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## Diversity and abundance of birds in the Savannah Woodlands of Gashaka-Gumti National Park, Taraba State, Nigeria

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### ABSTRACT

*This study assessed the diversity and abundance of species of birds in the savannah woodlands of Gashaka-Gumti National Park (GGNP) that is Bodel and Mayo-Selbe range using the "Time Species Count (TSC)" method. A total of 35 bird families and 96 species were recorded at both sites. 66 species in 29 bird families at Bodel and 73 species in 31 bird families at Mayo-Selbe were recorded respectively. There was significant difference in species diversity within bird families between the two sites ( $p < 0.05$ ) because of good breeding sites at Mayo-Selbe which include a wide variety of resources, high productivity and moderate levels of predation compare to Bodel. This study was carried out to enhance conservation; however the development of subsistence farming, tree cutting, and firewood collection should be restricted in the savannah woodlands areas.*

**Key words:** Birds, diversity, abundance, savannah woodlands, Gashaka-Gumti, National Park.

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### INTRODUCTION

A bird is an animal that belongs to the Class Aves. Birds are a diverse group of vertebrates that evolved from reptiles during the Mesozoic Era about 150 million years ago. Their bright colors, distinct songs and calls, and showy displays add enjoyment to our lives [1]. Bird can be broadly defined as a warm blooded egg-laying vertebrate distinguished by the possession of feathers, wings, and a beak (typically) by being able to fly. They are very popular to many who pursue wildlife watching and monitoring activities [2]. Birds are often common denizens of the ecosystems and they have been considered as an indicator species of inhabited areas [3]. Studies showed that depressed abundance of various bird species in most parts of the world today especially in urban areas are of particular concern as many cities are growing rapidly both in area and in population [4,5]. Population of birds is a sensitive indicator of pollution in both terrestrial and aquatic ecosystem [6,7]. The estimation of local densities of Avifauna helps to understand the abundance of various species of other organisms [8].

Birds in their diversity constitute part of the natural environment and play functional roles such as agents of flower pollination and seed dispersal, sources of food chain and agents in breaking seed dormancy [9]. As described by Nason [9] birds are highly specialized flying machines, and their ability to fly allows them to cover a wide range in search of food and escape predators easily. Estimates of bird's abundance are widely used in bird conservation. For

example, they allow us to measure changes in population size [10] and to assess whether isolated populations are workable [11]. Information on population sizes of individual species can also be used to set priorities, allowing conservation effort to be focused on those species most in need of attention [12]. Birds usually select foraging habitats based on the availability of their main prey items and understanding habitat preferences provides critical information for species conservation [13].

According to GGNP Handbook [14], Royal Society for the Protection of Birds (RSPB), recognized the Park as an Important Bird Area (IBA) in Africa and associated Islands with more than 500 species. Also, A Guide Book written by Dunn [15] provided an explicit provisional list of birds found precisely in the Savannah Woodlands. Hence, baseline information on the status of diversity and abundance of birds is important for conservation management and educational purposes.

## MATERIALS AND METHODS

### Description of the Study Area

Gashaka-Gumti National Park is located in the remote mountainous region of north-eastern Nigeria, between the boundaries of Adamawa and Taraba State (Figure 1). Geographically, the park lies between latitudes  $6^{\circ} 55' - 8^{\circ} 13' N$  and longitudes  $11^{\circ} - 13^{\circ} - 12^{\circ} E$  with an estimated landmass of 6,731 square kilometers of undulating terrain and deep rolling valleys. Ecologically, the park is situated in the sub-Sahara Guinea Savannah Zone of Africa, in the sub-Tropical Zone of the south-eastern highlands of the savannah area of Nigeria, south of the Benue River. The park is the main watershed/catchment area of the Taraba State River, the major tributary of the Benue River. It also shares international boundary with the Republic of Cameroon, adjacent to Faro National Park in that country. Immediately to the south of the park is the awe-inspiring Mambilla Plateau [14].

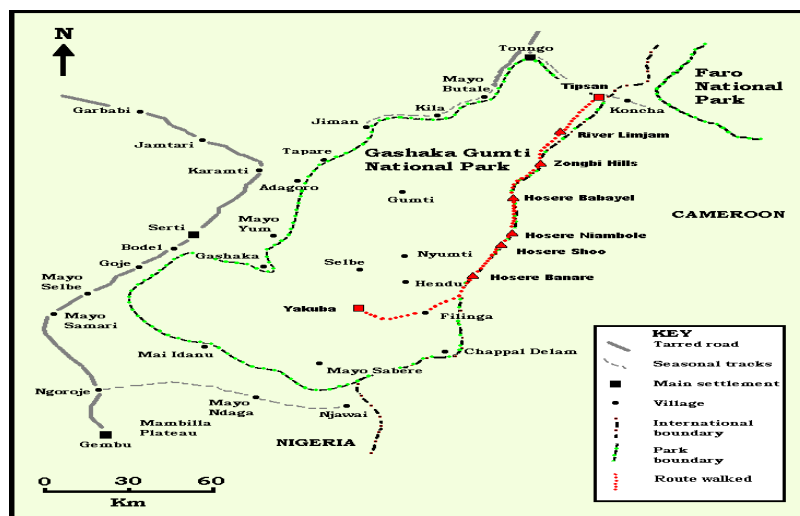


Figure 1: Location of study area at GGNP

### Bird Survey

The "Timed Species Count (TSC)" method developed by Pomeroy and Tengecho [16] was used for assessing the diversity and abundance of species of birds in the study sites. Two vantage positions (in areas where bird activity was greatest) were used for the observation of birds. As outlined by Robertson and Liley [17], TSC data were recorded in six columns, corresponding to six 10-minutes intervals during a survey that lasted for one hour. Birding was carried out at a slow pace at about  $1-2 \text{ km h}^{-1}$ . For the first 10-minutes, all species encountered were recorded in the first column. Only the names of species but not the number of individuals was recorded on the data form. For the second 10-minutes period, any species not already recorded was recorded in the second column. The remainder of the hour was also divided into 10-minutes periods and any species recorded for the first time during any 10-minutes period was recorded in the appropriate column, such that every species recorded during the hour was written down only once, in the column representing the 10-minutes period during which it was first seen. Distant birds were viewed for identification purposes with the aid of a pair of  $8 \times 30\text{mm}$  binocular. Identification and nomenclature of

birds followed Borrow and Demey [18]. In analyzing the results, each species was given a score depending on the 10 minutes period in which it was first recorded. Species recorded in the first ten minutes was given a score of six (6), species first recorded in the second ten minutes a score of five (5), and so on. Species recorded in the final ten minutes was given a score of one (1). If a species was not recorded from a survey, then it had a score of zero (0) for that survey. An index of the relative abundance of species recorded from repeated survey was calculated as the mean of scores from each survey, and therefore varies between a maximum value of six (6) and a minimum value of 1/n (where n is the number of repeated survey). Each TSC episode began between 07:00 – 07:30am or 16:30 – 17:00p.m. Additionally, the number of times a species was encountered during the TSC, or incidentally after the TSC was recorded on a separate data sheet.

## RESULTS

Table 1 compares the total count of bird species encountered at the two sites.

**Table 1: Comparative total count of species of birds at Bodel and Mayo-Selbe**

FAMILY-Species	Number counted	
	Bodel	Mayo-Selbe
PLOCEIDAE-Weavers		
Yellow mantled widow bird <i>Euplectes macrourus</i>	8	3
Village weaver <i>Ploceus cucullatus</i>	90	165
Red bellied malimbe <i>Malimbus erythrogaster</i>	2	1
Little weaver <i>Ploceus luteolus</i>	20	-
Crested malimbe <i>Malimbus malimbicus</i>	4	2
Marsh widowbird <i>Euplectes hartlaubi</i>	-	3
Red headed malimbe <i>Malimbus rubricollis</i>	-	3
RALLIDAE- rails, flufftails, crakes and gallinules		
Black crane <i>Amauromis flavirostris</i>	1	-
ESTRILDIDAE- estrildid finches		
Bronze manikin <i>Lonchura cucullata</i>	53	29
Red-cheeked cordon bleu <i>Uraeginthus bengalus</i>	7	10
Orange-cheeked waxbill <i>Estrilda melpoda</i>	6	5
Red-billed firefinch <i>Lagonosticta senegala</i>	2	3
Southern cordon bleu <i>Uraeginthus angolensis</i>	-	5
MUSOPHAGIDAE- turacos		
Eastern grey plantain eater <i>Crinifer zonurus</i>	11	10
Ross's turaco <i>Musophaga rossae</i>	1	-
MONARCHIDAE – monarchs		
Northern black fly catcher <i>Melaenornis edolioides</i>	3	-
White bellied crested flycatcher <i>Elminia albiventris</i>	-	4
Collared flycatcher <i>Ficedula albicollis</i>	-	3
São Tomé paradise flycatcher <i>Terpsiphone atrochalybeia</i>	-	50
African blue flycatcher <i>Elminia longicauda</i>	-	1
MALACONOTIDAE- bush-shrikes		
Tropical boubou <i>Laniarius aethiopicus</i>	2	-
Marsh tchagra <i>Antichromus minutus</i>	3	2
Mountain sooty boubou <i>Laniarius poensis</i>	-	4
PYCNONOTIDAE-bulbuls		
Common bulbul <i>Pycnonotus barbatus</i>	27	48
Honeyguidegreenbul <i>Baeopogon indicator</i>	2	-
Cameroon olive greenbul <i>Phyllastrephus poensis</i>	-	2
CUCULIDAE – cuckoos and coucals		
Senegal coucal <i>Centropus senegalensis</i>	8	2
Jacobin cuckoo <i>Oxylophus jacobinus</i>	3	-
NECTARINIIDAE – sunbirds		
Copper sunbird <i>Cinnyris cupreus</i>	15	10
Green throated sunbird <i>Chalcomitra rubescens</i>	11	-
Variable sunbird <i>Cinnyris venustus</i>	18	5
Tiny sunbird <i>Cinnyris minullus</i>	6	8
Pygmy sunbird <i>Hedydipna platura</i>	2	14
Green sunbird <i>Arthreptes rectirostris</i>	-	9
Purple – banded sunbird <i>Cinnyris bifasciatus</i>	-	1
COLUMBIDAE- Pigeons and Doves		
Red-eyed dove <i>Streptopelia semitorquata</i>	10	12
Vinaceous dove <i>Streptopelia vinacea</i>	8	4
Laughing dove <i>Streptopelia senegalensis</i>	11	8

African moaning dove <i>Sreptopelia decipiens</i>	2	0
African green pigeon <i>Treron calva</i>	-	1
VIDUIDAE – indigobirds and whydahs		
Pin-tailed whydah <i>Vidua macroura</i>	26	32
Village indigobird <i>Vidua chalybeate</i>	13	3
Exclamatory paradise whydah <i>Vidua interjecta</i>	-	24
Cameroon indigobird <i>Vidua camerunensis</i>	-	1
SYLVIIDAE – warblers		
Greater swamp warbler <i>Acrocephalus rufescens</i>	9	8
Blackcap <i>Silvia atricapilla</i>	1	-
African yellow warbler <i>Chloropeta natalensis</i>	4	5
Black throated apalis <i>Apalis nigriceps</i>	3	-
Whistling cisticola <i>Cisticola lateralis</i>	-	2
Garden warbler <i>Sylvia borin</i>	-	6
Sardinian warbler <i>Sylvia melanocephala</i>	-	4
ACCIPITRIDAE – Vultures, Eagles and Hawks		
Black kite <i>Milvus migrans</i>	5	3
Palm nutvulture <i>Gypohierax angolensis</i>	6	5
Common buzzard <i>Buteo buteo</i>	2	-
Lizard buzzard <i>Kaupifalco monogrammicus</i>	3	-
Black shoulder kite <i>Elanus aeruleus</i>	3	8
Crowned Eagle <i>Stephanoaetus coronatus</i>	1	2
Long crested eagle <i>Lophaetus occipitalis</i>	2	1
Red-tailed buzzard <i>Buteo auguralis</i>	1	3
African harrier hawk <i>Polyboriodes typus</i>	-	1
Hen harrier <i>Circus cyaneus</i>	-	2
HIRUNDINIDAE – swallows and martins		
Common house martin <i>Delichon urbica</i>	20	20
African river martin <i>Pseudochelidon eurystomina</i>	-	8
Square tailed sawing <i>Psaldoprocne nitens</i>	-	3
CORVIDAE – crows		
Piapiac <i>Ptilostomus afer</i>	26	20
Pied crow <i>Corvus albus</i>	6	5
SAGITTARIIDAE – secretary bird		
Secretary bird <i>Sagittarius serpentarius</i>	3	-
INDICATORIDAE- honeyguides		
Greater honeyguide <i>Indicator indicator</i>	11	5
Wahlberg's honeybird <i>Prodotiscus regulus</i>	2	-
PHASIANIDAE – quails, partridges and francolins		
Ahanta francolin <i>Francolinus achantensis</i>	5	4
Scaly francolin <i>Francolinus squamatus</i>	5	3
DICRURIDAE – drongos		
Fork-tailed drongos <i>Dicrurus adsimilis</i>	7	-
CORACIIDAE- rollers		
Abyssinian roller <i>Coracias abyssinicus</i>	5	7
PSITTACIDAE – parrots and lovebirds		
Senegal parrot <i>Poicephalus senegalus</i>	3	-
Red-headed lovebird <i>Agapornis pullarius</i>	2	-
ARDEIDAE – Herons, Egrets and Bitterns		
Black heron <i>Egretta ardesiaca</i>	3	-
Cattle egret <i>Bubulcus ibis</i>	24	30
Great egret <i>Egretta alba</i>	8	-
NUMIDIDAE- Guineafowls		
Helmeted guineafowl <i>Numida meleagris</i>	4	1
STURNIDAE – Starlings		
Lesser blue-eared starling <i>Lamprotornis chloropterus</i>	2	-
Purple glossy starling <i>Lamprotornis purpureus</i>	-	1
PHOENICULIDAE – Wood hoopoes		
Green wood- hoopoe <i>Phoeniculus purpureus</i>	5	1
LANIIDAE – true shrikes		
Yellow billed shrike <i>Corvinella corvina</i>	10	2
Lesser grey shrike <i>Lanius minor</i>	-	4
ALCEDINIDAE – kingfishers		
Giant kingfisher <i>Megaceryle maxima</i>	2	-
Woodland kingfisher <i>Halcyon senegalensis</i>	-	3
MUSCICAPIDAE – flycatchers		
African duskyflycatcher <i>Muscicapa adusta</i>	2	6
APODIDAE – swifts		
African palm swifts <i>Cypsiurus parvus</i>	20	80
Horus swift <i>Apus horus</i>	-	80

FRINGILLIDAE- True finches		
Yellow fronted canary <i>Serinus mozambicus</i>	-	9
COLIIDAE – Mousebirds		
Speckle mousebird <i>Colius straitus</i>	-	10
PASSERIDAE – sparrows		
Nother grey- headed sparrow <i>Passer griseus</i>	-	2
TIMALIIDAE – babblers		
African hillbabler <i>Pseudoalcippe abyssinica</i>	-	20
STRIGIDAE – typical owls		
Little owl <i>Athenoetua</i>	-	1
PICIDAE – woodpeckers and allies		
Little green woodpecker <i>Campetheramaculosa</i>	-	1

A total of 35 bird families and 96 species were recorded at both sites that is Bodel and Mayo-Selbe

**Table 2.** Compares the diversity of this vertebrate class of family, and species levels

Taxonomic Class	Bodel		Mayo-Selbe	
	Family	Species	Family	Species
Aves	29	66	31	71

66 species in 29 bird families were recorded at Bodel, while 73 species in 31 bird families were recorded at Mayo-Selbe (Table 2). There was significance difference in species diversity within bird families between the two sides ( $p < 0.05$ ; Mann-Whitney U-Test).

Note:  $n_1=29$ ,  $n_2=31$ ,  $R_1=895$  and  $R_2=935$ .

## DISCUSSION

A total of 35 bird families and 96 species were recorded at both sites Bodel and Mayo-Selbe sites. 66 species in 29 bird families were recorded at Bodel, while 73 species in 31 bird families were recorded at Mayo-Selbe. This indicates that the savannah woodlands of GGNP attract diverse numbers of bird species for conservation. According to Bibby *et al.* [19] bird's conspicuousness can vary with observer, weather, and time of the day. Hence Mayo-Selbe had a high diversity and abundance of bird species as a result of its good breeding sites, compared to Bodel. Factors that promoted the high diversity include a wide variety of resources, high productivity and moderate levels of predation [20]. But one of the most important factor observed in Bodel is the moderate levels of disturbances from outside the community, and the presence of an arboretum which influenced high population of members of some families of bird species like Estrildidae (estrildid finches) such as *Lonchura cucullata* (bronze mannikin), Nectariniidae (Sunbirds) such as *Cinnyris venustus* and *Cinnyris cupreus* (variable sunbird and copper sunbird respectively), and Ploceidae (weavers) such as *Ploceus luteolus* and *Ploceus cucullatus* (little weaver and village weaver respectively). This may be because of the different plant species precisely their fruits, seeds, leaves and grasses, some insects and maggots in the arboretum. The arboretum serves as a suitable feeding, nesting and breeding habitats for the birds. Ezealor [21] reported that Nigeria has about 910 species of birds in 90 families. According to GGNP Handbook, [14], BirdLife International and Royal Society for the Protection of Birds (RSPB) the park is recognized as an Important Bird Area (IBA) in Africa and associated Islands with more than 500 bird species. According to Dunn [15] visiting bird watchers constantly add new species to the list. This study agrees with the report of David *et al.* [22] who reported diversity of bird species and conservation of two lacustrine wetlands of the Upper Benue Basin, Adamawa-Nigeria in which 163 species in 53 bird families were recorded at Kiri lake, while 160 species in 55 bird families were recorded at Gyawana lake.

## CONCLUSION

Savannah woodlands of GGNP are capable of sustaining a large population of bird species types if human interference is curtailed. None of the birds recorded in the area is of global conservation significance. There is need to conserve natural savannah woodlands of Gashaka-Gumti National Park (GGNP) in its naturalness.

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