index representing the similarity values between study sites in Dalma Wildlife Sanctuary

	Site 2	Site 3	Site 4
Site 1	0.56	0.59	0.64
Site 2		0.61	0.55
Site 3			0.61

where j = number of species common to both sites
a = number of species in site A
b = number of species in site B. (Table 2)

One-way analysis of variance (ANOVA) was performed to test for differences between sites in terms of species richness and diversity values.

Bird species were ranked into following abundance categories (Ramírez-Albores & Ramírez 2002): abundant (total of 40 or more individuals recorded

daily), common (17 to 39 individuals recorded daily), scarce (11 to 16 individuals recorded), irregular (five to 10 individuals recorded) and rare (one to four individuals recorded). Species were identified directly in the field and where identification could not be done, photographs were taken. They were identified with the help of field guides (Grimmett et al. 1999; Kazmierczak & Singh 2001; Ali 2001).

Taxonomy adopted here is after Inskipp et al. (1996).

Results

A total of 71 species grouped into 36 families were recorded from the Dalma Wildlife Sanctuary during the study period (Table 5). The Sturnidae family shows the highest species richness within the sanctuary (five species), followed by Muscicapidae, Motacicillidae, Columbidae, Ardeidae, Anatidae (four species of each) (Table 5). The species richness of selected sites varied between 39 to 51 (Table 3), while overall diversity values ranged from 2.87 to 3.33 (Table 4). Of the species recorded in this study, 51 species were resident and the remaining species were recorded as migratory (Table 5). On the basis of relative abundance four species can be considered as rare, seven as irregular, 17 as scarce, 25 as common and 18 as abundant (Table 5, Fig. 1). A distinct seasonal variation in avian species richness was observed with a peak during the monsoons representing 43 species. However, species richness and the diversity values for the sites were seasonally almost similar (ANOVA, $p > 0.05$).

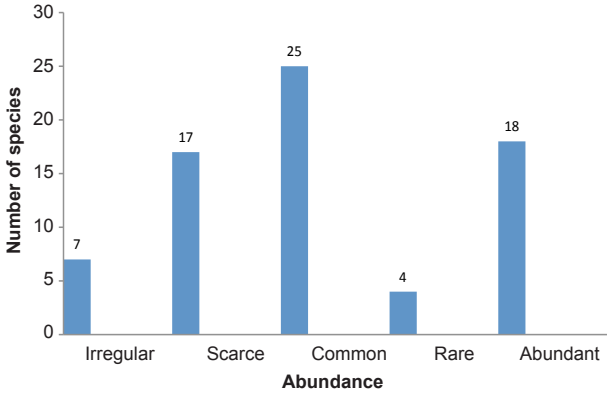

Figure 1. Relative abundance of bird species in Dalma Wildlife Sanctuary

Discussion

The two-year study observed 71 species from the Dalma Wildlife Sanctuary, which shows that this sanctuary supports a high diversity of birds. Most of the observed species are breeding residents mainly due to occurrence of various types of microhabitat within the sanctuary, nearby river and a large lake. Due to the abundance of endemic species this sanctuary is very important for bird conservation in this part of the world.

Seasonal changes in species richness were observed which is mainly due to changes in weather conditions or fluctuations in food productivity and habitat quality (Loiselle & Blake 1991; Norris & Marra 2007). Species

Table 3. Bird species richness for study sites in Dalma Wildlife Sanctuary, Jharkhand, India

Transects (Sites)	Total Richness	Richness (Spring)	Richness (Summer)	Richness (Rainy season)	Richness (Winter)
1	42	32	27	39	31
2	51	36	31	43	33
3	44	29	27	34	28
4	39	31	30	37	30

Table 4. Bird diversity values for study sites in Dalma Wildlife Sanctuary, Jharkhand, India

Transects (Sites)	Total Diversity Value	Diversity Value (Spring)	Diversity Value (Summer)	Diversity Value (Rainy Season)	Diversity Value (Winter)
1	3.21	3.09	2.84	3.11	2.98
2	3.33	3.17	2.99	3.03	2.83
3	2.87	2.98	2.90	2.88	2.76
4	3.01	3.00	2.85	2.68	2.89

richness of birds in the sanctuary becomes maximum during the monsoon season due to greater availability of insects and favourable weather conditions.

Occurrence of almost same species richness and similar diversity values during a season for the different sites selected for the sampling indicates uniform distribution of birds throughout the sanctuary. The Dimna Lake which is a famous tourist spot is located in the vicinity of the Dalma Wildlife Sanctuary. Increasing tourist activity especially during the months of December and January is now becoming a serious threat to the birds of this sanctuary. Utilization of river beds for sand is imposing immense pressure on the birds that breed at the river beds. Cattle grazing and use of forest wood as a source of fuel by local people are also creating adverse conditions for the birds of the region.

Therefore various measures should be taken for the conservation of birds of the sanctuary. Cattle grazing should be allowed in a controlled manner. Alternative fuel sources should be made available to the local communities. Establishment of eco-tourism committees with the help of local people and conducting awareness programs by the forest department on a regular basis would be an effective step in the avian diversity conservation of the Dalma Wildlife Sanctuary.

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Table 5. Checklist of birds recorded from Dalma Wildlife Sanctuary, Jharkhand, India

	Common Name	Scientific Name	Status	Abundance
	Accipitridae			
1	Black-shouldered Kite	*Elanus caeruleus*	R	I
	Alaudidae			
2	Ashy-crowned Finch-lark	*Eremopterix grisea*	W	S
	Alcedinidae			
3	Common Kingfisher	*Alcedo atthis*	R	S
4	White-throated Kingfisher	*Halcyon smyrnensis*	R	S
	Anatidae			
5	Northern Pintail	*Anas acuta*	W	S
6	Gadwall	*Anas strepera*	W	S
7	Lesser Whistling-duck	*Dendrocygna javanica*	W	S
8	Comb Duck	*Sarkidiornis melanotos*	R	C
	Ardeidae			
9	Indian Pond-heron	*Ardeola grayii*	R	C
10	Eastern Cattle Egret	*Bubulcus coromandus*	R	C
11	Intermediate Egret	*Mesophoyx intermedia*	R	C
12	Black-crowned Night-heron	*Nycticorax nycticorax*	R	S
	Burhinidae			
13	Indian Stone-curlew	*Burhinus oedicnemus*	R	R
	Capitonidae			
14	Coppersmith Barbet	*Megalaima haemacephala*	R	C
	Charadridae			
15	Grey-headed Lapwing	*Vanellus cinereus*	W	S
16	Red-wattled Lapwing	*Vanellus indicus*	W	S
	Cisticolidae			
17	Ashy Prinia	*Prinia socialis*	R	C
	Columbidae			
18	Rock Pigeon	*Columba livia*	R	C
19	Spotted Dove	*Streptopelia chinensis*	R	C
20	Eurasian Collared-dove	*Streptopelia decaocto*	R	C
21	Laughing Dove	*Streptopelia senegalensis*	R	C
	Coraciidae			
22	Indian Roller	*Coracias benghalensis*	R	C
	Corvidae			
23	Indian Jungle Crow	*Corvus macrorhynchos*	R	C
24	House Crow	*Corvus splendens*	R	A
25	Rufous Treepie	*Dendrocitta vagabunda*	R	S
	Cuculidae			
26	Greater Coucal	*Centropus sinensis*	R	C
27	Asian Koel	*Eudynamys scolopacea*	R	C
28	Common Hawk-cuckoo	*Hierococcyx varius*	R	S
	Daniidae			
29	Brown Shrike	*Lanius cristatus*	R	C
30	Black-headed Long-tailed Shrike	*Lanius schach tricolor*	R	S

	Dicruridae			
31	Ashy Drongo	*Dicrurus leucophaeus*	R	S
32	Black Drongo	*Dicrurus macrocercus*	R	C
	Estrildidae			
33	Indian Silverbill	*Lonchura malabarica*	R	S
	Accipitridae			
34	Black Kite	*Milvus migrans*	R	C
	Hirundinidae			
35	Barn Swallow	*Hirundo rustica*	W	A
	Jacanidae			
36	Pheasant-tailed Jacana	*Hydrophasianus chirurgus*	W	S
37	Bronze-winged Jacana	*Metopidius indicus*	W	S
	Meropidae			
38	Little Green Bee-eater	*Merops orientalis*	R	A
	Motacicillidae			
39	Paddyfield Pipit	*Anthus rufuls*	R	A
40	White-browed Wagtail	*Motacilla maderaspatensis*	W	S
41	White Wagtail	*Motacilla. alba leucopsis*	W	A
42	Western Yellow Wagtail	*Motacilla.flava*	W	A
	Muscicapidae			
43	Oriental Magpie-Robin	*Copsychus saularis*	R	A
44	Red-breasted Flycatcher	*Ficedula parva*	S	R
45	Indian Black Robin	*Saxicoloides fulicata*	R	I
46	Jungle Babbler	*Turdoides striatus*	R	A
	Nectariniidae			
47	Purple Sunbird	*Nectarinia asiatica*	R	A
	Oriolidae			
48	Indian Golden Oriole	*Oriolus kundoo*	S	C
	Phalacrocoracidae			
49	Little Cormorant	*Phalacrocorax niger*	S	C
	Phasianidae			
50	Grey Francolin	*Francolinus pondicerianus*	W	I
51	Indian Peafowl	*Pavo cristatus*	R	C
	Picidae			
52	Woodpecker	*Dendrocopos*	R	R
	Ploceidae			
53	Scaly-breasted Munia	*Lonchura punctulata*	R	C
54	House Sparrow	*Passer domesticus*	R	A
55	Indian Baya Weaver	*Ploceus philippinus*	R	A
	Podicipitidae			
56	Little Grebe	*Tachybaptus ruficollis*	W	C
	Psittacidae			
57	Alexandrine Parakeet	*Psittacula eupatria*	R	A
58	Rose-ringed Parakeet	*Psittacula krameri*	R	A
	Pycnonotidae			
59	Red-vented Bulbul	*Pycnonotus cafer*	R	A
60	Red-whiskered Bulbul	*Pycnonotus jocosus*	R	A

	Rallidae			
61	White-breasted Waterhen	*Amaurornis phoenicurus*	R	C
62	Common Moorhen	*Gallinula chloropus*	W	C
	Scolopacidae			
63	Common Sandpiper	*Actitis hypoleucos*	S	I
64	Green Sandpiper	*Tringa ochropus*	S	R
	Strigidae			
65	Indian Eagle-owl	*Bubo bengalensis*	R	C
	Sturnidae			
66	Bank Myna	*Acridotheres ginginianus*	R	A
67	Common Myna	*Acridotheres tristis*	R	A
68	Asian Pied Starling	*Sturnus contra*	R	A
69	Grey-headed Starling	*Sturnus malabaricus* - NE variant	R	I
70	Brahminy Starling	*Sturnus pagodarum*	R	I
	Upupidae			
71	Common Hoopoe	*Upupa epops*	R	I

Status: R - resident; W - winter visitor; T - transient; O - occasional; S - summer resident. **Abundance:** R - rare; I - irregular; S - scarce; C - common; A - abundant.

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