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Bird Species Count in Darawa Community Forest, Dutsin-Ma Local Government Area, Katsina State, Nigeria

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ABSTRACT

The abundance and diversity of bird species in the Darawa Community Forest in Dutsin-Ma Local Government Area, Katsina State, Nigeria were determined. The study area was divided into three according to the land use form, namely, Farmland, Forest land, and Riverbank. Bird watching was conducted in the morning and the evening. The survey was conducted between June and September 2019. Nine (9) species of birds were identified. The Yellow-Billed Oxpecker was the most diminutive, large species in the area. The diversity of bird species was determined using the Shannon and Simpson index. The abundance of bird species was high in the Farmland area; Bearded Barbet is the most numerous bird species. Indication of diversity was slightly higher in the Forest tree area (36.1), the Riverbank area (32.6), and the Farmland area (31.6). The study concluded that there are moderate species of birds in the study area.

Keywords: Abundance, bird species, community forest, diversity

INTRODUCTION

The birds, also known as Aves, are a group of endothermic vertebrates characterized by feathers, dense toothless teeth, hard-shelled eggs, high metabolic rate, four-chambered heart, and strong yet lightweight skeleton. Based on fossil evidence and biological evidence, many scientists accept that birds are a group of *Theropod-dinosaurs* and, particularly, members of the *Maniraptora*, a group of *Theropods* that includes *dromaeosaurs* and *oviraptorids*, among others (Watson et al., 2004). With the discovery of many scientists and more theropods closely related to birds, the previously clear distinction between non-birds and birds has blurred. Recent findings in northeast China's Liaoning Province, which demonstrate many small theropods feathered, contribute to this ambiguity (Turner et al., 2007).

Birds are a well-known vertebrate segment; they occur worldwide almost in all habitats and provide a wide range of services that benefit the human community (Whelan et al., 2016). For many ornithologists, birds are a vital resource because of the growing challenges and extensive resources used for quality conservation and wildlife habitat. Awareness of the need for wildlife conservation is spreading rapidly, but this needs to be transformed into a policy and decision-making and can be left fundamentally as research. This is because such decisions have not yielded the desired results for land use projects that threaten the very existence of biodiversity. One of the most exciting characteristics of biodiversity is that it is not distributed evenly. Each species has its unique list, which is determined by the interaction between existing natural conditions and the evolutionary

history of the species. The distribution of biodiversity is influenced by biological factors such as temperature, humidity, soil, the time of year and the amount of variation in climate and climate present. In addition to environmental factors, anthropogenic factors that alter ecosystems also influence the pattern of biological distribution. A particular species interacts with its nature in space and time (Jennifer, 2008). The bird community is not only stable but also flexible within the country on different scales of space and time and responds to various factors (Maron *et al.* 2005). Temporary rankings include the time of year or season, factors associated with climate change, resources, and life history, including breeding, migration, and employment (Jennifer, 2008).

The nature of the species, especially the feeders and the organization of the nest-building, also contributes to the transformation of the local community through its effects on the achievement of success and death of children or adults (Maron *et al.*, 2005). In space, the body's responses can be at a broader geographical level or the status of the habitat and grains within the selection of episodes (Hostetler 2001). The body responds to fine-grained patch formations at this low level for food purposes. A warm area of a closed road or roof can define a clip for house sparrows.

According to Labe *et al.* (2018), bird extinction and population decrease might affect society's most fundamental ecological processes. According to Anderson *et al.* (2006), when biodiversity such as forests and wetlands are eliminated, the functions of native birds frequently disappear as well. Loss of habitat, overexploitation and predators' expansion contribute to the decrease. Bird extinction is anticipated to continue soon if the issue of bird extinction is not remedied. Labe *et al.* (2018) highlighted the use of birds as a tool for environmental protection. Birds are excellent biological markers. They serve as good indicators of the condition of our biodiversity. When they begin to vanish, it indicates that something is missing with nature and that action is required. They are prepared for climatic changes such as pollution and air pollution. Birds can sense environmental factors that are not visible or detectable by human body characteristics. Mosquitoes, beetles, and stem borers are among the insects they consume. Consider the quantity of

these insects that can destroy our blood and ruin crops and forest trees and the birds that minimize the number of these insects (Ezealor, 2001).

Birds and forest flora have a strong bond; there are two profitable interactions through pollination and seed dispersion. Hummingbirds pollinate nectar-producing plants by carrying pollen from one blossom to the next using beaks and feathers. Some birds carry the fish's eggs on their legs, introducing various fish species to other parts of the river or wetland. Birds have a sound system that allows them to disperse plant seeds, making them propagation agents. Fruit is consumed, and plant seeds are swallowed. When people throw away their trash, the seeds are also thrown away. The seeds benefit from the sound reproduction of the birds' feathers (faeces) in the soil that falls on them.

The structure of the bird community varies around the world with different scales of space and time. These variations can be modified by a wide range of landscapes and local levels. The ecosystem also contributes to the occurrence and proliferation of the earth (Jennifer, 2008). Their patterns are closely related to environmental conditions (climate, habitat, and habitat) and human interventions that determine bird species diversity and abundance. Rodríguez-Estrella, (2007) explain that the loss of space is accelerated by urban migration that fragments habitat. Therefore, two processes, disintegration, and loss of nature, are interconnected and coincide. The habitat classification at the global level refers to the distribution of habitat fragments, not the total area and the ideal habitat concentrated in specific areas. The study sought a census of bird species in Darawa Community Forest, Dutsin-Ma Local Government Area, Katsina State to 1) determine the abundance of bird species, and 2) identify the variety of common bird species in the study area. The study hypothesized that 1) there is no significant difference in the abundance of bird species among the selected land uses and 2) there is no significant difference in the abundance of bird species between morning and evening observations.

MATERIALS AND METHODS

Study Area

Darawa community forest is located near the southern part of Darawa village in Dutsin-Ma

Local Government Area of Katsina State. It is located within the latitude of 12° 28' 30" N and a longitude of 7° 29' 27" E (Mapcarta, 2020). The climate is a local steppe climate. During the year, the rainfall is about 753 mm of precipitation which falls annually, and the rainfall pattern in the area varies greatly. This could lead to a widespread drought that could cause severe economic hardship. Annual temperatures range from 29°C to 31°C; in April and May, the highest and lowest temperatures are in December-February. Evapotranspiration is usually high throughout the year. The highest evaporation rate occurs during the dry season. The vegetation of the study site is the Sudan-Savanna type which includes features and species of both Guinea and Sahel Savanna (Tukur *et al.*, 2013).

The whole climate was divided into categories by Koppens classification as semi-arid, tropical wet, and dry weather. The patterns signify two main alternative seasons: the dry and rainy seasons. The rainy season is between April and September each year, sometimes fluctuating in terms of start and end. Dutsin-Ma falls beneath the Sudan savanna, characterized by a combination of trees and grasses. The most prominent tree species are usually the *Combretaceae* and *Cesalpinioideae*; other species of *Acacia* are also important. The most prominent grass species are the *Andropogoneae*, especially *Andropogon* and *Hyparrhenia*, in the shallow soil and *Loudetia* and *Aristida*. Much of the Sudan Savanna region is used in parkland, where valuable trees, such as shea butter, baobab, locust bean, and others, are saved from pruning. In contrast, sorghum, corn, maize, millet, or other crops are cultivated beneath.

Shepherds and ranchers use the Sudanese savanna. Cattle are mainly livestock, but camels are also kept in some areas, sheep, and goats. Large crops grew sorghum and sorghum with low rainfall. With increasing levels of drought since the 1970s, pastoral teachers have had to travel south to search for food and quarrel with established farmers. The independence of this region can be described as incorporating a relatively low plateau. The grounds are lined with vegetation outside of Granite rock known as Inselbergs. There are also low valleys or wide channels filled with sandy loads (Gabor *et al.*, 2014). Drainage containers are open local systems. The drainage basin is the

earth's crust that flows into a river and streams (river system), including table water and running water. All rivers are connected to many other small rivers called streams, known as river basins. The mighty river and all its rivers are known as the river basin. The main river and all the rivers you encounter form a pattern of the river system (Abaje, 2007).

The geology of the Dutsin-Ma region is primarily composed of low-lying, large metamorphic rocks. The oldest rocks are igneous species later transformed into metamorphic rocks due to heat and pressure. In some parts of the world, rocks have changed over time because of the weather and the effects of erosion. Rocks later led to the formation of granites and inselbergs similar to those found in the city centre of Dutsin-Ma.

Data Collection and Analysis

The reconnaissance survey was conducted in mid-May 2019, while the actual study was conducted from June to September 2019. Random sample locations representing each habitat type were selected based on a random sampling process. Depending on the grass structure, the study area was divided into three land-use forms, namely farms, forest trees, and the Darawa riverbank. The point count method by Sutherland *et al.* (2009), line transect method and linear search method were used for data collection. The transecting line of the agricultural field was used because the crops were planted in a line that made access and identification easier. Also, on the bank of the Darawa River, a linear bird search method has been used. This involved strolling along the riverbank (along the riverbank) and recording all the birds seen and found in and around the river. Birds of a feather on the roof were observed with the use of telescopes. Where the species cannot be directly identified in the field, information on the description of the species was recorded and identified (Richard *et al.*, 2010). A point count method was performed at a fixed point within a sample unit of 15 to 20 m at 5-10 minutes. A waiting period of 3-5 minutes was observed before the actual count to reduce the distortion during the count. The distance from which the birds occur was estimated, and the birds were identified as species and families. The species were observed using binoculars. A small length of 50-100 m was maintained at each counting station using GPS to

avoid double counting (Sutherland, 2009). Bird watching is done twice a day; morning between 6:00 to 10:00 am and evening between 4:00 to 6:30 pm with slow motion in sample locations. Birds were counted as sightings along the Riverbank, Farmland, and forest. A high-resolution binocular (10x46) was used to identify the birds' appearance and a field guide for "West African Birds" for bird identification. The Sony camera with a good zoom lens has been used to take pictures of birds.

All bird species encountered were recorded (their species, number, range of view (distance from observer) and location, and observation time also noted). The diversity of bird species was calculated using both indications for Simpson's diversity and the Shannon-Wiener diversity (Shannon and Weaver, 1948).

- A. (i) Simpson diversity index is expressed as:

$$D = \frac{\sum_{i=1}^q ni(ni - 1)}{N(N - 1)}$$

Where:

N= total number of individuals encountered

Ni = number of individuals of ith species enumerated for

i=1.....q

q = number of different species enumerated.

- (ii) Shannon-Wiener diversity index is expressed as:

$$H = -\sum_{i=1}^s pi \ln pi$$

Where:

pi = the proportion of individuals in the ith species

s = the total number of species

ln = natural logarithm

i = ith species

- B. Relative abundance has been measured for bird species using the formula below:

$$SRV = \frac{SA}{TA} \times 100$$

Where:

SRA = Species Relative abundance

SA = Species Abundance

TA = Total Abundance

Data were analyzed using analysis of variance (ANOVA), t-test, and the Duncan multiple range test. Software packages used include Microsoft Excel, Statistical Package for Social Science (SPSS) v. 16, and Paleontological Statistics (PAST) version 3. Data collected in the field were represented and summarized in tables.

RESULTS

Tables 1, 2, and 3 show the bird species found in the three land-use forms, farmland, riverbanks, and forest tree areas, respectively. Nine (9) species of birds were recorded in total. The identified bird species are divided into eight (8) families: Accipitridae, Ardeidae, Buphagidae, Columbidae, Corvidae, Lybiidae, Ploceidae, and Sturnidae. However, four species (Accipitridae, Columbidae, Ploceidae, and Sturnidae) are common. All eight families are very high on farms and at least on the riverbank.

Table 1: Species of birds found in Darawa farmland area

Family	Scientific Name	*Status	Common Name	Local name
Accipitridae	<i>Milvus aegyptius</i>	L.C	Yellow-billed Kite	Shaho
Ardeidae	<i>Bubulcus ibis</i>	L.C	Cattle Egret	Balbela
Buphagidae	<i>Buphagus africanus</i>	L.C	Yellow-billed Oxpecker	Charki
Columbidae	<i>Streptopelia senegalensis</i>	L.C	Laughing Dove	Kurchiya
"	<i>Columba guinea</i>	L.C	Speckled Pigeon	Hasbiya
Corvidae	<i>Corvus albus</i>	L.C	Pied Crow	Hankaka
Lybiidae	<i>Lybius dubius</i>	L.C	Bearded Barbet	Dodonduhuwa/Yautai
Ploceidae	<i>Bubalornis albirostris</i>	L.C	White-billed Buffalo Weaver	Chakwaikwaiwa
Sturnidae	<i>Lamprotornis pulcher</i>	L.C	Chestnut-Bellied Starling	Shaya

Source; Field Survey, 2019.

*LC: Least Concerned

Table 2: Species of birds observed on Darawa riverbank

Family	Scientific Name	Status	Common Name	Local name
Accipitridae	<i>Milvus aegyptius</i>	L.C	Yellow-billed Kite	Shaho
Ardeidae	<i>Bubulcus ibis</i>	L.C	Cattle Egret	Balbela
Lybiidae	<i>Bubalornis albirostris</i>	L.C	White-billed Buffalo Weaver	Chakwaikwaiwa
Stunidae	<i>Lamprotorni spulcher</i>	L.C	Chestnut-Bellied Starling	Shaya

Source; Field Survey, 2019.

Table 2: Species of birds found in Darawa forest tree

Family	Scientific Name	Status	Common Name	Local name
Accipitridae	<i>Milvus aegyptius</i>	L.C	Yellow-billed Kite	Shaho
Adeidae	<i>Bubulcus ibis</i>	L.C	Cattle Egret	Balbela
Buphagidae	<i>Buphagus africanus</i>	L.C	Yellow-billed Oxpecker	Charki
Columbidae	<i>Streptopelia senegalensis</i>	L.C	Laughing Dove	Kurchiya
Lybiidae	<i>Lybius dubius</i>	L.C	Bearded Barbet	Dodonduhuwa/Yautai
Sturnidae	<i>Lamprotornis pulcher</i>	L.C	Chestnut-Bellied Starling	Shaya

Source: Field Survey, 2019.

Table 4 shows that the bearded barbet has the highest percentage of forest area (36.1%), followed by the riverbank (32.26%), and the least

recorded was for farms (31.6). Cattle egret, red crow, and white buffalo have the highest percentage (54.5%, 54.0%, and 53.1%) on the

farmland, followed by the riverbank area of 45.5%, 45.9%, and 46.9%, respectively. The results also show that chestnut-bellied starling, laughing dove, and yellow Oxpecker have the highest percentage at 50.2%, 51.2%, and 50.2% on the farmland, followed by the forest area at 49.8%,

48.8%, and 49.8% respectively. The yellow kite was found to record the highest percentage of forest trees (37.7%), followed by the Farm (34.7%) and at least on the riverbank (27.6%). A portion of spackle pigeons was found in the forest area (51.7%), followed by the Farm (48.3%).

Table 4: Bird's species count at study area

SN	Birds	Farm land (%)	Forest trees (%)	River bank (%)	Total
1	Bearded Barbet	871 (31.6)	995 (36.1)	887 (32.6)	2753
2	Cattle egret	1068 (54.5)		890 (45.5)	1958
3	Chestnut-bellied starling	956 (50.2)	449 (49.8)		1905
4	Laughing dove	1038(51.2)	989 (48.8)		2027
5	Pied crow	942 (54.0)		801 (45.9)	1743
6	Speckle Pigeon	819 (48.3)	877 (51.7)		1696
7	White billed buffalo	916 (53.1)		808 (46.9)	1724
8	Yellow billed kite	593 (34.7)	644 (37.7)	473 (27.7)	1710
9	Yellow billed Oxpecker	660 (50.2)	656 (49.8)		1316
	Total	7863 (46.7)	4610 (27.4)	3859 (22.9)	16832

Source: Field Survey, 2019.

Table 5 shows the bird species observed in the morning and the months of data collection. It shows that 52.2% were observed in the morning program while 47.8% were observed and counted

in the evening. The highest number of bird species was observed in August (28.9%), followed by July (27.8%) and September (24.4%), and the smallest number was recorded in June (19.0%).

Table 5: Birds Species count based on periods and months of observations

SN	Birds	Birds count		Months				Total
		M	E	June	July	Aug	Sept	
1	Bearded Barbet	1372	1381	611	608	776	758	2753
2	Cattle egret	983	975	390	538	553	477	1958
3	Chestnut bellied S.	948	957	358	591	478	478	1905
4	Laughing dove	1066	960	312	554	666	495	2027
5	Pied crow	926	816	340	532	472	399	1743
6	Speckle Pigeon	880	816	306	450	518	422	1696
7	White billed buffalo	977	747	311	540	500	373	1724
8	Yellow billed kite	936	774	320	519	476	395	1710
9	Yellow billed O.	691	625	251	341	421	303	1316
	Total	8779	8051	3199	4673	4860	4100	16832
		(52.2)	(47.8)	(19.0)	(27.8)	(28.9)	(24.4)	

Source: Field Survey, 2019.

M = morning, E = evening

Table 6 shows that the most abundant bird species in farmland is the bearded barbet, and the least is the bright yellow Oxpecker. The bearded barbet has a considerable mass in the Forest of the Forest, and the bright yellow Oxpecker is a very small

abundance. The bearded barbet is the most abundant bird at the riverbank, while the Yellow Oxpecker is charged the least. The bearded barbet is the most abundant bird in perfect habitats, while the paid Oxpecker is the least abundant bird.

Table 6: The abundance of bird species in the Darawa Forest of Dutsin-Ma

SN	Birds	Farmland		Forest trees		Riverbank		Total	
		N	RA ₁	N	RA ₂	N	RA ₃	N	RA _T
1	Bearded Barbet	846	0.141	945	0.159	862	0.176	2753	0.164
2	Cattle egret	770	0.128	596	0.100	592	0.121	1958	0.116
3	Chestnut bellied starling	678	0.113	674	0.113	553	0.113	1905	0.113
4	Laughing dove	725	0.121	767	0.129	535	0.109	2027	0.120
5	Pied crow	601	0.100	685	0.115	457	0.093	1743	0.104
6	Speckle Pigeon	577	0.096	636	0.107	483	0.099	1696	0.101
7	White billed buffalo	649	0.108	534	0.090	541	0.111	1724	0.102
8	Yellow billed kite	593	0.099	644	0.108	473	0.097	1710	0.102
9	Yellow billed Oxpecker	459	0.077	459	0.077	398	0.081	1316	0.078
	Total	5998	1.000	5940	1.000	4894	1.000	16832	1.000

N = number of species observed, RA = Relative Abundance, 1 = Farm, 2 = Forest, 3 = River

In Table 7, the diversity index H reveals that the disparities between viewing areas are comparable. In contrast, the dominance index is the same in all regions and total is 0.88. It may be inferred that there is relative diversity within the diversity of viewpoints, which appears to be significantly more

on the Farm and in the Forest than on the Riverbank. As 1.00 neared, the rate of domination was relatively high (0.88). This indicates the abundance of bird species in the Darawa forest region within the Dutsin-Ma Local Government.

Table 7: Diversity of bird species in Darawa community Forest, Dutsinma

SN	Birds	Farmland		Forest trees		Riverbank		Total	
		H	D	H	D	H	D	H	D
1	Bearded Barbet	-0.29	0.02	-0.29	0.03	-0.31	0.03	-0.30	0.03
2	Cattle egret	-0.26	0.02	-0.23	0.01	-0.26	0.01	-0.25	0.01
3	Chestnut bellied starling	-0.25	0.01	-0.25	0.01	-0.25	0.01	-0.25	0.01
4	Laughing dove	-0.26	0.01	-0.26	0.02	-0.24	0.01	-0.26	0.01
5	Pied crow	-0.23	0.01	-0.25	0.01	-0.22	0.01	-0.24	0.01
6	Speckle Pigeon	-0.23	0.01	-0.24	0.01	-0.23	0.01	-0.23	0.01
7	White billed buffalo	-0.24	0.01	-0.22	0.01	-0.24	0.01	-0.23	0.01
8	Yellow billed kite	-0.23	0.01	-0.24	0.01	-0.23	0.01	-0.23	0.01
9	Yellow billed Oxpecker	-0.20	0.01	-0.20	0.01	-0.20	0.01	-0.20	0.01
	Total	2.18	0.88	2.18	0.88	2.17	0.88	2.18	0.88

Where H = Shannon Weiner's Index and D = Dominance (Simpson's Index)

In Table 8, differences in bird species abundance between farmland and forest trees are presented. It shows that the mean and standard deviation of the average bird on the farmland is 4.55 and 2.59, and for Forest trees, 4.63 and 2.56. The number of birds on the farmland is slightly higher than in the Forest trees. The t-calculated is 1.60 at the degree

of freedom of 11936, the alpha is 0.05, and the p-value is 0.11. Since the p-value is greater than the alpha value, null hypothesis 1 was accepted. Therefore, there is no significant difference in the abundance of birds between farmland and the Forest trees in the Darawa forest.

Table 8: Differences in the abundance of birds between farmland and forest trees

Area	N	Mean	Std. Dev.	t-cal	Df	p-value	Alpha
Farm land	5998	4.55	2.59	1.60	11936	0.11	0.05
Forest tree	5940	4.63	2.56				

From Table 9, the mean and standard deviation of the bird on the farmland is 4.55 and 2.59, and on the riverbank is 4.53 and 2.64. The number of birds on the Farmland is slightly higher than those on the riverbank. The t-calculated is rated at 0.34 at the degree of freedom of 10890, the alpha of

0.05, and the p-value is 0.69. Since the p-value is greater than the alpha value, null hypothesis 2 is accepted. Therefore, there is no significant difference in the abundance of birds between farmland and the river banks in the Darawa forest.

Table 9: Difference in abundance of birds between farmland and riverbank

Area	N	Mean	Std. Dev.	t-cal	Df	p-value	Alpha
Farm land	5998	4.55	2.59	0.34	10890	0.69	0.05
River bank	4894	4.53	2.64				

From Table 8, the mean and standard deviation of birds on the riverbank are 4.53 and 2.64, while for Forest trees, 4.63 and 2.56. There is little difference between the number of birds on the Riverbanks and those of the Forest trees. The t-calculated is 1.90 at the degree of freedom of

10832, alpha of 0.05, and a p-value of 0.06. Since the p-value is greater than the alpha value, null hypothesis 3 is accepted. Therefore, there is no significant difference between the abundance of birds on the Riverbanks and the Forest trees in the study area.

Table 10: The difference in the abundance of birds between riverbank and forest trees

Area	N	Mean	Std. Dev.	t-cal	Df	p-value	Alpha
River bank	4894	4.53	2.64	1.90	10832	0.06	0.05
Forest tree	5940	4.63	2.56				

From Table 11, the mean and standard deviations of the birds recorded in the morning are 4.66 and 2.59, and those recorded in the evening are 4.48 and 2.60. There is a difference between the number of birds recorded in the morning and those recorded in the evening. The t-calculated is 4.49 at the degree of freedom of 16828, the alpha is 0.05,

and the p-value is 0.00. Since the p-value is less than the alpha value, null hypothesis 4 is rejected. Thus, there is a significant difference between the numbers of birds recorded in the morning compared with those recorded in the evening in the Darawa forest.

Table 11: Difference in the abundance of birds between morning and evening observations

Observations	N	Mean	Stddev	t-cal	Df	p-value	Alpha
Morning	8779	4.66	2.59	4.49	16828	0.00	0.05
Evening	8051	4.48	2.60				

DISCUSSION

The Bearded barbet is a versatile bird that may be unaffected by human pressure, and it is of great size and difficult to catch. At the same time, the Yellow-billed Oxpecker is the minor abundance bird (with 1316 observations) as the species are straightforward to be trapped. This can be attributed to its great need for medicinal use and easily trapped bird. There are moderate variations between areas; a higher diversity was recorded in

the Farm area (with 5998 observations) and the Forest trees (with 5940 observations) than in the area on the riverbank (with 4894 observations). This can result from the availability of food materials in the farmland and forest trees than on the riverbank. Variations are reportedly high in the afternoon on the riverbank where they drink water. The prevalence rate is high (0.88) to about 1.00, which means there is moderate diversity of bird species in the Darawa forest. Therefore, there is no

significant difference between the abundance of birds on the farmland and the Forest trees in the Darawa forest. Comparing the number of bird species in the sparsely populated areas shows no significant difference between the Farm area and the riverbank in the Darawa forest. This indicates no significant difference compared to the riverbank with the abundance of birds in the agricultural area.

In addition, there is no significant difference between the abundance of birds on the banks of the River and Forest trees in the Darawa forest. These findings show that although the number of birds in the forested area is high, there is no significant difference compared to the riverbank. However, significant differences have been noted between the abundance of birds recorded in the morning and those recorded in the evening in the Darawa forest. A statistical study of bird species conducted at Darawa Community Forest found that the bearded barbet is the most abundant bird species. This may be related to its incredible power and smartness to escape being hunted by the locals. At the same time, the Yellow-billed Oxpecker is a victim of hunting due to its medicinal use.

These findings are consistent with that of Naka (2012), who reported a very high diversity of bird species and birds recorded in the Entoto Natural Park and Escapement Forest habitats in Addis Ababa. The species diversity and evenness increased in forests (with 8340 observations) and farmland (7432 observations). This shows that both habitats are essential for bird conservation as they provide the necessary services such as food, water, nesting, and breeding grounds. The species may be up in the afternoon on the riverbank where the birds drink water. The dominance value is high (0.88), which means the excellent diversity of bird species in the Darawa forest. These findings contradict Mollon (2010), which argues a need for rivers and bird sanctuaries in the Sudan-Saharan region. Recent discoveries are consistent with Okagbare (2018); it has been found that there is an indication of the equitable availability of habitat for food, coverage, composing, and more among species of birds crossing the wetlands. The diversity was negatively associated with the size of the wetlands.

The study found no significant difference between the number of birds on the Farm and the Forest trees in the Darawa forest. This means that a

higher number of birds used to be present in both places (in fields and forest trees) in hypothesis one. However, the hypothesis states no significant difference between the abundance of birds on the riverbank and the Forest trees in the Darawa forest. This has clearly shown that although plenty of birds is in the forest canopy, there is no difference from the riverbank. While the three hypotheses point out that there is no significant difference between the abundance of birds on the riverbank and the Forest trees in the Darawa forest. This clearly showed no significant difference from the riverbank despite the abundance of birds in the forest trees. And that there is a considerable difference between the numbers of birds recorded in the morning compared with those recorded in the evening in the Darawa forest. The number of birds in the morning may be related to the fact that the birds are still out of their nest.

CONCLUSION

The study concluded that there are moderate species of birds in the Darawa community forest due to the unavailability of food in the forestland and trees and water along the riverbank. At the same time, the species of forest trees contribute to the abundance of bird species. Forest, particularly, that of irregular shelterwood, necessitates regulating several timeframes throughout a terrain. Foresters and land managers may ensure that a stand contains a diversified and plentiful bird population throughout a depauperate development phase by keeping different heritage stand structures.

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