BIODIVERSITAS
Volume 23, Number 3, March 2022
Pages: 1535-1545

ISSN: 1412-033X
E-ISSN: 2085-4722
DOI: 10.13057/biodiv/d230343

Bird diversity and factors affecting bird abundance at Dullu Municipality, Dailekh, Nepal

SADIP BIKRAM SHAH, HARI PRASAD SHARMA♥
Central Department of Zoology, Institute of Science and Technology, Tribhuvan University. Kirtipur, Kathmandu, Nepal. Tel./fax. 0977-9869715416, ♥email: hpsharma@cdztu.edu.np

Manuscript received: 28 December 2021. Revision accepted: 25 February 2022.

Abstract. *Shah SB, Sharma HP. 2022. Bird diversity and factors affecting bird abundance at Dullu Municipality, Dailekh, Nepal. Biodiversitas 23: 1535-1545.* Bird distribution, diversity, and abundance in any ecosystem are determined by seasonality, disturbances, and availability of resources. The point count method was used for bird surveys during the winter and summer season to identify the bird diversity and factors affecting bird abundance in 2020 at Dailekh District, Nepal. Altogether 98 bird species belonging to 11 orders and 38 families were recorded. The highest species richness was found for order Passeriformes and Muscicapidae family. Among recorded species, the higher species richness of birds was found during winter than summer season, and 52 bird species were observed at both seasons. These birds were more evenly distributed in summer than in the winter season. Among 98 species, the higher bird species were resident (91%), followed by winter migrants (7%), and remaining 2% of birds were summer and passage migrants. Himalayan Vulture (*Gyps himalayensis* Hume, 1869) and Alexandrine Parakeet (*Palaeornis eupatria* Linnaeus, 1766) were near threatened species found in the study area. Forest habitats had more diverse bird species than agricultural land. Different environmental parameters such as nearest distance to the water source, canopy cover, and nearest distance to forest habitat significantly affected bird occurrences. The species richness was positively correlated with the nearest distance to agricultural land for both seasons; however, it decreased with increasing distance to water source and canopy cover. In the study area, migratory, residential, endemic, and threatened bird species indicated the uniqueness of the bird habitat in the area; therefore, a site-specific management plan is necessary to conserve these bird species.

Keywords: Abundance, bird, conservation, diversity, seasonality, threats

INTRODUCTION

Nepal supports the occurrence of diverse flora and fauna with global biodiversity hotspots at various elevational gradients (DNPWC 2018; Katuwal et al. 2018; Sarkar et al. 2018). These elevational changes favor presence of faunal species under different habitat structures (Sarkar et al. 2018). Among these different species, a total of 886 bird species are inhabited in Nepal, which is around 8.5% of global bird species (DNPWC and BCN 2018). These bird species include one endemic bird Spiny Babbler (*Acanthoptila nipalensis*), and about 560 residential birds and other seasonal migratory birds (Grimmett et al. 2016; Inskipp et al. 2016). Although higher numbers of the bird species are residents, and most of these are elevational migrants over short distances depending on the weather condition and food availability at local spatial scale (Inskipp et al. 2016; Saini et al. 2017). Among the migratory birds, around 62 bird species are summer visitors and mostly immigrate from the South like India, Sri Lanka, and 150 are winter visitors and 71 vagrants primarily migrating from Northern and Central Asia, and some of which are also passage migrants (Grimmett et al. 2016; Inskipp et al. 2020).

The spatial distribution of bird species, breeding success, and survival is influenced by the availability of key resources, including food, water, vegetation cover, and weather condition (Lee et al. 2012; Adhikari et al. 2020). While using these resources, bird species become an integrated part of ecosystem services at forest and farmland ecosystems (Mulwa et al. 2012; Katuwal et al. 2021). Within these ecosystems, their usefulness was reported as for seed dispersal, pests control in crops, environment cleaning as a natural scavenger, and crop pollination (Maas et al. 2013; Katuwal et al. 2021). Not only in ecosystem services, birds become important components of tourism industries for generating income sources for the local people (Areaya et al. 2013; Katuwal et al. 2020); however, many bird species are at risk of extinction in response to anthropogenic activities, including climate change, habitat alteration or loss, deforestation, wildlife trade, biological invasion, infrastructure, or combinations of these and other factors (Pyšek et al. 2017; Symes et al. 2018; Johnson et al. 2020l; Basaula et al. 2021; Dhakal et al. 2022).

Seasonality is one of the significant factors affecting bird diversity that influences key resources availability (Katuwal et al. 2016). Effects of seasonal changes can be noticed due to abiotic and biotic factors across several eco-regions, which affect the physiological changes in birds that cause bird migration to maximize the breeding success and high resource availability (Shoo et al. 2005; Amani et al. 2018; Pandey et al. 2020). Therefore, seasonal change is one factor that influences bird abundance through migration (Werema and Howell 2016; Almazán-Núñez et al. 2018). The diversity, abundance, and distribution of birds are also affected by foraging opportunities and

suitable nesting sites at the varied land cover, including forest, shrubs, grasslands, wetlands, agricultural land, and urban areas (Price et al. 2014; Hu et al. 2017).

The knowledge of seasonal bird abundance and habitat use is crucial for bird monitoring and management plans. In addition, the baseline data of seasonal distribution and habitat use of birds are important for the conservation in the areas where anthropogenic activities are major determining factors (Zhang et al. 2009; Price et al. 2014; Belay and Yihune 2017; Amani et al. 2018; Katuwal et al. 2021). The anthropogenic pressure and other environmental changes can affect the species' spatial distribution due to modification and habitat loss (Lee et al. 2012). Furthermore, the effects of deforestation and livestock grazing on the land cover and food requirement pose threats on the bird abundance and distribution (Mengesha et al. 2011). Understanding the factors that affect bird abundance and distribution at spatial and temporal changes is essential for planning and developing species conservation strategies. Therefore, we aimed to identify the bird abundance and factors affecting on the bird distribution in rural areas to provide the baseline data.

MATERIALS AND METHODS

Study area

The study area situated at Dullu Municipality (28° 45' 32" N to 28° 54' 24" N and 81° 31' 25" E to 81° 41' 29" E) at Dailkekh District of Karnali Province, Nepal. The area comprises 156.77 km^2 and is located at an elevation of 570 m to 1800 m from sea level (Figure 1). The Mahabharata range surrounds Dullu Municipality. The area was famous for its recognition as the capital of the Kingdom of Sinja and Nepalese stone tabloid, which is supposed to be written in the Nepali language for the first time. The climatic weather of the area varied, and the average temperature of the site is 21°C (minimum 19°C; maximum 34°C), and the annual precipitation is about 1377 mm**.** The study area is in a sub-tropical region with dominated chir pine-broadleaf forest. The vegetation of the study area is Chir Pine (*Pinus roxburghii*), Woolly-leaved Oak (*Quercus lanata*), Oval-shaped Lyonia *(Lyonia ovalifolia*), Mauwa (*Engelhardtia spicata*) and Coral Tree *(Erythrina stricta).* The fauna of the study area includes Leopard (*Panthera pardus*), Wild Boar (*Sus scorfa*), Asiatic Black Bear (*Ursus thibetanus*), Chukar Partridge (*Alectoris chukar*), Kalij Pheasant *(Lophura leucomelanos)*, Intermediate Egret *(Ardea intermedia*), Black Bulbul (*Hypsipetes leucocephalus*), Blue Whistling-thrush (*Myophonus caeruleus*), Crested Kingfisher (*Megaceryle lugubris*) Greenish Warbler (*Phylloscopus trochiloides*) and Blyth's Leaf Warbler (*Phylloscopus reguloides*) Barn Swallow (*Hirundo rustica*), Great Tit (*Parus major*), Snow Trout (*Schizothorax nepalensis*), Common Snow trout (*S. richardsoni*) and Golden Mahaseer (*Tor putitora*) (Acharya and Paudel 2020).

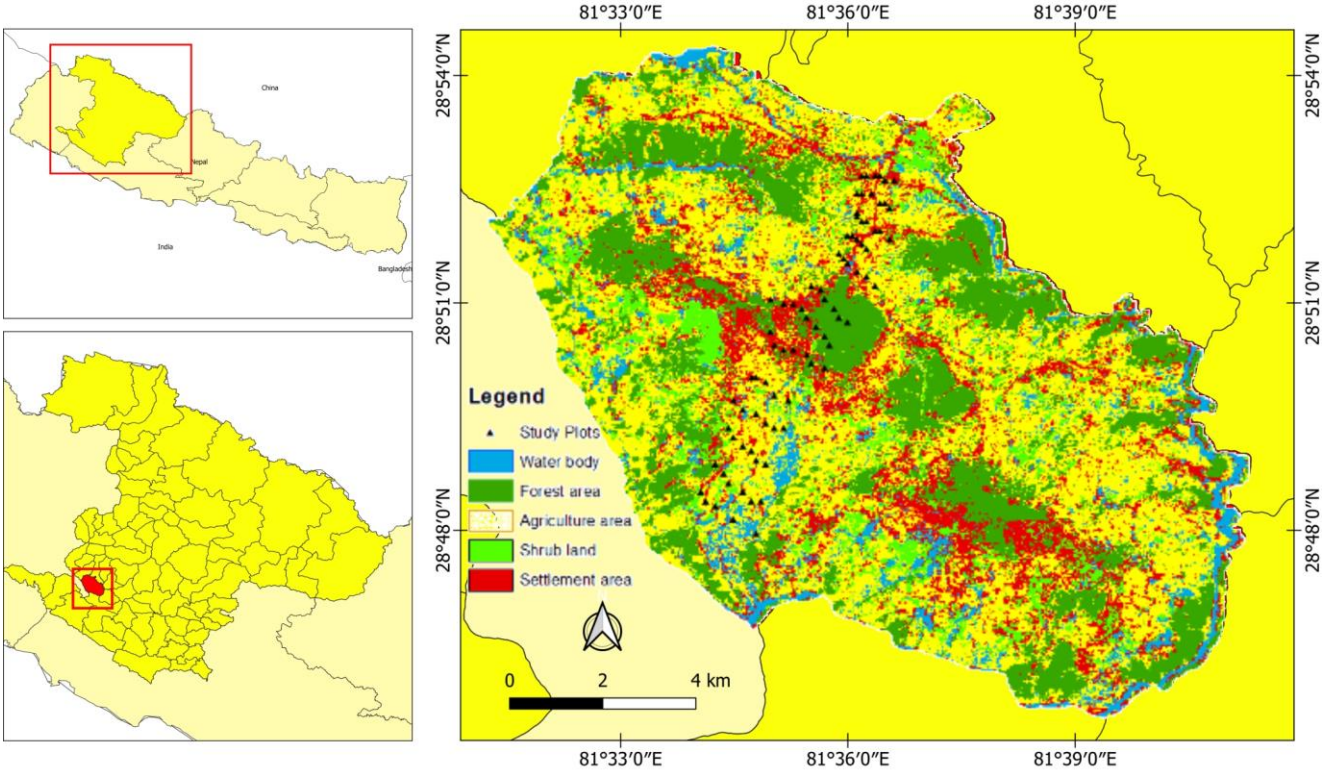

Figure 1. Study area with study plots at different land cover

Bird observation

Before regular bird observation, transects and observation plots were established in October 2019 in the study area. Bird observation was carried out in the winter (2 January to 21 February 2020) and summer (3 May to 22 June 2020) seasons. A total of 21 transects with an average length 880.95 ± 187.40 m and the range (500 to 1000 m) were established. The transect was established perpendicular to the road/footpath, and the interval between the two transects was 250 m. A circular plot of a 50 m radius was established at the interval of 250 m along the transect. Altogether 74 plots were established during this study. A point count method (Huff 2000) was applied, and the number of birds and species in both winter and summer seasons were recorded in each plot. Birds were recorded between 7:30 am to 11:30 am in winter, and 6:30 am to 10:30 am in summer. In the beginning, a five-minute time was spent in each plot to make the area quiet so that the area becomes natural, i.e., no disturbances due to the observer's presence. The number and species of the birds were recorded for 20 minutes at every five minutes interval. Altogether 48 visits were made, spending 12 days in each season in the field. The birds were observed using Bushnell Falcon 10×50 wide-angle binocular. Birds were identified in the field, and unidentified bird pictures were taken using Canon DS126371 camera for reference. A field guidebook of Grimmet et al. (2016) was used for bird identification, and expert consultation was performed for final confirmation. The highest numbers of birds for each species recorded for 20 minutes were used for data analysis. The residential and migratory status of birds was assessed with the help of the field guidebook Grimmet et al. (2016). The global and National threatened categories of each species were categorized using the IUCN and National Red List of Nepal birds, respectively (Inskipp et al. 2017; IUCN 2021). In addition, the bird species were categorized into five feeding guilds (omnivorous, insectivorous, frugivorous, carnivorous, and nectarivorous), and residential, summer migrants, winter migrants and passage migrants (Inskipp et al. 2016).

Habitat survey

For habitat utilization of bird species in the study area, habitat influencing variables such as numbers of trees, the height of each tree, tree canopy, habitat type (agricultural land or forest area) of each plot were recorded. The tree canopy was measured using a densitometer. The tree canopy was recorded from the center of each plot. Each plot's elevation, latitude, and longitude were also recorded using Garmin Etrex 10 GPS. In addition, the nearest distance of each plot to the forest, agricultural land, road, household, and water sources was also recorded. The closest distance to these sources was measured using measuring tape; however, the distance > 500 m was measured using Geographic Information System.

Data analysis

Shannon-Weiner diversity (Shannon-Wiener et al. 1949) and Pielou's species evenness (Pielou 1966) were calculated from the collected data as follows:

$$H' = -\sum P_i \log P_i$$

Where, H' = Shannon-Weiner diversity; P_i = the proportion of individuals in the i[th] species $= n_i / N$

n_i = number of individuals; N = Total number of individuals

$$E = H'/\log S$$

Where, E = Pielou's species evenness; S = Total number of species

Logistic regression was used to estimate the effects of canopy cover (%), distance to nearest settlement (m), agricultural habitat, forest habitat, distance to the nearest road (m), distance to the nearest water source (m), and elevation (m) on bird abundance. All combinations of variables without interactions were run. Before conducting logistic regression, correlation analysis was done between variables to exclude those strongly correlated with $|r| > 0.7$ in the same model (Libal et al. 2011). The predictive variables were not highly correlated ($|r| < 0.7$); therefore, all variables were used for the Generalized Linear Model. Models were ranked by using the Akaike Information Criterion adjusted for small samples (AICc; Burnham and Anderson 2002) and used Akaike model weights to estimate the relative strength of evidence for each model. Finally, all models used model averaging to estimate 95% confidence intervals for each variable and accepted statistical significance at $\alpha < 0.05$. All analyses were performed in R program (R Core Team 2020).

RESULTS AND DISCUSSION

Bird diversity

A total of 1911 individuals of birds belong to 98 species from 11 orders (Table S1), and 38 families were recorded during this study. Order Passeriformes had the highest diversity (77 species; 78.57%; 26 families) followed by Piciformes and Coraciiformes (three species; 3.06%; two families in each order), Accipitriformes Psittaciformes and Columbiformes (three species; 3.06%; one family), Galliformes (two species; 2.04%; one family), Cuculiformes; Strigiformes; Pelecaniformes and Bucerotiformes (one species; 1.02% in each family). Among the Order Passeriformes, we recorded higher number of birds (n = 10) on the families Muscicapidae and Phylloscopidae during this study period.

Among the observed birds, two species Alexandrine Parakeet (*Palaeornis eupatria*), and Himalayan Vulture (*Gyps himalayensis*), are under the globally Near Threatened (NT) category of the IUCN Red List. Three species, Chukar Partridge (*A. chukar*), Yellow-bellied Prinia (*Prinia flaviventris*), and Alexandrine Parakeet are nationally Near Threatened species, and Hume's Bush-warbler (*Horornis brunnescens*) and Himalayan Vulture (*G. Himalayensis*) were under the Vulnerable (VU) category National Red list (Table 1). All recorded birds

were at the normal elevational range of Nepal, except Variegated Laughing-thrush (*Trochalopteron variegatum*) which was recorded at the elevation of 1342 m (28°52.619'-081°36.691).

The Shannon–Wiener diversity index 3.951 (Winter = 3.793; summer = 3.586) and evenness 0.861 (Winter = 0.849; summer = 0.865) was found in the study area. Resident species (n = 89) had greater species richness than migratory (n = 9). Among the feeding guilds, the insectivorous were recorded as the highest number (n = 56) of bird species followed by omnivorous (n = 20), carnivorous (n = 8), granivorous (n = 6), frugivorous (n = 6) and nectarivorous (n = 2) (Figure 2).

Bird's seasonal variation

Nine out of 11 orders of birds were recorded in both winter and summer seasons. Two order Cuculiformes and Pelecaniformes were found only in the summer season. Order Galliformes and Passeriformes were recorded higher species number 66.67% and 61.74%, respectively, in the winter season, whereas birds under Accipitriformes were recorded with a higher number (75%) in the summer season. No variation in the number of birds was recorded for order Columbiformes, Coraciiformes, Psittaciformes, Piciformes, Bucerotiformes, and Strigiformes in the summer and winter season.

Bird species richness was varied with seasons (summer: 11, winter: 35, common in both seasons: 52). Higher bird abundance (n = 1071) was found in the winter season than in summer (n = 840). The Black Bulbul (*H. leucocephalus*), Aberrant Bush-warbler (*Horornis flavolivaceus*), Grey-breasted Prina (*Prinia hodgsonii*), Kalij Pheasant (*L. leucomelanos*), Slaty-headed Parakeet (*Himalayapsitta himalayana*), Chukar Partridge (*A. chukar*), Greenish Warbler (*P. trochiloides*) and Blyth's Leaf-warbler (*P. reguloides*) were highly abundant bird species in the winter season, whereas Barn Swallow (*H. rustica*), Great Tit (*P. major*), Rose-ringed Parakeet (*Alexandrinus krameri*), Oriental Turtle-dove (*Streptopelia orientalis*), Common Stonechat (*Saxicola torquata*), Red-rumped Swallow (*Cecropis daurica*), Rock Dove (*Columba livia*), Western Koel (*Eudynamys scolopaceus*) and Eastern Spotted Dove (*Spilopelia chinensis*) were abundant in summer season. Common Myna (*Acridotheres tristis*), Himalayan Bulbul (*Pycnonotus leucogenys*), Red-vented Bulbul (*Pycnonotus cafer*), House Sparrow (*Passer domesticus*), and Rufous Treepie (*Dendrocitta vagabunda*) were the most abundant bird species in both seasons.

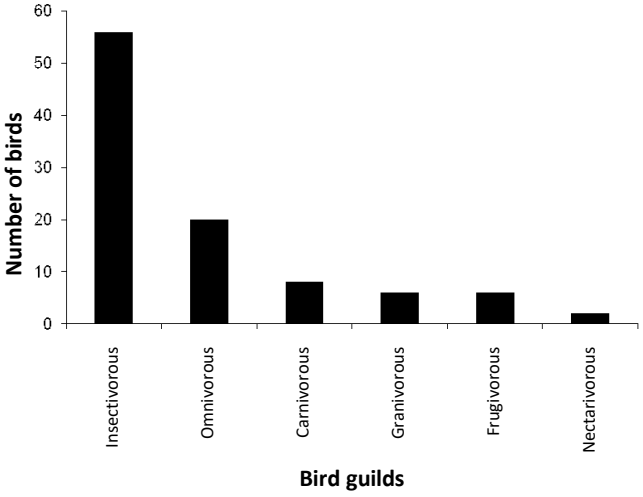

Figure 2. Feeding guilds of birds in Dullu Municipality, Dailekh, Nepal

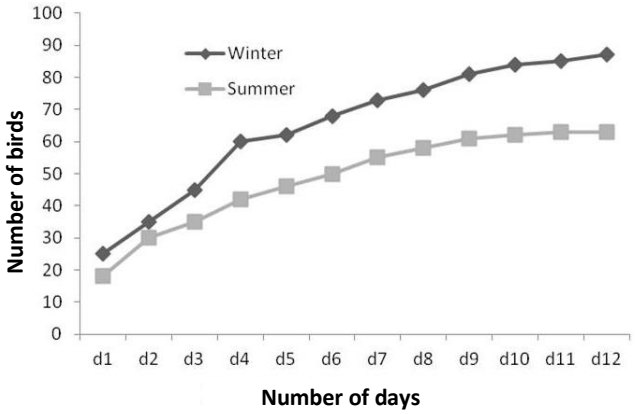

Figure 3. Species accumulation curve: the cumulative total number of species seen during the summer and winter seasons in the study area (d1= day 1 and d12= day 12)

Table 1. Threatened status of bird in the Dullu Municipality, Dailekh, Nepal. Status based on IUCN Red List category (iucnredlist.org) and National Red list Series 2015

Name of bird	Scientific name	IUCN category	National redlist category	Migration status	Seasonal occurrence	Habitat	Feeding guild
Alexandrine Parakeet	*Palaeornis eupatria*	NT	NT	Res	W/Sum	F/Ag	Frugivorous
Chukar Partridge	*Alectoris chukar*	LC	NT	Res	W/Sum	Ag	Omnivorous
Himalayan Vulture	*Gyps himalayensis*	NT	VU	Res	Sum	Ag	Carnivorous
Hume's Bush-warbler	*Horornis brunnescens*	LC	VU	Res	W	Ag	Insectivorous
Yellow-bellied Prinia	*Prinia flaviventris*	LC	NT	Res	W	Ag	Insectivorous

Note: NT: Near Threatened, LC: Least Concern, VU: Vulnerable, Res: Resident, W: winter, Sum: summer, F: Forest, Ag: Agriculture

Around 91% of bird species were resident, followed by winter migrants (7%), and the remaining (2%) were summer and passage migrants. Residential birds were more abundant in winter (n = 80) than summer season (n = 61). Spiny Babbler, an endemic species was found in both seasons, and passage migrant Western Crowned Warbler (*Phylloscopus occipitalis*) was recorded only in the summer season. Winter season had more diverse bird species (H = 3.79284) than summer (H = 3.58596), however these were more evenly distributed in summer (E = 0.865519) than winter season (E = 0.849288).

The species accumulation curve showed that the frequency of adding new birds to the list was more in the winter than summer season (Figure 3). The curve showed a rapid rise in the winter season and a gradual rise in the summer season. At the beginning survey, every record of new species was increased, and new records decreased in upcoming observations. Among the feeding guilds, the insectivorous and omnivorous bird species were more abundant in winter than summer season except for carnivorous species.

Among nationally vulnerable species, Himalayan Vulture was found only in summer, and Hume's Bush-warbler was found only in the winter season. Among nationally near-threatened species, Alexandrine Parakeet and Chukar Partridge were found in both seasons, whereas Yellow-bellied Prinia was found only in the winter season.

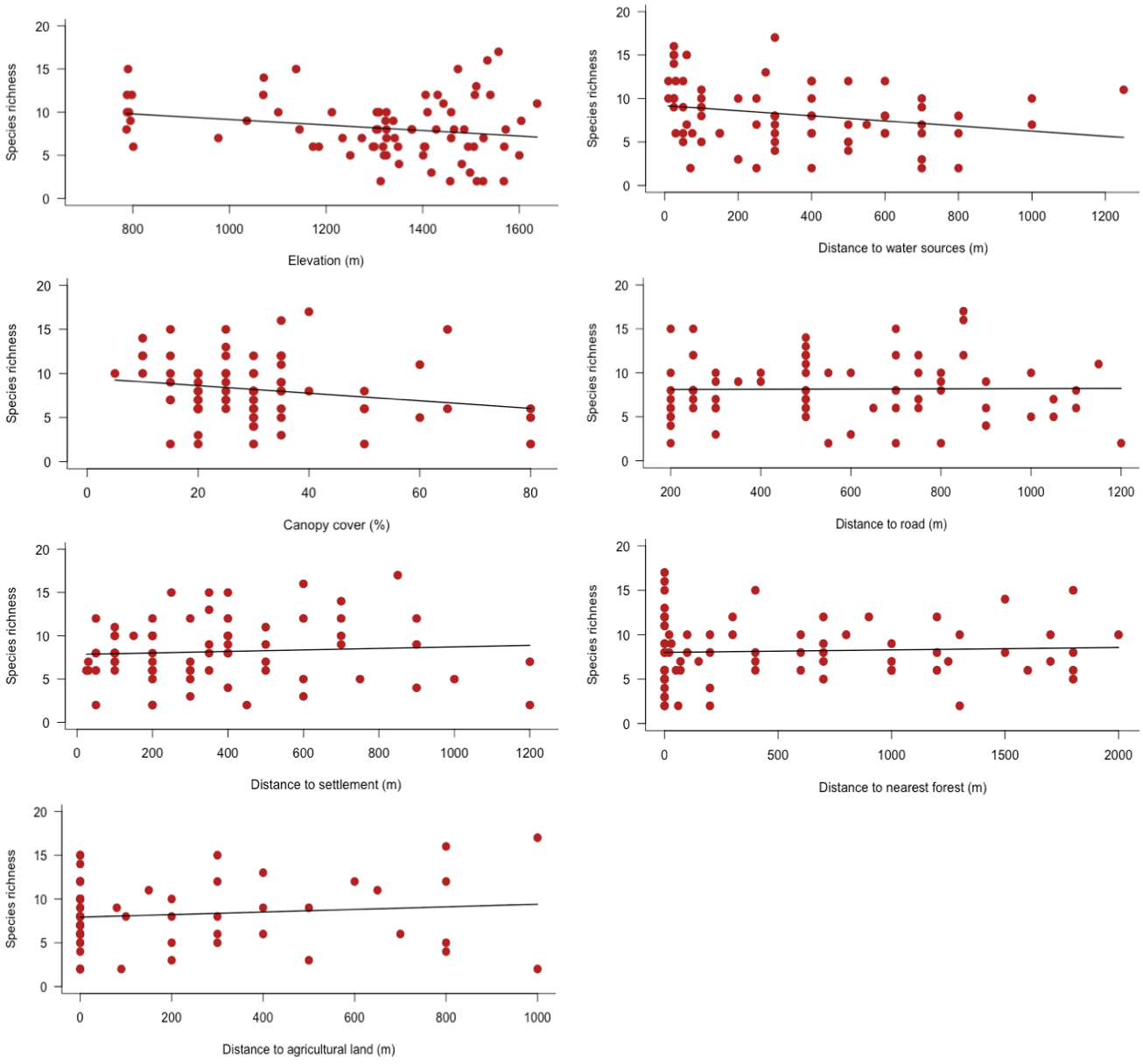

Figure 4. Bird species richness with elevation, nearest distance to water sources, canopy cover, distance to road, distance to settlement, distance to nearest forest and distance to settlement

Table 2. Model-averaged parameter estimates and 95% confidence limits (CL) describing the bird abundance in Dullu Municipality, Nepal (Figure 1) during 2020. Model parameters include canopy cover (%), distance to settlement (m), Forest (m), distance to the road (m), distance to water source (m), and elevation (m). Estimates were averaged from all models. Bold values are with significant effects

Parameters	Estimate	SE	Lower LC	Upper LC	Z	p
Canopy cover	-7.77E-03	3.66E-03	-1.49E-02	-5.93E-04	2.122	0.034
Distance to water source	-3.84E-04	1.70E-04	-7.17E-04	-5.02E-05	2.255	0.024
Forest	2.32E-01	1.06E-01	2.46E-02	4.40E-01	2.192	0.028
Elevation	-3.02E-04	2.66E-04	-8.25E-04	2.20E-04	1.135	0.257
Distance to road	6.72E-05	1.59E-04	-2.45E-04	3.79E-04	0.422	0.673
Distance to settlement	-4.26E-05	1.73E-04	-3.81E-04	2.96E-04	0.247	0.805

Factors affecting on bird abundance

The average tree canopy percentage in the study area was 29.93% (range: 5% to 80%). The nearest distance to road from the observation plot was 562.84 ± 291.67 m (range: 200 to 1200 m), household 366.96 ± 282.28 m (range: 25 to 1250 m), water source 347.91 ± 289.08 m (range: 10 to 1250 m), forest 531.35 ± 621.42 m (range: 0 to 2000 m) and agricultural land 163 ± 274.5 m (range: 0 to 1000 m) from the plot. The species richness was decreased with increasing elevation, distance to water sources and forest canopy cover percentage (Figure 4). However, the species richness was increased with increasing the distance to road, distance to household, distance to the nearest forest (Figure 4).

The probability of bird species presence was less in plots with increasing elevation, canopy cover, distance to the water source, and distance to settlements (Table 2). Canopy cover, distance to the water source, and forest habitat showed a significant role in bird occurrence (Table 2). Bird abundance increases with forest habitat, whereas it decreases with an increase in canopy cover and distance to the nearest water source.

Discussion

In this study, the small area supports the occurrence of many bird and higher bird richness. The relative diversity of avian fauna species could be attributed to the various habitat types that constitute the area, probably for shelter and foraging opportunities (Girma et al. 2017). In addition, it might be due to variation in environmental factors like light, temperature, humidity, and precipitation in the mid-hill regions. In most of the habitats, the bird community changes seasonally due to resource bottlenecks for food and water availability and temperature (Shoo et al. 2005). The occurrence of the highest number of birds for Passeriformes in the study area might be due to migratory birds or the residential behavior of birds in this order. Not only in this area, but the Passeriformes was also numerically dominant order in Khata corridor Forest, Nepal (Chaudhary et al. 2009), Nansebo Forest, Southern Ethiopia (Husein and Sultan 2019), and in Madhari Himal in Annapurna Conservation Area, Central Nepal (Pandey et al. 2020). The Muscicapidae, Phyllocopidae, Corvidae, Scotocercidae, and Leiotrichidae have higher species numbers in the study area, probably due to migratory birds, insectivorous and residential nature of most birds under these families, which are dominant species in this study. These families are also prevalent in other areas, including the Kanchanjunga landscape and Western Nepal (Kandel et al. 2018).

The species richness and diversity in the winter season was higher than the summer in the study area might be due to temporal variability in community structure, which can cause an increase in local movements and altitudinal migration in birds (Barcante et al. 2017; Delany et al. 2017; Eyres et al. 2017). Seasonal variation affects the species richness and distribution (Katuwal et al. 2016; Katuwal et al. 2018). Seasonal defoliation of plants in the winter season can support the occurrence of many foliage insects, the food of insectivorous birds (Katuwal et al. 2018; Tzortzakaki et al. 2018). In our study area, the insectivorous and omnivorous birds were abundant during the winter season due to the presence of migratory birds, probably they find this area suitable to avoid cold weather. In addition, the higher food availability in winter can be supported by the early flowering in the winter season (Harsha and Hosetti 2009), and probably due to availability of abundant grains and insects on agricultural land during winter season (Wilson et al. 1999). The low number of birds in the summer season might be due to migration time, observational bias due to the availability of thick leaves on trees, and the bird being less vocal during the breeding period could influence counting summer migrants (Katuwal et al. 2018). Low number during summer season might also be due to territorial behaviour of birds during the breeding/summer season (Desgranges et al. 2006).

In the study area, the higher number of winter migrants in might be due to favorable ecological and climatic conditions. In the high and mid-mountain regions, the bird species richness decreased during the winter season above 3000 m of elevation, where the area was covered by snow and low energy available (Pandey et al. 2020). The seasonal movement patterns, local and regional habitat changes, large-scale population changes, and climatic conditions could cause variation in species abundance between seasons. The higher number of residential birds in the study area might be due to suitable habitat for residential species which can tolerate the local disturbances (Zhang et al. 2009).

This area also supports the occurrence of some nationally vulnerable birds, including Hume's Bush Warbler, Himalayan Vulture (Globally Near Threatened),

and near-threatened birds, including Chukar Partridge, Yellow-Bellied Prinia, and Alexandrine Parakeet. They are threatened due to continuous declining their population in the last few years (IUCN 2021), probably due to habitat loss or fragmentation. Generally, the land-use change influences the habitat, structure, and composition of species (Brawn et al. 2001). In the present study, bird diversity is higher in forests, and abundance is higher in low canopy cover and agricultural land. This might be due to the food and shelter available in the forest, the higher abundant birds at low canopy cover and agricultural land is probably due to higher foraging space for both insectivore and herbivore birds (Wilson et al. 1999).

In addition, the area is adjunct to the agricultural land; therefore, the agro-forest can support the higher species abundance because of diverse habitats (Tanalgo et al. 2015). The species richness increases with increasing the distance to forest and distance to road, and the bird richness decreases with an increase in distance to settlement, distance to the water source, and canopy cover. Agro-forest can support the higher species richness because of diverse habitats (Tanalgo et al. 2015). In Annapurna Conservation Area, species richness is also negatively associated with distance to nearest water source and distance to settlement (Pandey et al. 2020). Because anthropogenic pressure near human settlement can cause disturbances for the occurrence of birds (Adhikari et al. 2019), birds can fly and find the water sources easily; therefore, we assume the distance to water sources at the local level does not matter for the occurrence of birds. A higher canopy decreases the bird species richness because it changes the microclimatic habitat, i.e., low light and low food available for birds.

In conclusion, the Dullu Municipality supports different types of birds, including migrants, residential, endemic, and threatened species. Various environmental factors such as distance to the forest and social factors such as settlements act on the bird species occurrence. Some migratory birds are unique and need more research on why these species choose this particular habitat. In addition, an endemic species was found for both seasons, which also indicates the uniqueness of the bird habitat in the area. Globally, the bird species are declining; therefore, to prevent this trend in the Dullu area, a site-specific management plan is necessary because these areas also have vulnerable and near threatened birds whose occurrence and abundance is suffered from anthropogenic and ecological factors. Therefore, we recommend to develop a site-specific management plan for bird conservation at Dullu Municipality Dailekh.

ACKNOWLEDGEMENTS

The study was financially supported by Dullu Municipality, Dailekh District, Nepal. In addition, the authors thank Central Department of Zoology, Tribhuvan University, Nepal for logistic support.

REFERENCES

Acharya KP, Paudel PK. 2020. Biodiversity in Karnali Province: Current Status and Conservation. Ministry of Industry, Tourism, Forest and Environment, Karnali Province Government, Surkhet, Nepal.

Adhikari JN, Bhattarai BP, Thapa TB. 2019. Factors affecting diversity and distribution of threatened birds in Chitwan National Park, Nepal. J Threat Taxa 11 (5): 13511-13522. DOI: 10.11609/jot.4137.11.5.13511-13522.

Adhikari S, Sharma HP, Gautam R, Basaula R. 2020. Effects of weather on breeding success of ashy prinia (*Prinia socialis*) in Manigram of Tilottama Municipality, Nepal. Nepal J Environ Sci 8:11-16. DOI: 10.3126/njes.v8i1.35404.

Almazán-Núñez RC, Alvarez-Alvarez EA, Pineda-López R, Corcuera P. 2018. Seasonal variation in bird assemblage composition in a dry forest of Southwestern Mexico. Ornit Neotrop 29: 215-224.

Amani M, Salehi B, Mahdavi S, Brisco B. 2018. Spectral analysis of wetlands using multi-source optical satellite imagery. Intl Soc Photog Remote Sens 144: 119-36. DOI: 10.1016/j.isprsjprs.2018.07.005.

Areaya H, Yonas M, Haileselasie TH. 2013. Community composition and abundance of residential birds in selected church forests, Tigray Region, Northern Ethiopia. Sci Res Essays 8 (22): 1038-1047. DOI: 10.5897/SRE2013.5367.

Barcante L, Vale M, Alves MA. 2017. Altitudinal migration by birds: A review of the literature and a comprehensive list of species. J Field Ornithol 88 (4): 321-335. DOI: 10.1111/jofo.12234.

Basaula R, Sharma HP, Belant JL, Sapkota K. 2021. Invasive water hyacinth limits globally threatened waterbird abundance and diversity at Lake Cluster of Pokhara Valley, Nepal. Sustainability 13 (24): 13700. DOI: 10.3390/su132413700.

Belay D, Yihune M. 2017. Diversity, distribution and relative abundance of avian fauna in and around Zengo Forest, East Gojjam, Ethiopia. Intl J Ecol Environ Sci 43(4): 287-293.

Brawn JD, Robinson SK, Thompson III FR. 2001. Role of disturbance in the ecology and conservation of birds. Ann Rev Ecol Systemat 32: 251-276. DOI: 10.1146/annurev.ecolsys.32.081501.114031.

Burnham KP, Anderson DR. 2002. Model Selection and Multimodel Inference: A Practical Information-Theoretic Approach 2nd ed. Springer, New York.

Chaudhary UK, Kafle G, Baral HS. 2009. Avifaunal diversity of Khata Corridor Forest. J Wetl Ecol 2: 48-56. DOI: 10.3126/jowe.v2i1.1857.

Delany S, Williams C, Sulston C, Norton J, Garbutt D. 2017. Passerine migration across the Himalayas. In: Prins HHT, Namgail T (eds). Bird Migration Across the Himalayas: Wetland Functioning Amidst Mountains and Glaciers. Cambridge University Press, United Kingdom.

Desgranges J, Ingram J, Drolet B, Morin J, Savage C, Borcard D. 2006. Modelling wetland bird response to water level changes in the Lake Ontario-St. Lawrence River hydro system. Environ Monit Assess 113: 329-365. DOI: 10.1007/s10661-005-9087-3.

Dhakal H, Sharma HP, McClure CJ, Virani M, Rolek BW, Pradhan NM, Bhusal KP. 2022. Vulture distribution and people perception of vultures in Pokhara Valley, Nepal. Ecol Evol 12 (1): e8528. DOI: 10.1002/ece3.8528.

DNPWC, BCN. 2018. Department of National Parks and Wildlife Conservation and Bird Conservation Nepal. Birds of Nepal: An Official Checklist, Kathmandu, Nepal.

DNPWC. 2018. Department of National Parks and Wildlife Conservation, Nepal. Available: http:// dnpwc.gov.np. Accessed on 22 May 2021.

Eyres A, Böhning-Gaese K, Fritz SA. 2017. Quantification of climatic niches in birds: Adding the temporal dimension. J Avian Biol 48 (12): 1517-1531. DOI: 10.1111/jav.01308.

Girma Z, Mengesha G, Asfaw T. 2017. Diversity, relative abundance and distribution of avian fauna in and around Wondo Genet forest, South-Central Ethiopia. Res J Forest 11 (1): 1-12. DOI: 10.3923/rjf.2017.1.12.

Grimmett R, Inskipp C, Inskipp T, Baral HS. 2016. Birds of Nepal: Helm Field Guide, Bloomsbury Publishing India Pvt., Ltd., New Delhi, India.

Harsha MN, Hosetti BB. 2009. Diversity and distribution of avifauna of Lakkavalli Range Forest, Bhadra Wildlife Sanctuary, Western Ghat, India. Ecoprint 16: 21-27. DOI: 10.3126/eco.v16i0.3469.

Hu Y, Jin K, Huang Z, Ding Z, Liang J, Pan X, Hu H, Jiang Z. 2017. Elevational patterns of non-volant small mammal species richness in Gyirong Valley, Central Himalaya: Evaluating multiple spatial and environmental drivers. J Biogeog 44: 2764-2777. DOI: 10.1111/jbi.13102.

Huff MH. 2000. A Habitat-Based Point-Count Protocol for Terrestrial Birds, Emphasizing Washington and Oregon (Vol. 501, pp. 39). US Department of Agriculture, Forest Service, Pacific Northwest Research Station. DOI: 10.2737/PNW-GTR-501.

Husein ZJ, Sultan M. 2019. Species composition and relative abundance of birds at Nansebo Forest, Southern Ethiopia. Adv Life Sci Technol 73: 1-9. DOI: 10.7176/ALST.

Inskipp C, Baral HS, Acharya S, Chaudhari H, Ghimire M, Giri D. 2020. Rare birds in Nepal. Nep J Zool 4 (2): 108-132. DOI: 10.3126/njz.v4i2.33894.

Inskipp C, Baral HS, Inskipp T, Khatiwada AP, Khatiwada MP, Poudyal LP. Amin R. 2017. Nepal's national red list of birds. J Threat Taxa 9 (1): 9700-9722. DOI: 10.11609/jott.2855.9.1.9700-9722.

Inskipp C, Baral HS, Phuyal S, Bhatt TR, Khatiwada M, Inskipp T, Khatiwada A, Gurung S, Singh PB, Murray L, Poudyal L, Amin R. 2016. The Status of Nepal's Birds: The National Red List Series, Zoological Society of London, UK. https://www.zsl.org/conservation/regions asia/national-redlistof-Nepal-birds. Accessed on 12 May 2021.

IUCN. 2021. The IUCN Red List of Threatened Species. Version 2021-3. <https://www.iucnredlist.org>. Accessed on 12 December 2021.

Johnson CK, Hitchens PL, Pandit PS, Rushmore J, Evans TS, Young CCW, Doyle MM. 2020. Global shifts in mammalian population trends reveal key predictors of virus spillover risk. Proc Royal Soc B. 287: 20192736. DOI: 10.1098/rspb.2019.2736.

Kandel P, Thapa I, Chettri N, Pradhan R, Sharma E. 2018. Birds of the Kangchenjunga Landscape, the Eastern Himalaya: status, threats and implications for conservation. Avian Res 9 (9): 1-13. DOI: 10.1186/s40657-018-0100-2.

Katuwal HB, Basnet H, Sharma HP, Koirala S, Khanal B, Neupane KR, Panta DB, Parajuli K, Lamichhane S, Rai M, Pun T, Shakya S, Baral S. 2020. Wildlife assessment of the Chandragiri Hills, Kathmandu: Potential for ecotourism. Eur J Ecol 6 (1): 27-50. DOI: 10.17161/eurojecol.v6i1.13520.

Katuwal HB, Basnet K, Khanal B, Devkota S, Rai SK, Gajurel JP. Scheidegger C, Nobis MP. 2016. Seasonal changes in bird species and feeding guilds along elevational gradients of the Central Himalayas, Nepal. PLoS ONE. 11 (7): e0158362. DOI: 10.1371/journal.pone.0158362.

Katuwal HB, Sharma HP, Shaner PJL, Gurung, R, Thapa V, Magar TG, Gurung TB, Parajuli K, Gurung MB, Basnet H, Koirala S, Ghimire MS, Yadav S, Belant JL, Shah K. 2018. Updating spatial information of 27 mammal species in Nepal. J Anim Plant Sci 28 (6): 1735-1745.

Katuwal HB, Zhang M, Baral HS, Sharma HP, Quan RC. 2021. Assessment of farmers' knowledge and perception towards farmland birds show the need of conservation intervention. Glob Ecol Conserv 27: e01563. DOI: 10.1016/j.gecco.2021.e01563.

Lee JH, Park D, Sung HC. 2012. Large-scale habitat association modeling of the endangered Korean rat snake (*Elaphe schrenckii*). Zool Sci 29 (5): 281-285. DOI: 10.2108/zsj.29.281.

Libal NS, Belant JL, Leopold BD, Wang G, Owen PA. 2011. Despotism and risk of infanticide influence grizzly bear den-site selection. PloS ONE 6 (9): e24133. DOI: 10.1371/journal.pone.0024133.

Maas B, Clough Y, Tscharntke T. 2013. Bats and birds increase crop yield in tropical agroforestry landscapes. Ecol Lett 16: 1480-1487. DOI: 10.1111/ele.12194.

Mengesha G, Mamo Y, Bekele A. 2011. A comparison of terrestrial bird community structure in the undisturbed and disturbed areas of the Abijata Shalla Lakes National Park, Ethiopia. Intl J Biodivers Conserv 3: 389-404. DOI: 10.5897/IJBC.9000004.

Mulwa RK, Böhning-Gaese K, Schleuning M. 2012. High bird species diversity in structurally heterogeneous farmland in Western Kenya. Biotrop 44 (6): 801-809. DOI: 10.1111/j.1744-7429.2012.00877.x.

Pandey N, Khanal L, Chalise MK. 2020. Correlates of avifaunal diversity along the elevational gradient of Madhari Himal in Annapurna Conservation Area, Central Nepal. Avian Res 11 (1): 1-14. DOI: 10.1186/s40657-020-00217-6.

Pielou EC. 1966. The measurement of diversity in different types of biological Collections. J Theor Biol 13: 131-144. DOI: 10.1016/0022-5193(66)90013-0.

Price TD, Hooper DM, Buchanan CD, Johansson US, Tietze DT, Alström P, Ghosh-Harihar M, Ishtiaq F, Gupta SK, Martens J, Harr B, Singh P, Mohan D. 2014. Niche filling slows the diversification of Himalayan songbirds. Nature 509: 222-225. DOI: 10.1038/nature13272.

Pyšek P, Blackburn TM, García-Berthou E, Perglová I, Rabitsch W. 2017. Displacement and local extinction of native and endemic species. impact of biological invasions on ecosystem services. In: Vilà M, Hulme PE (eds.). Impact of Biological Invasions on Ecosystem Services. Invading Nature - Springer Series in Invasion Ecology, Berlin. DOI: 10.1007/978-3-319-45121-3_10.

Saini V, Joshi K, Bhatt D, Singh A, Joshi R. 2017. Short Communication: Waterbird species distribution between natural and manmade wetland in Himalayan foothills of Uttarakhand, India. Biodiversitas 18: 334-340. DOI: 10.13057/biodiv/d180144.

Sarkar MS, Pandey A, Singh G, Lingwal S, John R, Hussain A, Rawat GS, Rawal RS. 2018. Multiscale statistical approach to assess habitat suitability and connectivity of common leopard (*Panthera pardus*) in Kailash Sacred Landscape, India. Spatial Stat 28: 304-318. DOI: 10.1016/j.spasta.2018.07.006.

Shannon-Wiener CE, Weaver W, Weater WJ. 1949. The Mathematical Theory of Communication; Math. Theory Commun. EUA University Illinois Press, Urbana, IL, USA.

Shoo LP, Williams SE, Hero JM. 2005. Climate warming and the rainforest birds of the Australian Wet Tropics: Using abundance data as a sensitive predictor of change in total population size. Biol Conserv 125: 335-343. DOI: 10.1016/j.biocon.2005.04.003.

Symes WS, Edwards DP, Miettinen J, Rheindt FE, Carrasco LR. 2018. The combined impacts of deforestation and wildlife trade on tropical biodiversity are severely underestimated. Nature Comm 9 (1): 1-9. DOI: 10.1038/s41467-018-06579-2.

Tanalgo KC, Pineda JAF, Agravante ME, Amerol ZM. 2015. Bird diversity and structure in different land-use types in lowland South-Central Mindanao, Philippines. Trop Life Sci Res 26 (2): 85-103.

Tzortzakaki O, Kati V, Kassara C, Tietze DT, Giokas S. 2018. Seasonal patterns of urban bird diversity in a Mediterranean coastal city: The positive role of open green spaces. Urban Ecosyst 21: 27-39. DOI: 10.1007/s11252-017-0695-9.

Werema C, Howell KM. 2016. Seasonal variation in University and abundance of understorey birds in Bunduki Forest Reserve, Tanzania: Evaluating the conservation value of a plantation forest. Ostrich 87 (1): 89-93. DOI: 10.2989/00306525.2015.1110842.

Wilson JD, Morris AJ, Arroyo BE, Clark SC, Bradbury RB. 1999. A review of the abundance and diversity of invertebrate and plant foods of granivorous birds in northern Europe in relation to agricultural change. Agric Ecosyst Environ 75 (1-2): 13-30. DOI: 10.1016/S0167-8809(99)00064-X.

Zhang DC, Zhang YH, Boufford DE, Sun H. 2009. Elevational patterns of species richness and endemism for some important taxa in the Hengduan Mountains, Southwestern China. Biodiv Conserv 18: 699-716. DOI: 10.1007/s10531-008-9534-x.

Table S1. Checklist of bird species at Dullu Municipality, Nepal

Common name	Scientific name	Orders	Family	Number	IUCN	National red list	MS	Habitat	Season	Feeding guild
Aberrant Bush-warbler	*Horornis flavolivaceus* (Blyth, 1845)	Passeriformes	Scotocercidae	29	LC	LC	Resident	B	W	Insectivorous
Alexandrine Parakeet	*Palaeornis eupatria* (Linnaeus, 1766)	Psittaciformes	Psittacidae	57	NT	NT	Resident	B	BS	Frugivorous
Ashy Drongo	*Dicrurus leucophaeus* (Vieillot, 1817)	Passeriformes	Dicruridae	3	LC	LC	Resident	A	W	Insectivorous
Asian Barred Owlet	*Glaucidium cuculoides* (Vigors, 1831)	Strigiformes	Strigidae	2	LC	LC	Resident	A	BS	Carnivorous
Western Koel	*Eudynamys scolopaceus* (Linnaeus, 1758)	Cuculiformes	Cuculidae	13	LC	LC	Resident	B	S	Omnivorous
Barn Swallow	*Hirundo rustica* (Linnaeus, 1758)	Passeriformes	Hirundinidae	53	LC	LC	Resident	A	BS	Insectivorous
Bar-tailed Treecreeper	*Certhia himalayana* (Vigors, 1832)	Passeriformes	Certhiidae	1	LC	LC	Resident	F	W	Insectivorous
Black Bulbul	*Hypsipetes leucocephalus* (Gmelin, 1789)	Passeriformes	Pycnonotidae	49	LC	LC	Resident	B	BS	Omnivorous
Black Drongo	*Dicrurus macrocercus* (Vieillot, 1817)	Passeriformes	Dicruridae	19	LC	LC	Resident	B	BS	Insectivorous
Black-faced Warbler	*Abroscopus schisticeps* (Gray, 1846)	Passeriformes	Scotocercidae	14	LC	LC	Resident	F	BS	Insectivorous
Black-headed Jay	*Garrulus lanceolatus* (Vigors, 1831)	Passeriformes	Corvidae	3	LC	LC	Resident	B	W	Omnivorous
Black kite	*Milvus migrans* (Boddaert, 1783)	Accipitriformes	Accipitridae	5	LC	LC	Resident	B	BS	Carnivorous
Black-lored Tit	*Parus xanthogenys* (Vigors, 1831)	Passeriformes	Paridae	14	LC	LC	Resident	B	BS	Insectivorous
Black Redstart	*Phoenicurus ochruros* (Gmelin, 1774)	Passeriformes	Muscicapidae	2	LC	LC	Resident	A	W	Insectivorous
Black-throated Thrush	*Turdus atrogularis* (Jarocki, 1819)	Passeriformes	Turdidae	13	LC	DD	Winter migrant	A	W	Insectivorous
Black-throated Tit	*Aegithalos concinnus* (Gould, 1855)	Passeriformes	Aegithalidae	11	LC	LC	Resident	F	BS	Insectivorous
Blue-capped Redstart	*Phoenicurus coeruleocephala* (Vigors, 1831)	Passeriformes	Muscicapidae	5	LC	LC	Resident	A	W	Insectivorous
Blue Rock-thrush	*Monticola solitarius* (Linnaeus, 1758)	Passeriformes	Muscicapidae	12	LC	LC	Resident	B	BS	Insectivorous
Blue Whistling-thrush	*Myophonus caeruleus* (Scopoli, 1786)	Passeriformes	Muscicapidae	17	LC	LC	Resident	B	BS	Omnivorous
Blyth's Leaf Warbler	*Phylloscopus reguloides* (Blyth, 1842)	Passeriformes	Phylloscopidae	14	LC	LC	Resident	B	W	Insectivorous
Booted Warbler	*Iduna caligata* (Lichtenstein, 1823)	Passeriformes	Acrocephalidae	8	LC	LC	Resident	A	W	Insectivorous
Brown Shrike	*Lanius cristatus* (Linnaeus, 1758)	Passeriformes	Laniidae	2	LC	LC	Winter migrant	B	W	Insectivorous
Buff-barred Warbler	*Phylloscopus pulcher* (Blyth, 1845)	Passeriformes	Phylloscopidae	2	LC	LC	Resident	F	W	Insectivorous
Chestnut-crowned Bush-warbler	*Cettia major* (Horsfield & Moore, 1854)	Passeriformes	Scotocercidae	8	LC	LC	Resident	F	W	Insectivorous
Chukar Partridge	*Alectoris chukar* (Gray, 1830)	Galliformes	Phasianidae	25	LC	NT	Resident	A	BS	Omnivorous
Common Chiffchaff	*Phylloscopus collybita* (Vieillot, 1817)	Passeriformes	Phylloscopidae	4	LC	LC	Winter migrant	A	W	Insectivorous
Common Hoopoe	*Upupa epops* (Linnaeus, 1758)	Bucerotiformes	Upupidae	3	LC	LC	Resident	B	BS	Insectivorous
Common Myna	*Acridotheres tristis* (Linnaeus, 1766)	Passeriformes	Sturnidae	138	LC	LC	Resident	B	BS	Omnivorous
Common Stonechat	*Saxicola torquata* (Linnaeus, 1766)	Passeriformes	Muscicapidae	28	LC	LC	Resident	B	BS	Insectivorous
Common Tailorbird	*Orthotomus sutorius* (Pennant, 1769)	Passeriformes	Cisticolidae	10	LC	LC	Resident	B	BS	Insectivorous
Crested Kingfisher	*Megaceryle lugubris* (Temminck, 1834)	Coraciiformes	Alcedinidae	2	LC	LC	Resident	A	BS	Carnivorous
Dusky Warbler	*Phylloscopus fuscatus* (Blyth, 1842)	Passeriformes	Phylloscopidae	4	LC	LC	Winter migrant	B	W	Insectivorous
Great Barbet	*Megalaima virens* (Boddaert, 1783)	Piciformes	Megalaimidae	5	LC	LC	Resident	F	BS	Frugivorous
Great Tit	*Parus major* (Linnaeus, 1758)	Passeriformes	Paridae	27	LC	LC	Resident	B	BS	Insectivorous
Green-backed Tit	*Parus monticolus* (Vigors, 1831)	Passeriformes	Paridae	19	LC	LC	Resident	F	BS	Insectivorous
Greenish Warbler	*Phylloscopus trochiloides* (Sundevall, 1837)	Passeriformes	Phylloscopidae	14	LC	LC	Winter migrant	B	W	Insectivorous
Grey-breasted Prinia	*Prinia hodgsonii* (Blyth, 1844)	Passeriformes	Cisticolidae	33	LC	LC	Resident	A	BS	Insectivorous
Grey Bushchat	*Saxicola ferreus* (Gray, 1846)	Passeriformes	Muscicapidae	14	LC	LC	Resident	A	BS	Insectivorous

Grey-hooded Warbler	*Phylloscopus xanthoschistos* (Gray, 1846)	Passeriformes	Phylloscopidae	21	LC	LC	Resident	B	BS	Insectivorous
Grey-sided Bush-warbler	*Cettia brunnifrons*(Hodgson, 1845)	Passeriformes	Scotocercidae	2	LC	LC	Resident	F	W	Insectivorous
Grey Treepie	*Dendrocitta formosae* (Swinhoe, 1863)	Passeriformes	Corvidae	24	LC	LC	Resident	B	BS	Omnivorous
Grey-capped Pygmy Woodpecker	*Dendrocopos canicapillus* (Blyth, 1845)	Piciformes	Picidae	2	LC	LC	Resident	F	W	Insectivorous
Himalayan Bulbul	*Pycnonotus leucogenys* (Gray, 1835)	Passeriformes	Pycnonotidae	135	LC	LC	Resident	B	BS	Omnivorous
Himalayan Griffon	*Gyps himalayensis* (Hume, 1869)	Accipitriformes	Accipitridae	2	NT	VU	Resident	A	S	Carnivorous
House Crow	*Corvus splendens* (Vieillot, 1817)	Passeriformes	Corvidae	6	LC	LC	Resident	A	S	Omnivorous
House Sparrow	*Passer domesticus* (Linnaeus, 1758)	Passeriformes	Passeridae	61	LC	LC	Resident	B	BS	Granivorous
Hume's Bush-warbler	*Cettia brunnescens* (Hume, 1872)	Passeriformes	Scotocercidae	3	LC	VU	Resident	A	W	Insectivorous
Hume's Leaf-warbler	*Phylloscopus humei* (Brooks, 1878)	Passeriformes	Phylloscopidae	2	LC	LC	Resident	F	W	Insectivorous
Indian Golden Oriole	*Oriolus kundoo* (Sykes, 1832)	Passeriformes	Oriolidae	3	LC	LC	Summer migrant	A	S	Omnivorous
Indian Roller	*Coracias benghalensis* (Linnaeus, 1758)	Coraciiformes	Coraciidae	4	LC	LC	Resident	A	BS	Insectivorous
Intermediate Egret	*Ardea intermedia* (Wagler, 1829)	Pelecaniformes	Ardeidae	3	LC	LC	Resident	A	S	Carnivorous
Jungle Babbler	*Turdoides striata* (Dumont, 1823)	Passeriformes	Leiotrichidae	11	LC	LC	Resident	B	BS	Omnivorous
Kalij Pheasant	*Lophura leucomelanos* (Latham, 1790)	Galliformes	Phasianidae	22	LC	LC	Resident	B	W	Omnivorous
Large-billed Crow	*Corvus macrorhynchos* Wagler, 1827	Passeriformes	Corvidae	33	LC	LC	Resident	B	BS	Omnivorous
Large Cuckooshrike	*Coracina javensis* (Horsfield, 1821)	Passeriformes	Campephagidae	5	LC	LC	Resident	F	BS	Insectivorous
Variegated Laughingthrush	*Garrulax variegatus* (Vigors, 1831)	Passeriformes	Leiotrichidae	19	LC	LC	Resident	B	W	Omnivorous
Lemon-rumped Leaf-warbler	*Phylloscopus chloronotus* (Gray & Gray, 1846)	Passeriformes	Phylloscopidae	10	LC	LC	Resident	F	W	Insectivorous
Long-tailed Minivet	*Pericrocotus ethologus* (Bangs & Phillips, 1914)	Passeriformes	Campephagidae	9	LC	LC	Resident	B	W	Insectivorous
Long-tailed Shrike	*Lanius schach* (Linnaeus, 1758)	Passeriformes	Laniidae	13	LC	LC	Resident	B	BS	Carnivorous
Maroon Oriole	*Oriolus traillii* (Vigors, 1832)	Passeriformes	Oriolidae	2	LC	LC	Resident	F	W	Omnivorous
Olive-backed Pipit	*Anthus hodgsoni* (Richmond, 1907)	Passeriformes	Motacillidae	5	LC	LC	Resident	A	W	Insectivorous
Oriental Magpie-robin	*Copsychus saularis* (Linnaeus, 1758)	Passeriformes	Muscicapidae	11	LC	LC	Resident	B	BS	Insectivorous
Oriental Turtle-dove	*Streptopelia orientalis* (Latham, 1790)	Columbiformes	Columbidae	37	LC	LC	Resident	B	BS	Granivorous
Indian White-eye	*Zosterops palpebrosus* (Temminck, 1824)	Passeriformes	Zosteropidae	7	LC	LC	Resident	B	BS	Omnivorous
Paddyfield Pipit	*Anthus rufulus* (Vieillot, 1818)	Passeriformes	Motacillidae	13	LC	LC	Resident	A	BS	Insectivorous
Plain Flowerpecker	*Dicaeum minullum* (Swinhoe, 1870)	Passeriformes	Dicaeidae	3	LC	LC	Resident	B	W	Nectarivorous
Pied Bushchat	*Saxicola caprata* (Linnaeus, 1766)	Passeriformes	Muscicapidae	21	LC	LC	Resident	B	BS	Insectivorous
Plumbeous Water-redstart	*Phoenicurus fuliginosus* (Vigors, 1831)	Passeriformes	Muscicapidae	10	LC	LC	Resident	B	BS	Insectivorous
Purple Sunbird	*Cinnyris asiatica* (Latham, 1790)	Passeriformes	Nectariniidae	2	LC	LC	Resident	A	S	Nectarivorous
Red-billed Blue Magpie	*Urocissa erythrorhyncha* (Boddaert, 1783)	Passeriformes	Corvidae	22	LC	LC	Resident	B	BS	Frugivorous
Red-rumped Swallow	*Cecropis daurica* (Linnaeus, 1771)	Passeriformes	Hirundinidae	15	LC	LC	Resident	A	S	Insectivorous
Red-vented Bulbul	*Pycnonotus cafer* (Linnaeus, 1766)	Passeriformes	Pycnonotidae	100	LC	LC	Resident	B	BS	Omnivorous
Common Pigeon	*Columba livia* (Gmelin, 1789)	Columbiformes	Columbidae	19	LC	LC	Resident	B	BS	Granivorous
Rufous-bellied Woodpecker	*Dendrocopos hyperythrus* (Vigors, 1831)	Piciformes	Picidae	1	LC	LC	Resident	F	S	Insectivorous
Rose-ringed Parakeet	*Psittacula krameri* (Scopoli, 1769)	Psittaciformes	Psittacidae	34	LC	LC	Resident	B	BS	Frugivorous
Rufous-fronted Tit	*Aegithalos iouschistos* (Blyth, 1844)	Passeriformes	Aegithalidae	2	LC	LC	Resident	F	W	Insectivorous
Rufous Sibia	*Heterophasia capistrata* (Vigors, 1831)	Passeriformes	Leiotrichidae	5	LC	LC	Resident	F	W	Omnivorous
Rufous Treepie	*Dendrocitta vagabunda* (Latham, 1790)	Passeriformes	Corvidae	38	LC	LC	Resident	B	BS	Frugivorous
Russet Sparrow	*Passer cinnamomeus* (Temminck, 1836)	Passeriformes	Passeridae	10	LC	LC	Resident	F	BS	Granivorous
Scaly Thrush	*Zoothera dauma* (Latham, 1790)	Passeriformes	Turdidae	1	LC	LC	Resident	F	W	Omnivorous
Scaly-breasted Munia	*Lonchura punctulata* (Linnaeus, 1758)	Passeriformes	Estrildidae	7	LC	LC	Resident	B	W	Granivorous
Scarlet Minivet	*Pericrocotus flammeus* (Forster, 1781)	Passeriformes	Campephagidae	6	LC	LC	Resident	F	S	Insectivorous
Shikra	*Accipiter badius* (Gmelin, 1788)	Accipitriformes	Accipitridae	4	LC	LC	Resident	B	S	Carnivorous

Slaty-headed Parakeet	*Psittacula himalayana* (Lesson, 1832)	Psittaciformes	Psittacidae	22	LC	LC	Resident	F	BS	Frugivorous
Spiny Babbler	*Turdoides nipalensis* (Hodgson, 1836)	Passeriformes	Leiotrichidae	5	LC	LC	Resident	F	BS	Insectivorous
Clamorous Reed-warbler	*Acrocephalus stentoreus* (Ehrenberg, 1833)	Passeriformes	Locustellidae	3	LC	LC	Winter migrant	F	W	Insectivorous
Spotted Dove	*Spilopelia chinensis* (Scopoli, 1786)	Columbiformes	Columbidae	14	LC	LC	Resident	B	BS	Granivorous
Striated Prinia	*Prinia crinigera* (Hodgson, 1836)	Passeriformes	Cisticolidae	38	LC	LC	Resident	B	BS	Insectivorous
Tickell's Leaf-warbler	*Phylloscopus affinis* (Tickell, 1833)	Passeriformes	Phylloscopidae	7	LC	LC	Resident	A	W	Insectivorous
Western Crowned Leaf-warbler	*Phylloscopus occipitalis* (Blyth, 1845)	Passeriformes	Phylloscopidae	10	LC	LC	Passage migrant	F	S	Insectivorous
White-browed Wagtail	*Motacilla maderaspatensis* (Gmelin, 1789)	Passeriformes	Motacillidae	4	LC	LC	Resident	A	BS	Insectivorous
White-capped Water-redstart	*Chaimarrornis leucocephalus* (Vigors, 1831)	Passeriformes	Muscicapidae	8	LC	LC	Resident	B	BS	Insectivorous
White-throated Fantail	*Rhipidura albicollis* (Vieillot, 1818)	Passeriformes	Rhipiduridae	3	LC	LC	Resident	B	BS	Insectivorous
White-throated Kingfisher	*Halcyon smyrnensis* (Linnaeus, 1758)	Coraciiformes	Alcedinidae	3	LC	LC	Resident	A	BS	Carnivorous
White Wagtail	*Motacilla alba* (Linnaeus, 1758)	Passeriformes	Motacillidae	4	LC	LC	Winter migrant	A	W	Insectivorous
White-throated Laughingthrush	*Garrulax albogularis* (Gould, 1836)	Passeriformes	Leiotrichidae	8	LC	LC	Resident	F	BS	Omnivorous
Yellow-bellied Fantail	*Rhipidura hypoxantha* Blyth, 1843	Passeriformes	Stenostiridae	3	LC	LC	Resident	F	W	Insectivorous
Yellow-bellied Prinia	*Prinia flaviventris* (Delessert, 1840)	Passeriformes	Cisticolidae	2	LC	NT	Resident	A	W	Insectivorous