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Sub-continental, residential and species diversity of avian fauna in Sirokhoma Valley, Garhwal Himalaya, India

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Abstract
Frequent survey from October 2019 to March 2020 in a Oak mixed forests of Sirokhoma valley, resulted in identification 40 birds species belonging to 6 orders. Maximum species diversity was record 42.66 (Black Kite) and minimum species diversity was recorded 7.79 (Grey hooded Warbler) respectively. The residential status, 38.55 percent birds were found with near distribution (Sighted 4 months), 19.27 percent with fair distribution (Sighted in more than 4 months and below 8 months) and 42.16 percent with wide distribution (Sighted in more than 8 months).

Keywords: Mixed forest, species diversity, avian fauna, Garhwal Himalaya

Introduction
Garhwal Himalaya has fabulously rich biotic wealth especially in terms of biodiversity. The vegetation spectrum due to various influences like altitude, topography, aspects local edaphic controls and micro climatic patterns is quite distinctive from the foothills zone gradually change from Sal-shisham dominated dense tropical and subtropical forest to Pine, Oak, *Cedrus* or *Birch* forests capes ultimately terminating into lush green and flow rich Himalaya meadows beyond the timber line and arctic vegetation ever higher up. The Garhwal Himalaya is the home of thousands of species of birds or avifauna. The bird assemblage of this mountain chain has been influenced by south India, Malaya, China, Tibetan and Central Asia elements. The larger birds found in the Garhwal Himalaya are Kites, Eagle, Vultures and Pheasants. The medium size birds include fowls, cocks, woodpeckers and swallows, tits and warblers are some of the smaller birds in the Himalayan chain. For the avifauna Fleming *et al*. (1979) [5], Gremitte *et al*. (2000) [6] and Ali (1981) [1] have marked the Kali Gandaki river in central Nepal as the dividing line between the eastern (rich in Indochinese dements) being situated close to this divider a greater degree of informing line of both these elements.

Study Site and Methods
The present study was conducted in the Sirokhoma Valley, Garhwal Himalaya; the area is spread in eastern part of Gopeshwar town and ranging from 1440m. to 1610 altitude. The survey area is comprised of Oak mixed forest and Pine mixed forest and dominant by *Quercus spp., Pinus roxburghii, Pinus wallichiana* etc. Due to the better moisture retaining capacity these forest support great vegetation diversity both in species and structure, resulting in greater avifaunal diversity also. The survey was carried out from October 2019 to March 2020. At the morning from 6:00 to 9:00 am, survey was conducted for 7 to10 days every month for the information on bird species diversity. The transect walk, point count, methods were followed to record the bird species diversity etc. Mostly, transects of 0.5 to 1.0 km. length was silently walked and all birds were counted. The bird flying 20 to 30 meter above the ground level were also recorded. With the aid of the field binocular (10 to 50X) and pictorial field guides (Grimmet *et al*. 2000 and Kazmeizak, 2002) [6, 7] each bird was identified. The cannon T-70 with 300mm. tele lens was used for photographic records. The collected data was analyzed by following formulae:
Species diversity = S/√N
Where S = Total no. of species
√N = No. of individual per species

Result

Various factors like types of habitat surveyed, climate, and time of survey, nature of particular bird's species and experience of the observer influence the records of bird fauna. However, study has resulted in the identification of 40 bird species belonging to 6 orders. The species diversity was recorded. Black kite was recorded with the maximum average species diversity (42.66), followed by Red rumped swallow (35.72), Yellow wagtail (32.69), Oriental magpie robin (31.86), White rumped vulture (29.17), Jungle myna (29.11), Red headed vulture (26.07 and Grey hooded warbler with minimum diversity (7.79) was recorded. The sub-continental status was assessed after Kazimeirzac (2000) and Bird life international (2000). White rumped vulture was found as resident and threatened, Jungle babbler as endemic, and Black lowred tit as endemic and altitudinal migrant and Yellow crowned woodpecker as near endemic. Other birds were recorded as breeder, winter visitor, passage migrant etc. The residential status was assessed on arbitrary frequency scale. 38.55 percent birds species were found with rear distribution (reD) (sighted upto 4 months), 19.27 percent with fair distribution (faD) (sighted in more than 4 months and below 8 months) and 42.16 percent with wide distribution (wiD) (sighted in more than 8 months).

Discussion

The present study yielded 40 species of the bird in the Oak Mixed and Pine mixed forest of Sirokhoma valley even in the presence of biotic pressure. If the Oak mixed and Pine forests of the study area harbour 40 species of birds, this mean that more than 50 types of forests have been described in Garhwal Himalaya by Champion & Seth (1968) [4] must have a good number of species of bird fauna. Bisht *et al*. (2004) [3] reported the 14 orders and 51 families and Passeriformes as the most crowded order. Their finding also showed Turdidae as the largest family presented by 32 species of bird fauna of different sites. Our results of study also described 7 orders, 26 families and Passeriformes as the most dominant order and Turdidae as the largest family with 11 species of bird. The birds groups like tits, Laughing thrush, thrushs, bulbuls, and woodpeckers are seem to be particular to this habitat. Tits like Great tit, Black throated tit, Laughing thrush, Streaked laughing thrush, thrush- Blue whistiling thrush, woodpeckers- Yellow crowned woodpecker, Scaly bellied woodpecker, bulbuls- Himalayan bulbul, Black bulbul, Red vented bulbul, parakeets- Slaty headed parakeet, Rose ringed parakeet, Great barbet, Common myna, Black headed jay and Red billed blue magpie are abundant. Among Galliformes- White-crested Kalij pheasant *Lophura leucomelanos hamiltonii* was found abundantly in this type of habitat, which was mainly ground feeder and their presence in good number indicates good and healthy environment. As they are first to disappear in vanishing habitat, Among Falconiformes- Himalayan griffon, White rumped vulture, Red headed vulture, and Black kite was also observed. Their presence reveals the availability of food for their survival in the temperate habitat.

Table 1: Sub-continental, residential and Species Diversity of bird species in study site Sirokhoma valley, Garhwal Himalaya

S. No.	Common Name	Scientific Name	Sub continental status	Residential status	Average spp. diversity
	Falconiformes Accipitridae				
1.	Himalayan Griffon	*Gyps himalayensis*	A	wiD	14.23
2.	White rumped vulture	*G. bengalensis*	R,Th	faD	29.17
3.	Red headed vulture	*Sarcogyps calvus*	R	faD	26.07
4.	Black kite	*Milvus migrans*	RM	faD	42.66
	Galliformes				
	Phasianidae				
5	Kalij Pheasant	*Lophura leucomelanos hamiltonii*	A	wiD	9.343
6	Black Partridage	*Francolinus francolinus*	R	reD	2.52
	Columbiformes				
	Columbidae				
7	Oriental turtle dove	*S. orientalis*	RMW	wiD	17.22
8	Spotted dove	*S. chinensis*	R˙A	wiD	18.17
	Psittaciformes				
	Psittacidae				
9	Rose ringed parakeet	*P. krameri*	R	wiD	14.51
10	Slaty headed parakeet	*P. himalayana*	RA	faD	10.07
	Upupidae				
11	Common hoopoe	*Upupa epops*	RBW	faD	14.20
	Piciformes				
	Capitonidae				
12	Great barbet	*Megalaima virens*	A	wiD	11.42
13	Scaly bellied woodpecker	*P. squamatus*	R	wiD	18.92
14	Yellow crowned woodpecker	*Dendrocopos mahrattensis*	N	wiD	19.31
	Passeriformes				
	Hirundinidae				
15	Red - Rumped swallow	*Hirundo daurica*	RAMW	reD	35.72
	Dicruridae				
16	Black drongo	*Dicrurus macrocercus*	R˙A	wiD	16.01
	Sturnidae				
17	Common myna	*Acredotheris tristis*	R	wiD	12.24
18	Jungle myna	*A. fuscus*	R˙	reD	29.11

	Corvidae				
19	Black headed jay	*Garrulus lanceolatus*	RA	wiD	11.63
20	Red billed blue magpie	*Urocissa erythrorhyncha*	RA	wiD	11.57
21	Large billed crow	*Corvus macrorhynchos*	RA	wiD	9.623
	Campephagidae				
22	Scarlet minivet	*Pericrocotus flammeus*	RA	wiD	7.95
	Pycnonotidae				
23	Himalayan bulbul	*Pycnonotus leucogenys*	R˙	wiD	14.50
25	Red vented bulbul	*P. cafer*	R	wiD	11.88
	Timaliidae				
27	Rusty cheeked scimitar babbler	*Pomatorhinus erythrogenys*	R	wiD	13.75
28	Streaked laughing thrush	*Garrulax lineatus*	A	wiD	8.832
	Certhidea				
29	Eurasian tree creeper	*Certhia familiaris*	RA	wiD	16.92
	Paridae				
	Turdidae				
30	Blue whistling thrush	*Myophonus caeruleus*	AM	wiD	12.51
31	Common stone chat	*Saxicola torquatus*	WAM	wiD	16.37
32	Oriental magpie robin	*Copsychus saularis*	RM	reD	31.86
33	Plain prinia	*Prinia inornata*	R˙	reD	25.85
	Motacillidae				
34	White wagtail	*M. alba*	AMW	reD	8.21
35	Yellow wagtail	*M. flava*	BWP	faD	32.69
	Muscicapidae				
36	Verditer flycatcher	*Eumyias thalassina*	MA	wiD	18.51
37	Slaty blue flycatcher	*Ficedula tricolor*	AR	reD	21.53
	Sylviidae				
38	Grey hooded warbler	*Seicercus xanthoschistos*	A	wiD	7.793
39	Ashy throated warbler	*Phylloscopus maculipennis*	A	wiD	8.296
40	Great tit	*p. major*	RA	wiD	14.71

The nomenclature adopted here is after Grimmett *et al*. 2000 [6] and sub-continental status after Kazmierczak (2000) and Bird life international (2001). The residential status of birds in the study area was assessed on an arbitrary frequency scale: Restricted distribution (reD) = sighted in less than in four months, fair distribution (faD) = sighted in 4-8 months, and wide distribution (wiD)= sighted in more than 8 months. The current status was assessed on the basis of average relative abundance: uncommon (uC)= having a relative abundance lees than 0.018, common (C) = having a relative abundance of 0.018 and above but less than 0.036 and very common (vC)= having a relative abundance of 0.036 and above.

E- endemic to the Indian sub-continent, N-near endemic, R-resident, B- breeder, A- altitudinal migrant, M- migrates within sub-continent (breeds in the Himalaya and winters in southern India and/Sri Lanka), P-passage migrant, W-winter visitor, Th- threatened with extinction, *-localised are patchily distributed (For example B*=breeds locally) and ˙-subject to some (local) seasonal movement or nomadism

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Conclusion

The study shows that Oak mixed and Pine Mixed forest have great number of avian fauna. These kinds of studies produce some premonitory information about birds of particular forest type, will helpful to make strategies for their protection and conservation.

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