

Community Structure and Relative Abundance of Bird Fauna of Different Habitats of Garhwal Himalaya, Uttarakhand-India

Sunil Bhandari¹, M. S. Bisht²

Department of Zoology, HNB Garhwal Central University Campus, Pauri-246001, Uttarakhand

Abstract: Present paper deals with survey of community structure and relative abundance of bird fauna of different habitats of Garhwal Himalaya, Uttarakhand during May 2008 to June 2012. Study was carried out in sub tropical forest (*Shorea, Dalbergia, Ficus, Magnifera sp*; 350-1000m), pine mixed forest (*Pinus, Quercus, Rhododendron sp*; 1000-1500m), mixed temperate forest (*Quercus sp., Rhododendron sp, Myrica sp*; 1500-2000m) and coniferous forest (*Cedrus, Pinus wallchiana, Cupressus*; 2000-2500m) in both district Chamoli and Pauri Garhwal, Uttarakhand. Out of the total 202 bird species belonging to 11 orders, 43 families and 8 sub-families recorded in different forests along altitudinal gradient. Highest diversity of birds was found in a mixed temperate forest where BSD (Shannon index- H') was recorded 3.8928 with total species richness (BSR)-159 species and 16304 individuals. The order Passeriformes and family Muscicapidae (with sub families- Turdinae, Timalidae, Sylviidae and Muscicapinae) in all habitats were dominant on other group of birds. The relative abundance of some birds like the Himalayan bulbul was recorded highest (13.49) in coniferous temperate forest.

Keywords: community structure, relative abundance, different habitats, bird's diversity, birds family.

1. Introduction

Birds are a good indicator species. Their presence is an indication of healthy ecosystem or habitats. The community structure or relative abundance of the bird fauna depends on physical structure and function of habitats. A bird community is an assemblage of species population occurring together in space and time and it may be of any size. The studies on distribution of bird communities in the different habitats along altitudinal gradient is thought to be important because it can provide important information on aspects of the environment limiting the distribution of organisms, factors influencing the structure of communities as described by Terborgh (1971, 1977 & 1985). The studies on altitudinal distribution patterns of birds has tended to focus on, variation in species diversity and richness with altitude range size and species turnover rates (Patterson *et al.*, 1998; Stotz, 1998; Blake and Loiselle, 2000). Past studies have documented the bird communities of the Himalayan region, mostly in the Western part (Khan *et al.*, 1993; Price *et al.*, 2003; Safiq *et al.*, 1997; Sultana *et al.*, 2007).

Garhwal Himalaya, Uttarakhand which includes in the Western Himalaya has a rich diversity of forests. Uttarakhand ranks 6th place amongst the states in terms of percentage of the forest area (Ministry of Environment and Forest, 2001). As per the report, the total forest area of the state is 34,662 hectare, of which reserve forest is 68.7%, protected forest is 30.8% and unclassified forest is 0.5%. The Garhwal district has the third rank of forest cover (Ministry of Environment and Forest 1999). Champion and Seth (1968) has categorized some 5 main types of forest in the area. Due to great altitudinal variation, variety of forests with different structural compositions exist here in short distance of just 100km. Garhwal Himalaya, a variety of habitats are found in a very short distance but till date no information is available on avian diversity of different forest types.

2. Material and Methods

The study was conducted in district Chamoli and Pauri Garhwal of Uttarakhand which lies between 29° 26' - 31° 28' North and 77° 49' - 80° 6' East. The region enjoys a wide range of altitudes extending from about 295m (near Chilla, Rishkesh) to the height of about 7,817m forming the Nanda Devi peak II (Fleming *et al.*, 1979; Ali, 1981). General topography of the study area is largely rugged, mountainous and with densely vegetated slopes. The study area presents a unique set of ecological characteristics over a complex variety of system that incorporates forests, meadows, savannah grassland, marshes and rivers. Garhwal Himalaya has 44.52% forest cover which is much less than the prescribed forest covers (i.e. 2/3 of the total geographical area) under National Forest Policy. The district Chamoli has 63.75% and Pauri Garhwal has 59.06% forest cover as reported (Govt. of Uttarakhand, 2002).

A survey was conducted from May 2008 to April 2012 on community structure and relative abundance of bird fauna of different habitats of Garhwal Himalaya. Study was carried out in sub tropical forest (*Shorea, Dalbergia, Ficus, Magnifera sp*; 350-1000m), pine mixed forest (*Pinus, Quercus, Rhododendron sp*; 1000-1500m), mixed temperate forest (*Quercus sp., Rhododendron sp, Myrica sp*; 1500-2000m) and coniferous forest (*Cedrus, Pinus wallchiana, Cupressus*; 2000-2500m) in both district Chamoli and Pauri Garhwal, Uttarakhand. Following the transect walk and point count methods, and with help of the field binocular (10x50X) and pocket field guide (Birds of the Himalaya: by S. Ali, 1983), each bird species was identified and counted.

3. Results and Discussion

Out of the total 202 bird species belonging to 11 orders, 43 families and 8 sub-families recorded in different forests along altitudinal gradient, 111, 156, 159, and 122 bird

species were recorded in sub-tropical forest, pine mixed forest, mixed temperate forest, and coniferous temperate forest respectively. Highest diversity of birds was found in a mixed temperate forest where BSD (Shannon index-H') was recorded 3.8928 with total species richness (BSR)-159 species and 16304 individuals. Minimum diversity of birds was found in the coniferous temperate forest (3.6136). Similarly, evenness index was recorded maximum in the sub tropical forest (0.76) and lowest in the chir pine mixed forest (0.73, Table-1, figure-1&2). The order Passeriformes and family Muscicapidae (with sub families- Turdinae, Timalidae, Sylvidae and Muscicapinae) in all habitats were dominant on other group of birds. The relative abundance of some birds like the Himalaya bulbul was recorded highest (13.49) in Coniferous temperate forest.

4. Birds diversity

1. Sub-tropical forest (500 to 1200m):

In subtropical forest, total 111 species were recorded. Overall mean diversity index (H') for one year (2008-09) was 3.6167. It was maximum 4.0485 in the month of June and minimum 2.6151 in the December. Maximum evenness index was recorded in the month of August (0.96) and minimum in the month of November (0.79).

Common and exclusive species of subtropical habitats:

Analysis of relative abundance (RA) led five dominant bird species of the sub tropical forest which comprised around 36.20% of total population of the bird community. Eight species identified as exclusive birds as were present only in this habitat (Table-2).

2. Pine-mixed forest (1000 to 1800m):

In the chir pine forest, total 156 birds were recorded. Overall diversity index (Shannon index) across the year (2008-09) was recorded 3.6942, which were maximum 3.8475 in the month of May and minimum (2.3971) in December. The maximum evenness index was recorded in the month of March (0.86) and minimum evenness index (0.74) in the month of December. Common and exclusive birds of pine mixed habitat given Table (3).

3. Mixed temperate forest (1500 to 2200m):

Highest number of birds 159 species with mean diversity index (BSD) 3.8929 was recorded in mixed temperate forest. It was maximum (4.1736) in the month of May and minimum (2.8062) in January. The evenness index was maximum in the month of February and March (0.88 each month) and minimum evenness index recorded in the month of June and December (0.78 each month). Common birds of mixed temperate forest given Table (4).

4. Coniferous temperate forest (above 2200m):

Total 122 species of birds with annual mean diversity index (Shannon index) 3.6136 was recorded in coniferous temperate forest. It was maximum (3.7795) in the month of April and minimum (2.3106) in September. The maximum evenness index was recorded in the month of April (0.84)

and minimum diversity index recorded in the month of September (0.69). Common birds of Coniferous temperate forest given Table (5).

Due to a great altitudinal variation, a rich diversity of forests is found within a short distance (just in a range of 100kms) and provides a good opportunity to examine the effect of vegetation on bird community structure. Therefore, present study was conducted to particular habitat diversity rich habitat, habitat specific and common birds for the conservation point. The bird fauna of sub-tropical forest, chir-pine mixed forest, mixed temperate forest and coniferous temperate forest along on altitudinal gradient (500-3750m) was studied.

Findings revealed that the mixed temperate forest (composed by *Quercus*, *Rhododendron*, *Myrica*, *Lyonia* etc) has rich diversity where maximum 159 species of birds with high diversity index (3.89) were recorded. In subtropical forest minimum numbers of birds (116 species) with 3.61 diversity index and 0.76 evenness index were recorded. Green imperial pigeon, Plum headed parakeet, blossom headed parakeet, Brown headed barbet, Common wood shrike and White browed fantail flycatcher) were observed as exclusive species of this habitat. In the chir pine mixed forest, 156 species birds with 3.69 diversity index and lowest evenness index (0.73) were recorded. Two species namely the Spot winged starling *Saroglossa spiloptera* (00.03) and Tickell's thrush *Turdus unicolor* (00.01) were identified as exclusive bird of this habitat. In coniferous temperate forest, only 122 species with 3.61 diversity indexes and 0.75 evenness index were recorded. No habitat specific birds were identified in the coniferous temperate forest.

The Himalayan bulbul *Pycnonotus leucogenys*, Slaty headed parakeet *Psittacula himalayana*, Streaked laughing thrush *Garrulax lineatus*, Black throated tit *Aegithalos concinnus* and Grey hooded warbler *Seicercus xanthoschistos* were identified as common birds of the study area along an altitudinal gradient. Analysis of feeding guilds revealed that the insectivore dominates in all habitats represented by more than 50% of total bird fauna (Figure-3).

Table 1: Bird species richness of different habitats of Garhwal Himalaya, Uttarakhand

S. N.	Forest community	TO	TF	TS	TI	Diversity Index	Evenness
1.	Sub-tropical forest	07	27	111	10,465	3.6167	0.76
2.	Pine-mixed forest	09	34	156	17,753	3.6942	0.73
3.	Mixed temperate forest	08	31	159	16,304	3.8928	0.76
4.	Coniferous temperate forest	10	24	122	20,269	3.6136	0.75
5.	Total	10	38	202	64,791	3.7143	0.69

(TO- Total orders, TF-total families, TS- total species and TI- total individuals)

Table 2: Some common and exclusive birds of sub-tropical forest.

Common species		Exclusive species	
Name of bird species	Relative abundance	Name of bird species	Relative abundance
Himalayan Bulbul <i>Pycnonotus leucogenys</i>	10.39	Green imperial pigeon <i>Ducula aenea</i>	00.04
Slaty headed parakeet <i>Psittacula himalayana</i>	7.56	Plum headed parakeet <i>Psittacula cyanocephala</i>	1.19
Streaked laughing thrush <i>Garrulax lineatus</i>	7.09	Blossam headed parakeet <i>Psittacula roseate</i>	6.00
Black throated tit <i>Aegitholos concinnus</i>	7.05	Brown headed barbet <i>Megalaima zeylanica</i>	00.01
Grey hooded warbler <i>Seicercus xanthoschistos</i>	4.10	Common wood shrike <i>Tephrodornis pondicerianus</i>	00.09
		Indian robin <i>Saxicoloides fulicata</i>	28.00
		White browed faintail flycatcher <i>Rhiphidiura aureala</i>	13.00
		Black naped monarch <i>Hypothymis azurea</i>	00.06

Table 3: Some common and exclusive birds of the chir-pine mixed forest

Common species		Exclusive species	
Name of species	Relative abundance	Name of species	Relative abundance
Himalayan bulbul <i>Pycnonotus leucogenys</i>	11.84	Spot winged starling <i>Saroglossa spiloptera</i>	00.03
Grey hooded warbler <i>Seicercus xanthoschistos</i>	8.29	Tickell's thrush <i>Turdus unicolor</i>	00.01
Large billed crow <i>Corvus macrorhynchus</i>	6.73		
Slaty headed parakeet <i>Psittacula himalayana</i>	6.39		
Blue whistling thrush <i>Myiophonus caeruleus</i>	4.16		

Table 4: Some common birds of the mixed temperate forest

Common species		
Name of species	Scientific name	Relative abundance
Large billed crow	<i>Corvus macrorhynchus</i>	9.35
Himalayan bulbul	<i>Pycnonotus leucogenys</i>	7.99
Slaty headed parakeet	<i>Psittacula himalayana</i>	6.50
Grey hooded warbler	<i>Seicercus xanthoschistos</i>	5.34
Ashy throated warbler	<i>Phyllascopus maculipennis</i>	3.61

Table 5: Some common birds of the coniferous temperate forest

Common species		
Name of species	Scientific name	Relative abundance
Himalayan bulbul	<i>Pycnonotus leucogenys</i>	13.49
Slaty headed parakeet	<i>Psittacula himalayana</i>	11.39
Large billed crow	<i>Corvus macrorhynchus</i>	6.28
Blue whistling thrush	<i>Myiophonus caeruleus</i>	3.71
Grey hooded warbler	<i>Seicercus xanthoschistos</i>	3.30

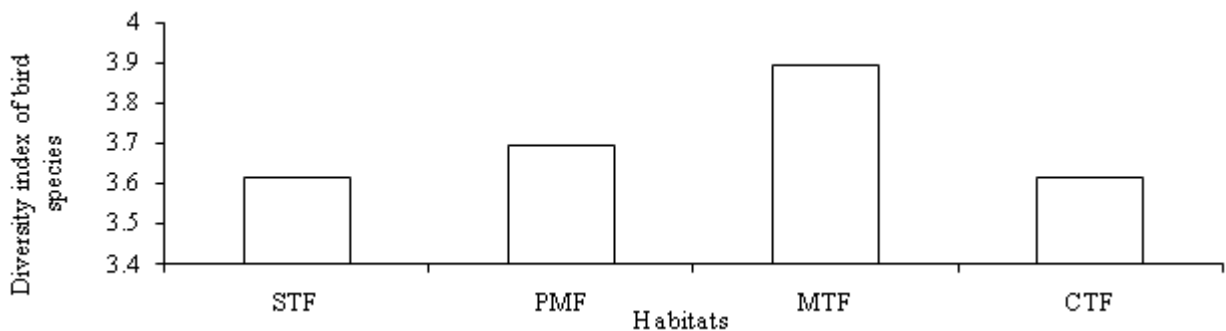


Figure 1: Shannon's diversity index (H') of birds of different habitats.

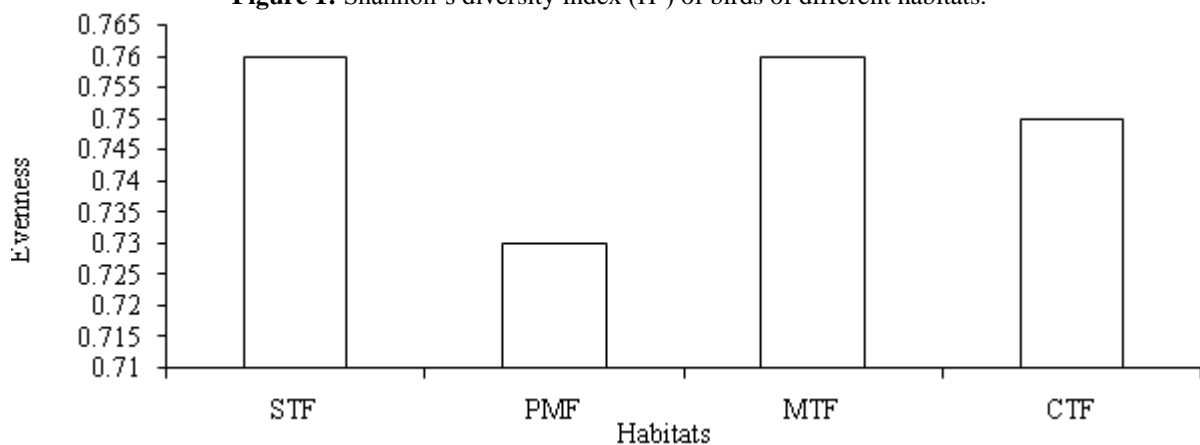


Figure 2: Evenness index of birds of different habitats.

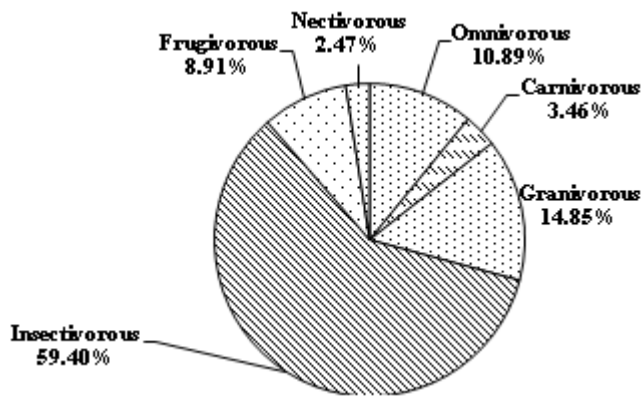


Figure 3: Percentage of birds under different trophic groups.

References

- [1] Ali, S. 1981. The Himalaya in Indian Ornithology. In (Ed.): Lal, J. S. *The Himalaya aspect of change*. Oxford University Press, New Delhi.
- [2] Ali, S. and Ripley, S. D. 1983. *Handbook of Bird of India and Pakistan*. Compact edition, Oxford University Press, New Delhi.
- [3] Blake, J. G. and Loiselle, B. A. 2000. Diversity of birds along an elevation gradient in the Cordillera Central Costa Rica. *The Auk*, **117**:663-686.
- [4] Champion, H.G. and Seth, S. K. 1968. *A revised survey of forest types of India*, New Delhi.
- [5] Fleming, R. L., Fleming, R. J. and Bangdel, L. S. 1979. *Birds of Nepal*. 2nd edition. Avlok. Kathmandu.
- [6] Govt. of Uttaranchal, 2002, IDFC, Food & Agri Division, Forestry & Rural Development Department, State Secretariat, Dehradun, *Agri-Vision: Uttaranchal*, p. 14.
- [7] Khan, J. A., Khan, D. N. and Ahmed, A. 1993. Preliminary investigations of bird community structure at Aligarh, India. *Tropical Ecology*, **34** (2):217-225.
- [8] MoEF (Ministry of Environment and Forests). 2001. *Environmental Impact Assessment: A Manual*. Impact Assessment Division, Ministry of Environment and Forests, Government of India, New Delhi.
- [9] MoEF (Ministry of Environment and Forests). 1999. *Annual Report (1999-2000)*. Ministry of Environment and Forests. New Delhi.
- [10] MoEF (Ministry of Environment and Forests). 1999. *National Policy and Macrolevel Action Strategy on Biodiversity*. Ministry of Environment and Forests, Government of India, New Delhi.
- [11] Patterson, B. D.; Stotz D F, Solari S, Fitzpatrick J W and Pacheco V 1998. Contrasting patterns of elevational zonation for birds and mammals in the Andes of southeastern Peru. *J. Biogeog.* **25**:593-607.
- [12] Price, T., Zee, J., Jamdar, K. and Jamdar, N. 2003. Bird species diversity along the Himalaya: a comparison oh Himanchal Pradesh with Kashmir. *Bomb. Nat. Hist. Soc.* **100**:394-410.
- [13] Shafiq, T., Javed, S. and Khan, J. A., 1997. Bird community structure of the middle altitude Oak forest in Kumaon Himalayas, India: A preliminary investigation. *Int. J. Ecol. Environ. Sci.*, **23**: 389-400.
- [14] Sultana, A., Hussain, M. S. and Khan, J. A. 2007. Bird communities of the proposed Naina and Pindari wildlife

- sanctuaries in the Kumaon Himalaya Uttarakhand India. *Bomb. Nat. Hist. Soc.* **104**:19-29.
- [15] Stotz, D. F. 1998. Endemism and species turn over with elevation in montane avifauna in neotropics: implications for conservation. In: *Conservation in a changing world* (Eds. Mace, G. M., Balmford, A. and Ginsberg, J. R.) Cambridge: University Press, 161-180.
 - [16] Terborgh, J. 1985. Habitat Selection in Amazonian birds. In: *Habitat Selection in birds* (Eds. M. L. Cody) Academic Press New York, Pp. 311-338.
 - [17] Terborgh, J. 1971. Distribution on environmental gradients: theory and a preliminary interpretation of distributional patterns in the avifauna of the Cordillera Vilcabamba, Peru. *Ecology*, **52**:23-40.
 - [18] Terborgh, J. 1977. Bird species diversity on an Andean elevational gradient. *Ecology*, **58**:1007-1019.