

Study of Avian Diversity in and around Chinari, District Hattian, Azad Jammu and Kashmir, Pakistan

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Abstract: Avian diversity was studied from March to October 2009 in Chinari Jhelum valley, Azad Jammu and Kashmir. The area was surveyed in the mornings and evenings when the birds were more active. Birds were recorded by using Fixed Point Count and Line-transect methods at different predetermined sites. A total of 70 bird species were recorded belonging to 13 orders and 39 families. Species richness was recorded highest in summer (n=54) followed by autumn (n=46) and spring (n=40). Seasonal Shannon Wiener index of these species was the highest in summer season (4.95), followed by spring (4.2) and autumn (3.26). Of the total species, 9 (13%) were resident, 7 (10%) were resident but confined to Himalayan ecosystem, 8 (11%) were summer visitors, 7 (10%) were winter visitors, 10 (14%) showed seasonal altitudinal migration while remaining 29 (42%) species were confined to Himalayan ecosystem. Of these species, 45 (64%) were common, 5 (7%) were abundant, 9 (13%) were rare while 11(16%) species were frequent. The most common birds were House sparrow, Common myna, House crow, Red vented bulbul, Koel, Spotted dove and Rose-ringed parakeet.

Keywords: AJ&K , Avian diversity, seasonal variation, species abundance, species richness

INTRODUCTION

Birds are important indicators of the ecosystem of an area. They play a crucial role in the biological system of the universe. Most birds are voracious feeders of a great variety of insects and thus, constitute one of the most effective natural checks upon insect numbers. If insect population remains unchecked in a biological system the extent of damage they cause is hard to estimate. Hoopoes, mynas, crows, bulbuls, babblers, flycatchers, wagtails and sparrows are well known predators of insects. They are "ecological litmus" and promptly respond to environmental changes (OPG, 2005). Most of the birds are agents of pollination for flowers and dispersal of seeds while some of them such as pheasants, partridges, sparrows and pigeons are also source of food (Roberts and Landfried, 1987). The prominent bird species include, Wagtail, Kingfisher, Bulbul, Dove, Crow, Warbler, Vulture, Chat, Thrush, Woodpecker, Flycatcher, Nuthatche, Magpie, Tree pie, and Swallow (Awan *et al.* 2004). Bird migration is described as "changes of habitat periodically reoccurring and alternating in direction, which tend to secure optimum environmental conditions at all times" (Ali, 2002). Many bird species migrate locally or over long distances, to avoid diverse conditions or in search of food. There are a number of seasonal immigrants that breed outside the territory, mostly in the Palearctic region

beyond Himalayas in central and northern Europe. The winter migrants are the ducks, geese, cranes, swallows, flycatchers and finches (Ali and Ripley, 1987).

Chinari (study area), is situated on the left bank of river Jhelum in District Hattian of Azad Jammu and Kashmir. The area comprises "Qazinaag Game Reserve" and surrounding areas. The area supports very diverse vegetation including cultivated fields providing habitat to various species of birds. No scientific study has, however, been carried out to document the bird diversity. Therefore, this study was conducted to record the existing avian diversity in the study area.

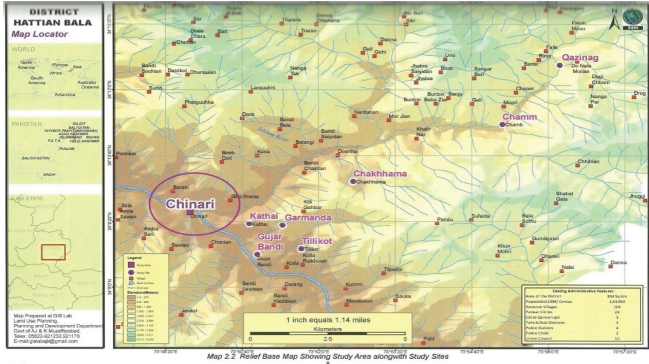
MATERIALS AND METHODS

Chinari, the study area, (34° 8' 34.292 - 09' 19.89" N and 73° 50' 16.26" - 58' 34.01" E) is situated at 1066 - 1539 m above sea level (asl) in District Hattian (51 km east to Muzaffarabad city) on the left bank of river Jhelum (Fig. 1). The study area was divided into six localities (Gojjar Bandi, Kathai, Tillikot, Chakhama, Qazinaag, Garmanda) on the basis of general topography. The presence, distribution, migration and population status of avian fauna was determined employing direct as well as indirect methods. Point Count and Line Transect methods were used during the field survey. Birds were identified by using Bird identification field guide books by Kazmierczak, 2006 and Grimmett *et al.*, 2010. However, nomenclature was adopted from Roberts (1991, 1992). Birds were observed early in the morning (starting at

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5:30 am during spring, 5:00 am during summer and 6:00 am during autumn) and before evening (up to 4:30 p.m. during spring, 6:30 p.m. during summer and 6:00 p.m. during autumn). Twelve visits were made to each study site.

Fig. 1: Location map of area showing study sites



In the areas where transect walk was not possible point counts were made. Duration of point count survey was thirty minutes when bird species and their numbers were recorded. Usually the radius of point counts was 50 meters but in small habitats radius of point count was 25 meters. Status of the species in the area was determined as common, frequent, abundant and rare.

The data was analyzed for relative abundance, species richness, and diversity indices by using the following formulae:

$$\text{Relative abundance} = P_i = n_i / N_i$$

Where;

- n_i = Number of individuals of one species
- N_i = Number of individuals of all species

$$\text{Percentage relative abundance} = \frac{\text{No. of species of one order}}{\text{Total No. of all species of all orders}} \times 100$$

Species diversity was determined using Shannon-Wiener Index and calculated as below:

$$\text{Shannon-Wiener Index} = H' = - \sum_{i=1}^S p_i \log_e p_i$$

Where;

- H' = value of the Shannon-Wiener index
- P_i = proportion of the i^{th} species
- \log_e = natural logarithm of p_i
- S = number of species in the community

Analysis of variance (ANOVA) was done to test the significant difference between different seasons and between different study sites of the area, considering the equal species richness and abundance in different localities and season as null hypothesis.

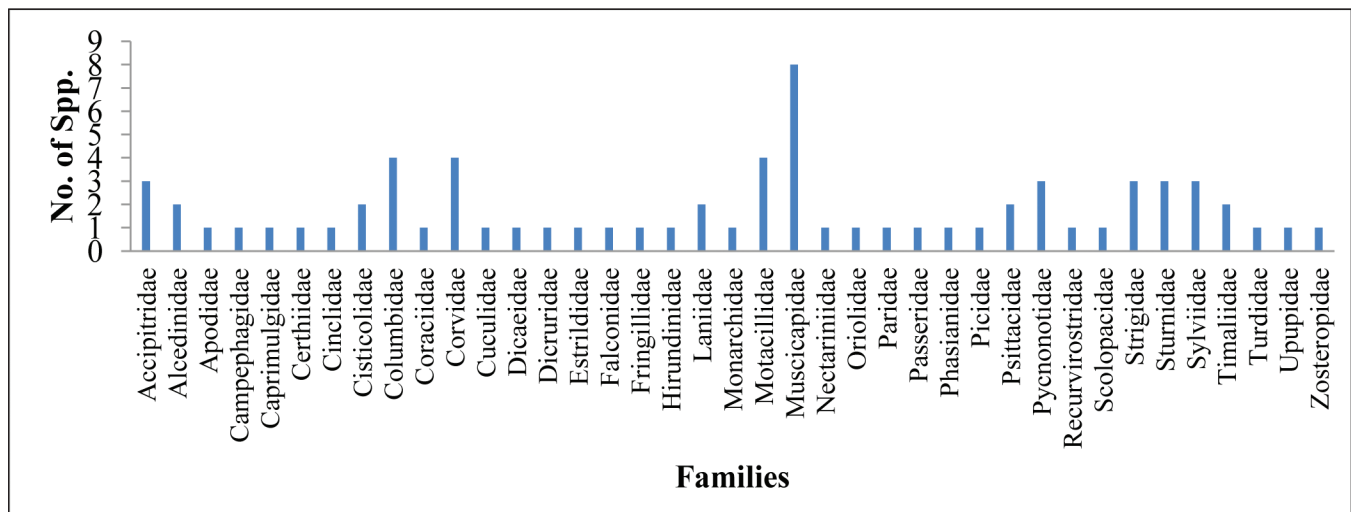
RESULTS AND DISCUSSION

During the study 70 bird species belonging to 13 orders and 39 families were observed and identified from different study sites located in Chinari area during 2009. Highest species richness was recorded at locality Tilikot ($n=30$) followed by Gojar Bandi ($n=25$) and Garmanda ($n=22$). Similarly, the highest number of species was recorded in the family Muscicapidae of order Passeriformes (Fig. 2, 3).

Relative abundance

Over all relative abundance was the highest for Common myna (0.055) and the lowest for Common starling (0.001) and Kestrel (0.001) (Table 1).

Fig. 2: Species richness in different families recorded during 2009

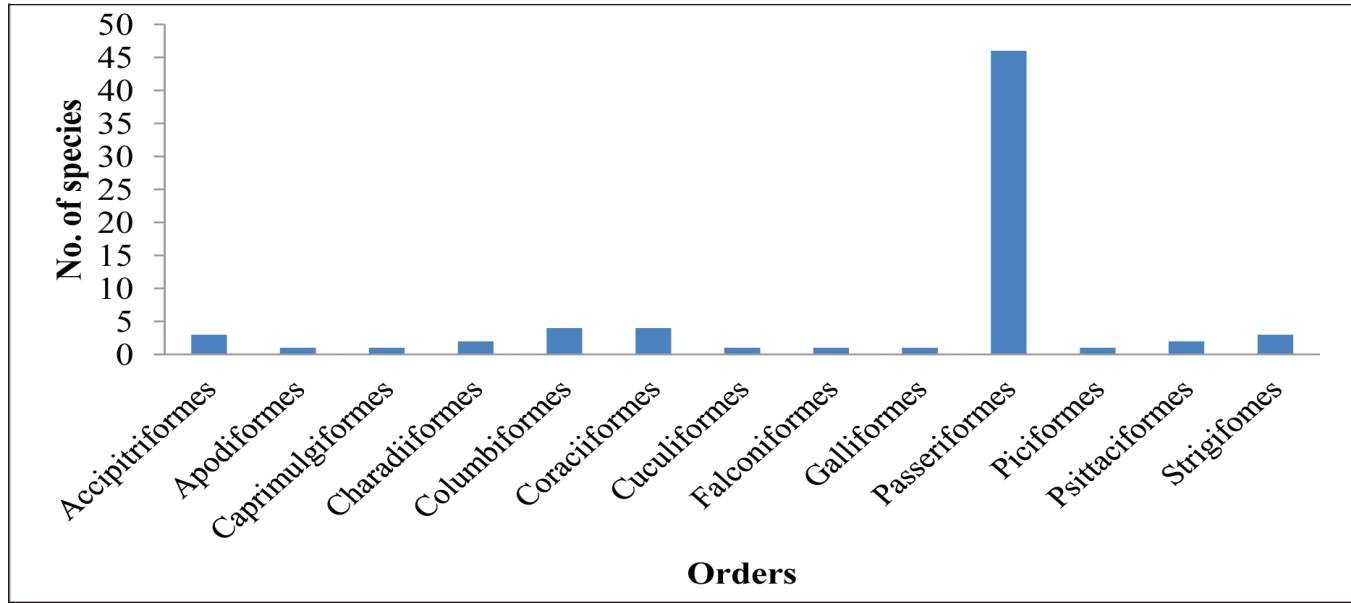


Out of 70 species, 46 species (66%) belonged to order Passeriformes followed by 4 species in each Coraciiformes (6%) and Columbiformes (6%), while only one species was recorded in orders Falconiformes (1%), Piciformes (1%), Galliformes (1%), and Cuculiformes (1%) (Fig. 3).

decreases during autumn.

Analysis of variance (ANOVA) was done to test the significant differences ($p = 0.05$) between different seasons and between different study sites of the area. Calculated value of F_1 (8.55) was greater than tabulated value (5.14) at degree of freedom (2, 6) and the calculated value of F_2 (9.98) was greater than tabulated

Fig. 3: Species richness in different orders recorded during 2009



Species richness and species abundance

Species richness was the highest during summer ($n=54$) followed by autumn ($n=46$) and spring ($n=40$). This may be due to seasonal migration of bird species. Species abundance was the highest during summer ($n=316$) followed by spring ($n=311$) and autumn ($n=280$). The availability of fruits as food may be one of the causes of this variation. Some bird species also feed on nectar of flowers; which may be the other reason for higher abundance during summer and spring.

Seasonal Shannon-Wiener Index

The highest seasonal Shannon-Wiener Index (4.95) of bird species was recorded in summer followed by spring (4.2) and autumn (3.26). Animal species are influenced by a wide variety of abiotic and biotic factors, which influence both their diversity and density. This difference in the biomass of the birds among different seasons of the year (2009) might be due to the availability of food. Most of the bird species breed during summer when they become more conspicuous during breeding season; this could, therefore, be another reason for higher diversity index during the summer season; whereas, during autumn or the early winter, birds migrate from higher altitudes to the lower altitudes, hence the diversity index

value (4.76) at degree of freedom (2, 6). So the null hypothesis was rejected and it was concluded that means of each season and study sites were significantly different.

In the study area, besides natural vegetation, a large area is under cultivation of important crops, like maize, rice, wheat etc. The cultivated areas are important source for the diversity of avian fauna in the study area. Most of the birds depend on the food in the form of seeds, grains, weeds or insects. The agricultural fields support pests and other insect life that attracts insectivorous birds, like shrikes, black drongo, thrushes etc. Thus the areas close to the agricultural land possess a large variety of birds, higher values of diversity indices and species richness as compared to non-agricultural areas.

Population and migration status

Of 70 bird species 45 (64%) were common, 5 (7%) abundant, 9 (13%) rare while the remaining 11 (16%) species were frequent. Nine (13%) bird species were resident, 7 (10%) were resident confined to Himalayan ecosystem, 8 (11%) summer visitors, 7 (10%) winter visitors, 10 (14%) showed seasonal altitudinal migration while the remaining 29 (42%) species remained confined to Himalayan ecosystem (Table 1).

Bird migration is described as “Changes of habitat periodically reoccurring and alternating in direction, which tend to secure optimum environmental conditions at all times” (Ali, 2002). Migration is one of the most fascinating phenomena of the nature by which it becomes possible for birds to avail habitats in two different geographical areas (Grewal, 2000). The insect life and vegetation cover becomes abundant after the monsoon in this area providing rich feeding conditions to the wintering birds. Most of the winter birds that come to the subcontinent enter through Pakistan. Mostly bird migrations are latitudinal i.e. from North to South. Migration may be nocturnal or diurnal. Birds of prey and swallows are diurnal while water-birds, cuckoos, flycatchers, thrushes, warblers and orioles are nocturnal and move during night. Similarly, local altitudinal migrations occurred among different seasons due to the climatic fluctuations. During harsh winter conditions, the birds usually migrate towards lower altitudes while in summer they preferred higher altitudes.

Among resident species, rose-ringed parakeet, house crow, house sparrow, mynas, bulbuls were common, whereas kingfisher, koel, yellow wagtail, pied kingfisher, white-breasted kingfisher, little forktail and common starling were scarce in numbers and occurred in small scattered populations.

Himalayan green finch, leaf bird, Indian eagle owl, woodpecker, yellow-billed blue magpie, golden-fronted leaf bird and spotted munia were frequent in the study area. Rollers and Indian tree pie were recorded as resident during the survey but were scarce in number (Awan *et al.* 2004). According to Roberts (1992), white wagtail, yellow wagtail and yellow-headed wagtail were winter visitors; however, during the survey yellow wagtail was recorded twice in the winter from two study sites, Gujjar Bandi and Tillikot. Large pied wagtail was recorded only once from Gujjar-Bandi along with white wagtail. House sparrow, house crow, myna and bulbul were recorded as resident and abundant as reported by Whistler (1949) and Roberts (1992).

CONCLUSION

The results showed that there was a significant difference in the avian diversity among different seasons of the year, 2009. The availability of fruit as food may be one of the cause of this variation. Further investigations into the actual composition of species between the habitats would provide a clear picture as to the factors influencing the density and diversity of birds in the study area. Most of bird species breed during summer; the birds become more conspicuous during the breeding season; this could be another reason for higher diversity index during this season. During winter birds migrate from higher altitudes to lower altitudes; as such the bird diversity index decreases with the change in season.

Having large area with crop cultivation along with natural vegetation, the study area provided good habitat to a large number of birds. Most of the birds depend on the food in the form of seeds, grains, weeds or insects closer to the agricultural land possess a variety of birds as compared to less vegetated areas.

Destruction of habitats at different localities also resulted in the elimination or migration of species. According to general perceptions of the local elder people, different localities like Chinari, Gojjar Bandi, Kathai, Garmanda had very small number of houses and were thickly vegetated having a variety of avian elements. However, now these areas are thickly populated and reduced patchy vegetations, thus many bird species like golden oriole, vultures, and rollers have migrated to higher elevations or other undisturbed vegetated areas around Chinari.

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Table 1: Bird recorded in and around the study area during 2009 with overall abundance and relative abundance

S. No.	English / Local name	Scientific name	Status	Occurrence	Number Observed	Relative abundance
Order Accipitriformes						
Family Accipitridae						
1	Black Kite	<i>Milvus migrans</i>	Common	HE	30	0.033
2	Himalayan Griffon vulture	<i>Gyps himalayensis</i>	Rare		4	0.004
3	Pallied harrier	<i>Circus macrourus</i>	Rare	R/AM	3	0.003
Order Apodiformes						
Family Apodidae						
4	Little house swift	<i>Apus affinis</i>	Common	AM	30	0.033
Order Caprimulgiformes						
Family Caprimulgidae						
5	Indian night jar	<i>Caprimulgus asiaticus</i>	Frequent	AM	2	0.002
Order Charadiiformes						
Family Scolopacidae						
6	Common sand piper	<i>Actitis hypoleucos</i>	Common	WV	4	0.004
Family Recurvirostridae						
7	Black winged Stilt	<i>Himantopus himantopus</i>	Common	HE	18	0.019
Order Columbiformes						
Family Columbidae						
8	Red collared dove	<i>Streptopelia tranquebarica</i>	Common	R	10	0.010
9	Blue rock Pigeon	<i>Columba livia</i>	Rare	HE	2	0.002
10	Spotted dove	<i>Streptopelia chinensis</i>	Common	SV	22	0.024
11	Collard dove	<i>Streptopelia decaocto</i>	Common	SV	25	0.257
Order Coraciiformes						
Family Alcedinidae						
12	White Breasted Kingfisher	<i>Halcyon smymensis</i>	Rare	HE	10	0.011
13	Pied Kingfisher	<i>Ceryle rudis</i>	Common	R	6	0.006
Family Coraciidae						
14	European roller	<i>Coracias garrulus</i>	Common	R/HE	2	0.002
Family Upupidae						
15	Hoopoe	<i>Upupa epops</i>	Common	R/HE	10	0.011
Order Cuculiformes						
Family Cuculidae						
16	Common koel	<i>Eudynamys scolopacea</i>	Common	R/HE	9	0.009
Order Falconiformes						
Family Falconidae						
17	Kestrel	<i>Falco tinnunculus</i>	Rare	AM	0	0.001
Order Galliformes						
Family Phasianidae						
18	Common quail	<i>Coturnix coturnix</i>	Common	HE	3	0.003
Order Passeriformes						
Family Campephagidae						
19	Scarlet Minivet	<i>Pericrocotus flammeus</i>	Common	WV	10	0.010

S. No.	English / Local name	Scientific name	Status	Occurrence	Number Observed	Relative abundance
Family Certhiidae						
20	Himalayan treecreeper	<i>Certhia himalayana</i>	Common	HE	3	0.003
Family Cinclidae						
21	Brown dipper	<i>Cinclus palasii</i>	Common	AM	2	0.002
Family Cisticolidae						
22	Brown hill Warbler	<i>Prinia criniger</i>	Common	HE	10	0.011
23	Faintail Warbler	<i>Cisticola juncidis</i>	Common	SV	8	0.008
Family Corvidae						
24	Jungle crow	<i>Corvus macrorhynchos</i>	Frequent	HE	46	0.050
25	Rufous tree pie	<i>Dendrocitta vagabunda</i>	Frequent	HE	20	0.022
26	House crow	<i>Corvus splendens</i>	Abundant	R	28	0.030
27	Yellow billed blue magpie	<i>Urocissa erythrorhyncha</i>	Rare	HE	15	0.015
Family Dicaeidae						
28	Pale-billed flower pecker	<i>Dicaeum erythrorhynchos</i>	Common	WV	2	0.002
Family Dicuridae						
29	Black drongo	<i>Dicurus macrocercus</i>	Abundant	R/HE	30	0.033
Family Estrildidae						
30	Scaly Breasted Munia	<i>Lonchura punctulata</i>	Frequent	HE	12	0.013
31	Yellow Breasted green finch	<i>Carduelis spinoides</i>	Frequent	HE	6	0.006
Family Hirundinidae						
32	Barn swallow	<i>Hirundo rustica</i>	Common	AM	20	0.022
Family Laniidae						
33	Long Tailed shrike	<i>Lanius schach</i>	Common	R/HE	8	0.008
34	Indian gray shrike	<i>Lanius excubitor</i>	Common	HE	9	0.009
Family Monarchidae						
35	Paradise flycatcher	<i>Terpsiphone paradisi</i>	Common	HE	4	0.004
Family Motacillidae						
36	Citrine wagtail	<i>Motacilla citreola</i>	Common	WV	6	0.006
37	Large pied wagtail	<i>Motacilla maderaspatensis</i>	Common	WV	8	0.008
38	Yellow wagtail	<i>Motacilla flava</i>	Rare	AM	4	0.004
39	White wagtail	<i>Motacilla alba</i>	Common	SV	5	0.051
Family Muscicapidae						
40	White caped Redstart	<i>Chaimarrornis leucocephalus</i>	Common	AM	4	0.004
41	Gray headed flycatcher	<i>Culicicapa ceylonensis</i>	Frequent	AM	6	0.006
42	Little fork tail	<i>Enicurus scouleri</i>	Rare	WV	3	0.004
43	Blue Rock thrush	<i>Monticola solitarius</i>	Common	HE	8	0.009
44	Plumbeous redstart	<i>Rhyacornis fuliginosa</i>	Common	HE	3	0.003
45	White ear	<i>Oenanthe oenanthe</i>	Common	WV	5	0.005
46	Oriental magpie Robin	<i>Copsychus saularis</i>	Frequent	HE	11	0.012
47	Pied bushchat	<i>Saxicola caprata</i>	Common	AM	5	0.005
Family Nectariniidae						
48	Purple sun bird	<i>Nectarinia asiatica</i>	Common	SV	12	0.013

S. No.	English / Local name	Scientific name	Status	Occurrence	Number Observed	Relative abundance
Family Oriolidae						
49	Golden oriole	<i>Oriolus oriolus</i>	Common	SV	10	0.011
Family Paridae						
50	Gray tit	<i>Parus major</i>	Common	HE	22	0.024
Family Passeridae						
51	House sparrow	<i>Passer domesticus</i>	Abundant	R	21	0.023
Family Pycnonotidae						
52	White cheeked bulbul	<i>Pycnonotus leucogenys</i>	Common	R	36	0.039
53	Red vented bulbul	<i>Pycnonotus cafer</i>	Common	R	20	0.022
54	Black bulbul	<i>Hypsipetes leucocephalus</i>	Abundant	R/HE	13	0.013
Family Sturnidae						
55	Common Myna	<i>Acridotheres tristis</i>	Abundant	R	50	0.055
56	Common Starling	<i>Sturnus vulgaris</i>	Rare	AM	1	0.001
57	Brahminy Myna	<i>Sturnus pagodarum</i>	Common	R	12	0.013
Family Sylviidae						
58	Brown chiff chaff	<i>Phylloscopus collybita</i>	Common	HE	4	0.004
59	Common Tailor bird	<i>Orthotomus sutorius</i>	Common	HE	12	0.013
60	Leaf warbler	<i>Phylloscopus</i> sp	Common	HE	7	0.007
Family Timaliidae						
61	Streaked Laughing Thrush	<i>Garrulax lineatus</i>	Common	HE	02	0.002
62	Wren babbler	<i>Turdoides striatus</i>	Frequent		25	0.027
Family Turdidae						
63	Whistling Thrush	<i>Myiophonus caeruleus</i>	Common	HE	4	0.004
Family Zosteropidae						
64	Indian white eye	<i>Zosterops palpebrosa</i>	Common	SV	12	0.013
Order Piciformes						
Family Picidae						
65	Yellow Crown Wood pecker	<i>Dendrocopos mahrattensis</i>	Frequent	HE	20	0.020
Order Psittaciformes						
Family Psittacidae						
66	Plum headed parakeet	<i>Psittacula cyanocephala</i>	Frequent	HE	2	0.002
67	Rose ringed parakeet	<i>Psittacula krameri</i>	Common	HE	28	0.030
Order Strigiformes						
Family Strigidae						
68	Eurasian eagle owl	<i>Bubo bubo</i>	Frequent	HE	2	0.002
69	Himalayan brown owl	<i>Strix leptogrammica</i>	Common	HE	2	0.002
70	Spotted Owlet	<i>Athene brama</i>	Common	HE	5	0.005

Legends

R =Resident; HE= Resident Birds of Himalayan Ecosystem; R/HE = Resident birds confined to Himalayan ecosystem;

SV= Summer visitor; AM= Seasonal Altitudinal Migrant; WV= Winter visitor