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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; Veraart et al. 2004). Basic information about explanatory factors of fluctuating bird population (Norvell 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 high 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 *Osmanthus* spp., *Rhododendron 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.

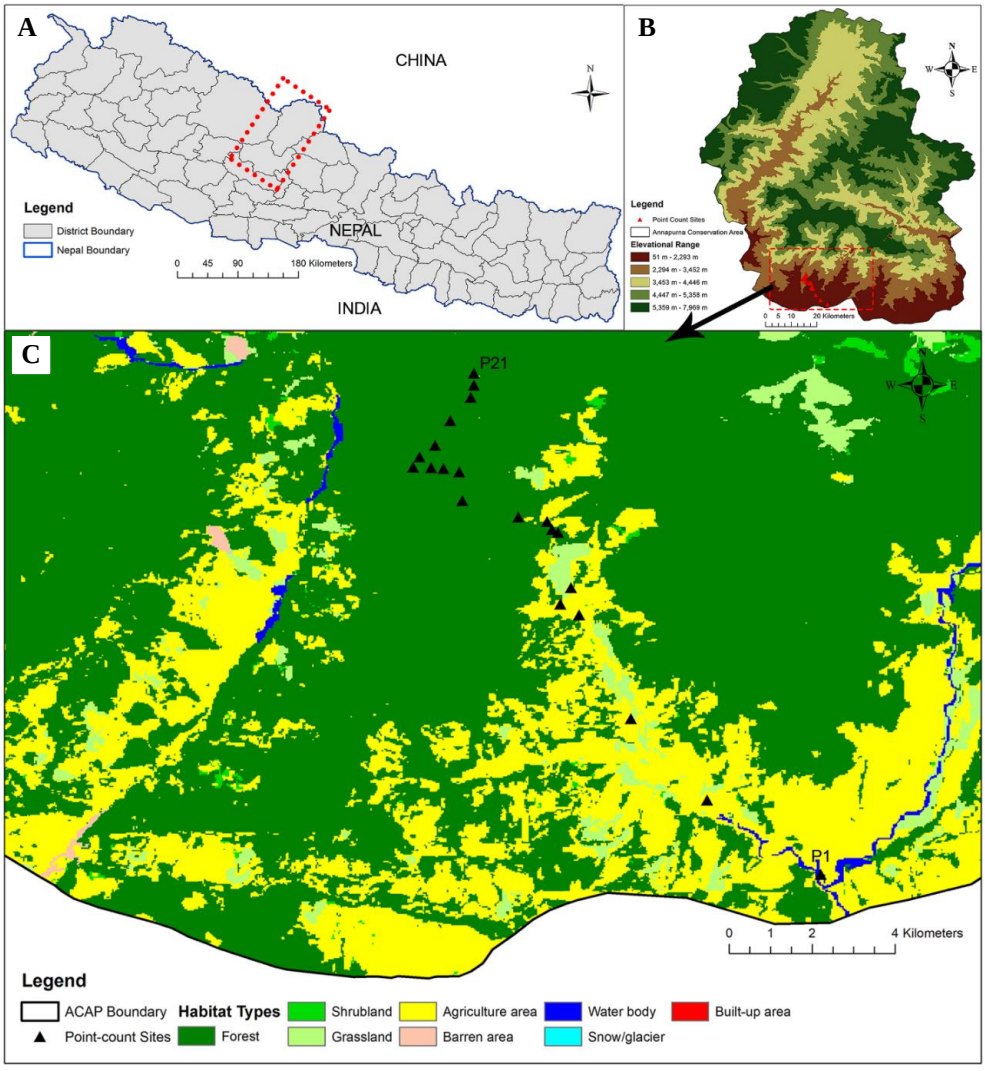

Figure 1. Map of the study area. A, Map of Nepal showing the Annapurna Conservation Area (ACA); B, Map of the ACA showing the elevational gradient; C, Map of south-western region of the ACA showing the point-count stations (P1-P21) and habitat types

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 10×50 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 (Willott 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 (Chettri 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 Leiotrichidae (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 seasonal 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). Not only that, forest edge has shrubby habitat which favors more richness and abundance (Wuczyński 2016).

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).

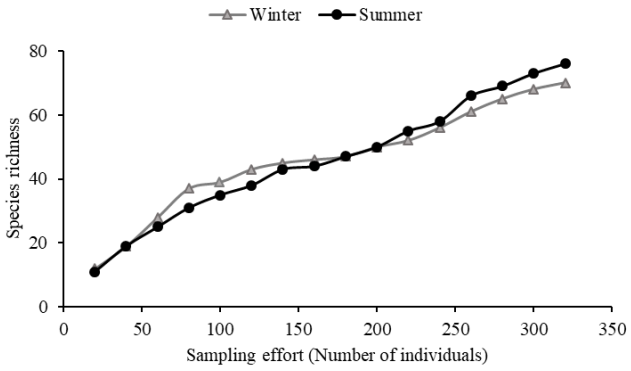

Figure 2. Species accumulation curve of birds recorded in the Mardi Himal, Nepal

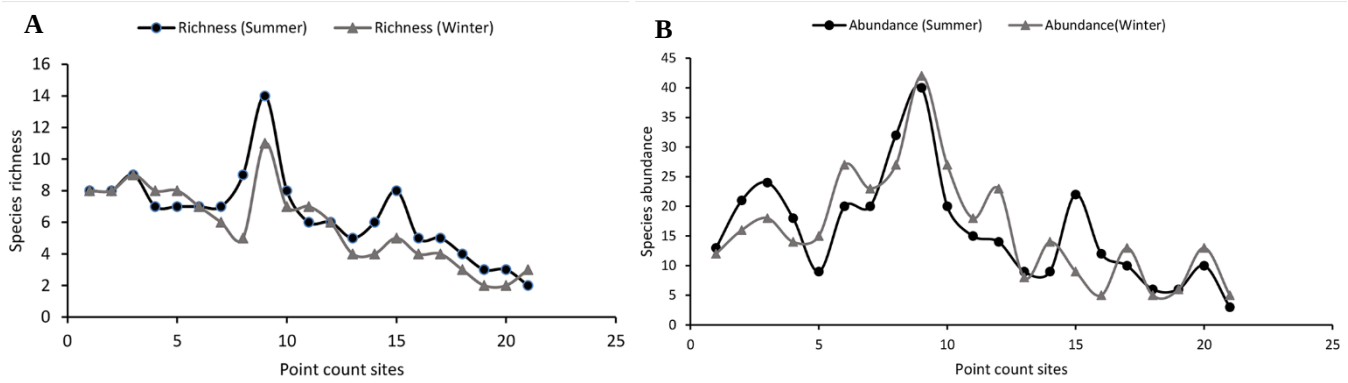

Figure 3. Seasonal species richness curve and seasonal species abundance curve of birds recorded in the Mardi Himal, Nepal

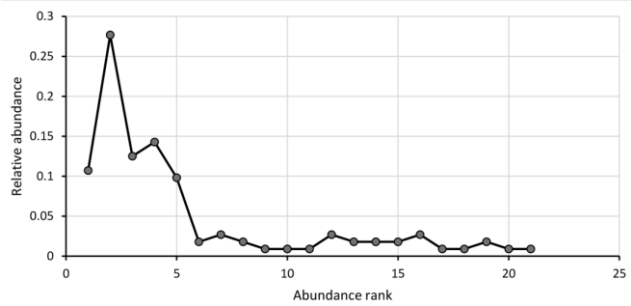

Figure 4. Rank abundance curve of bird species recorded in the Mardi Himal, Nepal

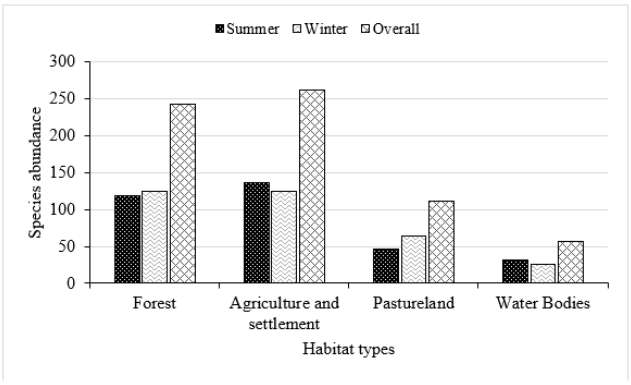

Figure 5. Habitat-wise bird species abundance for the two seasons recorded in Mardi Himal, Nepal.

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).

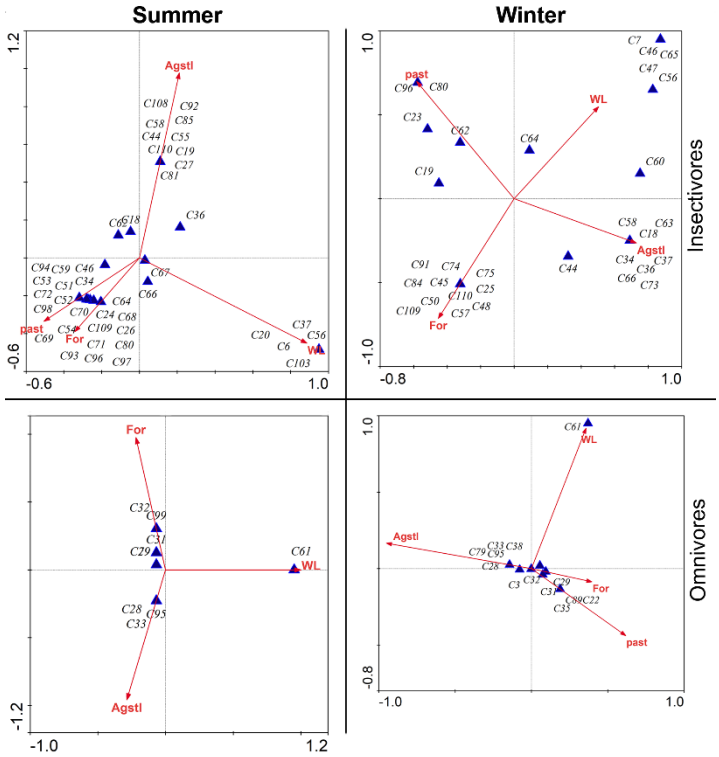

Figure 6. CCA ordination diagram (biplot) showing response of insectivores and omnivores to habitat variables in two seasons. Abbreviations: Past: pastureland, WL: Wetland dependent habitat, Agstl: Agricultural land and settlement, and For: Forest. Codes used for bird species are included in Table S1

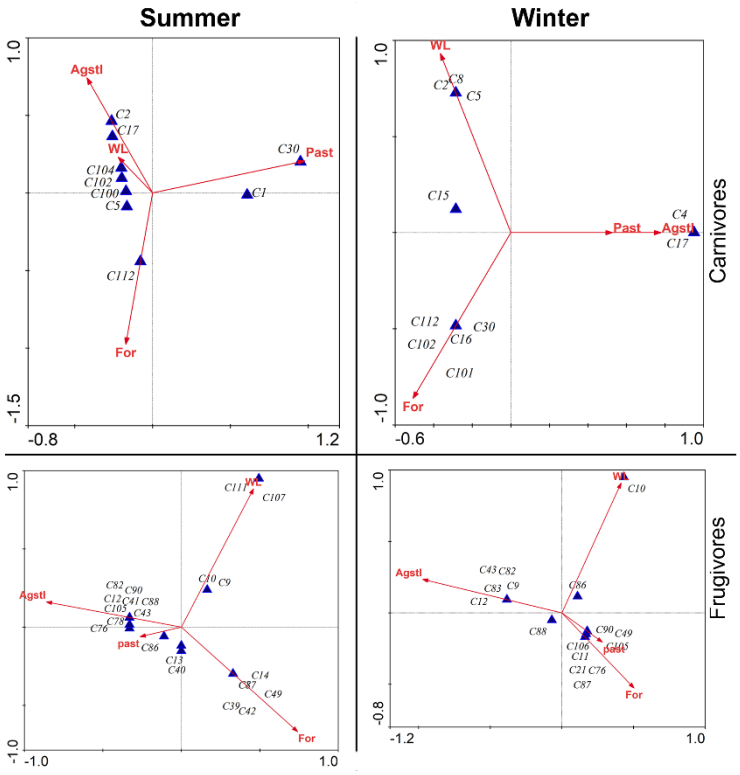

Figure 7. CCA ordination diagram (biplot) showing response of carnivores and frugivores to habitat variables in two seasons. Abbreviations: Past: pastureland, WL: Wetland dependent habitat, Agstl: Agricultural land and settlement, and For: Forest. Codes used for bird species are included in Table S1

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

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.

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Table S1. List of birds recorded in Mardi Himal, Nepal with taxonomic positions, feeding guilds and codes used for ordination analysis

Bird	Scientific Name	Order	Family	Feeding Guild	Bird Code
Himalayan Vulture	*Gyps himalayensis*	Accipitriformes	Accipitrinae	Carnivorous	C1
Egyptian Vulture	*Neophron percnopterus*	Accipitriformes	Accipitridae	Carnivorous	C2
Black Kite	*Milvus migrans*	Accipitriformes	Accipitridae	Omnivorous	C3
Himalayan Buzzard	*Buteo buteo*	Accipitriformes	Accipitridae	Carnivorous	C4
Goosander	*Mergus merganser*	Anseriformes	Anatidae	Carnivorous	C5
Hoopoe	*Upupa epops*	Bucerotiformes	Upupidae	Insectivorous	C6
Red-wattled Lapwing	*Vanellus indicus*	Charadriiformes	Charadriidae	Insectivorous	C7
River Lapwing	*Vanellus duvaucelii*	Charadriiformes	Charadriidae	Carnivorous	C8
Oriental Turtle Dove	*Streptopelia orientalis*	Columbiformes	Columbidae	Frugivorous	C9
Spotted Dove	*Stigmatopelia 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	*Macropygia 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	*Alcedo meninting*	Coraciiformes	Alcedinidae	Carnivorous	C16
White-throated Kingfisher	*Halcyon smyrnensis*	Coraciiformes	Alcendinidae	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 francolinus*	Galliformes	Phasianidae	Frugivorous	C21
Kalij Pheasant	*Lophura leucomelanos*	Galliformes	Phasianidae	Omnivorous	C22
Black-throated Tit	*Aegithalos concinnus*	Passeriformes	Aegithalidae	Insectivorous	C23
Rufous-fronted Tit	*Aegithalos iouschistos*	Passeriformes	Aegithalidae	Insectivorous	C24
Scarlet Minivet	*Perricrocotus flammeus*	Passeriformes	Campephagidae	Insectivorous	C25
Black-winged Cuckooshrike	*Coracina melaschistos*	Passeriformes	Campephagidae	Insectivorous	C26
Straited Prinia	*Prinia crinigera*	Passeriformes	Cisticolidae	Insectivorous	C27
House Crow	*Corvus splendens*	Passeriformes	Corvidae	Omnivorous	C28
Grey Treepie	*Dendrocitta formosae*	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	*Urocissa flavirostris*	Passeriformes	Corvidae	Omnivorous	C32
Red-billed Blue Magpie	*Urocissa erythrorhyncha*	Passeriformes	Corvidae	Omnivorous	C33
Red-billed Chough	*Pyrrhocorax pyrrhocorax*	Passeriformes	Corvidae	Insectivorous	C34
Alpine Chough	*Pyrrhocorax graculus*	Passeriformes	Corvidae	Omnivorous	C35
Black Drongo	*Dicrurus macrocercus*	Passeriformes	Dicruridae	Insectivorous	C36
Ashy Drongo	*Dicrurus leucophaeus*	Passeriformes	Dicruridae	Insectivorous	C37
Rock Bunting	*Emberiza cia*	Passeriformes	Emberizidae	Omnivorous	C38
Crested Bunting	*Melophus lathami*	Passeriformes	Emberizidae	Frugivorous	C39
Dark-breasted Rosefinch	*Carpodacus nipalensis*	Passeriformes	Fringillidae	Frugivorous	C40
Spot-winged Rosefinch	*Carpodacus rodopeplus*	Passeriformes	Fringillidae	Frugivorous	C41
Spot-winged Grosbeak	*Mycerobas melanozanthos*	Passeriformes	Fringillidae	Frugivorous	C42
Common Rosefinch	*Carpodacus erythrinus*	Passeriformes	Fringillidae	Frugivorous	C43
Barn Swallow	*Hirundo rustica*	Passeriformes	Hirundinidae	Insectivorous	C44
Eurasian Crag Martin	*Ptyonoprogne rupestris*	Passeriformes	Hirundinidae	Insectivorous	C45
Long-tailed Shrike	*Lanius schach*	Passeriformes	Laniidae	Insectivorous	C46
Grey-backed Shrike	*Lanius tephronotus*	Passeriformes	Laniidae	Insectivorous	C47
White-crested Laughingthrush	*Garrulax leucolophus*	Passeriformes	Leiotrichidae	Insectivorous	C48
Rufous Sibia	*Malacias capistratus*	Passeriformes	Leiotrichidae	Frugivorous	C49
Variegated Laughingthrush	*Garrulax variegatus*	Passeriformes	Leiotrichidae	Insectivorous	C50
Striated Laughingthrush	*Garrulax striatus*	Passeriformes	Leiotrichidae	Insectivorous	C51
Streaked Laughingthrush	*Garrulax squamatus*	Passeriformes	Leiotrichidae	Insectivorous	C52
Hoary-throated Barwing	*Actinodura nipalensis*	Passeriformes	Leiotrichidae	Insectivorous	C53
White-throated Laughingthrush	*Garrulax albogularis*	Passeriformes	Leiotrichidae	Insectivorous	C54
Spiny Babbler	*Turdoides nipalensis*	Passeriformes	Leiotrichidae	Insectivorous	C55
White-browed Wagtail	*Motacilla maderaspatensis*	Passeriformes	Motacillidae	Insectivorous	C56
Upland pipit	*Anthus Sylvanus*	Passeriformes	Motacillidae	Insectivorous	C57
Paddyfield Pipit	*Anthus rufulus*	Passeriformes	Motacillidae	Insectivorous	C58
Grey Wagtail	*Motacilla cinerea*	Passeriformes	Motacillidae	Insectivorous	C59
Spotted Forktail	*Enicurus maculatus*	Passeriformes	Muscicapidae	Insectivorous	C60
Plumbeous Water Redstart	*Rhyacornis fuliginosa*	Passeriformes	Muscicapidae	Omnivorous	C61
Grey Bushchat	*Saxicola ferreus*	Passeriformes	Muscicapidae	Insectivorous	C62
Blue Whistling Thrush	*Mypphonus caeruleus*	Passeriformes	Muscicapidae	Insectivorous	C63

Pied Bushchat	*Saxicola caprata*	Passeriformes	Muscicapidae	Insectivorous	C64
White-capped Redstart	*Chaimarronis leucocephalus*	Passeriformes	Muscicapidae	Insectivorous	C65
Verditer Flycatcher	*Eumyias thalassinus*	Passeriformes	Muscicapidae	Insectivorous	C66
Rufous-bellied Niltava	*Niltava sundara*	Passeriformes	Muscicapidae	Insectivorous	C67
Blue-capped Rock Thrush	*Monticola cinclorhynchus*	Passeriformes	Muscicapidae	Insectivorous	C68
Little Pied Flycatcher	*Ficedula westermanni*	Passeriformes	Muscicapidae	Insectivorous	C69
White-browed Bush Robin	*Tarsiger indicus*	Passeriformes	Muscicapidae	Insectivorous	C70
Pale Blue Flycatcher	*Cyornis unicolor*	Passeriformes	Muscicapidae	Insectivorous	C71
Indian Blue Robin	*Luscinia brunnea*	Passeriformes	Muscicapidae	Insectivorous	C72
Common Stonechat	*Saxicola leucurus*	Passeriformes	Muscicapidae	Insectivorous	C73
Hodgson's Redstart	*Phoenicurus hodgsoni*	Passeriformes	Muscicapidae	Insectivorous	C74
Himalayan Bluetail	*Tarsiger rufilatus*	Passeriformes	Muscicapidae	Insectivorous	C75
Green-tailed Sunbird	*Aethopyga nipalensis*	Passeriformes	Nectariniidae	Frugivorous	C76
Black-throated Sunbird	*Aethopyga saturata*	Passeriformes	Nectariniidae	Frugivorous	C77
Mrs Gould Sunbird	*Aethopyga gouldiae*	Passeriformes	Nectariniidae	Frugivorous	C78
Green-backed Tit	*Parus monticulus*	Passeriformes	Paridae	Omnivorous	C79
Black-lored Tit	*Parus xanthogenys*	Passeriformes	Paridae	Insectivorous	C80
Great Tit	*Parus major*	Passeriformes	Paridae	Insectivorous	C81
House Sparrow	*Passer domesticus*	Passeriformes	Passeridae	Frugivorous	C82
Russet Sparrow	*Passer rutilans*	Passeriformes	Passeridae	Frugivorous	C83
Ashy-throated Warbler	*Phylloscopus maculipennis*	Passeriformes	Phylloscopidae	Insectivorous	C84
Grey-hooded Warbler	*Phylloscopus xanthoschistos*	Passeriformes	Phylloscopidae	Insectivorous	C85
Red-vented Bulbul	*Pycnonotus cafer*	Passeriformes	Pycnonotidae	Frugivorous	C86
Black Bulbul	*Hypispetes leucocephalus*	Passeriformes	Pycnonotidae	Frugivorous	C87
Himalayan Bulbul	*Pycnonotus leucogenys*	Passeriformes	Pycnonotidae	Frugivorous	C88
Striated Bulbul	*Pycnonotus striatus*	Passeriformes	Pycnonotidae	Omnivorous	C89
Mountain Bulbul	*Ixos mcclellandii*	Passeriformes	Pycnonotidae	Frugivorous	C90
Grey-sided Bush Warbler	*Cettia brunnifrons*	Passeriformes	Scotocercidae	Insectivorous	C91
Aberrant Bush Warbler	*Cettia flavolivacea*	Passeriformes	Scotocercidae	Insectivorous	C92
Wallcreeper	*Tichodroma muraria*	Passeriformes	Sittidae	Insectivorous	C93
White-tailed Nuthatch	*Sitta himalayensis*	Passeriformes	Sittidae	Insectivorous	C94
Common Myna	*Acridotheres tristis*	Passeriformes	Sturnidae	Omnivorous	C95
Grey-winged Blackbird	*Turdus boulboul*	Passeriformes	Turdidae	Insectivorous	C96
Scaly Thrush	*Zoothera dauma*	Passeriformes	Turdidae	Insectivorous	C97
Orange-headed Thrush	*Zoothera citrina*	Passeriformes	Turdidae	Insectivorous	C98
Oriental White-eye	*Zosterops palpebrosus*	Passeriformes	Zosteropidae	Omnivorous	C99
Great Egret	*Casmerodius albus*	Pelecaniformes	Ardeidae	Carnivorous	C100
Indian Pond Heron	*Ardeola grayii*	Pelecaniformes	Ardeidae	Carnivorous	C101
Little Egret	*Egretta garzetta*	Pelecaniformes	Ardeidae	Carnivorous	C102
Cattle Egret	*Bubulcus ibis*	Pelecaniformes	Ardeidae	Insectivorous	C103
Intermediate Egret	*Mesophoyx intermedia*	Pelecaniformes	Ardeidae	Carnivorous	C104
Great Barbet	*Megalaima virens*	Piciformes	Megalaimidae	Frugivorous	C105
Blue-throated Barbet	*Megalaima asiatica*	Piciformes	Megalaimidae	Frugivorous	C106
Golden-throated Barbet	*Megalaima franklinii*	Piciformes	Megalaimidae	Frugivorous	C107
Fulvous-breasted Woodpecker	*Dendrocopos macei*	Piciformes	Picidae	Insectivorous	C108
Grey-headed Woodpecker	*Picus canus*	Piciformes	Picidae	Insectivorous	C109
Darjeeling Woodpecker	*Dendrocopos darjellensis*	Piciformes	Picidae	Insectivorous	C110
Slaty-headed Parakeet	*Psittacula himalayana*	Psittaciformes	Psittacidae	Frugivorous	C111
Collared Owlet	*Glaucidium brodiei*	Strigiformes	Strigidae	Carnivorous	C112