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Original Research Article

Diversity and Abundance of Avian Species in Old Oyo National Park Southwest Nigeria

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Abstract

Abundance and Diversity of avian species were studied in Old Oyo National Park Nigeria. The study area was divided into two ranges based on their different vegetation types. Point count method was used to collect data on bird species diversity and abundance in the two ranges. Counting bands of the 50m radius were used for all the stations. The minimum distance between two counting stations was 200 m. In all 30 counting station were used, 15 stations per a study range were used. On arrival at the sites, birds were allowed time to settle before recording all the birds seen or heard for a predetermined time, (usually, 20 minutes). Bird calls were also recorded with a voice recorder and played back later for confirmation. Physical features of birds sighted but could not be identified immediately were taken and field guide book of West African birds was used to identify the bird species and bird calls was used to confirmed the presence of nocturnal bird species within the study sites. Data was collected for six months with three months in the dry season (November, February and March) and three months in the wet season (June, August, and September) in 2015. A total of 149 bird species belonging to 52 families and 20 orders were recorded in the study area. The Order passerformes had the highest frequency (51 %) of the entire number of birds recorded, while the dominant family was Pycnonotidae, comprising (10 %) of the total species One endangered bird species, Crested Guinea Fowl (Guttera pucherani) was encountered inYemosho Range. The relative abundance of bird species was higher in Yemosho range (34.5 and 26.2) than in Maguba range 31.5 and 24.7) in both seasons of the year.

Keywords: Avian species, Diversity and conservation, Habitat fragmentation, Home range

INTRODUCTION

Habitat, including shelter and food supplies, determines the density of species and for that reason serves as the foundation for the conservation of several species (Martin, 1987). The exotic forest 1`there are roughly two tropical counterparts (Begon *et al.*, 2001). On the 902 threatened birds that use forests, 93% take place totally in the tropics (BirdLife International, 2000). Very much the same, tropical forests support the highest quantity of endemic birds' areas and are home to the best range-restricted bird types on the planet (Fahrig, 2003; Stattersfield *et al*., 1998). Just like the world's other tropical and sub-tropical parts, sub- Saharan Africa has a higher species diversity (over 2,300 bird varieties, which constitute about 20% of the world's total), a higher proportion (408 bird species) which are endemic to the continent (BirdLife International 2000; Brooks *et al.*, 2001).

Although some information abounds on biodiversity, our knowledge still remains highly imperfect and biased (Groombridge, 1992; UNEP, 1995). Most information is designed for terrestrial temperate areas with very good

fewer data from other areas of the world, especially from tropical Africa and other exotic parts of the world. (Stattersfield *et al.*, 1998). Substantial attention has been aimed towards bird inhabitant, sparked by matter over reported declines of types on a worldwide size (Robbins *et al.*, 1989). A lot of this attention is focused on bird-habitat-relationships, way more with the increasing data (Balmford *et al.*, 2001) that regions of fantastic conservation importance may coincide with regions of dense population settlement deal or impact, although Hurlbert (2004) argued that human being requirements on bio-diverse areas do not need to be because varieties richness and agricultural output show opposing human relationships with primary output. Therefore, the results of centers of types richness being associated with individual payout and impact demands priority-setting studies targeted at figuring out the near-minimum group of areas with the capacity of representing all kinds (Balmford *et al.*, 2001).

Southwestern Nigeria, from the point of view of biodiversity, however, is the spot of high population densities, and both guarded areas and unprotected forests (community forests) have been through transformations credited to powerful agricultural land-use in the name of development within the last 50 years (Agbelusi, 1994; Oates 1995). For this good reason, there exists immediate need to catalog natural background data in this area and attempt some biodiversity research, conservation activities, and initiate lasting ecotourism jobs. Nigerian Environmental Examination (2002) reported that increased export needs for primates, other mammals, and parrots for bushmeat and against the law timber and non-timber deals are the primary factors behind biodiversity loss in this area of the united states. Agricultural intensification, logging, and poaching within and 4 around Old Oyo Countrywide Area and Kainji Lake Countrywide Playground (KLNP) have led to a sharp decrease of primate, non-primate mammals, and avian types' populations. This suggested study will look at the remaining magnitude of biodiversity that continues to be obvious in these important parks in southwestern Nigeria and realizes some disruption factors and other ecological factors that condition the style of biodiversity, and also lay out some advice for conservation actions to the community authorities and local governments. The objectives of this study were to determine the effect of diversity and abundance of avian community, to obtain a checklist of avian species in the study area and to generate data that will provide baseline information necessary for conservation action

MATERIALS AND METHOD

Study Area

Old Oyo National Park (OONP) was carved out of the former Upper Ogun river game reserve and the Old Oyo forest reserve established in 1936. It is bordered in the North by Kwara State, in the South by Ikoyi while in the western part is bordered by towns such as Igbope and Sepeteri. OONP lies between latitudes 8˚10´ and 9˚05˙N and between longitudes 3˚35’ and 4˚ 20˙E. The park covers a land area of approximately 251,200 ha making it the fourth largest park in Nigeria. (Mengistu, and Salami,2007).

Vegetation of the Park has been classified as Southern Guinea Savanna. However, more studies classified the Southern portion of the vegetation as Forest savanna Mosaic with wooded savanna containing a relic of the moist semi-deciduous forest, grading northwards into drier mixed leguminous wooded Savanna with a continuous lower stratum of perennial grasses. The park is rich in abundant tree species such as the mahoganies, *Nauclea diderrichii (opepe), Terminalia ivorensis (Odigbo), Terminalia superba (Afara), Triplochiton sceleroxylon (Obeche)* (Keay, 1989). Outcrop vegetation in the hilly and rocky areas and Riparian grassland and fringing woodland and forest vary along major rivers and streams dominated. A dense and open savanna woodland mosaic in the central portion of the park, Dense savanna woodland, north of Igbeti-Kishi axis zone C and Open savanna woodland, North-east of the park Oyo-Ile sector (Isichei, (1995). There are three watersheds in Old Oyo National Park: River Ogun and its numerous tributaries, River Tessi and its tributaries and River Iwa and its tributaries. Ogun River flows southwards to the Atlantic Ocean. Several tributaries notably Oopo, Iwawa, Oowe and Owu flow southwestwards and southeastwards join it before its exit from the park. The Tessi River flows northwards to the River Niger. Three main tributaries including River Soro join it before it exists from the park. The Iwa River flows northeastwards to the River Niger.

Data Collection point

The study was carried out in Yemoso and Marguba ranges of OONP. Point count method (Sutherland *et al*.2009) was used to collect data on bird species diversity and abundance in the two ranges. Counting bands of the 50m radius were used for all the stations. To remove error of double counting, the minimum distance between two counting stations of 200 m was maintained. In all 30 counting station were used, 15 stations per a study block were used. On arrival at the sites, birds were allowed time to settle before recording all the birds seen or heard for a predetermined time usually, 20 minutes (Okosodo et al 2015). Bird calls were also recorded with a voice recorder and played back later for confirmation. Physical features of birds sighted but could not be identified immediately were taken and field guide book of West African birds (Burrow and Demey, 2011) was used to identify the bird species and bird calls was used to confirmed the presence of

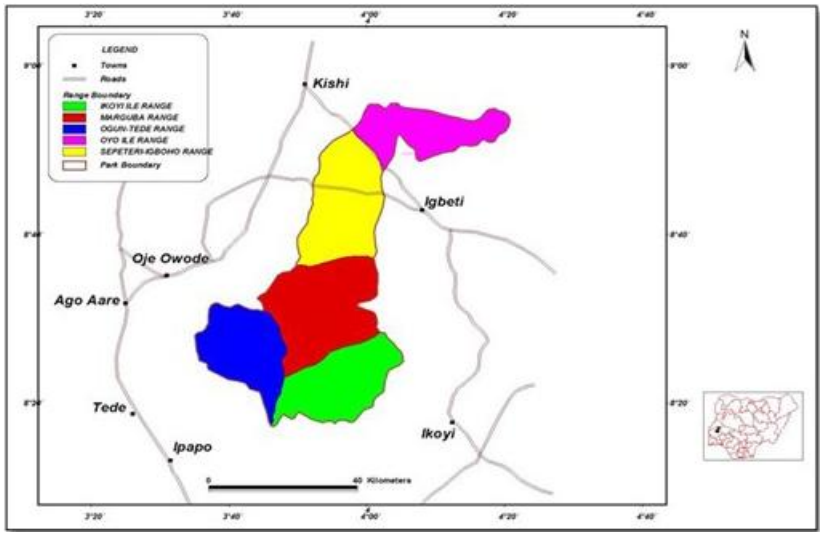

Figure 1. Map of the Study Area (Ogunjemite *et al.,* 2013)

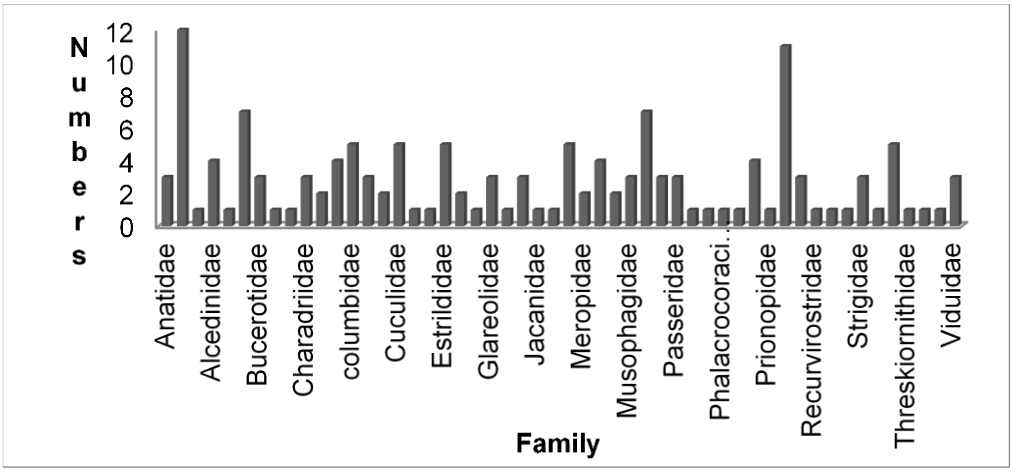

Figure 2. Family Composition of Bird Species in the Study Area

nocturnal bird species within the study sites.

Data was collected for six months with three months in the dry season (November, February and March) and three months in the wet season (June, August, and September) in 2015

Data collected from the observations were explored using the computer PAST Model version 3 to analyze bird species diversity indices, SHE analysis, and plot generalized linear model graph.

RESULTS

A total of 149 bird species belonging to 52 families and 20 orders were recorded in the study area. The order Passeriformes had the highest frequency (51 %) of the entire number of bird species encountered in the study area. The family *Accipitridae* has the highest number of bird species (13) followed by *Pycnonotidae* which has 11 bird species (Figure 2). Forty-two bird species were encountered in Marguba range that was not found in Yemoso range while eighteen bird species were encountered in Yemoso range that was not seen in Marguba range. However, eighty-nine bird species were observed to be common to both ranges (Figure 3). The relative population density was found to be higher in Yemoso range (34.3 and 26.2) than Marguba range (31.5 and 24.7) in both seasons of the year respectively (Figure 4).

From the result obtained on the bird species diversity index, Marguba range had high diversity index in both seasons with 4.508 in the dry season and 4.625 in the wet

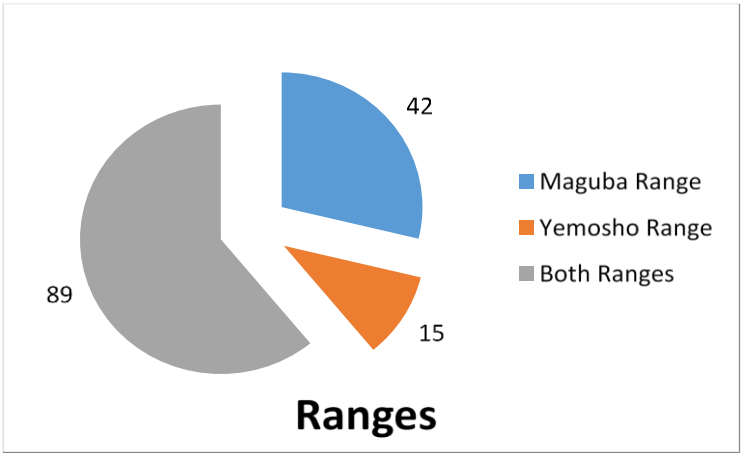

Figure 3. Exclusive and Bird Species Common to both Ranges

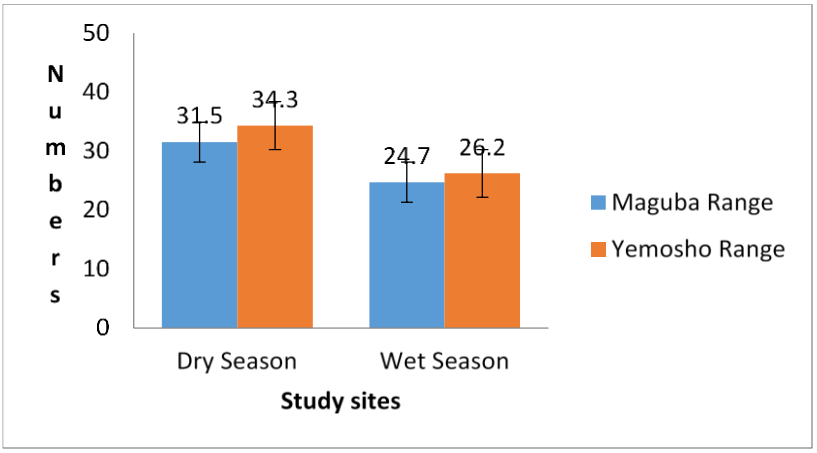

Figure 4. Relative Abundance of Bird Species in the Study Area

Table 1. Diversity of Bird Species in the Study Area during Dry Season

	Yeosu Range	Lower	Upper	Marguba Range	Lower	Upper
Taxa_S	113	108	113	143	139	143
Individuals	456	456	456	591	591	591
Dominance_D	0.01842	0.01668	0.02252	0.01196	0.0117	0.01521
Shannon_H	4.379	4.248	4.398	4.727	4.581	4.699
Evenness_e^H/S	0.7061	0.6287	0.7231	0.7902	0.6888	0.7704
Brillouin	4.017	3.902	4.037	4.358	4.23	4.336
Menhinick	5.292	5.058	5.292	5.882	5.718	5.882

Table 2. Diversity of Bird Species in the Study Area during Dry Season

	Yemoso Range	Lower	Upper	Marguba_Range	Lower	Upper
Taxa_S	123	118	123	128	124	128
Individuals	465	465	465	531	531	531
Dominance_D	0.01623	0.01468	0.02072	0.01258	0.01248	0.01575
Shannon_H	4.508	4.366	4.512	4.625	4.479	4.6
Evenness_e^H/S	0.7379	0.651	0.7446	0.797	0.6987	0.781
Brillouin	4.123	4	4.131	4.258	4.131	4.239
Menhinick	5.704	5.472	5.704	5.555	5.381	5.555

Table 3. Checklist of Bird Species in the Study Area

Family	Scientific Name	Common Name
Anatidae	*Dendrocygna viduata*	White Faced Whistling Duck
	Pteronetta hartlaubii	Hartlaub's Duck
	Sarkidiornis melanotos	Knob Bellied Duck
Accipitridae	*Aviceda cuculoides*	African Cuckoo Hawk
	Haliaeetus vocifer	African Fisheagle
	Polyboroides typus	African Harrier Hawk
	Gypohierax angolensis	Palm Nut Vulture
	Stephanoaetus coronatus	Crowned Eagle
	Polemaetus bellicosus	Martial Eagle
	Aquila spilogaster	African Hawk Eagle
	Circus ranivorus	African Marsh Harrier
	Elanus caeruleus	Black Shouldered Kite
	Milvus migrans	Black Kite
	Kaupifalco monogrammicus	Lizard Burzard
	Lophaetus occipitalis	Long Crested Eagle
	Buteo auguralis	Red Neck Burzard
Alaudidae	*Mirafra cantillans*	Singing Bush Lark
Alcedinidae	*Halcyon malimbica*	Blue Breasted Kingfisher
	Halcyon badia	*Chocolate-Backed Kingfisher*
	Alcedo cristata	Malachite Kingfisher
	Halcyon senegalensis	Senegal Woodland Kingfisher
Apodidae	*Cypsiurus parvus*	African Palm Swift
Ardeidae	*Ardea cinerea*	Gray Heron
	Ardea herodias	Great Blue Heron
	Bubulcus ibis	Cattle Egret
	Ardea alba	Great Egret
	Lsobrychus minutus	Litle Bitten
	Egretta garzetta	Little Egret
	Ardeola ralloides	Squaco Heron
Bucerotidae	*Tockus fasciatus*	African Pied Hornbill
	Tockus nasutus	Grey Hornbill
	Ceratogymna fistulator	Pipping Hornbill
Burhinidae	*Burhinus senegalensis*	Senegal Thick Knee
Caprimulgidae	*Caprimulgus nigriscapularis*	Black Shouldered Nightjar
Charadriidae	*Vanellus senegallus*	African Wattled Lapwing
	Pluvianus aegyptius	Egyptian Plover
	Vanellus leucurus	White Tailed Lapwing
Ciconiidae	*Anastomus lamelligerus*	Africa Openbill
	Ciconia episcopus	Woolly Neck Stork

Table 3. Continue

Cisticonidae	***Camaroptera brachyura***	**Grey Backed Camaroptera**
	Prinia subflava	Twany Flanked Prinnia
	Apalis flavida	Yellow Breasted Apalis
	Cisticola lateralis	Whistling Cisticola
columbidae	*Treron calva*	African Green Pigeon
	Turtur brehmeri	Blue Spotted Wood Dove
	Streptopelia capicola	Laughing Dove
	Streptopelia semitorquata	Red Eye Dove
	Streptopelia vinacea	Vinaceous Dove
Coraciidae	*Coracias abyssinica*	Abyssinian Roller
	Eurystomus glaacurus	Broad Billed Roller
	Coracias cyanogaster	Blue Bellied Roller
Corvidae	*Corvus albus*	Pied Crow
	Ptilostomus afer	Piapac
Cuculidae	*Centropus grillii*	Black Coucal
	Chrysococcyx caprius	Dedric Cuckoo
	Chrysococcyx cupreus	Emerald Cuckoo
	Chrysococcyx klaas	Klaas Cuckoo
	Centropus senegalensis	Senegal Coucal
Dicruridae	*Dicrurus adsimilis*	Fork Tailed Drongo
Emberizidae	*Emberiza flaviventris*	African Golden Breasted Bunting
Estrildidae	*Lagonosticta rubricata*	Blue Billied Firefinch
	Spermestes cucullatus	Bronze Mannikin
	Estrilda melpoda	Orange Cheeked Waxbill
	Pytilia afra	Orange Winged Pytillia
	Lagonosticta senegala	Red Billed Firefinch
Falconidae	*Falco tinnunculus*	Common Kestrel
	Falco ardosiaceus	Grey Kestrel
Fringillidae	*Linurgus olivaceus*	Oriole Finch
Glareolidae	*Glareola pratincola*	Collard Pratincole
	Glareola cinerea	Grey Pratincole
	Cursorius temminckii	Temminck's Courser
Heliornithidae	*Podica senegalensis*	African Finfoot
Hirundinidae	*Psalidoprocne obscura*	Fanti Saw – Wing
	Hirundo lucida	Red Chested Swallow
	Ptyonoprogne fuligula	Rock Martin
Jacanidae	*Actophilornis africanus*	African Jacana
Laniidae	*Lanius senator*	Woodchat Shrike
Melaconotidae	*Tchagra senegala*	Black Crowned Tchagra

Table 3. Continue

	Malaconotus blanchoti	**Grey Headed Bush Shrike**
	Laniarius leucorhynchus	Sooty Boubou
	Laniarius barbarus	Yellow Crowned Gonolek
	Dryoscopus gambensis	Northern Puffback
Meropidae	*Merops pusillus*	Little Bee Eater
	Merops malimbicus	Rosy Bee Eater
	Merops albicollis	Whitethroated Bee Eater
Motacillidae	*Anthus leucophrys*	Plain Backed Pipit
	Anthus trivialis	Tree Pipit
	Macronyx croceus	Yellow Throated Longclaw
	Motacilla flava	Yellow Wagtail
Muscicapidae	*Terpsifhone rufiventer*	Red Bellied Paradise Flycatcher
	Saxicola rubetra	Whinchat
Musophagidae	*Crinifer piscator*	Western Grey Plantain Eater
	Musophaga violacea	*Violet Turaco*
	Tauraco persa	Guinea Turaco
Nectariniidae	*Chalcomitra amethystina*	Amethyst Sunbird
	Cinnyris pulchellus	Beautiful Sunbird
	Hedydipna collaris	Collared Sunbird
	Cyanomitra verticalis	Green Headed Sunbird
	Cinnyris venustus	Variable Sunbird
	Anthreptes gabonicus	Mouse Brown Sunbird
	Cinnyris coccinigaster	Splendid Sunbird
Numididae	*Numida meleagris*	Helmented Guinea Fowl
	Guttera pucherani	Crested Guinea Fowl
Passeridae	*Petronia dentata*	Bush Petronia
	Passer montanus	Erusian Tree Sparrow
	Passer griseus	Grey Headed Sparrow
Oriolidae	*Oriolus auratus*	African Golden Oriole
Otididae	*Lissotis melanogaster*	Black Bellied Bustard
Phalacrocoracidae	*Phalacrocorax africanus*	Long Tailed Commorant
Phasianidae	*Francolinus bicalcaratus*	Double Spurred Francolins
Ploceidae	*Ploceus melanocephalus*	Black Headed Weaver
	Euplectes franciscanus	Northern Red Bishop
	Ploceus cucullatus	Village Weaver
	Ploceus tricolor	Yellow Mantled Window Bird
Prionopidae	*Prionops plumatus*	White Hekmet Shrike
Pycnonotidae	*Pycnonotus barbatus*	Common Bulbul
	Phyllastrephalus iterinus	Icterine Green Bull

Table 3. Continue

	Pryrrhurus scandens	**Leaflove**
	Chlorocichla simplex	Simple Greenbull
	Nicator chloris	Western Nicator
	Nicator vireo	Yellow Throated Nicator
	Andropadus virens	Little Greenbull
	Andropadus curvirostris	Plain Greenbull
	Pycnonotus cafer	Red Tailed Bulbul
	Bleda canicapilla	Grey Headed Bristlebill
	Baeopogon indicator	Honeyguide Greenbull
Rallidae	*Crex egregia*	African Crake
	Porphyrio alleni	Allen's Gallinule
	Amaurornis flavirostris	Black Crake
Recurvirostridae	*Himantopus himantopu*	Black Winged Stilt
Scolopacidae	*Tringa nebularia*	Common Greenshank
Scopidae	*Scopus umbretta*	Harmmerkop
Strigidae	*Ptilopsis leucotis*	Northern White Faced Owl
	Strix woodfordii	African Wood Owl
Sturnidae	*Lamprotornis purpureiceps*	Purple Glossy Starling
Sylviidae	*Melocichla mentalis*	African Moustached Warbler
	Sylvia borin	Garden Warbler
	Sylvietta virens	Green Comec
	Hyptergerus atriceps	Oriole Warbler
	Hyliota flavigaster	Yellow Bellied Hyliota
Threskiornithidae	*Bostrychia hagedash*	Hadada Ibis
Timaliidae	*Illadopsis fulvescens*	Brown Illadopsis
Turdidae	*Turdus pelios*	African Thrush
Viduidae	*Vidua macroura*	Pin Tailed Whydah
	Vidua chalybeata	Village Indigobird
	Anomalospiza imberbis	Cuckoo Finch

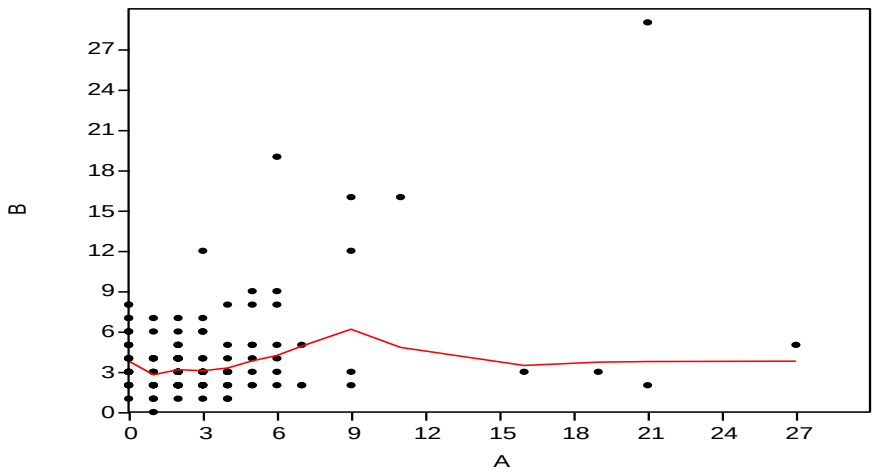

Figure 5. Bird Species Diversity in the Study area (Generalized Linear Model)

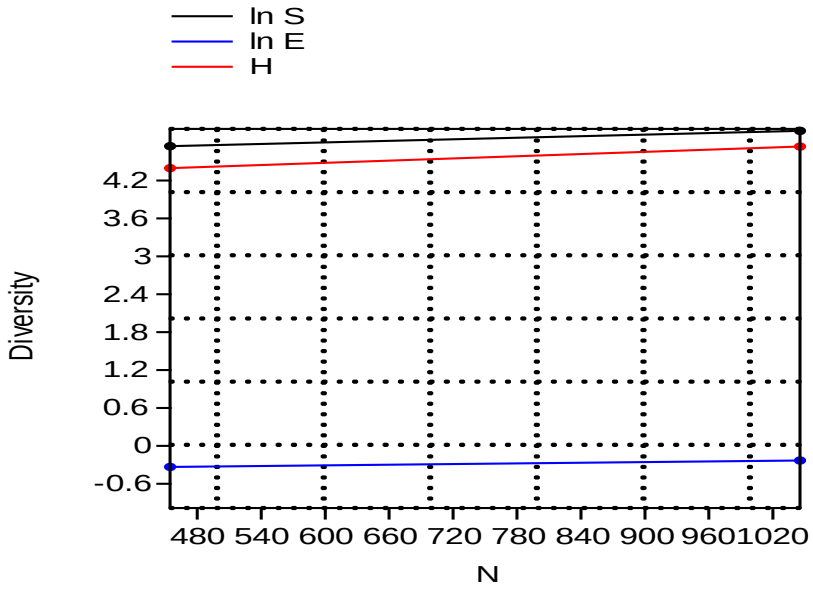

Figure 6. SHE Analysis of Bird Species Diversity in the Study Area

season while Yemoso range had a low diversity index of 4.379 and 4.508 (Tables 1 and 2). However, there is a significant difference ($p < 0.05$) =0.001 in the diversity of bird species between the two ranges. The generalized linear model and SHE analysis are shown in Figure 5 and 6 for both ranges.

DISCUSSION

The research study revealed that this Old Oyo National Park supports a diversity of bird species. The result obtained from research study indicates abundant birdlife in both Marguba and Yemoso ranges. However, there were differences in the bird species encountered in both ranges. The differences in bird species diversity and abundance in the different land use types may be due to land use changes and forest heterogeneity which bring about variation in the availability of food, cover, predation risk and micro - climatic variation which is supported by various authors. Cody (1985) reported the level of distribution of bird species in a habitat is normally as a result of an occurrence of plant species that support their population and to variation in species-specific requirements in the choice of habitat. This is also consistent with Mangnall and Crowe, (2003) that the distribution of bird species is largely dependent on the availability of food, water, and cover.

Different groups of bird species seem to respond differently to different land uses. Insectivores are known to be an indicator of noticeable responses to land use. This result is consistent with work of Matlock Jr *et al*. (2003) who reported that forest patches and protected area in Sao Tome have a high retention of bird species than agricultural landscapes. Furthermore, it has been reported that multi-strata tropical agroforestry systems support high bird diversity and populations than arboreal vegetation (Greenberg *et al*. 2000; Faria *et al*. 2006; Bos *et al* 2007). The number of bird species recorded in the Yemoso range was lower than the two rest blocks, and this suggests that human disturbance in terms of farming intensification areas alters bird species richness Pearson, 1977), (as they avoid predation. Similarly, Herkert (2009) reported that the loss of habitat to urbanization reduces the quality of the remaining vegetation thus affect the population of avian species in the area.

The relative abundance of avian species in the study area was higher in the Yemoso range than Marguba range. This agrees with previous work by Kormar (2006) who also reported a high abundance of bird species in cultivated areas, which could be due to food availability. From the result of the relative Yemoso has (34.5 and 34.3) while Marguba range has (24.7 and 26.2) in both seasons of the year relative bird species population abundance. This is consistent with the result obtained by Best *et al*, (1990) that the extent of change in bird species composition and abundance depends on the specificity of each bird species habitat requirement, in other words, the species tolerance to changes to its environment. Species with the restricted habitat changes pattern are more vulnerable to changes in land use practices than those occupying a wider variety of environment.

The avian behavioral pattern was found to play a big role in bird diversity and distribution among the two areas sampled (Cody 1985). For example, the bird species were *Gutters puncher ani*, and Emberiza Flavventris were sighted only in Yemoso range and Ardea *alba Bostrychia*

huge dash, Caprimulgus nigriscapularis and Lissotis melanogaster were encountered in Marguba range within the Park. The result indicates there was no significant difference p > 0.05) in avian species diversity between the ranges in both seasons of the year. Some savanna bird species were encountered in the forest area which suggests that human disturbance is ongoing in the study sites; therefore, land use change could result in the decline rare species in the area (Manu, 2000). This is consistent with the findings of MacArthur and MacArthur (2001) who reported that avian diversity increases with vegetation complexity. Pearson (1997) also reported that tropical wet evergreen forest support rarer bird species than other habitats. This suggests that the availability of nesting site is one of the principal factors that determine the structure of bird community in the agricultural landscape (Soderstrom *et al*., 2003).

CONCLUSION AND RECOMMENDATION

Bird species diversity was higher in the Marguba range than Yemoso range within the study area which suggests that land use change between the two ranges was responsible for this.

The study area is surrounded by large settlements and the people in the area are involved in logging, majorly cutting down commercial timber species such as *Ceiba pentandra*, *Alstonia congensis Cola gigantea, Daniella ogea, Urban expansion and deforestation.* Selective logging of tree species in this area should be properly managed so that avian habitats can be supported. Land conversion for agricultural purposes is very high in this region since most of the communities are agrarian. However, this may increase extinction risk for many threatened and endangered birds in the area, such as *Grosbeak Weaver Tockus fasciatus*, *Lamptotornis purpureiceps*, *Malimbus status* and *Thescelocichla leucopleura*

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