Bird Species Diversity in the Surrounding Communities of Zugurma Sector, Kainji Lake National Park, Nigeria

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Abstract

Birds play a crucial role in maintaining the equilibrium of ecosystems by providing numerous services. The study investigated the quantity, composition, distribution, and variety of birds in the Zugurma sector of Kainji Lake National Park in Nigeria. The neighbouring communities of the study area, namely Patiko (Site A), Nasarawa (Site B), and Wara (Site C), were examined between September 2018 and February 2019. The assessment of bird species was conducted using line transects. The Paleontological statistics package (PAST 2.17) was utilised for data analysis. A total of 69 avian species belonging to 33 distinct families and ten different Orders were identified. The most prominent and plentiful bird species observed were Pyconontus barbatus, commonly known as the Common bulbul, accounting for 178 individuals (5.32%); *Apus apus*, also known as the Common swift, with 122 individuals (3.64%); and *Streptoplia vinacea*, commonly referred to as the Vinaceous dove, with an unspecified number of individuals. The Shannon-Weiner Diversity Index revealed that Nassarawa (Site B) exhibited the highest bird diversity (3.851), followed by Wara (Site C) with a diversity index of 3.827. In contrast, Patiko (Site A) had the lowest bird diversity, with a score of 3.781. The overall diversity indexes were high. Therefore, a proposed program to periodically tag local bird species is suggested to monitor and record their movements. Regularly, it is important to conduct public education and awareness initiatives properly.

Keywords: Diversity, composition, line transect, bird species, distribution, community

Introduction

Birds are one of the best-known fauna species in the world (tropics). They are ecologically highly diverse and occupy a wide range of habitats. They have been used frequently to indicate biodiversity and environmental changes in the ecosystem (Clements, 2007). Over the years, birds have demonstrated their usefulness as indicators of biodiversity and environmental changes signifying ecological succession (Birdlife International, 2000; Gibbons *et al.*, 2007). They can be used to predict the distribution and conservation status of other wildlife; thus, any land area with diverse and abundant bird life is likely to be a rich, healthy ecosystem (Ezealor, 2002). Birds have also been acknowledged to have high educational value (Bibby *et al.*, 2000) due to their ability to thrive and move around in a wide variety of environments. A bird's reproduction is unusual. It reproduces by laying eggs. Birds develop from embryos in eggs outside the mother's body. All birds are covered with feathers, collectively called plumage, which is the outer layer of the skin. All birds possess beaks, a distinctive character

that facilitates immediate recognition. The bird's beak varies greatly in form and function but is always toothless and covered with a horny sheath. Birds are feathered flying machines, and the entire bird body is structured for flight (Clements, 2007). Birds form an integral part of the ecosystem. According to Birdlife International (2000), there are about 10,000 different bird species and about 200-400 billion individual birds in the world. It has been observed that developing management strategies for the conservation of wildlife species as well as the inventory of both fauna and flora resources to ensure proper monitoring required the knowledge of the population, abundance, distribution and movement of the species concerned (Kwaga *et al*., 2018).

Furthermore, wildlife inventory and evaluation aim to provide reliable information for management plans in order to guide the policy makers (park conservators) on how best to conserve the fauna and flora resources of the protected area and its environs for the present and future generations. This research study intends to encourage biodiversity conservation and management activities and provide baseline information for subsequent research work in the study area. Therefore, the objectives of the study are to determine the abundance, distribution, composition and diversity of bird species in surrounding communities of the Zugurma sector, Kainji Lake National Park, Nigeria.

Materials and Methods

Kainji Lake National Park (KLNP) covers a total area of 5,340.83 km2. It is made up of two non-contiguous sectors; the Borgu sector covers 3,970.83 $km^{2,}$ while the Zugurma sector covers 1,370 km^2 (Aremu *et al*., 2007). It lies approximately between latitudes 9^0 4^0'N and 10^0 3^0'N and longitudes 3^0 3^0'E and 5^0 5^0'E (Ezealor, 2002). The vegetation has been described as Northern Guinea Savanna. Zugurma sector lies between Borgu and Mashegu Local Government Areas of Niger State to the East

of the Lake. The mean annual rainfall varies from 1,100 mm to 1,150 mm in the Park. The mean (minimum and maximum) annual temperature is between 12oC and 37oC, while the average relative humidity is 53%. The study area is blessed with diverse flora and fauna resources.

A purposive stratified random sampling technique was used to select the actual communities for sampling due to the closeness and insecurity challenges around the National Park. The selected communities for this bird survey were Patiko (Site A), Nassarawa (Site B) and Wara (Site C). The Line transect was used for the study as outlined by (Bibby *et al*., 2000; Osunsina *et al.*, 2017). This census involved an observer moving slowly along the routes and recording all birds detected on either side of the route. The survey was carried out for six (6) months. Each line transect was visited twice weekly, in the Morning (6.00 am – 8.00 am) and evening (5.00 pm – 7.00 pm), by walking slowly along transects and making observations. All birds observed were identified to species level, counted and recorded in a field notebook, with the aid of a pair of binoculars (7x50) magnification and a field guide, Borrow and Demey (2014). Data was analysed using the Paleontological statistical package

Results and Discussion

Bird species composition and abundance in the surrounding communities of the Zugurma sector, Kainji Lake National Park, Nigeria, is represented in Table 1. A total of 69 bird species belonging to 33 families with 10 orders were encountered. This finding is similar to Orimaye *et al.* (2018), who recorded 40 bird species in a study of Avifauna Species Diversity and Distribution in Akure Forest Reserve. Irokanulo *et al*. (2010) also recorded 37 families in the Borgu Local Government Area of Niger State but far from Ekeke and

Stopford (1984) recorded 41families with 234 bird species in Federal College of Wildlife Management, New Bussa, Niger State and Ezealor (2002) had 41 families with 350 bird's species in Borgu sector, Kainji Lake National Park. Also, in some studies conducted by Lameed (2011) and Adang *et al*. (2015) at Dagon-waterfowl, Yobe state and Dadin kowa, Gombe state recorded 135birds species belonging to 40families and 60birds species belonging to 27families. However, Ezealor (2002) observed that a site of diverse and abundant bird life is likely to be healthy and rich in other forms of life. Also, the degrees of abundance vary with the availability of food, cover, and nesting materials, which encourages the bird population. The highest number of individual bird species were found in the following families "Columbidae" with six bird species, followed by "Cuculidae" with five bird species, then "Accipitridae" and "Sylividae" with 4 bird species respectively, while the least families were "Falconidae" "Turdidae", "Hurundidae", "Leiothridae", "Pyconotidae". "Viduadae", "Salponithidae", "Phylloscopidae"," Bupagidae", "Zosteriapidae", and "Apodidae" with a single bird species, respectively as in Table 1. The highest number of individual birds were found in Patiko (Site A) with 1195 (35.68%), followed by Nassarawa (Site B) with 1139 (34.01%), and while the least number of individual birds were sighted in Wara (Site C) with 1015 (30.31%) in Table 1. In addition (Table 1), the following bird's species were the most conspicuous and most abundant species which are *Pyconontus barbatus* (Common bulbul) with 178 (5.32%), followed by *Apus apus* (Common swift) with 122 (3.64%) , then *Streptoplia vinacea* (Vinaceous dove) with 120 (3.58%) and *Dendropicos goertae* (Grey woodpecker) with 110 (3.28%). The last and rarest bird species include *Treron calvus* (African green pigeon) with 5 (0.15%), *Kaupifalco monogrammicus* (Lizard buzzard) with 4 (0.12%) and *Platysteiria cyanea* (Common wattle eye) with 3 (0.09%).

Table 1: Birds Species Composition and Abundance in Surrounding Communities in Zugurma Sector, Kainji Lake National Park, Nigeria.

		COMMUNITIES				
ORDER	FAMILY	SCIENTIFIC NAME (COMMON NAME)	SITE A (n)	SITE B (n)	SITE C (n)	TOTAL (FREQ. %)
Bucerotiformes	Bucerotidae	*Lophoceros nasutus* (African grey hornbill)	20	35	23	78 (2.33)
		Tochus erthroryhnchus (Red billed hornbill)	27	7	2	36 (1.07)
Columbiformes	Columbidae	*Treron calvus* (African green pigeon)	2	0	3	5 (0.15)
		Streptopilia decipens (African mourning dove)	32	30	29	91 (2.72)
		Streptopilia senegalensi (Laughing dove)	39	35	26	100 (2.99)
		Streptopelia semitorquata (Red eyed dove)	0	2	5	7 (0.21)
		Columba guinea (Speckled pigeon)	23	13	29	65 (1.94)
		Streptoplia vinacea	79	20	21	120 (3.58)

		(Vinaceous dove)				
Coraciformes	Coraciidae	*Coracias abyssinicus* (Abyssinian roller)	7	3	1	11 (0.33)
		Coracias naevius (Rufous crowned roller)	2	4	3	9 (0.27)
Cuculiformes	Cuculidae	*Cuculus gularis* (African cuckoo)	0	8	3	11 (0.33)
		Chrysococcyx cupreus (African emerald cuckoo)	5	8	3	16 (0.48)
		Clamator lvaillantii (Leveillants cuckoo)	5	8	3	16 (0.48)
		Cuculus solitarius (Red chested cuckoo)	8	15	3	26 (0.78)
		Centropus senegalensis (Senegal coucal)	29	30	27	86 (2.57)
Falconiformes	Accipitridae	*Accipiter tachiro* (African goshawk)	8	6	2	16 (0.48)
		Milvus migrans (Yellow billed kite)	25	13	8	46 (1.37)
		Butastur rufipennis (Grasshopper buzzard)	4	2	8	I4 (0.42)
		Kaupifalco monogrammicus (Lizard buzzard)	3	1	0	4 (0.12)
	Falconidae	*Falco biamicus* (Lanner falcon)	5	3	0	8 (0.24)
Galliformes	Phasianidae	*Francolinus bicalcaratus* (Double spurred francolin)	25	12	21	58 (1.73)
Musophagiformes	Musophagidae	*Musophaga violacea* (Violet turaco)	5	29	5	39 (1.64)
		Crinifer piscator (Western grey plantain eater)	8	6	24	38 (1.13)
Nectariformes	Nectariniidae	*Cnnyris pulchella* (Beautiful sunbird)	38	23	20	81 (2.42)
		Cinnyris cupreus (Copper sunbird)	23	28	34	85 (2.54)
		Cinnnyris venustus (Variable sunbird)	35	20	21	76 (2.27)
Passeriformes	Muscicapidae	*Tersiphone viridis* (African paradise flycatcher)	5	13	14	32 (0.96)
		Melaenornis odoloides	14	8	22	44 (1.31)

	(Northern black flycatcher)				
	Ficedula hypoleuca (Pied flycatcher)	8	35	23	66 (1.97)
Motacilidae	*Motacilla aguimp* (African pied wagtail)	23	11	28	62 (1.85)
	Motacilla flava (Yellow wagtail)	6	7	2	15 (0.45)
Turdidae	*Turdus pelios* (African thrush)	29	38	20	87 (2.60)
Hirunidae	*Riparia paludicola* (Plain martin)	28	15	18	61 (1.82)
Estrilidae	*Lagonosticta rufopicta* (Bar breasted fire finich)	23	5	8	36 (1.07)
	Spermestes cucullatus (Bronze manikin)	25	30	45	100 (2.99)
	Amadina fasciata (Cut throat finch)	0	23	6	29 (0.87)
Sylvidae	*Cisticla eximius* (Black backed cisticola)	20	2	8	30 (0.90)
	Sylvia atricappilla (Blackcap babbler)	43	34	23	100 (2.99)
	Prinia subflava (Tawny flanked prinia)	9	19	4	32 (0.96)
Plocidae	*Ploceus nigricollis* (Black necked weaver)	25	15	18	58 (1.73)
	Euplectes hardeaceus (Black winged bishop)	8	4	9	21 (0.63)
	Euplectes franciscanus (Northern red bishop)	14	23	5	42 (1.25)
Meropidae	*Merops persicus* (Blue cheeked bee eater)	25	29	12	66 (1.97)
	Merops nubicus (Northern carmnie bee eater)	14	28	34	76 (2.27)
	Merops bulocki (Red throated bee eater)	4	21	25	50 (1.49)
Leiothrichidae	*Turdoides plebejus* (Brown babbler)	7	30	12	49 (1.46)
Pyconotidae	*Pyconontus barbatus* (Common bulbul)	28	65	85	178 (5.32)
Platysteiridae	*Platysteiria cyanea* (Common wattle eye)	2	1	0	3 (0.09)
Sturnidae	*Lamprotornis chalbeus* (Greater blue eared starling)	11	14	2	27 (0.81)

		Lamprotornis caudatus (Long tailed glossy starling)	42	15	22	79 (2.36)
	Lannidae	*Lanus isabellinus* (Isabelline shrike)	14	7	21	42 (1,25)
		Corvinella corvina (Yellow billed shrike)	25	45	22	92 (2.75)
	Corvidae	*Corvus alba* (Pied crow)	0	5	4	9 (0.27)
		Ptilostomus afer (Piapiac)	45	23	20	88 (2.63)
	Vidudae	*Vidua macrora* (Pin tailed whydah)	41	5	23	69 (2.06)
	Fringillidae	*Serinus gularis* (Streaky healed seed eater)	6	14	25	45 (1.34)
		Serinus mozambicus (Yellow fronted canary)	2	0	7	9 (0.27)
	Phylloscopidae	*Phylloscopus trochillus* (Willow warbler)	63	22	14	99 (2.96)
	Buphagidae	*Buphagus africanus* (Yellow billed oxpecker)	15	14	20	49 (1.46)
Piciformes	Lybidae	*Lybius dubius* (Bearded barbet)	4	28	5	37 (1.10)
		Buccanidon duchaillui (Veilots barber)	4	8	7	19 (0.57)
	Picidae	*Dendropicos fuscescens* (Cardinal woodpecker)	9	26	27	62 (1.85)
		Dendropicos goertae (Grey woodpecker)	35	56	19	110 (3.28)
	Indicatoridae	*Indicator indicator* (Greater honeyguide)	4	5	7	16 (0.48)
	Apopidae	*Apus apus* (Common swift)	58	41	23	122 (3.64)
TOTAL			1195	1139	1015	3349 (100)
FREQ. (%)			35.68	34.01	30.31	100

KEY: n =Number of individual species; Site A= Patiko; Site B= Nassarawa; Site C= Wara; Freq= Frequency; %= Percentage

Diversity indices of bird species in surrounding communities in the study area were summarised in Table 2. Bird species varied from 61 to 64 while bird species frequency or occurrences ranged from 1015 to 1195 individual bird species. Dominance lies between 0.025 to 0.028. Simpson diversity index (0.970) was the same in all three communities, indicating a very high Simpson diversity index in all communities, as reported by Beal *et al*. (2000). Shannon-Wiener diversity index ranges between 3.781 to 3.851, which is very high as compared to the standard value (3.500 to

4.000) and in line with Kangah-kesse *et al*., (2008) evenness index varied from 0.720 to 0.741. The studies at Abbiriw sacred Groove in Eastern Ghana higher the species evenness index, the more (4.46) and its surrounding cultivated area (3.36) species are proportionally distributed and vice- for Shannon-Wiener diversity index. The species versa.

Table 2: Diversity indices of bird species in surrounding communities in the study area.

PARAMETERS	COMMUNITIES SITE A	SITE B	SITE C
Number of Species (Taxa)	61	63	62
Number of individuals	1195	1139	1015
Dominance_D	0.028	0.025	0.027
Simpson diversity index_ 1-D	0.970	0.970	0.970
Shannon -Wiener diversity index_ H	3.781	3.851	3.827
Species Evenness_e^H/S	0.720	0.730	0.741

Site A= Patiko; Site B= Nassarawa; Site C= Wara

Conclusion and Recommendation

Birds are vital indicators of a degraded environment, and their absence spells doom in an ecosystem. The benefits of maintaining populations of bird species cannot be overemphasised; their diversity is likely to supply valuable services for surrounding communities, including pollination, seed dispersal, and pest control. It was observed that there was great similarity in composition, distribution and diversity of bird species populations in the study area. All diversity indices parameters were very high and encouraging. Consequently, natural and artificial factors (human encroachments, socio-cultural problems and socio-economic development) must have contributed to the slight reduction of biodiversity level in the study area. The following recommendations are proposed to safeguard bird species population and composition: human factors should be minimised, public enlightenment awareness programs should be encouraged, and bird protection clubs should be created

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