AN ASSESSMENT OF BIRD DIVERSITY AROUND JOSHIMATH NANDA DEVI BIOSPHERE RESERVE, UTTARAKHAND

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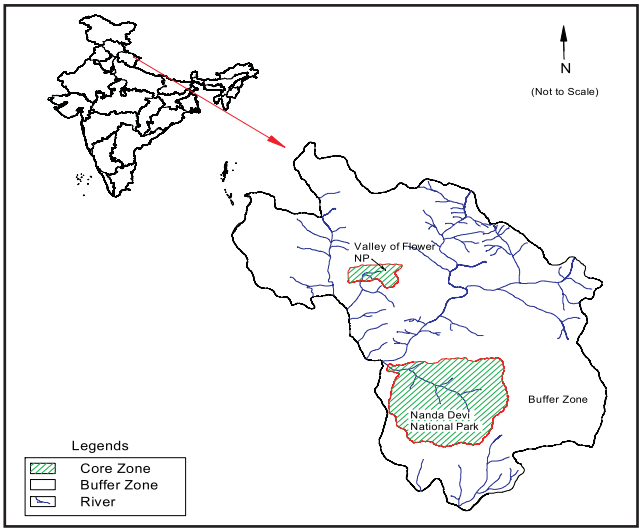
Introduction

The Indian Himalayan Region (IHR) is well recognized for its ecological, hydrological and aesthetic values and is considered as the repository of biological and cultural diversity, and supports about 18,440 species of plants (Singh and Hajra, 1996); 1748 species of medicinal plants (Samant *et al*., 1998) and 675 species of wild edibles (Samant and Dhar, 1997). Western Himalaya is an important area for bird diversity and harbours several regional endemic species and has been designated as Endemic Bird Area (EBA 28) which extends along the mountain chain from Western Nepal, west of Kali Gandaki Valley through Uttarakhand, Himachal Pradesh up to Jammu and Kashmir and contains 27 Important Bird Areas(IBA) (Islam and Rahamani, 2004). Nanda Devi Biosphere Reserve (NDBR- $30^0$08'- $31^0$02'N latitude, $79^0$12'$80^0$19'E) in the Chamoli district of Uttarakhand belongs to Western Himalayan biogeographic zonation of India and is among the world heritage sites. It has large altitudinal range (1,800-7,817 m amsl) and covers an area of 5860.69 Km^2, of which 5148.57 km^2 area is under buffer zone and 712.12 km^2 area is under core zone including the area of Valley of Flowers National Park. The unique topography, climate and soil support diverse habitats, species, communities and ecosystems. The high percentage of natural (native) and unique (endemic) species, richness and representativeness of the flora and fauna and also high diversity of species and communities itself identify the conservation value of the reserve. The vegetation mainly comprises of temperate, sub-alpine and alpine types. Sankaran (1993) recorded a total 141 bird species from NDBR of which 57 species within the National Park. Arora, *et al.* (1995) recorded 175 bird species belonging to 95 genera and 37 families from the buffer and core area of the NDBR. Some of the comprehensive bird list of the biosphere (NDBR) has been documented by Reed (1979), Lamba (1987), Sankaran (1993), Tak and Kumar (1987), Tak (1997) and Bhattacharya and Sathyakumar (2007). This study was carried out to scrutinize the diversity of the birds at different types of vegetation around NDBR, Uttarakhand.

The present study was conducted during March 2010 to May 2010 and was carried out in buffer zones, Joshimath and Auli *bugyal*. Before carrying on the study, the study site was parted into four zones explicitly conifer patch and human habitation at Joshimath and oak patch and mixed patch at Auli bugyal (Fig.1).

Fig. 1



Study area

Material and Methods

Point count transect method (Bibby *et al*., 1992) and line transect method (Emlen, 1971) were applied to quantify the diversity and the relative abundance of birds found in each habitat. Two transects of the trail length 2 km were laid in each habitat. Within which 10 points at equal intervals of 200 m from each point were taken. The bird species within the circular diameter of 30 m from the respective point were identified and noted down. Number of species, number of individual, dominance, Shannon Index (H) , Simpson Index and Evenness have been calculated using the computer software PAST (Palaeontological Statistics) developed by Begon *et al.,* 1999.

Besides this, vegetation analysis was also done by using the random quadrat method (size of quadrat, 10 x 10 m for trees; 5 x 5 m for shrubs and 1 x 1 m for herbs) as given by Misra (1968). Five quadrats were laid at each site

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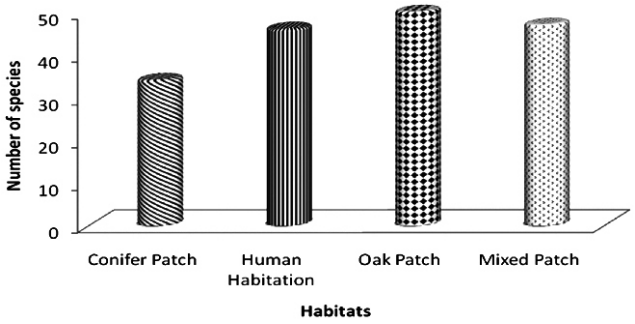
for trees, shrub and herbs separately in each quadrat. Vegetational analysis, which include density, frequency, abundance, basal area, relative frequency, relative density, relative dominance and IVI (Importance Value Index) were analyzed using the methods adopted by Misra (1968) and Curtis and McIntosh (1950).

Results

During the present study a total of 689 birds of 95 species were identified and recorded belonging to 25 families (Table 1). Most of them were the summer visitors 13 (13.68%), winter visitors 4 (4.21%) and the local resident 73 (76.84%) of the Joshimath and Auli bugyal. Two of them were resident migrant and three were altitudinal migrant. The dominant species at conifer patch were Grey bushchat, Large billed crow and Himalayan bulbul. At human habitation dominant species were House sparrow, Black bulbul and Streaked laughing thrush. Grey bushchat, Eurassian sparrow hawk, Himalayan bulbul and Spot winged tit were dominant at oak patch. At mixed patch olive-backed pipit, Grey treepie and Spotwinged tit were found to be dominant.

Distribution of bird species in different habitats showed 34 species in conifer patch, 46 species in human habitation, 50 species in oak patch and 47 species in mixed patch (Fig. 2). The larger number of individuals was found in human habitation i.e. 238, followed by oak patch i.e. 188, then mixed patch with 149 and then conifer patch with 114 individuals.

Fig. 2

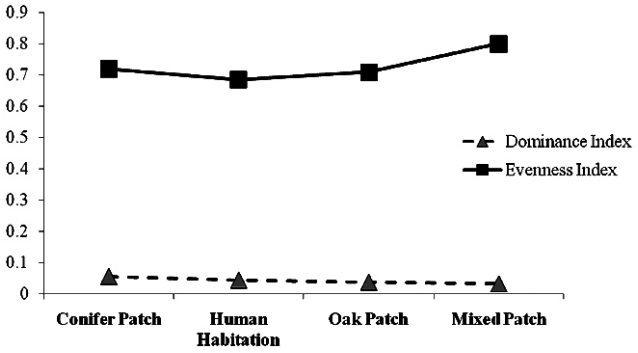


Number of bird species distributed in different habitats

Dominance was found to be higher in (Fig. 3) conifer patch (0.055375) followed by human habitation (0.04394) and oak patch (0.03699) and mixed patch with least dominance (0.03198) but there was no wide difference in all four habitats in terms of dominance. Species evenness was found to be higher in mixed patch (0.7993) followed by conifer patch (0.7178) and oak patch (0.7075) and least in human habitation (0.6835), and shows less variation between them.

As per random quadrat method applied in the four

Fig. 3



Dominance and Diversity Index across different habitat types

different habitats of Joshimath and Auli *bugyal* for assessing the vegetation composition, 84 species of the plants were identified. There were 18 species in tree layer, 35 species in the shrub and sapling layer and 31 species in the herbaceous layer. *Pinus wallichiana* was found to be dominated species at conifer patch and human habitation. *Quercus semecarpifolia* was most dominant at oak patch and mixed patch.

Importance Value Index (IVI), an indicative of species dominance among the four sites was recorded highest for kail (130.76) at Joshimath and highest for kharshu (103.80) at Auli bugyal. It was observed that during the entire course of study, kail (*Pinus wallichiana*) was a dominant species due to its more frequency, density and basal area and it was throughly present in all the habitats, tree layer as well as in shrub layer followed by *Quercus semecarpifolia*.

Discussion

As the study was carried on the summer season, when temperature ranges from 13°C to 29°C, the maximum recorded birds were local residents and few summer migrants. The area receives 180 cm rainfall annually which seems to be most influential determining the diversity of the bird and the vegetation found over there. As the results showed, there is not much variation between the species evenness, species richness, and diversity within the four habitats. Compared to other three habitats, the conifer forest patch was least diverse in terms of bird species recorded as this is the most homogenous in terms of vegetation structure and composition, without significant herb and shrub layer. The human habitation harbors a significant bird diversity compared to other natural forest patches, which is in accordance to the mid-disturbance hypotheses, i.e., anthropogenic influence creates some special niches for birds which are absent from natural habitats. Since spatial variation between the species occur due to productivity, resource richness, predation intensity,

Table 1

Birds recorded from Joshimath and Auli bugyal

Sl.No.	Scientific Name	Common name	Status	Habitat	IUCN Status
1	2	3	4	5	6
1	*Accipiter nisus melaschistos*	Eurasian Sparrowhawk	R br	OP	LC
2	*Acridotheres furcus*	Jungle Myna	R	HH, MP	LC
3	*Acridotheres tristis*	Common Myna	R	CP	LC
4	*Adgithalos concinus*	Black-throated Tit	R	CP	LC
5	*Anthus hodgsonii*	Olive-backed Pipit	SV br	MP	LC
6	*Anthus trivialis*	Tree Pipit	R WV	OP	LC
7	*Apus apus*	Common Swift	SV	HH, OP	LC
8	*Aquila nipalensis*	Steppe Eagle	WV & E	CP	LC
9	*Brachypteryx montana*	Spot-winged Tit	R br	HH, OP, MP	LC
10	*Brachypteryx montana*	White-browed Shortwing	R	MP	LC
11	*Carpodacus erythrinus*	Common Rosefinch	SV br	CP, HH, OP, MP	LC
12	*Carpodacus nipalensis*	Dark-breasted Rosefinch	SV	HH	LC
13	*Catreus wallichii*	Cheer Pheasant	R	OP	V
14	*Certhia discolor*	Brown-throated Treecreeper	R	MP	LC
15	*Certhia familiaris*	Eursrian Treecreeper	R	MP	LC
16	*Certhia himalayana*	Bar-tailed Treecreeper	R br	OP	LC
17	*Cettia acanthizoides*	Yellowish-bellied Bush Warbler	R	CP, HH	LC
18	*Cettia major*	Chestnut-crowned Bush Warbler	R br	HH, MP	LC
19	*Chaimarrornis leucocephalus*	White-capped Water Redstart	R br	OP	LC
20	*Cinclus pallasii*	Brown Dipper	R	OP	LC
21	*Collocalia brevirostris*	Himalayan Swiftlet	R	HH, OP	LC
22	*Columba livia*	Rock Pigeon	R	HH	LC
23	*Corvus corax*	Common Raven	R	CP, HH, OP	LC
24	*Corvus macrorhynchos*	Jungle Crow	R	CP, HH, MP	LC
25	*Corvus macrorhynchos Intermedia*	Large-billed Crow	R	CP, HH, OP, MP	LC
26	*Cuculus canorus*	Eurasian Cuckoo	R br	OP, MP	LC
27	*Cuculus micropterus*	Indian Cuckoo	R M	OP	LC
28	*Dendrocitta formosae*	Grey Treepie	R	CP, HH	LC
29	*Dendrocitta frontalis*	Collared Treepie	R	MP	LC
30	*Dendrocitta vagabunda*	Rufous Treepie	R	CP, HH	LC
31	*Dendrocopos himalayensis*	Himalayan Woodpecker	R	OP,MP	LC
32	*Dendrocopos macei*	Fulvous-breasted Woodpecker	R	OP,MP	LC
33	*Dicrurus aeneus*	Bronzed Drongo	R	HH	LC
34	*Dicrurus leucophaeus*	Ashy Drongo	SV br	CP, HH	LC
35	*Dicrurus macrocercus*	Black Drongo	R	CP, HH, OP, MP	LC
36	*Emberiza cia*	Rock Bunting	R br	CP, OP, MP	LC
37	*Emberiza leucocephala*	Pine Bunting	WV	OP	LC
38	*Enicurus maculatus*	Spotted Forktail	R	OP	LC
39	*Eumyias thalassina*	Verditer Flycatcher	SV	CP, HH, OP, MP	LC
40	*Ficedula parva albicilla*	Red-throated Flycatcher	WV	MP	LC
41	*Ficedula super cillaris*	Ultramarine Flycatcher	SV	HH, OP	LC
42	*Ficedula tricolor*	Slaty-backed Flycatcher	SV	HH	LC
43	*Ficedula westermanni*	Little Pied Flycatcher	R	CP, OP, MP	LC
44	*Garrulax lineatus*	Streaked Laughingthrush	R	HH, OP	LC
45	*Garrulax monileger*	Lesser Necklaced Laughingthrush	R	MP	LC
46	*Gypaetus barbatus aureus*	Lammergeier	R & E	CP, HH	LC
47	*Gyps himalayensis*	Himalayan Griffon	R	CP, HH, OP	LC
48	*Heterophasia capistrata*	Rufous Sibia	R	OP	LC
49	*Hypsipetes leucocephalus*	Black Bulbul	R	CP, HH	LC
50	*Lanius Schach erythronotus*	Long-tailed Shrike	SV	CP, HH	LC
51	*Lanius tephronotus*	Grey-backed Shrike	WV br	CP, HH	LC
52	*Leucosticte nemoricola*	Plain Mountain Finch	R br	OP	LC
53	*Lophophorous impejanus*	Himalayan Monal	R & E	OP	LC
54	*Lophura leucomelana*	Kalij Pheasant	R	OP	LC
55	*Magalaima virens*	Great Barbet	R	CP, HH	LC

Contd.....

1	2	3	4	5	6
56	*Monticola solitarius*	Blue Rock Thrush	SV br	MP	LC
57	*Motacilla caspica*	Grey Wagtail	SV br	CP, OP, MP	LC
58	*Motacilla flava*	Yellow Wagtail	RM	OP, MP	LC
59	*Mycerobas affinis*	Collared Grosebeak	R br	OP	LC
60	*Mycerobas icterioides*	Black-and-yellow Grosebeak	R	MP	LC
61	*Mycerobas melanozanthos*	Spotwinged Grosebeak	R br	HH	LC
62	*Myiophonus caeruleus*	Blue Whistling Thrush	R br	CP, HH, OP, MP	LC
63	*Niltava macgriguriae*	Small Niltava	R	CP, HH, MP	LC
64	*Niltava sundara*	Rofous-bellied Niltava	R	MP	LC
65	*Nucifraga caryocatactes*	Spotted Nutcracker	R	OP, MP	LC
66	*Parus ater*	Coal Tit	R br	OP, MP	LC
67	*Parus major*	Great Tit	R	HH, OP	LC
68	*Passer domesticus*	House Sparrow	R	HH, OP, MP	LC
69	*Pericrocotus flammeus*	Scarlet Minivet	R	OP, MP	LC
70	*Phylloscopus fuligiventer*	Smoky Warbler	AM br	MP	LC
71	*Phylloscopus humei*	Hume's Warbler	R br	MP	LC
72	*Phylloscopus trochiloides*	Greenish Warbler	SV br	CP, HH, OP, MP	LC
73	*Picus canus*	Grey-headed Woodpecker	R	CP, HH	LC
74	*Prunella strophiata*	Rufous-breasted Accentor	R br	OP, MP	LC
75	*Psittacula cyanocephala*	Plum-headed Parakeet	R	CP, HH	LC
76	*Psittacula himalayana*	Slaty-headed Parakeet	R	CP, HH	LC
77	*Pycnonotus cafer*	Red-vented Bulbul	R	HH	LC
78	*Pycnonotus leucogenys*	Himalyan Bulbul	R	CP, HH, OP, MP	LC
79	*Pyrrhoplectes epauletta*	Gold-naped Finch	R	HH	LC
80	*Rhipidura albicollis*	White-throated Fantail	R br	CP, HH, MP	LC
81	*Rhipidura hypoxantha*	Yellow-bellied Fantail	AM br	MP	LC
82	*Saxicola ferrea*	Grey Bushchat	R br	CP, HH, OP, MP	LC
83	*Seicercus xanthoschistos*	Grey-hooded Warbler	R	HH	LC
84	*Sitta castanea*	Chestnut-bellied Nut hatch	R	MP	LC
85	*Streptopelia chinensis*	Spotted Dove	R	CP, HH	LC
86	*Streptopelia orientalis*	Oriental Turtle Dove	R & SV	OP, MP	LC
87	*Tarsiger cyanurus*	Orange-flanked Bush Robin	R	OP	LC
88	*Tarsiger hyperythrus*	Rufous-breasted Bush Robin	R br	HH, OP, MP	LC
89	*Turdoides striatus*	Jungle Babbler	R	OP	LC
90	*Turdus albocinctus*	White-collared Black bird	R br	OP, MP	LC
91	*Turdus viscivorus*	Mistle Thrush	R br	OP	LC
92	*Urocissa flavirostris*	Yellow-billed Blue Magpie	R	CP, HH	LC
93	*Zoothera dauma*	Scaly Thrush	AM br	MP	LC
94	*Zoothera wardii*	Pied Thrush	SV br	CP, HH, OP, MP	LC
95	Zosterops palpebrosus	Oriental White-eye	R	OP, MP	LC

Status - R- Resident; E -Endangered Habitat - CP- Conifer Patch; Br- Breeds; HH - Human habitation; WV- winter visitor; MP- Mixed Patch; SV- Summer visitor; OP- Oak Patch; AM - Altitudinal Migrant; RM - Resident migrant; IUCN Category-LC-Least Concerned, V-Vulnerable.

spatial heterogeneity, environmental harshness while temporal variation between the species occurs due to climatic variation and disturbances, it is clear that the slight variation between them was due to habitat differentiation, vegetation composition, structure and the feeding habits of the birds. The uniform diversity between the sites occurs due to the overlapping of the habitats, less remoteness, altitudinal similarity and majority due to species preference to the specific habitat based on food and shelter. Moreover, the most of the bird species are residents, summer visitors, winter visitors, altitudinal migrants, so the diversity entirely depends on the preference of these birds. Current study documented 95 species of birds from the buffer areas of the reserve, which is the highest record so far. Although the study was unable to document any further addition to the species list from the area, it strongly recommends sound management and conservation intervention for the buffer area as it came out as a good repository of bird diversity of the entire biosphere reserve.

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SUMMARY

Assessment of bird diversity has been conducted in different forest types (conifer, oak, mixed) and human settlement and area around Joshimath, the buffer zone of Nanda Devi Biosphere Reserve. Point count transect and line transect method were applied for bird survey. Dominance was found to be higher in conifer patch. Species evenness was found in human habitation which is in accordance with mid-disturbance hypothesis. Kail (*Pinus wallichiana*) was dominant tree-species in all the habitats. The study recorded 95 bird with the one vulnerable species Cheer Pheasant (*Catreus wallichii*). The study recommends for sound conservation management practices in and around the buffer area as it was a good repository of bird diversity of the entire biosphere reserve.

Key words : Nanda Devi Biosphere Reserve, Bird diversity, Buffer Area , Cheer pheasant (*Catreus wallichii*).

जोशीमठ नंदादेवी जीवमण्डल संरक्षित क्षेत्र, उत्तराखण्ड में पक्षी विविधता का आंकलन

रोही जान, वी.पी. उनियाल व अनिता चौहान

सारांश

जोशीमठ के आसपास बसी मानव बस्ती, नन्दा देवी जीवमण्डल संरक्षित क्षेत्र और विभिन्न प्रकार के वन प्ररूपों (शंकुधर, बांज, मिश्र) में मिलती पक्षी विविधता का आकलन-कार्य संचालित किया गया। स्थल गणन संक्षेत्र और पंक्ति संक्षेत्र रीतियां पक्षियों का सर्वेक्षण करने में अपनाई गई। बाहुल्य शंकुधर वन (टुकड़े) में मिला। पक्षियों की एक समानता मानव बस्तियों में रहती मिली जो मध्यम विघ्न पड़ती प्रस्थापना के अनुसार ही है। सभी प्राकृतावासों में कैल (*पाईनस वालिशियाना*) की बहुलता मिली। अध्ययन में 95 पक्षी जातियां आलेखित हुई जिनमें एक पराजेय चीर फीजेड (*कैटरेडस वालिशिआई*) भी है। यह अध्ययन मध्यवर्ती पड़ते क्षेत्र में और उसके आसपास अच्छी संरक्षण-प्रबन्धन रीतियां अपनाई जाना अभिस्तावित करता है क्योंकि यही समूचे जीव मण्डल संरक्षित क्षेत्र में पक्षि विविधता बनाए रखने का अच्छा आश्रयस्थल है।

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