Bird community structure as a function of habitat heterogeneity: A case of Mardi Himal, Central Nepal

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Abstract. Pandey N, Khanal L, Chapagain N, Singh KD, Bhattarai BP, Chalise MK. 2021. Bird community structure as a function of habitat heterogeneity: A case of Mardi Himal, Central Nepal. Biodiversitas 22: 262-271. Community structure of birds at different habitat types is underexplored in the montane environment of the central Himalaya. Therefore, this study explored bird community structure in different habitat types in Mardi Himal of the Annapurna Conservation Area, central Nepal, and tested association of different feeding guilds with the habitats. Data on the avian richness and abundance were collected in the winter and the summer of 2019 by point count method along the elevational gradient in every 100 m rise and analyzed using ordination methods. A total of 673 individuals of 112 bird species from 35 families under 13 orders were recorded. Among the observed orders and families, the order Passeriformes (77 species) and family Muscicapidae (16 species) were the most dominant. A linear species accumulation curve was obtained in both seasons. Species richness and abundance were found higher at forest edges of mid elevations and insectivores were the most abundant birds. Frugivorous and carnivorous birds showed no specific association with habitat types, whereas, insectivores and omnivores were more abundant in pastureland and forest, respectively. Our results revealed that the community composition of birds varies with the habitat types and their feeding specialization is one of the major determinants.

Keywords: Bird community, elevation, feeding guilds, habitat, species accumulation curve

INTRODUCTION

Spatiotemporal distribution of some key environmental resources governs abundance of bird species (McCain 2009). Therefore, studies have attempted to study factors that affect bird abundance and distribution at spatial and temporal scales (He et al. 2019; Pandey et al. 2020). Studies have shown association of particular bird species to the specific habitat (Brawn et al. 2001; Seymour and Simmons 2008). Due to birds’ rapid response to changing habitat (Cresswell et al. 2007), they are good indicator of habitat quality, productivity, and stability (Vallecillo et al. 2016) and hence they are used as surrogates for assessing the impact of habitat changes (Chettri et al. 2001; Verraart et al. 2004). Basic information about explanatory factors of fluctuating bird population (Norrvell et al. 2003) and information for conservation and management of threatened species (Sauer and Link 2002) are provided by monitoring species abundance, habitat preference, and correlations between species abundance and habitat.

Seasonal change in climate of a mountain ecosystem affects the bird species richness, composition and abundance (Blake and Loiselle 2000; Shiu and Lee 2003; Shoo et al. 2005). Changes in abiotic and biotic factors force the bird species to ascend and descend avoiding the harsh environmental conditions (Amani et al. 2018). Seasonal change affects food, water, and cover availability of bird population, so, they shift/migrate to habitat/areas with surplus resources to maximize breeding success and to minimize physiological risk and low resource availability (Beuel et al. 2016; Girma et al. 2017; Kawamura et al. 2019), which ultimately brings change in seasonal site-wise richness pattern.

Annapurna Conservation Area (ACA) is one of the Important Bird and Biodiversity Areas (IBAs) and a global hotspot of bird diversity (BCN 2011; Pandey et al. 2020). It is one of the largest protected areas of Nepal covering an area of 7629 square kilometers. Its area stretches from the subtropical lowlands and lush temperate rhododendron forest in the south to dry alpine forest in the north. Apart from having spectacular landscapes, the ACA is known as a treasure house to 22 different forest types, 1226 species of flowering plants, 105 mammals, 518 birds, 40 reptiles, and 23 amphibians (NTNC-ACAP 2020). A total of 518 bird species representing 14 orders and 52 families were recorded in ACA (Inskipp and Inskipp 2003). Despite having large avian species richness, studies on avian species in the ACA are limited to the checklist or basic ecology of the single or few species.

Mardi Himal trek is a newly established (officially opened in 2012 AD) trekking trail that lies in the south-western side of the Annapurna mountain range in the ACA (Pandey et al. 2020). To date, research along this route to exhibit the avian species distribution and abundance on different habitat types is lacking. In order to fill this gap, which ultimately aids the conservation of species and
proper management of the mountain trail with potential anthropogenic pressure, this study was carried out in the Mardi Himal aiming to assess i) avian community structure ii) richness and abundance in different habitat types, and iii) habitat association of different feeding guilds of the birds.

MATERIALS AND METHODS

Study area

The central one-third stretch of the Himalayan range is the Nepal Himalaya. Mardi Himal, the southern summit (5578 m asl) of Annapurna mountain range, has a newly open trekking trail with panoramic view of Annapurna, Dhaulagiri, Macchapuchre, and Manaslu mountains that are the major attraction of this trekking trail. The trail has diverse vegetation types ranging from sub-tropical to sub-alpine grassland. The lowest elevational point (P1, 1030 m asl) of the study was the confluence site of Seti Gandaki and Mardi River; and the highest point (P21, 3050 m asl) was the Low-Camp of Mardi Himal (Figure 1).

Vegetation varies along the trekking trail. Lower elevational point count sites (around 1100 m asl), lies on upper sub-tropical bioclimatic zone which is characterized by presence of vegetation like Schima wallichii, Castanopsis indica, Alnus nepalensis, Holarrhena antidysenterica, etc. Vegetation found in the middle elevation (around 1600 m) area is Santalum spp. (dominant), Alnus nepalensis, Juglans regia, Prunus sp., Ficus auriculata, Prunus spp. etc. In the high elevational point, there is a dense forest of Osmania spp., Rhododendrom arboreum, Juniperus squamat, Quercus semecarpifolia, etc. Treeline ends and meadows with shrubs are found after this elevation. The landscape changes quite abruptly into a rugged high mountain landscape.

Figure 1. Map of the study area. A, Map of Nepal showing the Annapurna Conservation Area (ACA); B, Map of the ACA showing the elevational gradient; C, Map of south-western region of the ACA showing the point-count stations (P1-P21) and habitat types
Bird survey

Two seasonal field surveys were conducted in the winter (January-February) and the summer (May-June) of 2019. Point count method (Bibby et al. 2000) was used to survey bird abundance and diversity. Point count sites (n = 21) were set up with about every 100 m rise in elevation (Table 1), which was recorded by Garmin Etrex 10 GPS. Birds observed and heard within 50 m radius were recorded from a fixed point. Two censuses were conducted per season on each point. Time period for point count varied with habitat; for open space, it was 10 minutes and for dense forest, it was 20 minutes to detect rare and inconspicuous species (Aleixo and Galetti 1997; Dos Anjos and Boçon 1999). Bushnell Falcon 10x50 wide-angle binoculars were used and photographs were taken using Nikon p900 camera. Birds were observed from 30 minutes after dawn to 11:30 AM, and again from 3:00 PM till 30 minutes before sunset as practiced by (He et al. 2019). The field book ‘Birds of Nepal’ (Grimmett et al. 2016) was used for identification of birds.

Data analysis

Observed birds were classified into four feeding guilds: carnivorous, frugivorous, omnivorous, and insectivorous, based on the diet descriptions available in Grimmett et al. (2016). Then, birds were classified based on habitat types (i.e. forest, pastureland, water-dependent land and agricultural land and settlement). All types of forest were included in forest type habitat; meadows, grassland and shrubby habitat with trees were included in pastureland; riverbank and marshy land were included in water-dependent land; farmlands and adjacent settlements were included in agricultural and settlement habitat. Distance from the nearest water source referred to numerical description of how far the water bodies were from the point count site. In this study, the distance to the nearest water source was measured with references to the Mardi River, Modi River, and Pau Khola. To test whether the sampling effort was enough to detect all the species that occur in the study area, species accumulation curve was produced, by plotting the cumulative number of species detected against the sampling effort (Willett 2001). To display relative species abundance of birds, the Rank Abundance Curve (RAC) or Whittaker plot was constructed using the abundance rank on the x-axis and the relative abundance/proportion on the y-axis. The RAC can be effective in analyzing types of abundance distributions in communities and its shape is linked with ecological processes underpinning communities (Fisher et al. 1943; Izsák and Pavoine 2012). The relationships between bird species and different habitat types were analyzed using the ordination method- Canonical Correspondence Analysis (CCA). Species data on different feeding guilds were considered as response variable and habitat type data where those birds were recorded was predictor variable. All ordination plots were drawn using Canoco v.5.01 (Ter Braak & Smilauer 1998).

RESULTS AND DISCUSSION

Avian community structure

A total of 673 bird individuals belonging to 13 orders, 35 families, and 112 species were recorded (Table S1).

Table 1. The 21 point count stations along the Mardi Himal Trekking route with GPS details and habitat features

| Point count station | Longitude | Latitude | Elevation (m asl) | Habitat type |
|---------------------|-----------|----------|------------------|--------------|
| P1                  | 83.9316   | 28.296   | 1030             | Riverbank    |
| P2                  | 83.8905   | 28.3295  | 1108             | Riverbank    |
| P3                  | 83.8793   | 28.3518  | 1193             | Agricultural land and Settlement |
| P4                  | 83.8752   | 28.3541  | 1310             | Forest (Sub-tropical) |
| P5                  | 83.8775   | 28.3576  | 1410             | Forest (Sub-tropical) |
| P6                  | 83.8755   | 28.3008  | 1551             | Agricultural land and Settlement |
| P7                  | 83.8747   | 28.3695  | 1648             | Forest (Upper Sub-tropical) |
| P8                  | 83.8734   | 28.37009 | 1756             | Forest (Upper Sub-tropical) |
| P9                  | 83.8723   | 28.3718  | 1862             | Agricultural land and Settlement |
| P10                 | 83.8661   | 28.3728  | 1950             | Pastureland |
| P11                 | 83.854    | 28.3763  | 2084             | Pastureland |
| P12                 | 83.8533   | 28.3825  | 2175             | Pastureland |
| P13                 | 83.8499   | 28.3832  | 2263             | Forest (Lower temperate) |
| P14                 | 83.8472   | 28.3834  | 2342             | Pastureland |
| P15                 | 83.8433   | 28.3835  | 2449             | Pastureland |
| P16                 | 83.8447   | 28.3857  | 2515             | Forest (Temperate) |
| P17                 | 83.8481   | 28.3882  | 2615             | Forest (Temperate) |
| P18                 | 83.8514   | 28.3935  | 2735             | Forest (Upper Temperate) |
| P19                 | 83.8558   | 28.3985  | 2825             | Forest (Upper Temperate) |
| P20                 | 83.8565   | 28.4011  | 2945             | Pastureland (Sub-alpine grassland) |
| P21                 | 83.8565   | 28.4037  | 3020             | Pastureland (Sub-alpine grassland) |
Three globally threatened birds like Egyptian Vulture (*Neophron percnopterus*), Himalayan Vulture (*Gyps himalayensis*), River Lapwing (*Vanellus duvaucelli*) and the endemic bird of Nepal—Spiny Babbler (*Turdoides nipalensis*) were recorded. Birds from insectivorous (richness = 58, abundance = 250) feeding guild dominate the avian community, followed by frugivorous (richness = 26, abundance = 262), omnivorous (richness = 14, abundance = 116) and carnivorous (richness = 14, abundance = 45). Similar dominance of insectivores has been reported from the eastern Himalaya (Chhetri et al. 2018) and eastern part of the Nepal Himalaya (Kandel et al. 2018).

Out of 13 orders, order Passeriformes had the highest (77) number of species recorded and lowest (1) from orders Bucerotiformes, Psittaciformes, Strigiformes and Anseriformes. Among the avian families, the highest number of species were recorded from family Muscicapidae (16), followed by family Leiothrichidae (8), and the least (1) were recorded from families—Anatidae, Cisticolidae, Psittacidae, Strigidae, Sturnidae, Upupidae, and Zosteropidae. Previous surveys and researches from the ACA found that avian community is dominated by order Passeriformes (Inskipp and Inskipp 2003; Neupane et al. 2020). Similar result was shown by other bird researches (Abbas et al. 2019; Abie et al. 2019; Adhikari et al. 2019; Chaudhari et al. 2009). The species accumulation curve based on observed species richness of both seasons is almost linear indicating the likelihood of encountering more species with increasing sampling effort. An almost similar type of pattern was observed for both the summer and winter seasons (Figure 2). The last point count site changes to high elevational meadows in the summer season and is covered by snow for more than nine months. Such type of habitat and presence of bird refugia in mountain might be the reason for linear nature of accumulation curve. Glacial mountains and high elevation topography have refugia for birds and animals from other taxa too (Wu et al. 2017; Abbas et al. 2019).

**Avian richness and abundance**

Species richness curve based on observed species richness showed that the richness initially was lesser, then gradually increased at mid-elevation and declined with further increase in elevation forming a hump-shaped pattern. Almost similar type of pattern was observed for both summer and winter season (Figure 3). However, the curves were not smoothly unimodal, indicating that elevation is not the sole driver of the avian richness. The lower richness in initial points might be due to high anthropogenic disturbances like roads and construction of hydropower stations. Though few generalist species might be benefitted (Marcum 2006) but, in general, anthropogenic disturbances have significant negative effects to bird richness and abundance (Canaday 1996; Gove et al. 2008; Marcum 2006). Omnivorous species have less effect of disturbances than other feeding guilds. Peak of the bird richness and abundance at mid-elevation might also be due to edge effect of agricultural fields and forest. Both farm and forest birds were recorded at this elevation. Edge effect has been observed in avian communities such that edge creates attractive habitats and have higher bird diversities due to heterogeneity of edge vegetation (Deikumah et al. 2017; Flaspohler et al. 2001).

The rank abundance curve (RAC) showed a steep gradient (Figure 4) indicating low evenness as the high-ranking species have much higher abundances than the low-ranking species. We observed a lognormal theoretical species abundance distribution that a convex segment of the RAC close to the y-axis is followed by a concave segment. This type of RAC is common mostly in cases of equilibrium communities subjected to many controlling factors (Izsák 2008).

![Figure 2. Species accumulation curve of birds recorded in the Mardi Himal, Nepal](image)

![Figure 3. Seasonal species richness curve and seasonal species abundance curve of birds recorded in the Mardi Himal, Nepal](image)
Season wise habitat association of avian community

The overall species abundance was the highest in agricultural land and settlement followed by forest and was found lowest in water-dependent habitat. Species abundance varies with season in different habitat types. In summer, abundance of agriculture/settlement and water-dependent habitat was found higher. Likewise, in winter, abundance of forest and pastureland reliant species was found higher (Figure 5).

Season wise habitat association was tested for selected habitat types- forest habitat, pastureland, wetland-dependent habitat, and agricultural land and settlement. The Monte-Carlo permutation test of significance of all canonical axes revealed significant preference of the insectivorous species in summer (Trace = 2.181, F-ratio = 1.289, P = 0.04) to different habitat types (Figure 6). Similarly, omnivorous birds also showed significant association with habitat types in both summer and winter season (summer: Trace = 1.524, F-ratio = 1.566, P = 0.047 and winter: Trace = 1.480, F-ratio = 2.169, P = 0.002). However, the Monte-Carlo permutation test of significance of all canonical axes showed no significant relationship of the insectivorous in winter (Trace = 1.928, F-ratio = 1.099, P = 0.202), carnivorous in both seasons (summer: Trace = 1.632, F-ratio = 1.277, P = 0.156 and winter Trace = 2.042, F-ratio = 0.742, P = 0.776) and frugivorous species in both seasons (summer: Trace = 1.577, F-ratio = 1.241, P = 0.14 and winter Trace = 1.516, F-ratio = 0.970, P = 0.536) to the habitat types (Figure 7).

Figure 4. Rank abundance curve of bird species recorded in the Mardi Himal, Nepal.

Figure 5. Habitat-wise bird species abundance for the two seasons recorded in Mardi Himal, Nepal.

Figure 6. CCA ordination diagram (biplot) showing response of insectivores and omnivores to habitat variables in two seasons. Abbreviations: Past: pastureland, WL: Wetland dependent habitat, Agstl: Agricultural land and settlement, and For: Forest. Codes used for bird species are included in Table S1.
Certain types of birds are confined to specific habitats such as agricultural fields, shrubs or forests, etc. These ranges of habitat provide different kinds of food, easy availability of water and mates for nesting or reproduction (Baschuk et al. 2012; Fernández Cañero and González Redondo 2010) thus are distributed heterogeneously. We observed a negative correlation of species richness with distance to the nearest water source (GLM; summer, $r = -0.004$, $p = 0.014$; winter, $r = -0.003$, $P = 0.109$) which means bird richness decreases with an increase in distance to water sources. Li et al. (2013) concluded that avian species richness is a hump-shaped function of energy availability, but a linear function of water availability and further emphasized that water availability has strong effects on plant richness and weaker effects on vertebrate richness. Likewise, Currie (1991) observed that the richness of vertebrates (birds, mammals, amphibians, and reptiles) is more influenced by energy while the same in the tree species are more influenced by water availability. The influence of water on plants presumably affects vertebrate species richness staunchly since plants are the chief source of food and habitat and fulfill their dietary requirements and niche (Kissling et al. 2007).

We observed no specific association of the frugivorous and carnivorous birds with the habitat types or the resource availability. Frugivorous are relatively flexible to switch to other resources in response to fluctuations in fruit resource availability (Bender et al. 2017), and hence are less specific to the habitats and more specific to fruiting season. Ordination analysis revealed a significant relationship of insectivorous and omnivorous birds to specific habitats. Herzog et al. (2005) conducted avian research in Swiss agricultural landscape and found that pastureland didn’t contribute to bird diversity. Contrarily, this study showed that pasture grasslands support many insectivorous bird species, which is consistent with the results from previous studies (Söderström et al. 2001; Tanis et al. 2020; Zahn et al. 2010). Higher food availability in grasslands may be the reason for supporting bird diversity (Jokimäki et al. 1996; Nilsson 1979). Likewise, in our study, we found that omnivorous species are mostly found in forest habitats. Similar results were shown by studies around the globe (Dario 2017; Mahiga et al. 2019). Insectivorous birds are the habitat specialists and are least dispersive or residential (He et al. 2019), hence are more specialized to the habitat. Habitat conditions such as landscape-level habitat heterogeneity are important determinants of the distribution of avian species (Basnet et al. 2016). Therefore, the presence of multiple habitat types is also a driver of the avian species assemblage in Mardi Himal.

This study from Mardi Himal of central Nepal found that Muscicapidae family and order Passeriformes were dominant in avian community. Species richness curve peaked at mid-elevation and species accumulation curve was linear. The highest species abundance was recorded in agricultural land and settlement. Frugivorous and carnivorous birds did not show significant relationship to the habitat types whereas insectivorous and omnivorous

![CCA ordination diagram (biplot) showing response of carnivores and frugivores to habitat variables in two seasons. Abbreviations: Past: pastureland, WL: Wetland dependent habitat, Agstl: Agricultural land and settlement, and For: Forest. Codes used for bird species are included in Table S1](image-url)
bird species showed their significant association to pastureland and forest habitats, respectively. An extensive avian survey covering all seasons is important for further exploration, which might play a crucial role in developing baseline information and implementing conservation actions in the central Himalaya.

**ACKNOWLEDGEMENTS**

We would like to thank Department of National Parks and Wildlife Conservation, Government of Nepal, and Annapurna Conservation Area Project, Pokhara for granting research permission. We thank Shiva Prasad Bhandari of Mardi Himal Eco-Village for providing accommodation during field. NP, LK, and MKC conceptualized the study. NP, NC and KDS performed field survey and gathered data. NP, LK and BPB analyzed data. NP and LK prepared the manuscript. MKC supervised the research. All authors read the manuscript, contributed to its improvement, and approved for submission.

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| Bird                                | Scientific Name            | Order             | Family          | Feeding Guild | Bird Code |
|-------------------------------------|----------------------------|-------------------|-----------------|---------------|-----------|
| Himalayan Vulture                   | Gyps himalayensis         | Accipitiformes    | Accipitridae    | Carnivorous   | C1        |
| Egyptian Vulture                   | Neophron percnopterus     | Accipitiformes    | Accipitridae    | Carnivorous   | C2        |
| Black Kite                          | Milvus migrans           | Accipitiformes    | Accipitridae    | Carnivorous   | C3        |
| Himalayan Buzzard                   | Buteo buteo              | Accipitiformes    | Accipitridae    | Carnivorous   | C4        |
| Goosander                           | Mergus merganser         | Anseriformes      | Anatidae        | Carnivorous   | C5        |
| Hoopoe                              | Upupa epops              | Bucerotiformes    | Upupidae        | Insectivorous | C6        |
| Red-wattled Lapwing                 | Vangula indicus          | Charadriiformes   | Charadriidae    | Insectivorous | C7        |
| River Lapwing                       | Vangula duculaeiculus    | Charadriiformes   | Charadriidae    | Carnivorous   | C8        |
| Oriental Turtle Dove                | Streptopelia orientalis  | Columbiformes     | Columbidae      | Frugivorous   | C9        |
| Spotted Dove                        | Stignatopelia chinensis  | Columbiformes     | Columbidae      | Frugivorous   | C10       |
| Speckled Wood Pigeon                | Columba hodgsonii        | Columbiformes     | Columbidae      | Frugivorous   | C11       |
| Common Pigeon                       | Columba livia             | Columbiformes     | Columbidae      | Frugivorous   | C12       |
| Barred Cuckoo Dove                  | Macrocygla unchall       | Columbiformes     | Columbidae      | Frugivorous   | C13       |
| Wedge-tailed Green Pigeon           | Treron sphenurus         | Columbiformes     | Columbidae      | Frugivorous   | C14       |
| Common Kingfisher                   | Alcedo atthis            | Coraciiformes     | Alcedinidae     | Carnivorous   | C15       |
| Blue-eared Kingfisher               | Garciavirgatus           | Coraciiformes     | Alcedinidae     | Carnivorous   | C16       |
| White-throated Kingfisher           | Halcyon smyrnensis       | Coraciiformes     | Alcedinidae     | Carnivorous   | C17       |
| Lesser Coucal                       | Centropus bengalensis    | Cuculiformes      | Cuculidae       | Insectivorous | C18       |
| Eurasian Cuckoo                     | Cuculus canorus          | Cuculiformes      | Cuculidae       | Insectivorous | C19       |
| Indian Cuckoo                       | Cuculus micropterus      | Cuculiformes      | Cuculidae       | Insectivorous | C20       |
| Black Francolin                     | Francolinus franzolinus  | Galliformes       | Phasianidae     | Frugivorous   | C21       |
| Kalij Pheasant                      | Lophura leucomelanos     | Galliformes       | Phasianidae     | Carnivorous   | C22       |
| Black-throated Tit                  | Aegithalos concinnus     | Passeriformes     | Aegialthidae    | Insectivorous | C23       |
| Rufous-fronted Tit                  | Aegithalos iouschiostos  | Passeriformes     | Aegialthidae    | Insectivorous | C24       |
| Scarlet Minivet                     | Perricocetus flammeus    | Passeriformes     | Campephagidae   | Insectivorous | C25       |
| Black-winged Cuckooshrike           | Coracina melaschistos    | Passeriformes     | Campephagidae   | Insectivorous | C26       |
| Striated Prinia                     | Prinia crinigera         | Passeriformes     | Cisticolidae    | Insectivorous | C27       |
| House Crow                          | Corvus splendens         | Passeriformes     | Corvidae        | Carnivorous   | C28       |
| Grey Treepie                        | Dendrocttona formosa     | Passeriformes     | Corvidae        | Omnivorous    | C29       |
| Common Green Magpie                 | Cissa chinensis          | Passeriformes     | Corvidae        | Carnivorous   | C30       |
| Large-billed Crow                   | Corvus macrorhynchos     | Passeriformes     | Corvidae        | Omnivorous    | C31       |
| Yellow-billed Blue Magpie           | Uroocissa flavirostris   | Passeriformes     | Corvidae        | Omnivorous    | C32       |
| Red-billed Blue Magpie              | Uroocissa erythrohyncha  | Passeriformes     | Corvidae        | Omnivorous    | C33       |
| Red-billed Chough                   | Pyrrhocorax pyrrhocorax  | Passeriformes     | Corvidae        | Insectivorous | C34       |
| Alpine Chough                       | Pyrrhocorax gracilis     | Passeriformes     | Corvidae        | Omnivorous    | C35       |
| Black Drongo                        | Dicrurus macrocercus     | Passeriformes     | Dicridae        | Insectivorous | C36       |
| Ashy Drongo                         | Dicrurus leucophaeus     | Passeriformes     | Dicridae        | Insectivorous | C37       |
| Rock Bunting                        | Emberiza cia             | Passeriformes     | Emberizidae     | Omnivorous    | C38       |
| Crested Bunting                     | Melophos lathami         | Passeriformes     | Emberizidae     | Frugivorous   | C39       |
| Dark-breasted Rosefinch             | Carpodacus nipalensis    | Passeriformes     | Fringillidae    | Frugivorous   | C40       |
| Spot-winged Rosefinch               | Carpodacus rodopiplus    | Passeriformes     | Fringillidae    | Frugivorous   | C41       |
| Spot-winged Grosbeak                | Mycrobos melancanthos    | Passeriformes     | Fringillidae    | Frugivorous   | C42       |
| Common Rosefinch                    | Carpodacus erythrinus    | Passeriformes     | Fringillidae    | Frugivorous   | C43       |
| Barn Swallow                        | Hirundo rustica          | Passeriformes     | Hirundinidae    | Insectivorous | C44       |
| Eurasian Crag Martin                | Ptenonoprogne rupestris  | Passeriformes     | Hirundinidae    | Insectivorous | C45       |
| Long-tailed Shrike                  | Lanius schach            | Passeriformes     | Laniidae        | Insectivorous | C46       |
| Grey-backed Shrike                  | Lanius reifrotorius      | Passeriformes     | Laniidae        | Insectivorous | C47       |
| White-crested Laughingthrush        | Garrulax leucomelas      | Passeriformes     | Leioptrichidae  | Insectivorous | C48       |
| Rufous Sibia                        | Malacius capistratus     | Passeriformes     | Leioptrichidae  | Carnivorous   | C49       |
| Varied Laughingthrush               | Garrulax variagatus      | Passeriformes     | Leioptrichidae  | Insectivorous | C50       |
| Striated Laughingthrush             | Garrulax striatus        | Passeriformes     | Leioptrichidae  | Insectivorous | C51       |
| Streaked Laughingthrush             | Garrulax squamatus       | Passeriformes     | Leioptrichidae  | Insectivorous | C52       |
| Hoary-throated Barwing              | Actinodura nipalensis    | Passeriformes     | Leioptrichidae  | Insectivorous | C53       |
| White-throated Laughingthrush       | Garrulax albogetherius   | Passeriformes     | Leioptrichidae  | Insectivorous | C54       |
| Spiny Babbler                       | Turdoides nipalensis     | Passeriformes     | Leioptrichidae  | Insectivorous | C55       |
| White-browed Wagtail                | Motacilla maderaspatenisis | Passeriformes | Motacillidae    | Insectivorous | C56       |
| Upland pipt                          | Anthus Sylvanus          | Passeriformes     | Motacillidae    | Insectivorous | C57       |
| Paddyfield Pipit                    | Anthus rufus             | Passeriformes     | Motacillidae    | Insectivorous | C58       |
| Grey Wagtail                        | Motacilla cinera         | Passeriformes     | Motacillidae    | Insectivorous | C59       |
| Spotted Forktail                    | Enicurus maculatus       | Passeriformes     | Muscicapaedae   | Insectivorous | C60       |
| Plumbeous Water Redstart            | Rhyacornis fuliginosa    | Passeriformes     | Muscicapaedae   | Omnivorous    | C61       |
| Grey Bushchat                       | Saxicola ferreus         | Passeriformes     | Muscicapaedae   | Insectivorous | C62       |
| Blue Whistling Thrush               | Myiopica caeruleus       | Passeriformes     | Muscicapaedae   | Insectivorous | C63       |
| Scientific Name | Common Name | Order | Family | Diet | Code |
|-----------------|-------------|-------|--------|------|------|
| Saxicola caprata | Pied Bushchat | Passeriformes | Passeridae | Insectivorous | C64 |
| Chlamarronis leucocephalus | White-capped Redstart | Passeriformes | Passeridae | Insectivorous | C65 |
| Eumyias thalassinus | Verditer Flycatcher | Passeriformes | Passeridae | Insectivorous | C66 |
| Niltava sundara | Rufous-bellied Niltava | Passeriformes | Passeridae | Insectivorous | C67 |
| Monticola cinclorhynchos | Blue-capped Rock Thrush | Passeriformes | Passeridae | Insectivorous | C68 |
| Ficedula westermanni | Little Pied Flycatcher | Passeriformes | Passeridae | Insectivorous | C69 |
| Tarsiger indicus | White-browed Bush Robin | Passeriformes | Passeridae | Insectivorous | C70 |
| Cyornis unicolor | Pale Blue Flycatcher | Passeriformes | Passeridae | Insectivorous | C71 |
| Luscinia striata | Indian Blue Robin | Passeriformes | Passeridae | Insectivorous | C72 |
| Saxicola leucura | Common Stonechat | Passeriformes | Passeridae | Insectivorous | C73 |
| Phoenicurus hodgsoni | Hodgson's Redstart | Passeriformes | Passeridae | Insectivorous | C74 |
| Tarsiger rufilatus | Himalayan Bluetail | Passeriformes | Passeridae | Insectivorous | C75 |
| Aethopyga nipalensis | Green-tailed Sunbird | Passeriformes | Passeridae | Insectivorous | C76 |
| Nectarinidae | Black-throated Sunbird | Passeriformes | Passeridae | Frugivorous | C77 |
| Aethopyga gouldiae | Mrs Gould Sunbird | Passeriformes | Passeridae | Frugivorous | C78 |
| Parus monticulus | Green-backed Tit | Passeriformes | Passeridae | Omnivorous | C79 |
| Parus xanthogenys | Black-lored Tit | Passeriformes | Passeridae | Insectivorous | C80 |
| Passer domesticus | Great Tit | Passeriformes | Passeridae | Frugivorous | C81 |
| Passer rutilans | House Sparrow | Passeriformes | Passeridae | Frugivorous | C82 |
| Phylloscopus maculipennis | Ashy-throated Warbler | Passeriformes | Passeridae | Insectivorous | C83 |
| Phylloscopus xanthochistos | Grey-hooded Warbler | Passeriformes | Passeridae | Insectivorous | C84 |
| Pycnonotus cafer | Red-vented Bulbul | Passeriformes | Passeridae | Frugivorous | C85 |
| Hypsipetes leucocephalus | Black Bulbul | Passeriformes | Passeridae | Frugivorous | C86 |
| Pycnonotus leucogenys | Himalayan Bulbul | Passeriformes | Passeridae | Frugivorous | C87 |
| Pycnonotus sinensis | Striated Bulbul | Passeriformes | Passeridae | Omnivorous | C88 |
| Isos melelelandii | Mountain Bulbul | Passeriformes | Passeridae | Frugivorous | C89 |
| Cettia brunnifrons | Grey-sided Bush Warbler | Passeriformes | Passeridae | Insectivorous | C90 |
| Cettia flavolivacea | Aberrant Bush Warbler | Passeriformes | Passeridae | Insectivorous | C91 |
| Tichodroma muraria | Wallcreeper | Passeriformes | Sittidae | Insectivorous | C92 |
| Sitta himalayensis | White-tailed Nuthatch | Passeriformes | Sittidae | Insectivorous | C93 |
| Acridotheres tristis | Common Myna | Passeriformes | Sturnidae | Omnivorous | C94 |
| Turdus boulboul | Grey-winged Blackbird | Passeriformes | Turdidae | Insectivorous | C95 |
| Zoothera dauma | Scaly Thrush | Passeriformes | Turdidae | Insectivorous | C96 |
| Zoothera citrina | Orange-headed Thrush | Passeriformes | Turdidae | Insectivorous | C97 |
| Zosterops palpebrosus | Oriental White-eye | Passeriformes | Zosteropidae | Omnivorous | C98 |
| Casmerodius albus | Great Egret | Pelecaniformes | Ardeidae | Carnivorous | C99 |
| Ardea cinerea | Indian Pond Heron | Pelecaniformes | Ardeidae | Carnivorous | C100 |
| Egretta garzetta | Little Egret | Pelecaniformes | Ardeidae | Carnivorous | C101 |
| Bubulcus ibis | Cattle Egret | Pelecaniformes | Ardeidae | Insectivorous | C102 |
| Mesophoyx intermedia | Intermediate Egret | Pelecaniformes | Ardeidae | Carnivorous | C103 |
| Megalaima virens | Great Barbet | Piciformes | Megalaimidae | Frugivorous | C104 |
| Megalaima asiatica | Blue-throated Barbet | Piciformes | Megalaimidae | Frugivorous | C105 |
| Megalaima franklinii | Golden-throated Barbet | Piciformes | Megalaimidae | Frugivorous | C106 |
| Dendrocopos macei | Fulvous-breasted Woodpecker | Piciformes | Picidae | Insectivorous | C107 |
| Picus canus | Grey-headed Woodpecker | Piciformes | Picidae | Insectivorous | C108 |
| Dendrocopos darjellensis | Darjeeling Woodpecker | Piciformes | Picidae | Insectivorous | C109 |
| Psittacula himalayana | Slaty-headed Parakeet | Psittaciformes | Psittacidae | Frugivorous | C110 |
| Glaucidium brodiei | Collared Owlet | Strigiformes | Strigidae | Carnivorous | C111 |