Asian Journal of Conservation Biology, July 2014. Vol. 3 No. 1, pp. 48–59 AJCB: FP0037
ISSN 2278-7666 ©*TCRP* 2014

Avian diversity and species composition along elevation at Doon valley forest of Dehradun district (Garhwal Himalaya) in Uttarakhand state, India

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(Accepted 12 May, 2014)

ABSTRACT

Species diversity and community composition of birds change rapidly along elevation gradient, particularly in tropical and subtropical regions. Total 118 species (18082 individuals) belonging to 41 families were reported along the elevation at Doon valley forest of Dehradun district. Avian species composition exhibits fluctuation along the elevations. Diversity indices in terms of diversity, richness and non parameter estimator values (Chao I, Chao II and Jackknife) indicate the same patterns and the indices values were found highest at (1358m) mid elevation zone of the study range (325 m- 2300 m asl). Increase species richness at 1358m asl in our study be connected to the vegetation variety which emerge to retain the presence of Shelter and other food resources. However, poor abundance of galliformes (Red jungle fowl, Kaleej and Indian pea fowl) is due to hunting in the Doon valley region and the presence of two new records like White rumped munia, Red whiskered bulbul and endangered species Egyptian vulture and two near threatened species viz. River lapwing and Alexandrine parakeet concerns the conservation of birds in this area.

Key words: Diversity, Richness, Chao I, Chao II, Jackknife

INTRODUCTION

Biodiversity is not evenly distributed across the earth. It may be influence by geography (Karr, 1976). Elevation gradient distributions across the globe are a powerful test system for understanding biodiversity (McCain, 2009). From the last decades, relation between species community composition and elevation at global level is an important theme in ecology. Many studies have been conducted on avian species distribution pattern along elevation gradient at regional level (Cody, 1974; Able & Noor, 1976; Rahbek, 2005) especially in temperate regions. Species diversity and community composition change rapidly along elevation gradient, particularly in tropical and subtropical regions (Terborgh, 1977; Brown and Gibson, 1983; Wu *et al*., 2010). Generally, the information about the avian species distribution pattern along the elevation is not clear such as in term of humped shape is about 49%, decreases 20% and 24% high richness at low elevation respectively of all cases of bird richness distribution along elevation gradient (Rahbek, 1995, Rahbek, 2005). About 1313 species (13%) of the world avian species are reported in India and the Indian sub continent (Grimmett *et al*., 2011). The Indian Himalayan range is well recognized for its biological diversity and ecological values (Bhattacharya *et al*., 2007). The western part of Himalayan is an important area of regional endemism and has been designated by Bird Life International as Endemic Bird Area (EBA 128). It also contains 27 Important Bird Areas (IBAs) (Islam *et al*., 2004). The foothills of western Himalaya in Dehradun valley is known for their diverse avifauna assemblage and the Knowledge about avifauna of Doon valley is based on only checklist (Osmaston, 1935; Mohan, 1992; Mohan, 1997; Singh, 2000). However, the available information about relation between elevation and avian species richness is insufficient. Few studies in Indian Himalaya region have been conducted last five year such as in Eastern Himalayan Mountain the state of Sikkim at regional level (gamma) Acharya, 2011 and different forest habitat of Nainital district (western Himalaya) at local level (alpha) Joshi *et al*., 2009; Bhatt *et al*., 2011. An attempt was made to understand the avian species distribution pattern along the elevation at forest habitat (local level) of Doon valley and also contribute to find out the rich avian diversity areas and status of avian species in Doon valley of Western Garhwal Himalaya.

MATERIALS AND METHODS

Study area*:* The present study was carried out at the Doon valley (29^0 55' and 30^0 30'N, 77^0 35' and 78^0 24' E), which covered 85.7 % area of Dehradun district of Uttarakhand (Figure 1, Table 1). Doon valley hill area (range 1300 – 2500 m) is dominant with the *Rhododendron arboretum*, *Quercus incana*, *Quercus dilatata* and *Cedrus deodara* trees. However, major part of this region (range 300m - 1000m) is occupied by the *Shorea robusta*, *Terminalia bellerica*, *Cedrela toona*, *Dalbergia sissoo* and *Butea monoserma* tree species (Champion *et*

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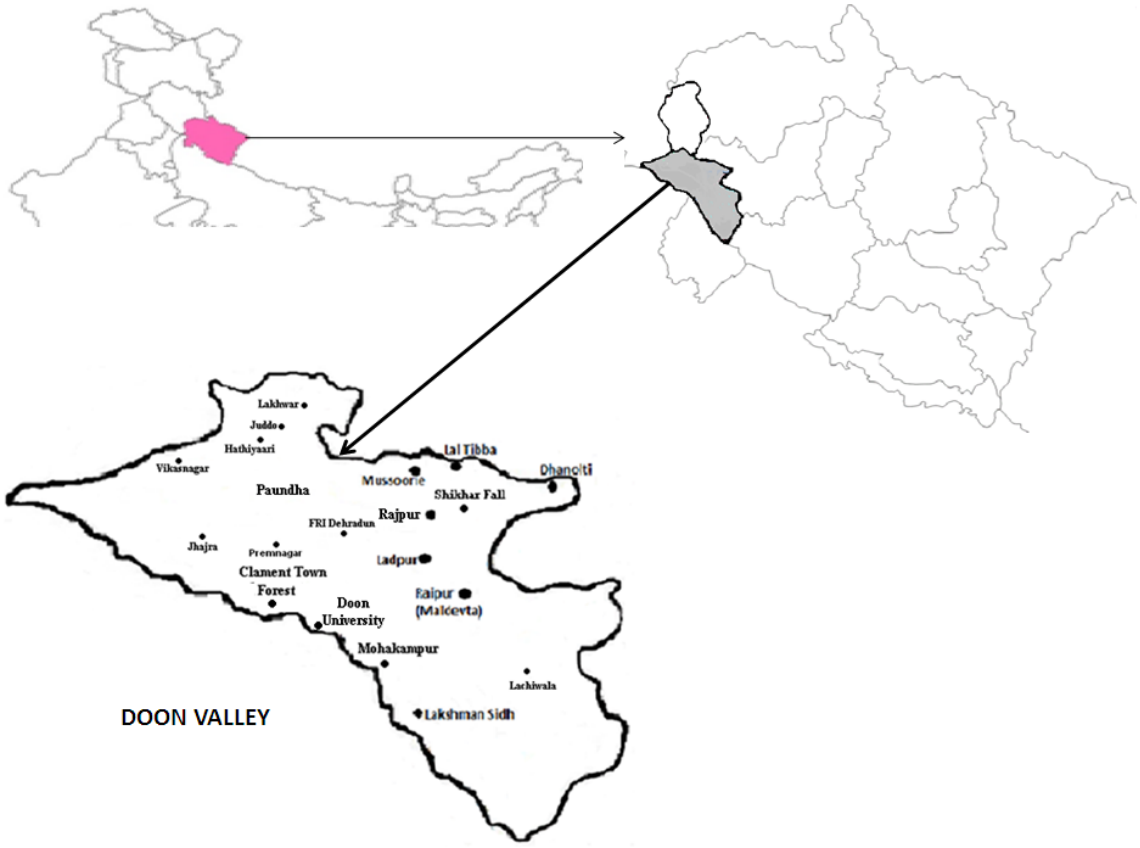

Figure 1. Showing the different study sites in Doon Valley of Dehradun District

al., 1968). The temperature varies from 10^0 C in winter (December – February) to 38^0 C in summer months (April - July). The rainfall pattern in study area is monsoon dependent. Dehradun receives the maximum rainfall in between July - September (Pandey *et al*., 1994).

Bird sampling and identification: The bird survey was conducted Feb 2012 to Feb 2013, at different elevation zones forest of Doon valley in Dehradun district.. Fixed width line transect along with fixed radius point count method (Bibby *et al*., 2000) were applied to quantify the diversity and abundance of bird species in each elevation zone forest habitat and the sampling was done between 06.00 – 11.00 hrs and 16.30 – 19.30 hrs in summer months (April - September) and between 07.00 – 11.30 hrs and 15.00 – 16.00 hrs in winter months (October - March). Sampling was not done during harsh weather and rainy days. Field guide books (Kazmierczak *et al*., 2003; Grimmett *et al*., 2011) were used for bird's identification. Total 162 points were studied in all the elevation zones and about 5 minutes stayed each point for bird count. No specimens were collected but most of species was taken photographed for reference.

Data analysis: The bird survey was completed from 200m asl to 2300m asl elevation ranges with 200 m interval and complete study area was categories about 7 elevational zones. The Shannon- Weavers and Simpson indices were used to calculate the avian diversity in Doon valley. Shannon – Weaver equation: $H' = -\sum p_i (\ln p_i)$ (Shannon and Weaver, 1949).

Where, p_i is the proportion of each species in the sample, $p_i = n/N$ where n_i is the number of individuals of species and N is the total number of individuals of all species

Simpson's equation: $D = \sum n (n-1)/N (N-1)$

Where, D = Simpson's index of dominance; N = is the total number individuals of all species; n = number of individuals of specific species per sample and $\sum$ = sum.

Species richness, the number of species recorded from a study site was calculated by Margalef's formula SR = (S-1)/Log N (Margalef, 1951).

Where, S = Total number of species N = total numbers of individuals present in the sample.

In addition, non parametric estimators (Chao I, Chao II and Jackknife) were used to estimate the avian species richness from the sample.

Chao I equation: $Si = S_{obs} + (a^2/2b)$ (Chao, 1984).

Where Sobs = is the observed number of species in a sample; a = is the number of observed species that are represented by only a single individual in the sample; b = is the number of observed species represented by exactly two individuals in that sample.

Chao II equation (based on present – absent data): $S2 = S_{obs} + (L_2/2M)$ (Chao II).

Where L = is the numbers of species that occur in only one sample (unique species) and M = is the number of species that occur in exactly two samples.

Jackknife equation: $S_3 = S_{obs} + L (n-1/n)$ (Burnham and Overton, 1978, 1979).

Where n = the number of samples, L = is the numbers of species that occur in only one sample (unique species).

Table 1. Numbers of species and individuals observed in different elevational zones forest of Doon valley.

Category	325m	630 m	870 m	1100 m	1358 m	1800 m	2300 m
Coordinate							
Elevation range	250-450	530-730	770-970	1000-1200	1200-1400	1500-2100	2180-2420
Longitude	78° 15' E	78° 05' E	78° 08' E	78° 05' E	78° 04' E	77° 52' E	78° 06' E
Latitude	30° 02' N	30° 19' N	30° 20' N	30° 24' N	30° 25' N	30° 42' N	30° 27' N
Annual temp. (C°)	Min Max 2-35	Min Max 7-40	Min Max 9-37	Min Max 10 -32	Min Max 2-27	Min Max 2-21	Min Max -2 -20
Vegetation zone	Moist Si-walik Sal Forest	Moist Si-walik Sal Forest	Moist Siwalik Sal Forest	Dry Siwalik Sal forest	Mixed De-ciduous Forest	Ban Oak Forest	Moist Deo-dar Forest
Observation							
Number of spe-cies	30	34	40	44	51	27	24
Number of indi-vidual	294	265	227	204	683	189	279
Number of point studied	23	23	23	23	23	23	23
Covered study area (ha)	150	150	150	150	150	150	150
Human distur-bance	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

Statistical analysis

The non parametric estimators of Chao I, Chao II and Jackknife were selected to explore the abundance and distribution of estimate species using Estimate S (ver. 7.5) software (Colwell, 2005). Analysis of variance (one way ANOVA) was applied to test the avian species differences among the elevation. A rarefaction analysis was used to illustrate the species accumulation with elevational zone and curves were used to understand the species distribution in different elevation. Jaccard's similarity index (cluster analysis) with single linkage dendogram was used to identify the similarity between avifauna and different elevation zone.

RESULTS AND DISCUSSION

Total 118 species belonging to 41 families (Annexure 1) were reported along the elevation at Doon valley forest of Dehradun district. The Picidae family was dominants with 11 species among the families, followed by Corvidae (9) and Turdinae (8) respectively. Total of the 118 species most of them 93 (78.81 %) were the residential at Doon valley and 16 species (13.55 %) were summer visitor and four Species (3.38 %) namely Yellow-breasted Greenfinch *Carduelis spinoides,* Grey Wagtail *Motacilla cinerea,* White Wagtail *Motacilla alba*, Blue Rock-thrush *Monticola solitarius)* were winter visitor. However, five species (4.23 %) (i.e. Great Gray Shrike *Lanius excubitor,* Green-tailed Sunbird *Aethopyga nipalensis,* Purple Sunbird *Nectarinia asiatica,* Yellow-bellied Fantail-Flycatcher *Rhipidura hypoxantha,* Grey-headed Starling *(Sturnus malabaricus)* were altitudinal migration also noticed in the study area. Out of these one endangered Egyptian vulture (IUCN, 2013) and two near threatened (Alexandrine parakeet and River lapwing) species reported in the study area. Along with two new reported species namely White rumped munia and Red Whiskered Bulbul at the study sites. The presence of diverse avian population, seasonal migratory species and threatened species indicates the rich food availability, shelter and important birding area of the study area. In addition of the Pheasant species like Kaleej (*Lophura leucomelaos)* Red jungle fowl (*Gallus gallus)* and Indian Peafowl (*Pavo cristatus*) was also reported during survey. The abundance of Kaleej (n = 14, SD ± 4.2), Red jungle fowl (n = 26, SD ± 3.3) and Indian Peafowl (n = 23, SD ± 4.7) were recorded low at low elevational zones of the study sites.

Diversity pattern

Avian species diversity exhibited fluctuations along the elevation. The minimum diversity value of Shannon - Weaver index was (2.88) at 2300m and followed by (2.98) at 1800m. However, the maximum diversity value (3.42) was recorded at 1358 m asl and followed by (3.38) at 1118m respectively. These results were also supported by the Simpson diversity, dominance and reciprocal indices. The Simpson diversity index value was maximum (0.96) at 1358 m and minimum (0.93) at 2300 m of the study sites. Same as the Simpson reciprocal index was also highest (25.31) at 1358 m elevation and minimum value (14.61) was at 2300 m elevation (Figure 2). The avian species richness (Mergelf's index) value was highest (7.65) at 1358 m asl. The non parametric species estimator (Chao I, Chao II and Jackknife) also supports the Mergelf's species richness values. Number of species estimated, at 2300 m were 39 for Choa 1, 40 for Chao II and 39 for Jackknife, at 1800 m were 42 for Chao I, 43 for Chao II and 46 for Jackknife, at 1358 m were 51 for Choa I, 54 for Chao II and 57 for Jackknife, at 1100 m were 49 for Choa 1, 53 for Chao II for and 54 for Jackknife, at 630 m were 47 for Chao I, 48 for Chao II and 49 for Jackknife and at 325 m were 45 for Chao 1, 48 for Chao II and 48 for Jackknife, these values were very close to the actual number of species observed (Figure 3).

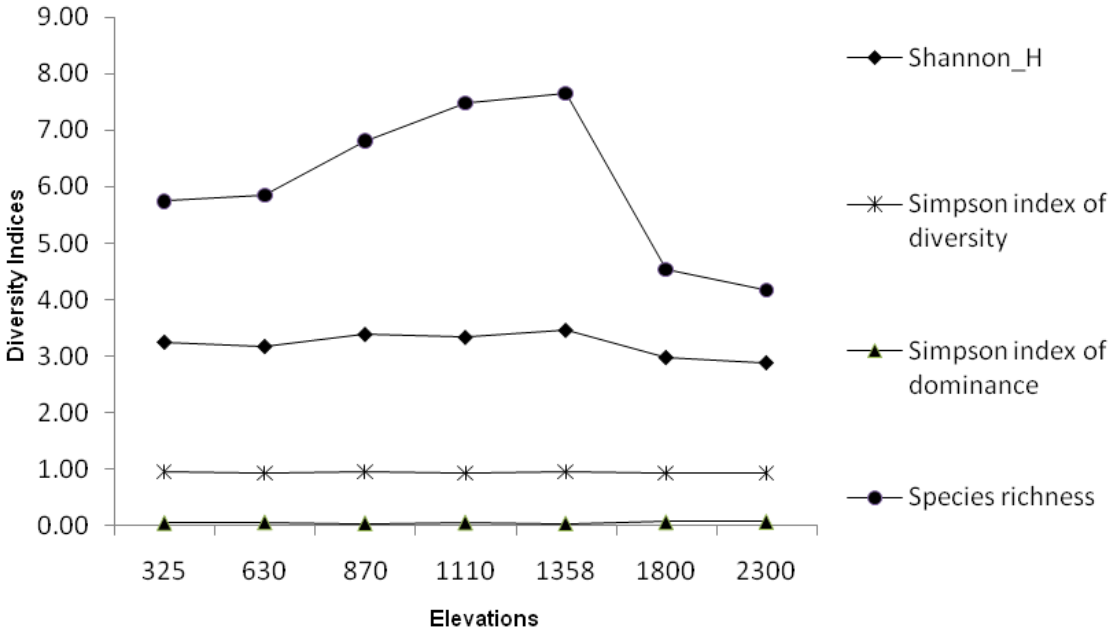

Figure 2. Variation of species diversity indices (Diversity and Richness)

Distribution Patterns

The finding of this study revealed diverse populations of birds along altitudinal gradient in the study area. The rarefaction curve (Figure 4) reveal that the mid elevation zone (1358 m asl) of the study area range have the highest species abundance with maximum 51 numbers of species. The Anova test analysis between elevation and species abundance indicates the abundance was highly significant (*df = 6, F = 4.73, P = 0.001*) at 1358 m of the study area. The results illustrate that the avian species diversity increase from low elevation (325 m) to mid elevation (1358 m) after that decline at once till 2300 m asl such pattern indicate humped shape distribution model of avian species along elevation in doon valley area of tropical region. Most such studies especially in temperate region have found the highest species richness at mid elevation of their study range such as Peruvian Andes (Rehbak 1995, 2005), Madagescan rain forest (Colwell *et al*., 2000), Bolwian Andes south American forest (Kessler *et al*., 2001) Columbian Andes forest (Kattan *et al*., 2000). Similarly, few studies in tropical region also found highest species richness at mid elevation of the study area such as western Himalaya Nainital district, (Bhatt *et al*., 2011; Joshi *et al*., 2009) and North east at Teesta valley (Acharya *et al*., 2011). However, Factor including sampling, area effects, temperature and human disturbance and their combined effect on avian species distribution pattern (Mc Cain *et al*., 2009). In the present study due to short span of elevational gradients it was not clear temperature effects on species distribution. Relatively short span of elevation gradients of species richness was particularly sensitive to the effects of area and sampling method (Rahbek, 1995). Area of sampling in seven different elevational zones was about 150 ha. Along the elevation at local level no area effects were observed in avian distribution pattern at 3 different elevational zone of Nainital District (Bhatt *et al*., 2011). Increase species richness at 1358m asl in our study be connected to the variety of vegetation which emerge to retain the presence of food resources. Vegetation relationship effects on the species distribution along elevation were

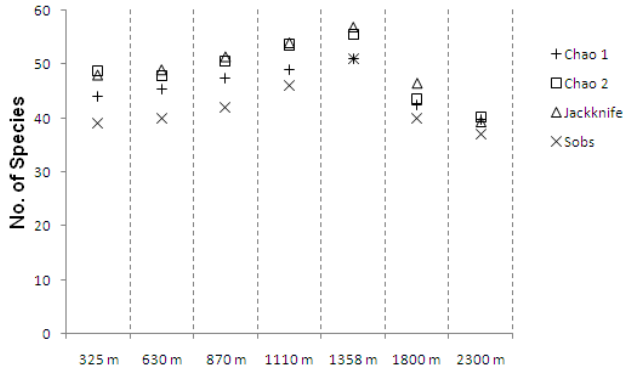

Figure 3. Estimate of Species richness from Chao I, Chao II, Jackknife and Species observed

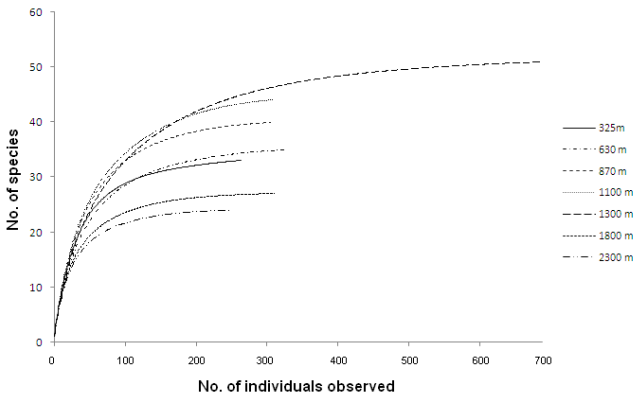

Figure 4. Individual based rarefaction curves for different elevation zones of Doon valley

reported in Kumaun Himalaya (Joshi, *et al*., 2012). Terborgh (1977, 1971) suggested that habitat complexity increase habitat for insects, which in term increase their diversity and abundance ultimately increasing the diversity and population of birds. Hierarchial cluster analysis showed that sequential similarity was present between elevation and group of avian species. Six clusters were formed at 0.85 similarity level and indicate the deviation among the group of avian species from low to high elevation zone of the study area (Figure 5). The presence of the Galliformes as Kaleej *Lophura leucomelanos,* Red Jungle fowl *Gallus gallus* and Indian peafowl (*Pavo cristatus*) indicates the food resources availability and shelter in the study area however the poor abundance of these pheasants in Doon Valley intense their conservation. Since, during this survey, a casual conversation with local community has indicated that pheasants and owls are commonly being hunted for food and trade purpose. It has not been reported in earlier studies of Doon valley forest. As well, presence of endangered species in Doon valley point out the more attention is required to conserve these forest and natural habitats.

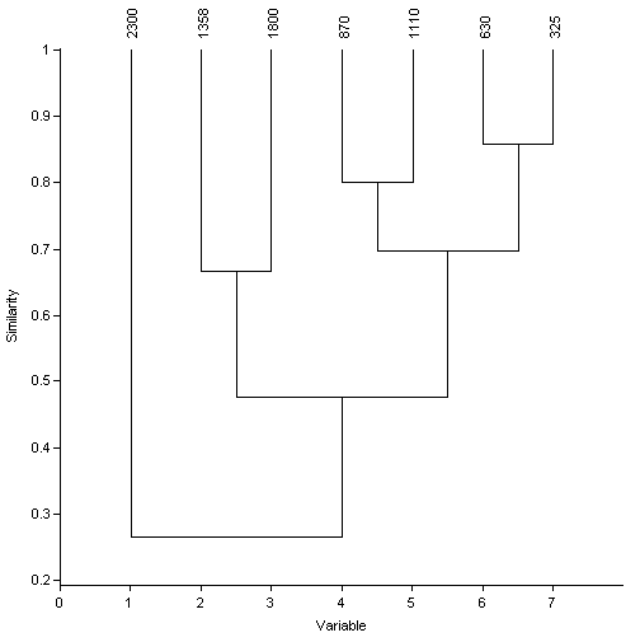

Figure 5. Dendogram showing paired group of species similarity at different elevational

CONCLUSION

The present study highlights the variety and rich abundance of the avian species in the Doon valley forest. The investigation indicates that all the diversity indices show high abundance of avian at mid elevational zones forest. The study suggests that avian species distribution along the elevation is hump shaped pattern at local level which may regulated by vegetation structure. Although, further studies require understanding the vegetation role on species distribution pattern in Doon valley area. The presence of endangered bird species and two new reported species (White rumped munia and Red-whiskered Bulbul) in the study area designate the importance of this area as a bird watching site, extending area of these species in Doon valley region and recommend starting the avian conservation programmes with local participatory.

ACKNOWLEDGEMENTS

We are very grateful to the Uttarakhand State Biotech. Department (USBD), Dehradun, Govt. of Uttarakhand for their financial supports to carry out this work.

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Annexure 1: List of avian species recorded in Doon valley of Uttarakhand

Family	Common name	Scientific name	325 m	630 m	870 m	1100 m	1358m	1800 m	2300 m	No. of individual
Accipitridae	Booted Eagle	*Hieraaetus pennatus*		+		+	+			**7**
	Egyptian Vulture	*Neophron percnopterus*	+							**19**
Bucerotidae	Indian Grey Hornbill	*Ocyceros birostris*	+		+	+	+			**16**
	Oriental pied Hornbill	*Anthracoceros albirostris*		+	+					**8**
Campephagidae	Scarlet minivet	*Pericrocotus flammeus*				+				**4**
Capitonidae	Blue-Throated Barbet	*Megalaima asiatica*	+	+						**6**
	Copper smith barbet	*Megalaima haemacephala*					+			**1**
	Great Hill Barbet	*Megalaima virens*					+			**1**
	Lineated Barbet	*Megalaima lineata*		+	+					**12**
Certhiidae	Eurasian Tree-Creeper	*Certhia familiaris*				+		+	+	**15**
Charadriidae	Red-wattled Lapwing	*Vanellus indicus*	+				+			**11**
Columbidae	Blue rock pigeon	*Columba livia*						+	+	**25**
	Wedge-tailed Green Pigeon	*Treron sphenura*			+					**1**
	Emerald Dove	*Chalcophaps indica*				+				**1**
	Laughing Dove	*Streptopelia senegalensis*	+				+			**4**
	Spotted Dove	*Streptopelia chinensis*	+	+	+	+	+	+	+	**82**

Compephagidae	Bar-winged Flycatcher-Shrike	*Hemipus picatus*					+			**6**
	Small minivet	*Pericrocotus cinnamomeus*				+				**6**
Corvidae	Black headed jay	*Garrulus lanceolatus*							+	**17**
	Common Crow	*Corvus splendens*	+	+	+	+	+	+	+	**47**
	Common raven	*Corvus corax*						+		**6**
	Eurasian Jay	*Garrulus glandarius*	+							**2**
	Grey tree pie	*Dendrocitta formosae*						+		**3**
	Jungle Crow	*Corvus macrorhynchos*	+	+	+	+	+	+	+	**86**
	Red-billed blue magpie	*Urocissa erythrorhyncha*				+	+			**12**
	Rufous Treepie	*Dendrocitta vagabunda*		+			+			**11**
	Yellow-billed Blue Magpie	*Urocissa flavirostris*					+			**6**
Cuculidae	Asian Koel	*Eudynamys scolopaceus*	+	+	+	+				**18**
	Common Hawk Cuckoo	*Hierococcyx varius*		+						**2**
	Indian Cuckoo	*Cuculus micropterus*	+	+	+	+				**8**
	Lesser coucal	*Centropus bengalensis*		+						**12**
	Pied Cuckoo (Jacobin)	*Clamator Jacobinus*	+	+	+	+	+			**15**
Dicruridae	Black Drongo	*Dicrurus macrocercus*	+	+	+	+				**32**
	Splangled Drongo	*Dicrurus hottentottus*		+	+	+	+			**47**
Emberizinae	Creasted bunting	*Melophus lathami*					+		+	**31**

Estrildidae	Spotted Munia	*Lonchura punctulata*	+			+			**12**
Fringillidae	Pink brown rosefinch	*Carpodacus eos*						+	**4**
	Yellow brested green finch	*Carduelis spinoides*						+	**7**
Muscicapinae	Ultramarine Flycatcher	*Ficedula superciliaris*						+	
Hirundinidae	Wire-tailed Swallow	*Hirundo smithii*	+						**2**
	Red rumped Swallow	*Hirundo daurica*						+	**28**
Irenidae	Common Iora	*Aegithina tiphia*		+					**1**
Laniidae	Bay-backed Shrike	*Lanius vittatus*				+			**14**
	Great gray Shrike	*Lanius excubitor*					+		**2**
Meropidae	Blue-tailed Bee-eater	*Merops philippinus*	+						**1**
	Chestnut-headed Bee-eater	*Merops leschenaulti*				+			**1**
	Green Bee-eater	*Merops orientalis*	+	+		+			**52**
	Indian Roller	*Coracias benghalensis*	+						**3**
Monarchinae	Asian paradise flycatcher	*Terpsiphone paradisi*		+	+	+			**22**
Motacillidae	Grey wagtail	*Motacilla cinerea*				+			**2**
	White-browed Wagtail	*Motacilla maderaspat-ensis*				+			**1**
	White wagtail	*Motacilla alba*				+			**6**
Muscicapinae	Blue niltava	*Niltava macrgrigoriae*						+	**4**
	Slaty blue fly-catcher	*Ficedula tricolor*					+		**5**

	Verditer fly-catcher	*Eumyias thalassina*					+		+	**7**
	Grey- headed canary fly-catcher	*Culicicapa ceylonensis*		+				+		**8**
Nectariniidae	Crimson Sunbird	*Aethopyga siparaja*	+				+			**6**
	Green -tailed Sunbird	*Aethopyga nipalensis*							+	**2**
	Purple Sunbird	*Nectaria asiatica*	+	+			+			**31**
Oriolidae	Black-hooded Oriole	*Oriolus xanthornus*	+	+	+					**16**
	Eurasian Golden oriole	*Oriolus oriolus*	+	+		+	+			**23**
Paridae	Black throated tit	*Aegitbalos conccinnus*					+	+	+	**69**
	Great Tit	*Parus major*	+	+	+	+	+	+	+	**91**
	Green backed tit	*Parus monticolus*						+		**19**
	Grey crested tit	*Parus dicbrous*						+		**7**
	Spot-winged Crested Tit	*Parus melanolophus*						+		**2**
Phasianidae	Black Francolin	*Francolinus francolinus*	+				+			**10**
	Indian peafowl	*Pavo cristatus*	+	+	+					**23**
	Red Jungle fowl	*Gallus gallus*	+	+	+					**24**
Picidae	Black-rumped Flameback	*Dinopium benghalense*	+							**4**
	Brown-fronted Woodpecker	*Dendrocopos auriceps*		+				+		**8**
	Fulvous-breasted Woodpecker	*Dendrocopos macei*			+					**7**
	Greater Flame-back	*Chrysocolaptes lucidus*			+					**2**
	Grey-capped Pygmy Wood-pecker	*Dendrocopos canicapil-lus*				+				**2**
	Grey-headed Woodpecker	*Picus canus*		+	+	+	+			**20**
	Himalayan Goldenback	*Dinopium shorii*		+						**7**

	Himalayan Woodpecker	*Dendrocopos himalayensis*	+							**1**
	Lesser yelllownape	*Picus chlorolophus*		+			+			**6**
	Speckled Piculet	*Picumnus innominatus*					+			**5**
	Yellow-crowned Woodpecker	*Dendrocopos mahrattensis*			+					**5**
Psittacidae	Plum-headed Parakeet	*Psittacula cyanocephala*	+				+			**25**
	Rose-ringed parakeet	*Psittacula krameri*					+			**5**
Pycnonotidae	Black bulbul	*Hypsipetes leucocepalus*		+					+	**20**
	Himalayan Bulbul	*Pycnonotus leucogenys*	+	+	+	+	+	+	+	**173**
	Mountain Bulbul	*Lxos mcclellandoii*							**1**	**1**
	Red-vented Bulbul	*Pycnonotus Cafer*	+	+	+	+	+	+	+	**151**
Rhipidurinae	White-throated Fantail	*Rhipidura albicollis*				+				**12**
	Yellow-bellied Fantail Flycatcher	*Rhipidura hypoxantha*					+			**4**
Rallidae	White breasted Water hen	*Amaurornis phoenicurus*	+	+		+	+			**10**
Sittidae	Chestnut-Bellied Nuthatch	*Sitta castanea*	+	+		+				**37**
Strigidae	Spotted Owlet	Athene brama		+						**2**
Sturnidae	Chestnut tailed Starling	*Sturnia malabarica*		+						**12**
	Jungle Myna	*Acridotheres fuscus*		+	+	+	+		+	**129**
Sylviinae	Ashy Prinia	*Prinia socialis*	+				+			**24**
	Franklin's Prinia	*Prinia hodgsonii*			+					**4**
	Grey hooded warbler	*Phylloscopus xanthoschistos*	+				+			**8**
	Indian tailor bird	*Orthotomus sutorius*	+	+		+				**12**
	Jungle Prinia	*Prinia sylvatica*		+	+					**18**
	Lagre billed leaf warbler	*Pbylloscopus magnirostris*						+		**10**

	Lemon rumped warbler	*Pbylloscopus cblorono-tus*						+		**16**
	Plain Prinia	*Prinia inornata*	+							**6**
Timaliinae	Jungle Babbler	*Turdoides striata*	+	+	+	+	+			**173**
	Puff-throated Babbler	*Pellorneum ruficeps*			+					**2**
	Red-billed Leio-thrix	*Leiothrix lutea*				+				**9**
	Rufous sibia	*Heteropbasia capistrata*							+	**5**
	Rusty Cheeked Scimitar babbler	*Pomatorhinus erythrogenys*				+	+			**24**
	Streaked laugh-ingthrush	*Garrulax lineatus*				+	+	+	+	**40**
	White-crested laughingthrush	*Garrulax leucolophus*		+						**4**
Turdinae	Blue fronted redstart	*Pboenicurus frontalis*		+				+	+	**9**
	Blue Whistling-Thrush	*Myiophonus caeruleus*	+	+	+	+	+	+	+	**81**
	Common Stone-chat	*Saxicola torquata*	+							**2**
	Indian Robin	*Saxicoloides fulicata*	+							**5**
	Oriental Magpie Robin	*Copsychus saularis*	+							**11**
	Pied Bush chat	*Saxicola caprata*	+		+	+	+			**46**
	Himalayan ruby throated	*Luscinia pectoralis*					+			**6**
	White-capped redstart	*Chaimarrornis leuco-cephalus*							+	**2**
Upupidae	Common Hoo-poe	*Upupa epops*	+		+		+			**13**
Zosteropidae	Oriental White-eye	*Zosterops palpebrosus*	+	+	+	+	+	+	+	**145**