



## SPECIES DIVERSITY OF DRY SEASON AVIAN FAUNA IN KANO, NIGERIA

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### ABSTRACT

*The avian fauna in Nigeria and the rest of West Africa is fairly rich, especially during the rainy season when most of the birds are breeding. However, the frequency of species encounter in the field changes as the dry season progresses. The present study examined the diversity of birds during the three dry months following the rains, i.e., November 2016-January 2017, using point count protocol in four partially protected sites, namely, Bayero University Old Campus, Bayero University Kano New Campus, Audu Bako Zoological Garden and Aminu Kano Teaching Hospital. Checklist records show that 42 individual species belonged to 23 families. Most of these species were common to three of the four study sites, and a few, such as Squacco Heron, Ardeola ralloides, were encountered only at Kano Zoo, a small patch of wetland that contrasts with the other drier sites. The Shannon Diversity Index was highest at the Zoological garden site, 2.76. The Piapiac, Ptilostomis afer was peculiar to Aminu Kano Teaching Hospital. Regression analysis showed no influence of months on the frequency of birds seen. However, the Zoological garden in particular, had significant effect on frequencies of birds ( $P < 0.05$ ).*

**Key Words:** Avian, Birds, Diversity, Kano, Nigeria.

### INTRODUCTION

The general purpose of most avian field studies is to estimate how many species of a given taxon or group of taxa occur in an area. Initially, many species are found as larger areas were sampled and a plot of accumulated number of area sampled rises steeply at first and then move slowly as the increasingly rare species were added. The general characteristic of ecological communities is that the number of species accumulates with increasing area sampled (Mark, 2007).

The present study sought to assemble information on frequencies, checklist, and diversity of species of birds from four partial refuge sites in the general Kano area of northern Nigeria during the early dry season, in contrast to most other investigations that are done during the rains which coincides with the breeding season.

### MATERIALS AND METHODS

#### Study Area

The area around Kano (12° 00'N; 8°13'E; 481MSL; 980 mm Annual Precipitation) is described as Sudanian Savanna that stretches into the Sahel in the north. The city records on average of about 980 mm of precipitation per year, much of which falls from June through

September. Kano is typically very hot throughout the year, though from December through February, the city is noticeably cooler. Night-time temperatures are cool during the months of December, January and February, with average low temperatures 11 to 15 °C (52 to 59 °F).

#### STUDY SITES

The research was conducted in four study sites, namely, Bayero University Kano, (BUK) Old Campus (11°59'N; 8°28'E); BUK New Campus (11°58'N; 8°27'E); Audu Bako Zoological Garden (11°58'N; 8°31'E); and Aminu Kano Teaching Hospital (11°57'N; 8°32'E). These sites are shown in Figure 1.

Bayero University Kano New Campus was characterized with minimal disturbances in scattered cultivation and it's typically grassland savannah. Also this study site has relatively largest size in contrast to the others. Bayero University Kano Old Campus on the other hand has the high level of physical development and high diversity of exotic trees. There is also much disturbance. Aminu Kano Teaching Hospital is smaller in size than both Bayero University Kano New Campus and Bayero University Kano Old Campus but larger than Audu Bako Zoological Garden.

Also in contrast, it has a large of pool of water and some patches of undisturbed vegetation. Audu Bako Zoological Garden is the smallest in size when compared to the remaining sites, but

its major outstanding difference from the other sites is possession of many smaller patches of heavily wooded areas.

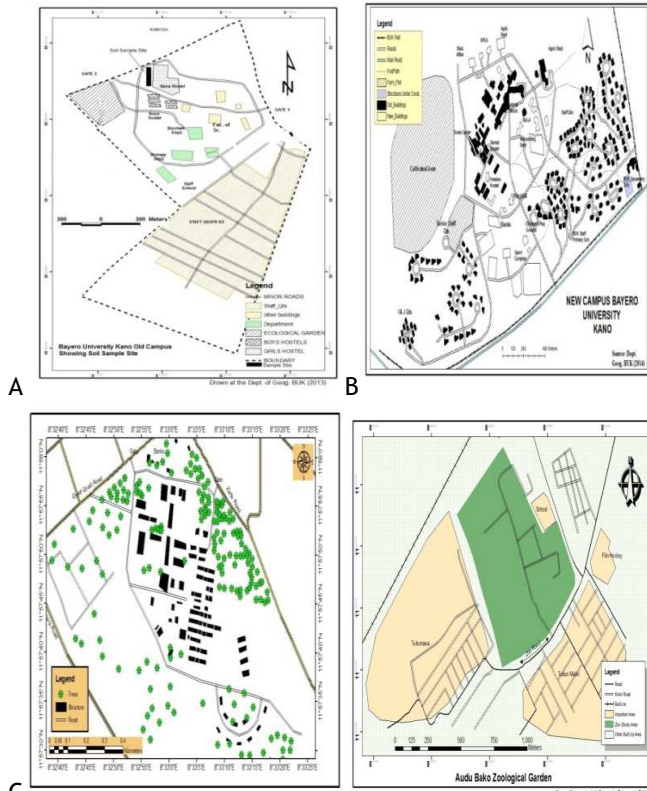


Figure 1. Maps of the four study sites: BUK Old Campus; BUK New Campus; Audu Bako Zoological Garden; Aminu Kano Teaching Hospital.

**Sample Collection**

Each study site was divided into several grids, each measuring 150m x 150m (22500m<sup>2</sup>). Sample size was determined, and study plots (sampling stations) were selected randomly. BUK Old Campus 30 sampling stations were selected. The same procedure was applied for selecting grids in the remaining study sites, namely, BUK New Campus (46), Audu Bako Zoological Garden (14) and Aminu Kano Teaching Hospital (22). The number of these stations selected reflects relative size of accessible area in each site. Simple Point Count Protocol was used. Observer would walk from one end of the grid to another, pausing every 25m to scan the area, both left and right, and record all birds noticed up to 100m away. Binocular were used whenever necessary. In all four study sites, count starts early in the mornings, from 6:30am to noon every day until all the sampling stations and the sampling points were visited. Each study site, sampling station and sampling point was visited once per

month, starting from November 2016 to January 2017. Birds were identified using field guidebook of West African birds (Nik and Ron, 2014).

**Statistical analysis**

Shannon Weiner and Simpson’s diversity indices were used to calculate bird diversity in the study sites. Also ANOVA was done to compare the effect of the sites and months on the birds population.

**RESULTS AND DISCUSSION**

Overall checklist of Birds from four study sites are shown in Table 1. Site with a check mark indicate sighting of the named species. About 25% of the species, including, Crested Lark, *Gelarida cristata* and Common Bulbul, *Pynonotus barbatus* were seen in all the four sites studied. The African Grey Hornbill, *Torchus nasustus* was unique to the BUK New Campus. Similarly, the Yellow-billed Ox-pecker, *Buphagus africanus*, was found only in Kano Zoo.

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The overall checklist of birds had 42 individual species belonging to 23 families most of which were found in the New Campus except very few of which were only found at the Zoo, e.g., Scauoco Heron (*Ardeola ralloides*), Common Quail (*Cotomix cotomix*) and Common Moorhen (*Gallinula chloropus*). One species, Paipiac, *Ptilostomis afer* was seen only at Aminu Kano Teaching Hospital.

The frequency of birds for all the four sites showed the species with highest frequency to include, *Streptopelia senegalensis*, 75.6; *Ptilomis afer*, 41.8; *Myrmococichla aethiops*, 26.22; and *Turdoides plejebus*, 18.33. Regression results for the influence of months on frequencies

was insignificant. However, for the site effect on frequencies, the result was significant ( $F = 7.76$ ;  $P < 0.05$ ). Contributing to frequencies of birds seen, the coefficients of values showed no monthly effect, and amongst site, only the New Campus had a significant effect ( $P < 0.05$ ) on frequencies seen.

Diversity Index was computed for all sites. For Shannon-Weiner Index, the values range from 1 to 5, with five being the highest value. However, for the Simpson index, 1 is the highest value. Both indices are given in Tables 2.

Table 1. Overall checklist in all four study sites. AKTH - Aminu Kano Teaching Hospital; BUK O.C - Bayero University Kano Old Campus; BUK N.C - Bayero University Kano New Campus ; Zoo KN - Audu Bako Zoological Park Kano

Cumulative	BUK Old camp.	BUK New camp.	Zoo Kano	AKTH
Shannon H	2.36	2.59	2.76	2.29
Simpson D	0.14	0.12	0.08	0.17

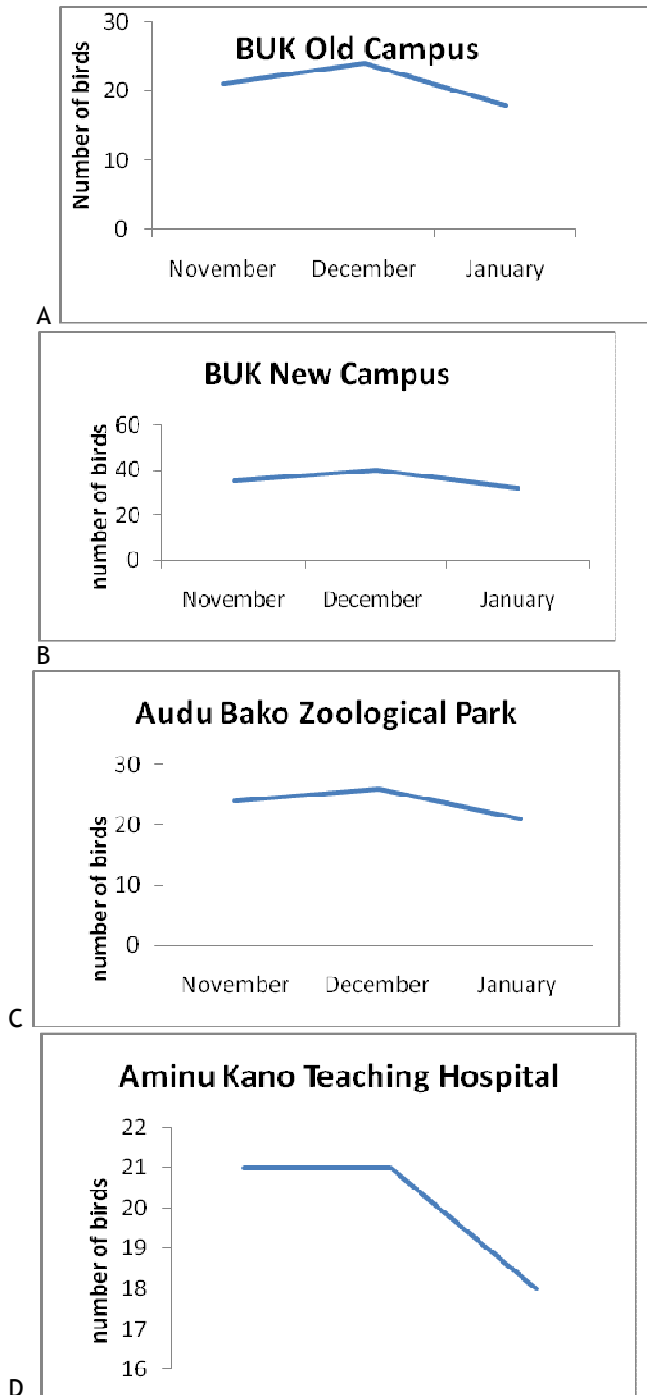
Table 2. Shannon Weiner and Simpson diversity indices in different sampling sites recorded in November, December, 2016, and January. 2017.

Scientific Name	Family Name	BUK O.C	BUK N.C	Zoo KN	AKTH
<i>Ploceus melanocephalus</i>	Ploceidae	02	06	03	02
<i>Ploceus baglafecht</i>	Ploceidae	01	05	-	-
<i>Cotomix cotomix</i>	Ploceidae	-	04	20	-
<i>Ardeola ralloides</i>	Ardeidae	-	-	10	-
<i>Ardeaola intermedia</i>	Ardeidae	07	09	49	23
<i>Bulbulcus ibis</i>	Ardeidae	01	04	-	03
<i>Gallinula chloropus</i>	Rallidae	-	-	03	-
<i>Vorellus tactus</i>	Charadiidae	13	14	01	-
<i>Streptopelia senegalensis</i>	Columbidae	194	427	106	180
<i>Streptopelia decipiens</i>	Columbidae	05	07	32	-
<i>Columba guinea</i>	Columbidae	-	04	-	09
<i>Crinifer piscator</i>	Musophagidae	31	58	33	23
<i>Centropus senegalensis</i>	Coculidae	-	04	08	03
<i>Coracias abyssinicus</i>	Coraciidae	01	02	-	03
<i>Torchus erythrorhynchus</i>	Bucerotidae	20	48	23	14
<i>Torchus nasustus</i>	Bucerotidae	-	01	-	-
<i>Pogonorus dubius</i>	Lybiidae	-	01	-	-
<i>Gelarida cristata</i>	Laudidade	05	16	01	04
<i>Pynonotus barbatus</i>	Pycnonotidae	10	22	06	12
<i>Myrmecocichla aethiops</i>	Muscicapidae	70	197	10	37
<i>Euodice centans</i>	Muscicapidae	-	02	-	-
<i>Turdoides plejebus</i>	Leiothricludae	35	105	51	29
<i>Corvinella corvine</i>	Lagnidae	06	28	06	08
<i>Laniarius barbarous</i>	Malaconitidae	13	31	21	01
<i>Laniarius erythrogaster</i>	Malaconitidae	02	09	01	-
<i>Ptilostomis afer</i>	Corvidae	-	-	-	05
<i>Corbus albus</i>	Corvidae	-	01	02	10
<i>Lamproturmis chloropterus</i>	Sturnidae	-	37	01	-
<i>Lamproturmis caudatus</i>	Sturnidae	36	70	54	20
<i>Lamproturmis pulcher</i>	Sturnidae	145	306	39	68
<i>Buphagus africanus</i>	Buphagidae	-	-	05	-
<i>Lagonistica rufopicata</i>	Estrildidadae	03	18	-	-
<i>Lagonistica senegala</i>	Estrildidadae	24	30	01	06
<i>Lagonistica rubricate</i>	Estrildidadae	04	15	-	-
<i>Lagonistica rara</i>	Estrildidadae	12	18	-	01
<i>Vidua chalybeats</i>	Vidudae	03	19	-	-
<i>Chalictinia riocorri</i>	Accipitidae	08	25	01	-
<i>Milvus migranus</i>	Accipitidae	-	02	35	-
<i>Milvus aegyptius</i>	Accipitidae	-	-	07	-
<i>Tyrannus tyrannus</i>	Tyrannidae	29	42	19	33
<i>Phoeniculus purpureus</i>	Phoeiculidae	-	48	04	-
<i>Psittacara holochlorus</i>	Psittacudae	-	14	01	01

General Linear Model ANOVA showing the effects of months and site on the frequencies

of species recorded where sites (0.000) showed no effect. However, time (months) has shown significance effect on the population (0.447).

Fig2. Species accumulation curves for all sites are shown in Figures 2a-d. Each site shows the increasing number of species as more sampling points were added.



The Zoological garden had the highest Shanon diversity index value of  $H = 2.76$  seen in Table 2, perhaps due to the nature of the site, which had large plant cover, providing birds with shelter and food. There was also water everywhere in this particular site, thus giving

rise to the emergence of some unique species like Squaco Heron, Common Moorhen and Common quail. This agrees with results in Lameed (2012) and Eddy and Leo (2010), where they attribute the avian diversity to the nature of vegetation and availability of water.

The BUK New Campus had the second highest Shannon diversity index value of 2.59. Almost all species of birds found in the remaining three study sites were also seen at BUK New Campus. The BUK New Campus was second most diverse probably due to its vast land mass with cultivated farmlands that attract more birds. From the checklist in Table 1, only five species of the overall species seen were missing from the BUK New Campus. The site also had forest characteristics, and this makes it possible for many species of birds to thrive there (Mark, 2007). The two other sites, i.e. BUK Old Campus and Aminu Kano Teaching Hospital had low species diversity compared to BUK New Campus and Audu Bako Zoological Garden, attributed to the sparse number of trees and many built-up structures which took more than two-third of the site's areas, and this also agrees with the work done by Pierre (1995), where he notes that urbanization affects the population of birds negatively.

That regression analysis showed no significant effect of months on bird frequencies was not a surprise, as the months were not far apart, but site effect was significant ( $F = 7.76$ ;  $P < 0.05$ ), as noted for the positive peculiarities of the Zoo and BUK New Campus. This showed that the

larger sites, vegetation cover and water might support the possibility of higher number of individuals and species. This has also been reported by David *et.al*, (2015). Pyre (1995) attributes the decline in the population of birds to the increase in human population, and this was noticed in the study sites located in the metropolitan area, i.e., like Aminu Kano Teaching Hospital and BUK Old Campus.

#### CONCLUSION

Thus, it was evident that BUK New Campus has the highest number of individual species which is probably due to its vast land mass. The least was Aminu Kano Teaching Hospital and this may be because the site had more buildings than trees. From finding of this research and other related works it is clear that vegetation and land mass play important roles in the diversity and distribution of avian species.

#### Recommendations

It is recommended that: Policies should be enacted, enforced and implemented by the government regarding endangering ecosystems and its biotic components. Also more refuge sites should be created so as to enable birds come and lives freely.

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