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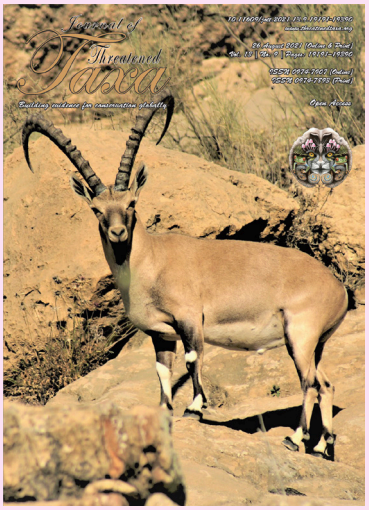

ARTICLE

FACTORS AFFECTING THE SPECIES RICHNESS AND COMPOSITION OF BIRD SPECIES IN A COMMUNITY MANAGED FOREST OF NEPAL

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ARTICLE

Factors affecting the species richness and composition of bird species in a community managed forest of Nepal

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Abstract: There exists limited information on biodiversity including avifaunal diversity and habitat condition in community forests (CF) of Nepal; thus we aimed to fulfill such gaps in Tibrekot CF of Kaski district. We used the point count method for assessing bird diversity and laid out a circular plot size of radius 5-m within 15-m distance from each point count station for recording the biophysical habitat characteristics. Bird species' diversity, richness and evenness were calculated using popular indexes and General Linear Model (GLM) was used to test the respective effect of various biophysical factors associated with the richness of bird species. In total, 166 (summer 122, winter 125) bird species were recorded in 46 sample plots. The Shannon-Wiener diversity index was calculated as 3.99 and 4.09, Margalef's richness index as 16.84 and 17.53 and Pielou's evenness index as 0.83 and 0.84 for summer and winter, respectively. The influencing factors for richness of bird species were season ($\chi 2_{1, 90}$= 112.21; P= 0.016) with higher richness in the summer season and low vegetation cover ($\chi 2_{1, 89}$= 113.88; P= 0.0064) with higher richness in lower percentage cover. Thus, community managed forest should be protected as it has a significant role in increasing bird diversity, which has potential for attracting avifaunal tourism for the benefit of the local communities.

Keywords: Biodiversity, evenness index, Margalef's richness index, Pielou's vegetation cover, Shannon-wiener index.

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INTRODUCTION

Nepal is a biodiversity-rich country that represents a significant share of global biodiversity (Paudel et al. 2012). The country occupies about 0.1% of the global area, but harbors 3.2% and 1.1% of the world's known flora and fauna, respectively (MoFSC 2014). This includes 5.2% of the world's known mammals, 9.5% birds, 5.1% gymnosperms, and 8.2% bryophytes. The Middle Mountains, also known as Middle Hills or Mid-hills is physiologically the most diverse region of Nepal (MoFSC 2014). The zone has the greatest diversity of ecosystems (52) and species in Nepal due to climatic variations ranging from subtropical to temperate monsoonal climate and a great variety of terrain and soil types.

Birds are an important part of forest ecosystems and a key part of food chains that are crucial for maintaining ecosystem function and resilience (Lundberg & Moberg 2003; Mahiga et al. 2019). In addition, birds play vital ecological roles in both agricultural land and forest ecosystems especially pest control, pollination, and seed dispersal (Whelan et al. 2008; Mulwa et al. 2012; Basnet et al. 2016). Bird communities are also indicators of the quality of forest habitats and thus can help to guide management and conservation at regional and landscape levels (Canterbury et al. 2000; Moning & Müller 2008). Many new research studies have focused on the distribution of bird species richness and diversity (Wu et al. 2013) and their changes over time. Studies have found variation in species diversity among different regions of Nepal. For example, Jha (2019) observed 78 bird species belonging to seven orders and 24 families in the foothills of Phulchoki Hill. Pandey et al. (2020) recorded 112 species belonging to 13 orders and 35 families in the Mardi Himal trekking region. In contrast, the diversity of bird species was found to be higher in Reshunga Forest in the west with 201 recorded bird species (Thakuri 2011).

Bird species diversity and richness are associated with distribution and presence of field margins, forest edges, habitat fragmentation, habitat quality, landscape changes, landscape structure, farming systems, type of vegetation, and climate (Basnet et al. 2016). A recent study has found that temperature, precipitation, habitat resources, and the level of disturbances influenced bird species' diversity and richness in the mid-hills (Pandey et al. 2020). Heterogeneity of bird habitats and the level of human disturbance have significantly influenced the distribution, diversity, and abundance of threatened bird species in central Nepal (Adhikari et al. 2019). However, there is limited information about the seasonal diversity and composition of bird species and the associated vegetation characteristics and other habitat factors influencing the species richness in Nepal.

Seasonal change in climate is an additional prominent characteristic of mountain ecosystems that can influence the temporal dynamics of bird species richness and composition. Birds in mountain environments are sensitive to seasonal variation in climate, due to resource bottlenecks for food and water availability and to temperature regulation requirements (Katuwal et al. 2016). In Nepal, seasonal migration of birds is closely linked to changes between the dry and monsoon seasons. Summer migration usually starts between March and May (premonsoon season) and sometimes migration is extended to the monsoon season in June and July, while the winter migration starts during the post-monsoon season in September (Katuwal et al. 2016). In contrast, although the diversity index was found to be higher in the summer season, species richness remained uniform in both summer and winter seasons in the Mardi Himal region of the mid-hills (Pandey et al. 2020).

The livelihood of people of developing countries, as well as biodiversity, is enhanced through the maintenance of forest cover (Persha et al. 2010). When forest habitats are protected, avifaunal tourism can be promoted that can contribute to the rural economy of poor people (Girma et al. 2017; Gupta et al. 2019). However, the role of community-managed forests in conservation of avifaunal diversity is often neglected. In this study, we explore the contribution of community forest to the avifaunal composition and species richness, followed by determining the associated habitat characteristics. To the best of our knowledge, such information is lacking in Nepal, therefore we believe that this study helps to fill such gaps, which can ultimately contribute to conservation of bird species and their habitats.

STUDY AREA

Tibrekot Community Forest (CF) is located at Hemja in the northern part of Pokhara Metropolitan City ward number 25, Kaski district in Nepal at 28.29° N latitude and 83.93° E longitude (Figure 1). The CF covers an area of 120 ha with elevation of 1,000–1,400 m from mean sea level that was handed over as community forestry to the local users in the year 2000. The average annual temperature is 14–25 °C and the average annual rainfall is 1,000 mm. *Schima-Castanopsis* is the dominant species of the forest composition; other species recorded are *Alnus nepalensis, Engelhardia spicata*, and

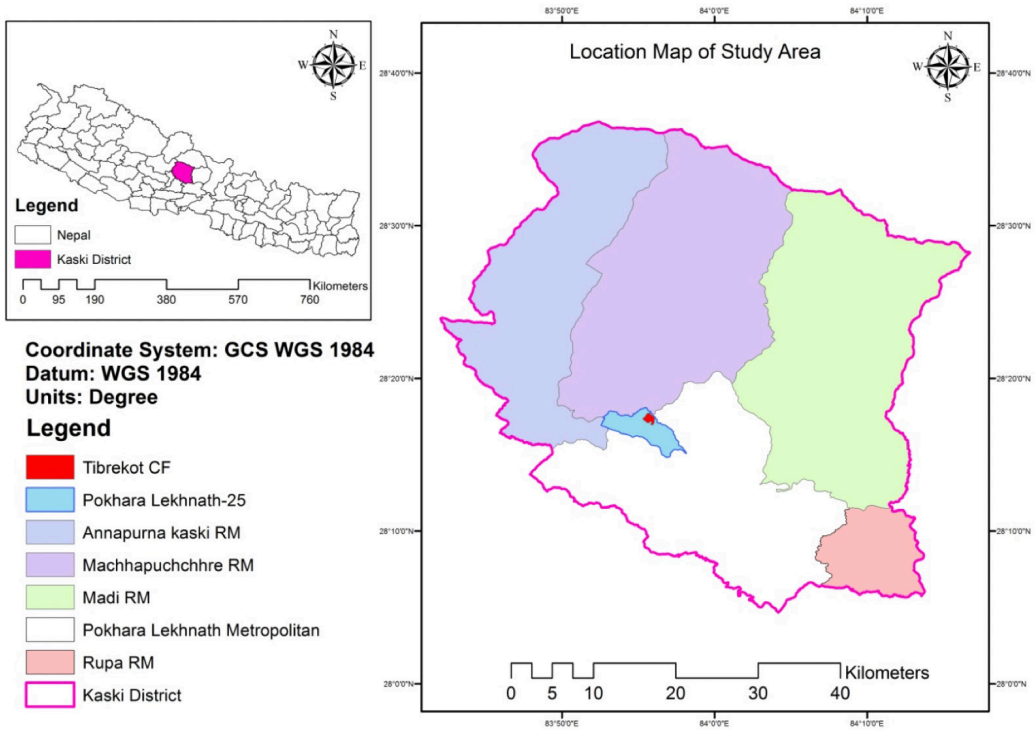

Figure 1. Study area.

Myrica esculanta. Mammal species recorded include *Rhesus macaque, Panthera pardus, Canis aureus*, *and Hystrix brachyura.*

Altogether, 260 households manage the Tibrekot CF. The forest was one of the long-term research sites of Tribhuvan University, Institute of Forestry/ ComForM Project-funded by Denmark from 2004 to 2014 (https://www.iofpc.edu.np/project/community-based-natural-forest-management-in-the-himalaya-comform). As the study site lies near the Pokhara valley and on the way to the popular Mardi Himal trekking route, protecting such community-managed forest can attract avifaunal tourists who should consequently benefit local communities. Besides, protection and maintenance of green forest nearby the city not only attracts tourists, but also provides important ecosystem services and beauty to the city's surroundings.

FIELD METHODS

Bird Survey

Bird species in the study area were surveyed using the point count method (Ralph et al. 1995). Points were laid at a distance of 200 m apart (as far as possible except on some sites with steep slopes, ridges, and dense bushes) along the existing trails as well as new trails in order to represent the entire forest area (Ralph et at. 1995). In addition, a few point count stations were placed on the private lands that were connected to the CF (on the southwestern side) in order to include the bird species from that region (Figure 3). The distance between two consecutive stations was maintained at 200 m to avoid double counting. The bird species seen and heard within a 20 m radius were counted for a period of 10 minutes (Ralph et al. 1995; Hostetler & Main 2001). To minimize disturbances during the survey, a waiting period of 3 to 5 min prior to counting was applied. The data collection was carried out for five hours per day from 06:30 to 10:00 h in the morning and from 16:30 to 18:00 h in the evening, as during those time intervals the activities of the birds were considered to be prominent (Hostetler & Main 2001). The winter field data was collected during January 2019 while the summer data was collected during August 2019 by assuming that most of the seasonal migratory bird species visit the study area by that time. In total, we spent 15 days for the fieldwork during each season. We avoided performing point counts in days with rain and stronger wind. We belonged to a team of 10 people including a bird expert, Bachelor in Forestry graduates, and experienced local people, for the entire field survey of each season. In addition, we hired the bird expert to identify the birds and record their associated habitat

characteristics during the field survey. The bird expert, prior to the collection of field data, trained all the field team members for a few days. Furthermore, the bird species were identified at species level with a popular guide, Helm Field Guide 'Birds of Nepal' (Nepali version) and details like number of individuals of particular bird species were also noted. Photographs and calls were used to identify the conspicuous birds whereas others were identified with the aid of binoculars and a spotting scope.

Recording habitat characteristics

A circular plot of 5 m radius was laid near each point count station (within 15 m) for recording the habitat characteristics of bird species (Bernard et al. 2014). The habitat characteristics include vegetation canopy layer (≥20 m above ground), understory vegetation (5 to 20 m above ground), low vegetation (2 to 5m above ground) and ground vegetation (≤2 m above ground) according to the designed quadrat size for different categories of species. Different parameters of the trees were recorded including DBH, height, crown cover, ground cover, number of trees, frequency of shrubs and herbs. Additionally, habitat parameters such as elevation, aspect, slope, geographic coordinates were also recorded from the same plots.

Data Analysis

Abundance and diversity analysis

We followed Bird Life International for the nomenclature and classification of birds (Burfield et al. 2017), IUCN (2017) for the global status and population trend and National Red List Series of Nepal's Birds for the national and migratory status (Inskipp et al. 2016). The relative abundance was determined using the equation:

Relative abundance (%)= $^{n}/_{N}$ ×100

Where,

n= numbers of individuals of particular recorded species

N= total number of individuals of recorded species

In addition, the abundance status was assessed as per the criteria of Khan & Ali (2014).

Very common if seen on >75% of visits

Common if seen on 50–74% of visits

Uncommon if seen on 25–49% of visits

Rare if seen on <25% of visits

Complete checklists of bird species were compiled in Microsoft office excel showing orders, family, species, and bird type.

Similarly, species diversity was determined using Shannon-Wiener's index (Odum 1971) (H´), Margalef's richness index (Margalef 1958), and Pielou's evenness index (Pielou 1996).

Shannon-Wiener's index

$H' = -\sum {}^{ni}/_{N} \ln {}^{ni}/_{n}$

where,

ni= number of individuals of i^{th} species

N= total number of all individuals

ln= natural logarithm

The value of the index ranges from 1.5 (low species richness and evenness) to 5.0 (high species evenness and richness).

Margalef's richness index

$R = {}^{S-1}/_{\ln N}$

where,

S= total number of species

N= total number of individuals encountered

ln= natural logarithm

Higher the value of 'R", higher will be the species richness.

Pielou's evenness index

e= H'/ ln S

where,

S= total number of species

H= Shannon-Weaver diversity index

The value of 'e' ranges from 0 to 1 with 1 being complete evenness i.e. species are equally distributed throughout the habitat.

Modeling analysis

Generalized linear model (GLM) was used to test the respective effect of various biophysical factors associated with occupied habitats on the richness of bird species. The independent pre-determined predictor variables were season, aspect, elevation, slope, percentage cover of different vegetation categories including canopy layer (≥20 m above ground), understory layer (5–20 m above ground), lower vegetation layer (2–5 m above ground), and ground vegetation layer (≤2 m above ground) whereas the dependent response variable was bird species richness. After checking the normality and linearity using histogram and Q-Q plot diagram, we found that most of the assumptions were fulfilled by our data and the analysis was followed by a backwards selection method (stepwise removal of non-significant variables or factors). The final model was developed with significant predictor variables for which the likelihood ratio of $\chi 2$ was significant (i.e., $P \leq 0.05$). All the modeling

analysis was performed using R×64 3.3.3 (http://cran.r-project.org/) with R Studio and the significance was set at 5%.

RESULTS

A total of 166 bird species was recorded in 46 sample plots. Among the recorded species, 122 species of birds were recorded in summer while 125 species of birds were recorded in winter. A total of 44 bird species was recorded only in winter and 41 bird species were recorded only in summer, whereas 81 bird species were recorded in both summer and winter. Among the total number of bird species 65% species were found to be carnivores, 9% species were insectivores, 17% species were omnivores, 6% species were frugivores, and 3% species were nectivores (Figure 2). The richness of bird species was found to differ among the measured plots (Figure 3).

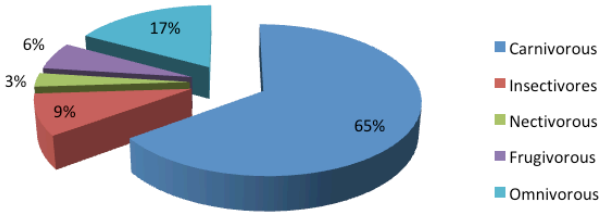

Figure 2. Feeding character of bird species recorded in the study area.

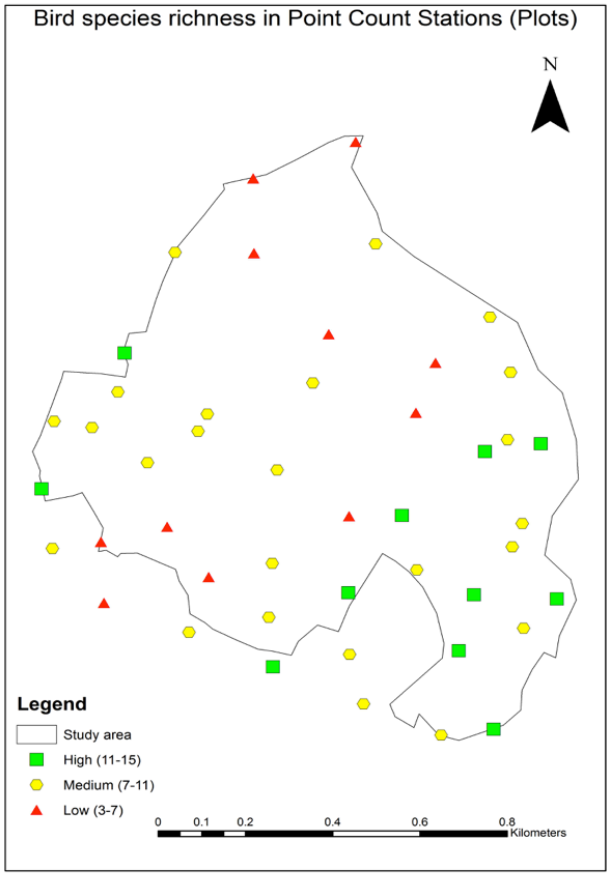

Figure 3. Richness of bird species in point count stations.

Relative abundance and diversity of bird species

As per the criteria of Khan & Ali (2014), most of the species were rare (recorded on less than 25% of visits). The most abundant bird species found in the study area was Black Bulbul *Hypsipetes leucocephalus* (RA= 8.28) followed by White-crested Laughingthrush *Garrulax leucolophus* (RA= 6.99), and Great Barbet *Psilopogon virens* (RA= 6.3) in summer, whereas in winter the most abundant bird species was Grey-hooded Warbler *Phylloscopus xanthoschistos* (RA= 7.54) followed by Barn Swallow *Hirundo rustica* (RA= 6.61) and White-crested Laughingthrush *Garrulax leucolophus* (RA= 5.68) in winter. The relative abundance of 10 most dominant species is given below (Table 1).

Species Diversity

The value of Shannon-wieners index ranges from 1.5 to 5 in which 1.5 was the low species richness and evenness and 5 was the high species richness and evenness. The values of index of bird in summer and winter were 3.99 and 4.09**,** respectively, which mean the species richness and evenness of birds was high in the study area. It was high because there were more species with single individual and two individuals recorded. The higher the value of Margalef's richness index, the higher will be the species richness. The values of the index in summer and winter were 16.84 and 17.53, respectively, which means the species richness was high. The value of Pielou's evenness index ranges from 0 to 1 in which 1 means complete evenness that indicates the species are equally distributed throughout the habitat. The values of the index in summer and winter were 0.83 and 0.84, respectively, which means the species were evenly distributed in the study area (Table 2).

Habitat factors influencing the richness of bird species

Among different pre-determined biophysical variables, GLM analysis found significant effect of two variables only, i.e., season and low vegetation percentage cover on the richness of bird species in the occupied plots. There was a seasonal effect on richness of bird species in the study area ($\chi 2_{1, 90}$= 112.21; P= 0.016), with higher richness of bird species in the summer

Table 1. Relative abundance and diversity of bird species.

	Common name	Scientific name	Relative abundance	
			Summer	Winter
1	Barn Swallow	*Hirundo rustica*	2.27	6.61
2	Black Bulbul	*Hypsipetes leucocephalus*	8.28	0
3	Black-lored Tit	*Machlolophus xanthogenys*	1.97	3.05
4	Great Barbet	*Psilopogon virens*	6.3	1.52
5	Grey-headed Canary-flycatcher	*Culicicapa ceylonensis*	2.35	2.79
6	Grey-hooded Warbler	*Phylloscopus xanthoschistos*	4.78	7.54
7	Grey Treepie	*Dendrocitta formosae*	4.93	5.17
8	Long-tailed Minivet	*Pericrocotus ethologus*	3.03	4.32
9	Red-vented Bulbul	*Pycnonotus cafer*	2.43	2.88
10	White-crested Laughingthrush	*Garrulax leucolophus*	6.99	5.68

Table 2. Species diversity index of the bird species.

	Species diversity index	Summer bird species	Winter bird species
1	Shannon-wieners index	3.99	4.09
2	Margalef's richness index	16.84	17.53
3	Pielou's evenness index	0.83	0.84

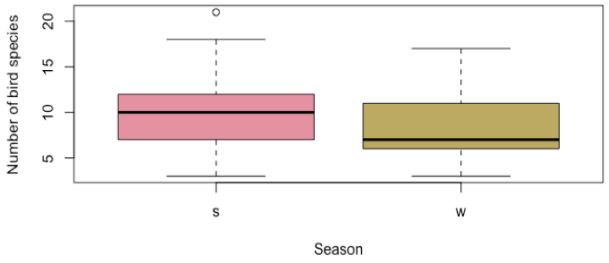

Figure 4. Bird species richness in two different seasons.

season than in the winter season (Figure 4). There was a significant effect of low vegetation percentage cover on the richness of bird species ($\chi 2_{1, 89}$= 113.88; P= 0.0064), with a higher richness of bird species in lower percentage cover (Figure 5). However, results of the GLM showed no significant differences in the richness of bird species with regard to other independent habitat variables.

DISCUSSION

This study aimed to assess the species composition and the habitat factors influencing the bird species richness in Tibrekot community forests (CF) that helped to fulfill such research gap, particularly in the context of community forests in Nepal. A total of 166 bird species was recorded in 46 sample plots in the CF during summer and winter surveys. In Tibrekot CF, we recorded two globally near threatened vulture species, the Himalayan Griffon *Gyps himalayensis* and Cinereous Vulture *Aegypius monachus* and these two species were nationally Vulnerable and Endangered species, respectively.

Thus, the large number of bird species recorded including two globally near threatened species justifies the importance to birds of Tibrekot CF. The value of Shannon-wieners index (3.99 and 4.09) showed that richness and evenness of birds was high in both seasons in the study area. The value of Margalef's richness index (16.84 and 17.53) also showed that richness of birds was high. In addition, the value of Pielou's evenness index (0.83 and 0.84) showed that the bird species were equally distributed throughout the habitat in the study area. In contrast, some past studies have reported lower richness and evenness of birds in more disturbed regions (Peh et al. 2006; Shahabuddin & Kumar 2007).

The general positive effect on biodiversity is likely to

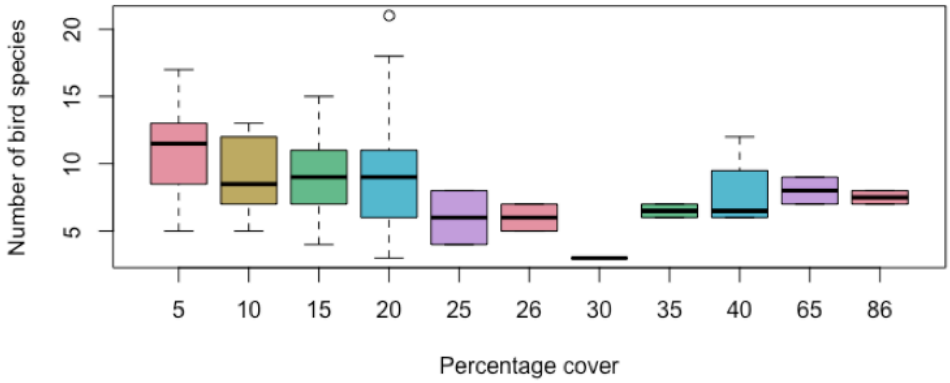

Figure 5. Bird species richness along different percentage cover of low vegetation.

reveal the contribution of CF not only in revitalizing the degraded forestlands, but also the communities' efforts in maintaining the richness of faunal species (Luintel et al. 2018; Joshi & Singh 2020; Joshi et al. 2020). The higher richness and diversity of forest specialists birds in sites within CF areas may be related to the fact that anthropogenic disturbance is limited in such areas (Baral & Inskipp 2005). Various studies have shown that extraction and over consumption of fodder, fuel wood, and non-timber forest product can negatively influence avifaunal communities (Shahabuddin & Kumar 2007; Dahal et al. 2009; Kumar et al. 2011; Inskipp et al. 2013). The different disturbance intolerant species of CF may therefore benefit from sustainable forest management that restricts the illegal removal of standing dead trees, fallen timber for firewood and pruning of canopies (Dahal et al. 2014; Joshi et al. 2019, 2020). However, the relationship between the richness of bird species and the level of disturbances were not investigated in this study.

Seasonality was one of the influencing factors for bird species richness in the study area. In Nepal, seasonal migration of birds is closely linked to changes between the dry and monsoon seasons. It was found to be the determining factor for the abundance and distribution of both migratory and non-migratory bird species (Girma et al. 2017). In addition, Manu & Cresswell (2007) reported that other environmental factors influence the distribution and richness of bird species including floristic composition, habitat structure, food availability, temperature, and climate. Pandey et al. (2020) reported that multiple variables have profound influences on bird diversity and richness in Nepal comprising habitat area, gradients of climate (temperature and precipitation), resource availability and disturbance. Adhikari et al. (2019) have mentioned that human disturbance negatively influences the distribution and diversity of bird species. Nevertheless, we did not take into account the climatic variables as well as habitat disturbance activities that can influence bird species composition and diversity. Heterogeneous and natural habitat conditions can help to protect the bird diversity in the mid-hills of Nepal (Basnet et al. 2016). Therefore, it is essential to conduct further studies on how birds respond to habitat modifications and the influence of different climatic and habitat biophysical variables at the local level. Such crucial information will help the concerned authorities to prepare the site-specific strategies and plans focused on protecting the bird species at the local level.

CONCLUSION

Out of 166 bird species, 81 species were recorded in both seasons within the study area. Although richness of bird species was similar in the different seasons, relative abundance and species evenness was higher in summer. The most abundant bird species found in the study area was Black Bulbul *Hypsipetes leucocephalus*. There was a significant seasonal effect on richness of bird species with higher richness in summer season and at low vegetation percentage cover. Such vital information about the avifaunal species and the associated habitat factors in the community managed forest will help to develop strategies and plans to protect the avifaunal species and their habitats, which has also potential to initiate avifaunal tourism in Nepal for the benefit of local communities.

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Appendix 1. Protection status of bird species.

	Species	Category	Number of observation
1	Total		166
2	CITES	I	1
		II	19
		III	1
3	IUCN Global	Critically endangered	3
		Endangered	2
		Vulnerable	0
		Near Threatened	2
4	IUCN National	Critically endangered	2
		Endangered	2
		Vulnerable	5
		Near Threatened	5
5	B05		5
6	B07		12
7	B08		22
8	B11		3

Appendix 2. List of the most abundant bird species.

	Common name	Scientific name	Order	Family	Feeding character	No. of observations	
						Summer	Winter
1	Barn Swallow	*Hirundo rustica*	Passeriformes	Hirundinidae	Insectivores	30	78
2	Black Bulbul	*Hypsipetes leucocephalus*	Passeriformes	Pycnonotidae	Omnivorous	109	0
3	Black-lored Tit	*Machlolophus xanthogenys*	Passeriformes	Paridae	Insectivores	26	36
4	Great Barbet	*Psilopogon virens*	Piciformes	Megalaimidae	Frugivorous	83	18
5	Grey-headed Canary-flycatcher	*Culicicapa ceylonensis*	Passeriformes	Stenostiridae	Insectivores	31	33
6	Grey-hooded Warbler	*Phylloscopus xanthoschistos*	Passeriformes	Phylloscopidae	Insectivores	63	89
7	Grey Treepie	*Dendrocitta formosae*	Passeriformes	Corvidae	Omnivorous	65	61
8	Long-tailed Minivet	*Pericrocotus ethologus*	Passeriformes	Campephagidae	Insectivores	40	51
9	Red-vented Bulbul	*Pycnonotus cafer*	Passeriformes	Pycnonotidae	Omnivorous	32	34
10	White-crested Laughingthrushh	*Garrulax leucolophus*	Passeriformes	Leiotrichidae	Insectivores	92	67

Appendix 3. List of total bird species (166) recorded in the study area.

	Common name	Scientific name
1	Ashy Drongo	*Dicrurus leucophaeus*
2	Ashy-throated Warbler	*Phylloscopus maculipennis*
3	Asian Barred Owlet	*Glaucidium cuculoides*
4	Asian Plain Martin	*Riparia chinensis*
5	Barn Swallow	*Hirundo rustica*
6	Bar-winged Flycatcher-shrike	*Hemipus picatus*
7	Black Bulbul	*Hypsipetes leucocephalus*
8	Black-chinned Babbler	*Cyanoderma pyrrhops*
9	Black Drongo	*Dicrurus macrocercus*
10	Black Eagle	*Ictinaetus malaiensis*
11	Black Francolin	*Francolinus francolinus*
12	Black-headed Jay	*Garrulus lanceolatus*
13	Black Kite	*Milvus migrans*
14	Black-lored Tit	*Machlolophus xanthogenys*
15	Black-throated Sunbird	*Aethopyga saturata*
16	Black-throated Thrush	*Turdus atrogularis*
17	Black-winged Cuckooshrike	*Lalage melaschistos*
18	Blue-bearded Bee-eater	*Nyctyornis athertoni*
19	Blue-capped Rock-thrush	*Monticola cinclorhyncha*
20	Blue-throated Barbet	*Psilopogon asiaticus*
21	Blue-throated Blue-flycatcher	*Cyornis rubeculoides*
22	Blue Whistling-thrush	*Myophonus caeruleus*
23	Blue-winged Minla	*Siva cyanouroptera*
24	Brahminy Starling	*Sturnia pagodarum*
25	Bronzed Drongo	*Dicrurus aeneus*
26	Buff-barred warbler	*Phylloscopus pulcher*
27	Cattle Egret	*Bubulcus ibis*
28	Chestnut-bellied Nuthatch	*Sitta cinnamoventris*
29	Chestnut-bellied Rock-thrush	*Monticola rufiventris*
30	Chestnut-headed Tesia	*Cettia castaneocoronata*
31	Cinereous Tit	*Parus cinereous*
32	Cinereous Vulture	*Aegypius monachus*
33	Collared Owlet	*Glaucidium brodiei*
34	Collared Scops-owl	*Otus lettia*
35	Common Barn-owl	*Tyto alba*
36	Common Green Magpie	*Cissa chinensis*
37	Common Hawk-cuckoo	*Hierococcyx varius*
38	Common Hoopoe	*Upupa epops*
39	Common Kestrel	*Falco tinnunculus*
40	Common Myna	*Acridotheres tristis*
41	Common Tailorbird	*Orthotomus sutorius*
42	Coppersmith Barbet	*Psilopogon haemacephalus*
43	Crested Serpent-eagle	*Spilornis cheela*
44	Crimson Sunbird	*Aethopyga siparaja*
45	Egyptian Vulture	*Neophron percnopterus*
46	Eurasian Tree Sparrow	*Passer montanus*
47	Eurasian Wryneck	*Jynx torquilla*
48	Fire-breasted Flowerpecker	*Dicaeum ignipectus*
49	Fulvous-breasted Woodpecker	*Dendrocopos macei*
50	Golden-throated Barbet	*Psilopogon franklinii*
51	Goosander	*Mergus merganser*
52	Great Barbet	*Psilopogon virens*
53	Greater Coucal	*Centropus sinensis*
54	Greater Flameback	*Chrysocolaptes guttacristatus*
55	Greater Yellownape	*Chrysophlegma flavinucha*
56	Green-backed Tit	*Parus monticolus*
57	Green-billed Malkoha	*Phaenicophaeus tristis*
58	Greenish Warbler	*Phylloscopus trochiloides*
59	Green Shrike-babbler	*Pteruthius xanthochlorus*
60	Green-tailed Sunbird	*Aethopyga nipalensis*
61	Grey-backed Shrike	*Lanius tephronotus*
62	Grey-bellied Cuckoo	*Cuculus passerinus*
63	Grey-bellied Tesia	*Tesia cyaniventer*
64	Grey Bushchat	*Saxicola ferreus*
65	Grey-headed Canary-flycatcher	*Culicicapa ceylonensis*
66	Grey-hooded Warbler	*Phylloscopus xanthoschistos*
67	Grey-naped Woodpecker	*Picus canicapillus*
68	Grey Nightjar	*Caprimulgus jotaka*
69	Grey-throated Babbler	*Stachyris nigriceps*
70	Grey Treepie	*Dendrocitta formosae*
71	Grey Wagtail	*Motacilla cinerea*
72	Hair-crested Drongo	*Dicrurus hottentottus*
73	Hill Partridge	*Arborophila torqueola*
74	Himalayan Bulbul	*Pycnonotus leucogenys*
75	Himalayan Griffon	*Gyps himalayensis*
76	Himalayan Swiftlet	*Aerodramus brevirostris*
77	Hodgson's Treecreeper	*Certhia hodgsoni*
78	House Crow	*Corvus splendens*
79	House Sparrow	*Passer domesticus*
80	House Swift	*Apus nipalensis*
81	Hume's Leaf-warbler	*Phylloscopus humei*
82	Indian Cuckoo	*Cuculus micropterus*
83	Indian Cuckooshrike	*Coracina macei*
84	Indian Golden Oriole	*Oriolus kundoo*
85	Indian Pond-heron	*Ardeola grayii*
86	Jungle Myna	*Acridotheres fuscus*
87	Kalij Pheasant	*Lophura leucomelanos*
88	Large-billed Crow	*Corvus macrorhynchos*

	Common name	Scientific name
89	Lemon-rumped warbler	*Phylloscopus chloronotus*
90	Lesser Racquet-tailed Drongo	*Dicrurus remifer*
91	Lesser Yellownape	*Picus chlorolophus*
92	Little Egret	*Egretta garzetta*
93	Long-tailed Broadbill	*Psarisomus dalhousiae*
94	Long-tailed Minivet	*Pericrocotus ethologus*
95	Long-tailed Shrike	*Lanius schach*
96	Maroon Oriole	*Oriolus traillii*
97	Mountain Bulbul	*Ixos mcclellandii*
98	Mountain Hawk-eagle	*Nisaetus nipalensis*
99	Mountain Scops-owl	*Otus spilocephalus*
100	Northern Wren	*Troglodytes troglodytes*
101	Olive-backed Pipit	*Anthus hodgsoni*
102	Orange-bellied Leafbird	*Chloropsis hardwickii*
103	Orange-headed Thrush	*Geokichla citrina*
104	Oriental Magpie-robin	*Copsychus saularis*
105	Oriental Turtle-dove	*Streptopelia orientalis*
106	Oriental White-eye	*Zosterops palpebrosus*
107	Paddyfield Pipit	*Anthus rufulus*
108	Peregrine Falcon	*Falco peregrinus*
109	Plumbeous Water-redstart	*Phoenicurus fuliginosus*
110	Puff-throated Babbler	*Pellorneum ruficeps*
111	Red-billed Blue Magpie	*Urocissa erythroryncha*
112	Red-billed Leiothrix	*Leiothrix lutea*
113	Red-headed Tit	*Aegithalos iredalei*
114	Red-headed Vulture	*Sarcogyps calvus*
115	Red-rumped Swallow	*Cecropis daurica*
116	Red-throated Flycatcher	*Ficedula albicilla*
117	Red-vented Bulbul	*Pycnonotus cafer*
118	Rock Dove	*Columba livia*
119	Rose-ringed Parakeet	*Psittacula krameri*
120	Rosy Pipit	*Anthus roseatus*
121	Rufous-bellied Niltava	*Niltava sundara*
122	Rufous-chinned Laughingthrush	*Garrulax rufogularis*
123	Rufous-gorgeted Flycatcher	*Ficedula strophiata*
124	Rufous-throated Partridge	*Arborophila rufogularis*
125	Rufous Woodpecker	*Micropternus brachyurus*
126	Rusty-cheeked Scimitar-babbler	*Erythrogenys erythrogenys*
127	Scaly-breasted Cupwing	*Pnoepyga albiventer*

	Common name	Scientific name
128	Scaly-breasted Munia	*Lonchura punctulata*
129	Scaly Thrush	*Zoothera dauma*
130	Scarlet Minivet	*Pericrocotus flammeus*
131	Shikra	*Accipiter badius*
132	Slaty-backed Flycatcher	*Ficedula erithacus*
133	Slaty-headed Parakeet	*Psittacula himalayana*
134	Slender-billed Vulture	*Gyps tenuirostris*
135	Small Niltava	*Niltava macgrigoriae*
136	Snowy-browed Flycatcher	*Ficedula hyperythra*
137	Speckled Piculet	*Picumnus innominatus*
138	Spiny Babbler	*Acanthoptila nipalensis*
139	Spotted froktal	*Enicurus maculatus*
140	Spotted Owlet	*Athene brama*
141	Steppe Eagle	*Aquila nipalensis*
142	Striated Prinia	*Prinia crinigera*
143	Thick-billed Warbler	*Arundinax aedon*
144	Tickell's Leaf-warbler	*Phylloscopus affinis*
145	Ultramarine Flycatcher	*Ficedula superciliaris*
146	Velvet-fronted Nuthatch	*Sitta frontalis*
147	Verditer Flycatcher	*Eumyias thalassinus*
148	Wallcreeper	*Tichodroma muraria*
149	Wedge-tailed Green-pigeon	*Treron sphenurus*
150	Western Koel	*Eudynamys scolopaceus*
151	Western Spotted Dove	*Spilopelia suratensis*
152	Western Yellow Wagtail	*Motacilla flava*
153	Whistler's Warbler	*Phylloscopus whistleri*
154	White-bellied Erpornis	*Erpornis zantholeuca*
155	White-breasted Kingfisher	*Halcyon smyrnensis*
156	White-browed Shrike-babbler	*Pteruthius aeralatus*
157	White-browed Wagtail	*Motacilla maderaspatensis*
158	White-capped Water-redstart	*Phoenicurus leucocephalus*
159	White-crested Laughingthrush	*Garrulax leucolophus*
160	White-rumped Munia	*Lonchura striata*
161	White-rumped Vulture	*Gyps bengalensis*
162	White-tailed Nuthatch	*Sitta himalayensis*
163	White-throated Fantail	*Rhipidura albicollis*
164	White-throated Laughingthrush	*Garrulax albogularis*
165	White Wagtail	*Motacilla alba*
166	Yellow-bellied Fairy-fantail	*Chelidorhynx hypoxanthus*

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