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Research Article

Diversity, Species Composition, and Relative Abundance of Avifauna at Debre Libanos Monastery, Ethiopia

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Data on avifaunal diversity and distribution are vital to enhance and inform conservation efforts. Therefore, this study was conducted to explore the diversity, distribution, and relative abundance of bird species in the Derbe Libanos Monastery Forest. The data were collected from December 2019 to September 2020, covering both the wet and dry seasons. Natural forest, plantation, cliff forest, and settlement were identified as an important habitat for the birds using a stratified random sampling design based on vegetation composition and characteristics. Point counts were employed to identify and record birds in the four habitat types. During the study, 61 avian species belonging to 13 orders and 31 families were identified. The highest diversity ($H' = 3.43$) and evenness ($E = 0.96$) were observed in the summer season in natural forests. The difference in abundance of bird species was statistically significant between observed and expected counts of each species in different habitats ($\chi^2 = 629.97$, df = 60, and $p < 0.001$). Recognizing that the monastery forest has a large number of bird species, enhanced avian monitoring and forest reintegration opportunities should be prioritized for conservation.

1. Introduction

Ethiopia is a tropical country with a wide altitudinal range, great geographical diversity with high and rugged mountains, flat-topped plateaus and deep gorges, incised river valleys and rolling plains, and macro- and micro-climate variability [1]. As a result, the country is endowed with great biological diversity of plant, animal, and microbial genetic resources [2].

Birds are the best-known group of vertebrates in Ethiopia [3]. Most birds are useful for humans, for example, pollination [4] and control of insect populations [5] in different ecosystems. Bird abundance as a bioindicator species shows a strong and significant positive correlation with both tree abundance and cover [6].

To date Ethiopia has 873 species of birds, of which 19 are Ethiopia's endemic 39 are globally threatened, one exotic species and 13 species are near endemic shared the highlands of Ethiopia and Eritrea [7]. However, according to different studies, the number, distribution, and abundance of bird species vary as a result of habitat variabilities.

As shown in the above, Ethiopia has a diverse number of species as a result of its diverse habitat types and agro-ecological variability [8]. However, the diversity and abundance of the species are decreasing at an alarming rate [9–12]. Forest reduction, fragmentation, and loss are greatly affecting the population dynamics and dispersal potential of birds, as well as the ecological functions of birds [13, 14].

By considering the rapid decrement of bird population and range, Ethiopia has established 69 Important Bird Areas (IBAs) to protect the country's biodiversity and boost economic growth through tourism and related activities [15]. Debre Libanos monastery forest is found in Oromia Regional State and is one of the bird areas designated for biodiversity protection [16]. However, different protected areas have been established, but the organized baseline data needed to help the conservation and management of the area are lacking with regard to birds. Some studies have been

conducted on the diversity and distribution of birds in different areas in Ethiopia, but no research has been conducted on the diversity and distribution of birds in the Debre Libanos monastery forest. Due to habitat variability and anthropogenic extent in this area, a specific study is required for the management and conservation plans. Therefore, the goal of this study was to investigate the bird diversity, distribution, and avian diversity in the Debre Libanos Monastery forest.

2. Materials and Methods

2.1. Description of the Study Area. The study area is located in the Oromia Regional state, North Shoa Zone, Ethiopia, 104 km to the north of Addis Ababa, the capital city of Ethiopia. It lies between 09°43′ 30″N latitude and 38°51′0″E longitude (Figure 1). The study area lies along the eastern part of Fiche Selale town with altitude ranging from 2400 m whilst the rim of the valley rises to over 2560 m [17, 18]. The area is characterized by bimodal rainfall season (June to September) and shorter rainy season (March to April). The mean annual rainfall is about 1037 mm, while the minimum temperature is 5.7°C and the maximum temperature is 22.9°C.

2.2. Data Collection and Sampling Design. Field binoculars, Geospatial Positioning System (GPS72hz), sound recorder, Sony digital camera, and bird guidebook were used during the study period [19]. **Binocular** used to determine the clear vision of bird species at a distance; **GPS** used for determine the position of sampling area and area demarcation; **Bird Guidebook** for identification of on bird species to the other; **Sound recorder** helps to record calls and sounds of birds, to analyze effectively; **Sony digital camera** is used to take photos of birds.

A pilot survey was carried out in December, 2019 to collect basic information about the study site. The real study was carried out from January 2020 to September 2020 by considering both the wet and dry seasons. The wet season data covers from June to September, and the dry season is from January to May. In this study, stratified random sampling design was employed since the study area was not uniform in terms of habitat types. The area was stratified into four habitat types (natural forest, plantation, cliff/riverine forest, and settlement). Natural forest is a forest which has reproduced naturally, consisting of naturally immigrant or indigenous tree species and strains; plantation area includes the area where human planted tree is found, i.e., Eucalyptus plant species in the monastery area; settlement is the place where peoples live; cliff/riverine forest is an area, which is located or dwelling near a river and contain rocks.

In total, this survey established 19 sampling plots to cover the area, 4 plots on natural forest, 3 plots at cliff/riverine forest, 7 plots on plantation, and 5 plots on settlement contingent on the proportion of area coverage of the habitat. In each plot, there were 9-point count stations designed within 30 m radius to the observer. Birds did not easily observe if the distance is greater than 30 m radius. In each point station, 2–5 minutes were stayed for the birds to settle in case of any disturbance. To avoid double counting of avian species, the distance between each sampling plot was 250 m. Bird observation was carried out twice per day from 6:30 to 10:00 in the morning and 4:00 to 6:00 in the afternoon when birds were active [20]. The survey was carried out for two days per week, depending on the air quality. Throughout this survey, two counting techniques such as direct observation and indirect observation (alarm call, song, and feather) were functional.

2.3. Statistical Analysis. The data were analyzed using SPSS version 23.0 software [21]. Shannon–Weiner index, *t*-test, and chi-square test were used. One sample *t*-test was used to analyze the effect of season and habitat type on the abundance of avian species. Chi-square test was used to compare seasonal variations in diversity and evenness of birds at a 95% level of significance. Shannon–Weiner index was used to evaluate the diversity and evenness of bird species in different habitats within the study area [22].

Shannon Diversity Index $(H') = \sum$ (pilnpi), where H' is the Shannon–Wiener Index of Diversity; Pi is the proportion of the species relative to the total number of species; and ln indicates the natural logarithm.

Evenness or equitability index $(E) = H'/H_{\max,}$ where $H'\max = \ln$ (S) = natural logarithm of the total number of species (S) in each habitat [23]. E values range from 0 to 1, in which 1 indicates complete evenness.

Sørensen similarity index (S) is used to measure species similarity among different habitat types. It is equal to 1 in the case of complete species similarity between four habitats and 0 if species of two habitat types are dissimilar [24]:

$$\text{Sørensen similarity index}\,(S) = \frac{2c}{A + B + C + D}, \tag{1}$$

where C is the number of bird species common in all four habitats, A is the number of bird species observed in site A, B is the number of bird species observed in site B, C is the number of bird species observed in site C, and D is the number of bird species observed in site D.

The relative abundance of each species was estimated from encounter rates. This value is used to give each species an ordinal rank of abundance using the ranking scale [25]:

$$\text{encounter rate} = \frac{\text{number of individual of a species}}{\text{number of observation hours}} * 100. \tag{2}$$

The value of encounter rate was used to categorize each species into the following categories: <0.1 (rare), 0.1–2.0 (uncommon), 2.1–10.0 (frequent), 10.1–40.0 (common), and >40 (abundant) [26].

3. Results

3.1. Species Composition. A total of 61 avian species belonging to 13 orders and 31 families were recorded in the study area (Table 1). Among the thirteen identified orders, Passeriformes (60.7%) was the dominance order, containing

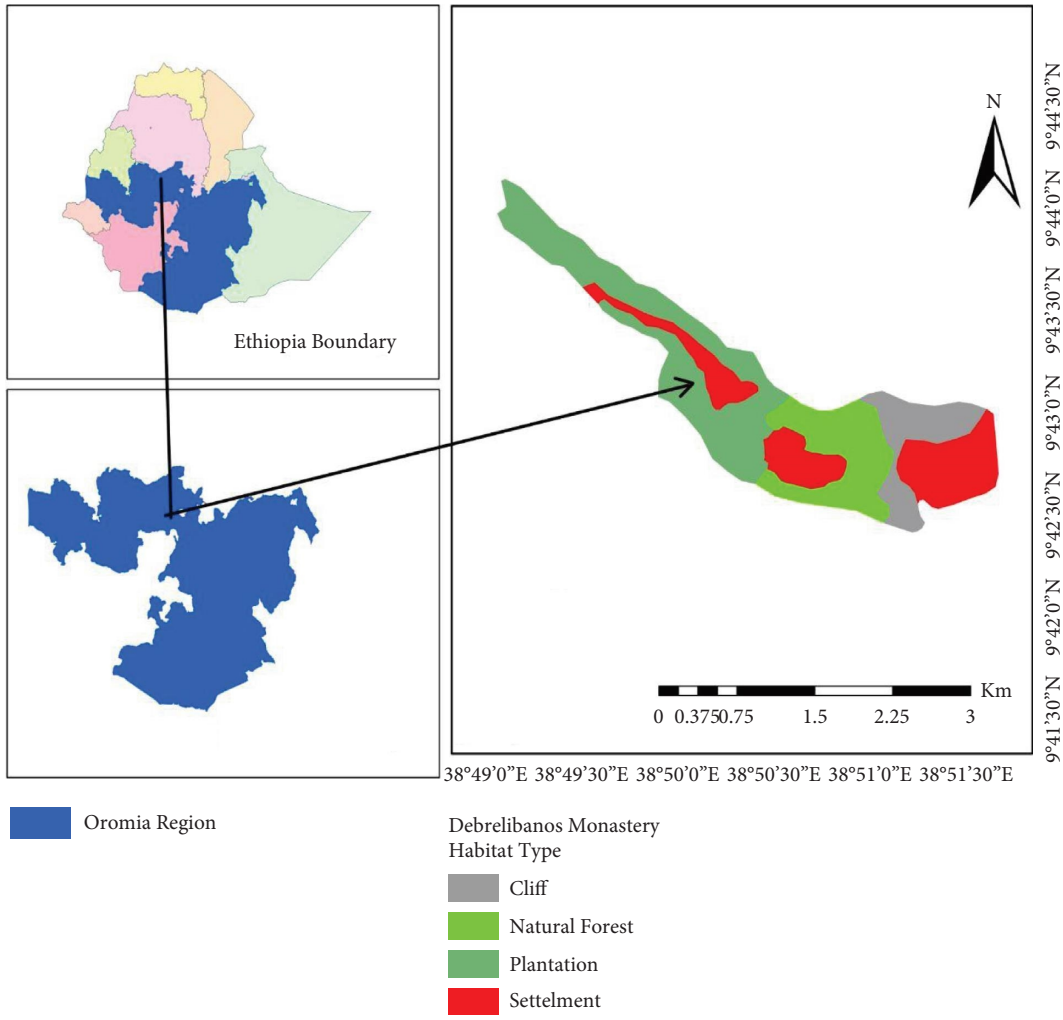

Figure 1: Map of the study area.

a high number of species followed by order Accipitriformes (9.8%), whereas the least number of bird species was recorded in Apodiformes, Coliiformes, Psittaciformes, and Strigiformes that accounts (1.6%) of the other order (Figure 2).

Among the 61 bird species, 30 were common for both wet and dry seasons, while 18 and 13 bird species were exclusively recorded during the wet and the dry seasons, respectively. Abyssinian Woodpecker (*Dendropicos abyssinicus*; Stanley, 1814) is one of the endemic species of in Ethiopia, and five semiendemic avian species were recorded in the study area (Table 1). Hooded Vulture and Ethiopian Boubou are the threatened species observed in the study area.

3.2. Species Diversity and Distribution. The species diversity was higher ($H' = 3.43$) in the natural forest during the dry season. While the least species diversity ($H' = 2.07$) was recorded in the plantation habitat during the wet season (Table 2). The highest evenness ($E = 0.96$) was observed in the natural forest during the dry season, and the lowest evenness ($E = 0.78$) was observed at settlement habitat in the wet season (Table 2). The distribution of bird species was varied between the study sites across seasons during the study period. During the wet season, 48 bird species were observed in wet season and 43 species of birds were observed during the dry season throughout the study period. The highest species richness (41 species) was noted in natural forest during the wet season, and (37 species) were observed in the dry season. While the lowest species richness was recorded at plantation habitat during the wet season (Table 2). The chi-square test analysis of bird species was statistically significantly different, in wet and in dry seasons ($\chi^2 = 629.97$, $\mathrm{df} = 60$, $p < 0.001$) in four habitat types throughout the study period.

3.3. Similarity of Bird Species between the Wet and Dry Seasons. There was 80% of avian species similarity between natural forest and cliff/riverine forest during the dry season and 68.6% of species similarity recorded in wet season (Table 3). However, the lowest 15.4% avian species similarity was observed between natural forest and plantation habitat

Table 1: Bird species recorded at Debre Libanos Monastery forest during the wet and dry seasons.

Orders	Family	Common name	Scientific name	IUCN red list category
Accipitriformes	Accipitridae	Augur buzzard	*Buteo augur* (Eduard Rüppell, 1836) +	LC
		Black-chested snake-eagle	*Circaetus pectoralis* (A. Smith, 1829)**	LC
		Hooded vulture ¥	*Necrosyrtes monachus* (Temminck, 1823)**	CR
		Tawny eagle	*Aquila rapax* (Temminck, 1828) +	VU
		White-backed volture	*Gyps africanus* (Salvadori, 1865) +	CR
		Yellow-billed kite	*Milvus aegyptius* (Gmelin, 1788) +	LC
Apodiformes	Apodidae	Nyanza swift	*Apus niansae* (Rejchenow, 1887) +	LC
Bucerotiformes	Bucerotidae	Red-billed hornbill	*Tockus erythrorhynchus* (Temminck, 1823)**	LC
		Hemprich's hornbill	*Tockus hemprichii* (Ehrenberg, 1833) +	LC
Coliiformes	Collidae	Speckled mousebird	*Colius striatus* (Gmelin, 1789)**	LC
Coraciiformes	Meropidae	Little bee-eater	*Merops pusillus* (Statius Muller, 1776)**	LC
	Alcedinidae	Malachite kingfisher	*Alcedo cristata* (Pallas, 1764)*	LC
Columbiformes	Columbidae	Dusky turtle dove	*Streptopelia turtur* (Eduard Rüppell, 1837)**	LC
		Laughing dove	*Streptopelia senegalensis* (Linnaeus, 1766) +	LC
		Red-eyed dove	*Streptopelia semitorquata* (Rüppell, 1837) +	LC
		Speckled pigeon	*Columba guinea* (Linnaeus, 1758)**	LC
		White-collared pigeon ⧖	*Columba albitorques* (Rüppell, 1837) +	LC
Falconiformes	Falconidae	Lanner falcon	*Falco biarmicus* (Temminck, 1825) +	LC
Galliformes	Phasianidae	Erckel's francolin ◆	*Pternistis erckelii* (Rüppell, 1835) +	LC
Musophagiformes	Musophagidae	White-cheecked turaco ◆	*Tauraco ruspolii* (Eduard Rüppell, 1835)**	LC
Passeriformes	Cisticolidae	Grey-backed camaroptera	*Camaroptera brachyura* (Cretzschmar, 1830)*	LC
		Tawny-flanked prina	*Prinia subflava* (Gmelin, 1789)**	LC
		Ethiopian cisticola	*Cisticola lugubris* (Rüppell, 1840) +	LC
	Corvidae	Cape crow	*Corvus capensis* (MHC, 1823)**	LC
		Pied crow	*Corvus albus* (Muller, 1776)**	LC
		Fan-tailed raven	*Corvus rhipidurus* (E. Hartert, 1918)*	LC
	Estrildidae	Red-billed firefinch	*Lagonosticta senegala* (C. Linnaeus, 1766)**	LC
		Red-cheeked cordon-bleu	*Uraeginthus bengalus* (Linnaeus, 1766)**	LC
	Fringillidae	African citril	*Serinus citrinelloides* (Rüppell, 1840)*	LC
		Brown-rumped seedeater	*Serinus tristriatus* (Rüppell, 1840)**	LC
		Streaky seedeater	*Serinus striolatus* (Smith, 1836)*	LC
	Hirundinidae	Common fiscal	*Lanius collaris* (Linnaeus, 1766)**	LC
		Rock martin	*Ptyonoprogne fuligula* (Lichtenstein, 1842) +	LC
	Malacotonidae	Ethiopian boubou ¥	*Laniarius aethiopicus* (Gmelin, 1789)**	LC
	Monarchidae	African paradise flycatcher	*Terpsiphone viridis* (Muller, 1776)**	LC
	Motacillidae	Mountain wagtail	*Motacilla clara* (Sharpe, 1908)*	LC
	Muscicapidae	Mocking cliff chat	*Thamnolaea cinnamomeiventris* (Lafresnaye, 1836)*	LC
		Moorland chat ⧖	*Pinarochroa, sordida* (Rüppell, 1837)**	LC
		Ruppell's black chat	*Myrmecocichla melaena* (Rüppell, 1837)**	LC
		Ruppell's robin-chat ⧖	*Cossypha semirufa* (Eduard Rüppell, 1840)**	LC
	Nectariniidae	Scarlet-chested sunbird	*Chalcomitra senegalensis* (Linnaeus, 1766)*	LC
		Tacazza sunbird	*Nectarinia tacazze* (Stanley, 1814) +	LC
		Variable sunbird	*Cinnyris venustus* (G. Shaw, 1799)**	LC
	Oriolidae	Abyssinian oriole	*Oriolus monacha* (Gmelin, 1789)**	LC
	Passeridae	Swainson's sparrow ◆	*Passer swainsonii* (Rüppell, 1840) +	LC
	Ploceidae	Baglafecht weaver	*Ploceus baglafecht* (Daudin, 1802)**	LC
		Red-collared widowbird	*Euplectes ardens* (P. Boddaert, 1783) +	LC
		Village weaver	*Ploceus cucullatus* (Müller, 1766)**	LC
		Yellow bishop	*Euplectes capensis* (Linnaeus, 1766)*	LC
	Pycnonotidae	Common bulbul	*Pycnonotus barbatus* (Desfontaines, 1789)*	LC
	Sturnidae	Greater blue-eared starling	*Lamprotornis chalybaeus* (Ehrenberg, 1828)**	LC
		Red-winged starling	*Onychognathus morio* (Linnaeus, 1766)**	LC
	Timaliidae	White-rumped babbler ◆	*Turdoides leucopygia* (Rüppell, 1840)*	LC
	Turdidae	Mountain thrush	*Turdus abyssinicus* (Gmelin, 1789)**	LC
		White-winged cliff chat ⧖	*Thamnolaea semirufa* (Eduard Rüppell, 1837) +	LC
	Viduidae	Pin-tailed whydah	*Vidua macroura* (P. Pallas, 1764) +	LC
		Village indigobird	*Vidua chalybeate* (Müller, 1776)*	LC
Piciformes	Picidae	Nubian woodpecker	*Campethera nubica* (P. Boddaert, 1783)**	LC
		Abyssinian woodpecker ♠	*Dendropicos abyssinicus* (Stanley, 1814)**	LC

Table 1: Continued.

Orders	Family	Common name	Scientific name	IUCN red list category
Psittaciformes	Psittaculidae	Black-winged lovebird ⧖	*Agapornis pullarius* (Stanley, 1814)**	LC
Strigiformes	Strigidae	Greyish eagle-owl	*Bubo cinerascens* (Guerin-Meneville, 1843)*	LC

*means dry; + means wet; ** means both wet and dry; ♠ means endemic; ⧖ means endemic to Ethiopia and Eretria; ◆ means near endemic; ¥ means threatened; unmarked species are resident birds; LC: list concern; CR: critically endangered.

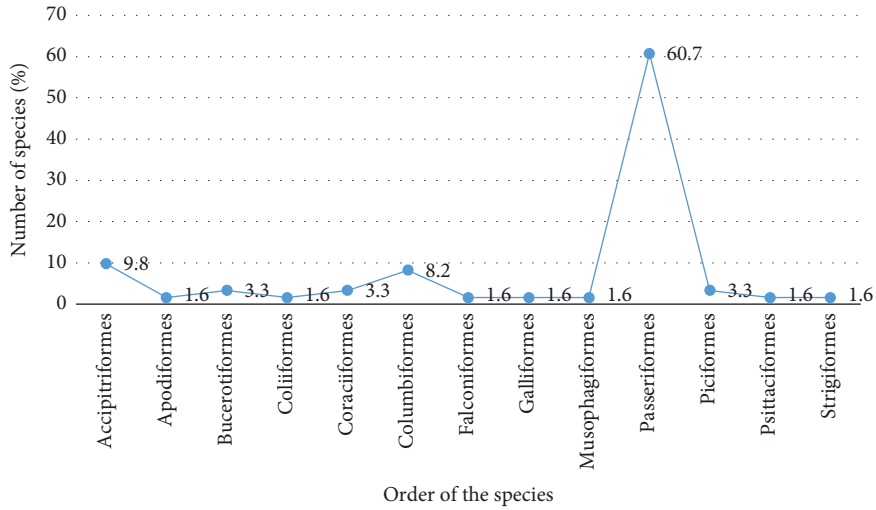

Figure 2: Composition of avifauna species (by orders) in the study area.

Table 2: Bird species abundance, diversity, richness, and evenness during the wet and dry seasons.

Habitats	Season	Species richness	Abundance	H'	H_{max} = Ln (S)	$E = H'/H$max
Natural forest	Wet	41	977	2.93	3.71	0.79
	Dry	37	349	3.47	3.61	0.96
Cliff/riverine forest	Wet	23	418	2.79	3.14	0.89
	Dry	28	366	2.76	3.33	0.83
Plantation	Wet	11	151	2.07	2.40	0.86
	Dry	15	106	2.56	2.71	0.95
Settlement	Wet	17	279	2.16	2.78	0.78
	Dry	16	184	2.47	2.77	0.89

H': Shannon–Weiner index; H'/Hmax: evenness (E); Hmax: Ln (S); S: the total number of species.

during the wet season. The three habitat types had 8.8% and 14.7% avian species similarity during the wet and dry seasons, respectively.

3.4. Bird Species Abundance. Highest abundance ($n = 1825$) of bird was detected during the wet season and ($n = 1005$) individuals were observed in dry season. The maximum number of individual ($n = 1326$) bird species account in the forest habitat followed by ($n = 784$) riverine habitat, ($n = 463$) settlement habitat, and the least abundance of bird species recorded in plantation habitat (Table 4). The t-test analysis indicated that abundance of bird was statistically and significantly different in wet and dry seasons ($t = 39.5$, df = 2829, $p < 0.001$) and statistically significantly different in four habitat types ($t = 87.9$, df = 2829, $p < 0.001$) throughout the study period.

Most avian species, 31 and 20, were found within the ordinal rank of "uncommon" during the wet and dry seasons, respectively, in the natural forest (Table 5). Least number of avian species was recorded in settlement and plantation. The plantation habitat hold one species within the ordinal rank as "uncommon" in wet season but in settlement habitat one species recorded within the ordinal rank as "common" and "uncommon" in wet and dry seasons, respectively. Abundant and rare bird species did not record in this study area in both wet and dry seasons.

Among the total of 61 species of birds recorded in the study area, the relative abundance of nine bird species accounts for 64.28%. Out of these nine top avian species, Ethiopian Boubou accounted for the highest relative abundance (13.64%), followed by Abyssinian Woodpecker (13.43%), but Dusky Turtle Dove had the least relative abundance (Figure 3).

Table 3: Sorensen similarity index (*S*) of bird species in different habitats during wet and dry season.

Habitats	Season	Common species	Similarity index
NF vs. RF vs. PL vs. ST	Wet	4	0.088
	Dry	7	0.147
NF vs. RF vs. PL	Wet	7	0.165
	Dry	13	0.325
NF vs. PL vs. ST	Wet	6	0.176
	Dry	8	0.239
RF vs. PL vs. ST	Wet	4	0.160
	Dry	7	0.241
NF vs. RF	Wet	22	0.686
	Dry	26	0.800
NF vs. PL	Wet	4	0.154
	Dry	11	0.423
NF vs. ST	Wet	9	0.316
	Dry	10	0.385
RF vs. PL	Wet	7	0.412
	Dry	12	0.558
RF vs. ST	Wet	5	0.256
	Dry	9	0.419
PL vs. ST	Wet	6	0.444
	Dry	8	0.533

NF: natural forest; RF: cliff/riverine forest; PL: plantation; ST: settlement.

Table 4: Habitat crass tabulation of bird abundance in wet and dry seasons.

	Habitat type				Total
	Plantation	Natural forest	Settlement	Cliff/riverine forest	
Season type					
Wet	151	977	279	418	1825
Dry	106	349	184	366	1005
Total	257	1326	463	784	2830

Table 5: Number of bird species between different habitat ordinal scale categories.

Habitat	Season	Ordinal scale (rank)		
		Common	Frequent	Uncommon
Natural forest	Wet	2 (1.1%)	7 (3.8%)	31 (16.8)
	Dry	—	16 (8.6%)	20 (10.8%)
Cliff/riverine forest	Wet	2 (1.1%)	11 (5.9%)	10 (5.4%)
	Dry	2 (1.1%)	11 (5.9%)	15 (8.1%)
Plantation	Wet	2 (1.1%)	8 (4.3%)	1 (0.5%)
	Dry	2 (1.1%)	13 (7.1%)	—
Settlement	Wet	1 (0.5%)	14 (7.6%)	2 (1.1%)
	Dry	2 (1.1%)	14 (7.6%)	1 (0.5%)

4. Discussion

To date, there has not been any study conducted on the species diversity, composition, and relative abundance of avian species in the study area. Among the recorded species, Abyssinia Woodpecker is an Endemic bird found only in Ethiopia; five species, Black-winged Lovebird, White-winged Cliff Chat, Rupel's Robin-Chat, Moorland Chat, and White-collared Pigeon are near endemic species shared Eritrea. Supported by [27] on a guide book of endemic birds in Ethiopia and Eritrea, documented Black-winged Lovebird, White-winged Cliff Chat, Rupel's Robin-Chat, Moorland Chat, and White-collared Pigeon bird species shared in Ethiopia and Eritrea highland. Hooded Vulture found in our study categorized under critically endangered status by IUCN [28]. The remaining bird species are resident recorded during our study.

The order Passeriformes is the most dominant order that contains 18 families and 37 species in the study area. Similarly, bird species under Passeriformes order are dominant in the other studies [20, 29–31]. Most bird species are recorded in the order Passeriformes due to the rapid

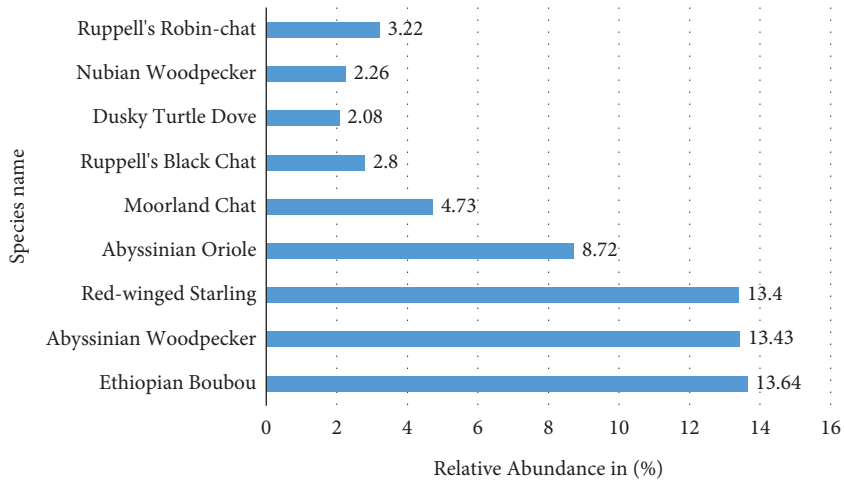

Figure 3: Nine bird species with higher relative (%) in the study area, with indication of the percentages for each species.

evolution of Passerine species and their adaptation to all terrestrial environments and the presence of a large number of species [32]. Alemu et al. [33] studied that most of the avian composition was recorded in the order of Musophagiformes in the Bahr Dar City report.

In our study, among the 61 species of birds recorded during the study period, the maximum abundance of 48 species was recorded in the wet season and 43 species of birds were recorded in the dry season. Bibby et al. [25] suggested that bird richness was higher during the wet season than during the dry season because of the increased availability of insects during the wet season. However, the present study contradicts the findings of [34] that bird species richness was the highest in all habitats during the dry season. Moreover, Genet and Ejigu [35] recorded 90 bird species in the wet and 96 in the dry season. In the present study, a high diversity and evenness of bird species was observed in the natural forest in both wet and dry seasons, probably due to the good availability of food, nesting sites, vegetation composition, and diving sites. A study supported by Tsegaye et al. [26], indicated that differences in species diversity, species abundance, and number of individuals among different species were associated with differences in habitat characteristics and feeding habits. In addition, Mola et al. [36] reported that the distribution and abundance of many bird species is determined by the vegetation structure. Shiferaw Yazezew, Yasin and Tekalign, Austin et al., Alemu et al., Tessfa et al., Genet and Ejigu, Mola et al., and Girma et al [30, 37] say that the lowest species richness and abundance were observed in forest habitats than in farms and settlements. According to their reasons, in natural forest in their study area, the vegetation composition is low; as a result, only specialist bird species live there. We found the second highest number of bird species recorded in the riverine forest. This is possible because there are different types of flora and fauna in the river basin forest, which are used as a habitat for different species of birds. On the contrary, in our study, the lowest bird species richness was recorded in settlement habitat. Similarly, according to the findings of [38], the lowest bird species diversity was recorded in settlements. The reason is that humans destroy forests and the habitats of wild animals in order to meet their needs and for housing. Moreover, Mengesha et al. [13] pointed out that land use and land cover influence the diversity and abundance of bird species in their study.

In this study, 80% species similarity between natural forest and riverine forest was observed in the dry season and 68.6% was observed in the wet season. This is possible because they are interspersed with similar plants, and may contain similar species of birds that share the same plants for habitat. This result is consistent with [26, 29], reported that animals in the same ecological condition were more similar to each other in terms of species richness and geographic structure than animals in different ecological conditions. In contrast, the least avian species were observed to be similar between natural forest and plantation. This is possible because they may not have shared species between the two habitats and may not have had the same type of flora as they occurred in different areas.

Most of the bird species in this study were found within the ordinal rank of uncommon. This is because the species may have a large home range and a high demand for the species due to the complexity of the flora [36, 39]. Similarly, Genet and Ejigu [35] reported the presence of more uncommon bird species in the Apin forest during the wet and dry seasons. The presence of a large number of rank "uncommon bird species" may be due to the breading nature and large home range of bird species [40]. On the other hand, the Ethiopian bubu, Abyssinian Woodpecker, red-winged starling, Abyssinian oriole, and moorland chat are relatively abundant compared to other bird species. This is due to the fact that the abundance of those species correlated with the availability of feeding, watering, and breeding grounds [41].

5. Conclusion

The result of this research has informed us the presence of a considerable number of species of birds in the area. Among them, the Abyssinian Woodpecker, an endemic species is

found only in Ethiopia. Due to habitat variation, bird species found in the four habitats are different. The Hooded Vulture is classified as one of the critically endangered species listed by the IUCN. Both bird species diversity and richness are high in natural forests; this may be due to the availability of sufficient food, living conditions, and nesting grounds.

Sixty one species of birds have been found, and it has been realized from the study that Debre Libanos monastery is important for the protection of species. However, it draws researchers' attention and tourists to establish eco-tourism activities that benefit the local community and assure it is protected sustainably; the effort made to protect the area and its wildlife is low. Therefore, better management strategies and conservation plans need to be in place. In addition, further ecological studies need to be conducted to understand which threats are affecting the ecology of birds and management strategies.

Data Availability

The data used for this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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