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WILDBIRD ABUNDANCE AND RICHNESS IN FORESTRY RESEARCH INSTITUTE OF NIGERIA (FRIN), JERICHO, IBADAN, OYO STATE

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ABSTRACT

This study assessed avi-fauna species richness and abundance indices in environs of Forestry Research Institutes of Nigeria (FRIN).The study area, FRIN, was divided based on landuse activities into three; residential, plantations (Teak (Tectona grandis), and Gmelina (Gmelina arborea)) and fallow land. Ten (10) point counts were made in each of the land use areas at distance of 200m and visited between 06:00hrs-10:00hrs and 0400hr-0600hr for a period of 10 minutes each. A pair of 8x42 binoculars, voice recorder and Helms field guide to the birds of Western Africa was used for species identification and confirmation. Species richness, sighting index, bird species diversity (Shannon and Simpson), and Sorenson index of similarity were deduced. Data were analyzed using frequency; PPMC, Percentage and correlation at α 0.05.A total 78 bird species belonging to 38 families were recorded. Yellow-billed kite (Milvus migrans parasitus) was the most abundant species with frequency (228) and sighting index (12.5%). The residential area had the highest mean bird species richness per point. The overall Shannon diversity index (3.52) and Simpson diversity index (0.95) indicated that the study site is highly diverse in bird species. Exotic trees species do not support bird abundance and richness in the study area, therefore effort should be put in place to restore the depleted habitat planting of native tree species.

Keywords: Species richness, Abundance, Wild birds, Landuse, Forestry Research Institute of Nigeria.

INTRODUCTION

Birds are excellent indicators of biological diversity. In environments where there are a large number of birds, there are also many organisms. Bird abundance and diversity are possible indices or indicators of how biologically rich an environment or habitat could be. A survey of the birdlife of any environment will definitely give a clue to the health status of that environment in terms of biodiversity (Birdlife International, 2000). Birds are mobile, moving and capable of dispersing to favorable from unfavorable environments. Among birds, some species are representative of peculiar landscapes. Such species may have restricted habitat requirements and are therefore sensitive to changes in the environment e.g. Bicknell's Trush (*Catharus bicknelli)*. They generally easily disappear as a result of habitat destruction or degradation (Birdlife International, 2000).

Abundance of bird species is largely influenced by the spatiotemporal distribution of some key environmental resources (McCain, 2009). As a result, various studies elsewhere in the world attempted to study factors that affect bird abundance and distribution at spatial and temporal scales (Mengesha *et al*. 2010). Seasonality plays a major role in determining the abundance and distribution of birds. Seasonality affects food and cover availability of bird population, which in turn affects breeding success and ultimately survival of

the bird species (Mengesha *et al*., 2010). The seasonal variation in the amount of rainfall and temperature and spatial and temporal microhabitat conditions are known to affect the availability of various food items for birds (Mengesha *et al*., 2011). Based on species sensitivity to the type of habitat, these could alter the diversity, abundance, and distribution of birds in an area. Particularly, it has been revealed that processes acting in breeding and wintering grounds determine both the patterns of habitat occupancy and seasonal abundance in migratory bird species Tropical and subtropical countries witness a certain type of seasonal migration of birds, which is not well known in the northern latitudes.

Large areas of cultivated grain fields offer reliable food sources for granivores, while tree plantations are providing suitable habitats for some tree dwelling birds in areas where they did not previously exist. Urbanization is also providing additional habitats for a number of species in areas with an otherwise flat topography. Bird species diversity and richness are directly correlated with habitat diversity of both biological and structural features (Sritharan and Burgess, 2012). Higher number of birds in terrestrial habitat may be attributed to the terrestrial habitat having greater resources such as food and nesting sites and a resulting ability to support more bird.

Urbanization has been one of the most challenging of factors militating against wildlife conservation, this is as a result of the numbers of species lost or threatened (Borowiecki and Karol, 2013). Numerous studies have found that both the richness and abundance of native species including plants, mammals, insect and amphibians decrease in response to urbanization (Borowiecki and Karol, 2013).Biodiversity is greatly reduced when large areas of natural habitat are fragmented. The expansion of cities causes the fragmentation of natural habitat through the construction of roads, houses and industry. In many cases all that remains are small remnant patches of the original habitat contained within the confined of the city (Borowiecki and Karol, 2013).

As part of the FRIN mandate on conservation of biodiversity, there is need to carry out a research work on avi-fauna species within the plantation, resident and abandoned bushes in FRIN because some indigenous trees in FRIN have been replaced with exotic species as this could distort species distribution and making some generalist species more common. Disturbance by the people living in the neighboring community due to habitat destruction for building and farming and eradication of indigenous tree species can lead to expansion of edge effect and isolation of forest or bush field to another.

This research work assessed the effect of three landuse types on wildbird abundance, richness and species diversity in Forestry Research Institute of Nigeria (FRIN).

MATERIALS AND METHOD

Study Area

The study area is situated at Jericho Ibadan North Local government area of Oyo state It lies between latitude 7° 26′ N and longitude 3°26′ E. The annual rainfall is about 420mm in 109 days, maximum temperature of 24°C, relative humidity ranges from about 82 percent between June and September to approximately 60 percent between December and February. The FRIN Covers 103 hectares of land comprises of the Residence, (Offices and Staff Quarters), Plantation ((Teak *Tectona grandis)* and Gmelina (*Gmelina arborea*) and Fallow land. The residential are covers about 20% of the FRIN land and diversity of trees is less trees. Plantation covers almost 40% with exotic tree such as Teak (*Tectona grandis)*, Gmelina (*Gmelina arborea*) and nursery while Fallow land covers almost 43% together with grasses, shrub and more of indigenous trees. The area is characterized by a rainfall pattern from 1400mm-1500mm. The relative humidity is about 85%. The area experiences two distinct seasons which are wet and dry season, rainy season starts from April-October while dry season starts from November till March (FRIN meteorological station, 2010). The FRIN was divided into three based on landuse activities; residential, plantations (Teak *Tectona grandis)*, Gmelina (*Gmelina arborea*) and Fallow land.

Experimental Design and Data Collection

This study was carried out in Forestry Research institute of Nigeria and was divided into three based on land use activities; residential, plantations

(Teak *Tectona grandis)*, and Gmelina (*Gmelina arborea*) and abandoned bushes. Thirty (30) point counts (ten points per land use areas) were used to assess for bird species richness at an independent distance of 200m from each other to avoid double counting of the same individual of a species following (Aynalem and Bekele,2008). These points were visited twice in a day between the hours of 6-10 am in the morning and 4-6 pm in the evening for a period of 10 minutes each. During each visit, a pair of 8x42 binoculars was used for sighting and identifying distant birds while direct observation was used to identify short distance birds And two different seasons (rainy and dry) were taken into consideration effect of season. All birds observed during the survey (both seen and heard) were identified to species level and recorded in a field notebook. Helms field guide to the birds of Western Africa (Borrow and Demey, 2004) was used for identification of the birds; bird calls were recorded with a voice recorder and later played back for confirmation. Bird calls were recorded with a voice recorder and later played back for confirmation. Also, the photographs of the birds were taken using a Fuji Film digital camera Fine Pix A700 for record purposes. Species and abundance of birds encountered per point were noted. Data was analyzed using inferential statistics at 0.05 level of error.

Method of Data Analysis

Sighting index

The sighting index of species was obtained by dividing the abundance of a species by the total abundance of all species combined based on the assumption that the frequently seen the species the more abundant it multiplied by 100.

$$\text{Sighting index} = \frac{\text{Species abundance}}{\text{Total abundance}} \times 100$$

Birds' diversity

Birds' diversitywas calculated using both Shannon-Weiner and Simpson's diversity indices. Shannon-Weiner diversity Index 'H' was calculated using the formula:

$H^1 = \sum_{i=1}^{R} PilnPi$ (Shannon, 1948)

Where, *Pi* = Proportion of individual species

R = total number of species of the community (number seen and heard).

Simpson's diversity Index (D)

Simpson's diversity Index 'D' was calculated using the formula

$D = \frac{\sum ni(ni-1)}{N(N-1)}$ (Simpson, 1949)

Where, n*i* = the total number of birds of each individual species

N = the total number of birds of all species.

The value of D ranges between 0 and 1. With this index, 1 represents infinite diversity and 0, no diversity.

Sorensen similarity index

Sorensen similarity index was used to compare the similarity of bird species between plantation and campus. It measures similarity in species composition Magurran (2004) for two sites, A and B, by the Equation:

$C_S = \frac{2ab}{a+b}$ (Sorensen, 1948)

Where; *a* is the number of species found in site A

b is the number of species in site B

ab is the number of species shared by the two sites.

RESULTS

Species Inventory

A total number of 3,815 birds in 78 species belonging to 38 families were encountered and recorded on the entire FRIN site during this survey between March, 2018 and October, 2018(see Appendix 1). The list which displays the species names, frequency of occurrence and sighting index is presented in appendix 1. Yellow-billed kite (*Milvus migrans parasitus)* has the highest abundance (501) ,the highest frequency (228) and sighting index(12.5%), followed by Purple glossy staling (*Lamprotornis purpureiceps*) with abundance (378) while Red-Faced Cisticola (*Cisticola erythrops*) had the least abundance (1).The residential Area had the highest mean of bird species richness per point.

Bird Species Diversity

Abandoned bushes had the highest number of family of 32 compared to the other land use, while plantation having relatively less number of species per point. The number of species per point is a measure of richness. The more species present in a sample, the richer the sample. The overall Shannon Wiener diversity index (H`) was = 3.52, Simpson diversity index D=0.95, which indicates the entire site is highly diverse in bird species.

Bird distribution across the three landuse types in the study site

Of the three land use types, abandoned bush has the highest total and mean bird abundance (1299), followed by campus (1263) and the least at the Plantation (1252). Abandon bush has the highest species richness (67), followed by Campus (55) and the least in plantation (53) respectively. Abandon bush has the highest Shannon Wiener diversity index (0.9532), Simpson diversity index (3.4778), which shows it has the highest species diversity followed by Campus (0.9208 : 3.065) while the plantation has the least species diversity (0.8913 ; 2.9155) (see Table 4.3). Many birds were found in abandoned bushes and mostly indigenous trees species with high altitudes were always used as nesting site by larger birds in the sturdy area to prevent their chicks from predation and birds had a long affiliation with only the indigenous tree species while the exotic species were only used for roosting. Some of the trees used for nesting by Yellow-billed kite within the campus had been felled for planks making. I agree with the findings of (Okosodo *et al.*, 2016) which stated that farmland, Urban expansion, deforestation and Selective logging of tree may increase extinction risk for many threatened and endangered birds and the findings of (Bolwig *et al*., 2009) also stated that large-scale agriculture was associated with a considerable loss of woody plant species richness and abundance compared to small holder farming, especially for native species. Despite the large numbers of exotic trees in FRIN larger birds e.g. Yellow-billed kite (*Milvus migrans parasitus*) made used of only the indigenous tree species as a nesting site even within the plantation (*Gmelina aboria and Tectona grandis*). The Iroko tree on the sport field is mostly used by Red-headed Malimbe (*Malimbus rubricollis*) as a nesting site while different native species were found within the abandoned bushes.

Diversity Indices for the three Landuse types

The indices of Species diversity are given in Table 3: Abandoned bush has the highest value of Simpson and Shannon Index (0.95 and 3.47) which shows Abandon bush had greater variety bird species and more diverse than campus and plantation.

Sorensen Similarity Index in Bird Species Composition across the Landuse types

Abandon bush and Campus had the highest bird species similarities, while campus and plantation had the least, this shows that Abandon bush and campus had close species composition. This is probably due to similarities in tree vegetation and variability in the vegetation on the campus and in the abandon bush (Table 1).

Number of Individual Bird Species Recorded In Each Landuse

Figure 1 shows that Campus had highest number of individual bird species followed by abandon bush and the least was observed in the plantation.

Table 1: Sorensen Similarity Index, Showing Similarity of Bird Composition across the Landuse types.

Land-use	Sorensen similarity index
Fallow land and Campus	0.6065
Fallow land and plantation	0.5167
Campus and plantation	0.4629

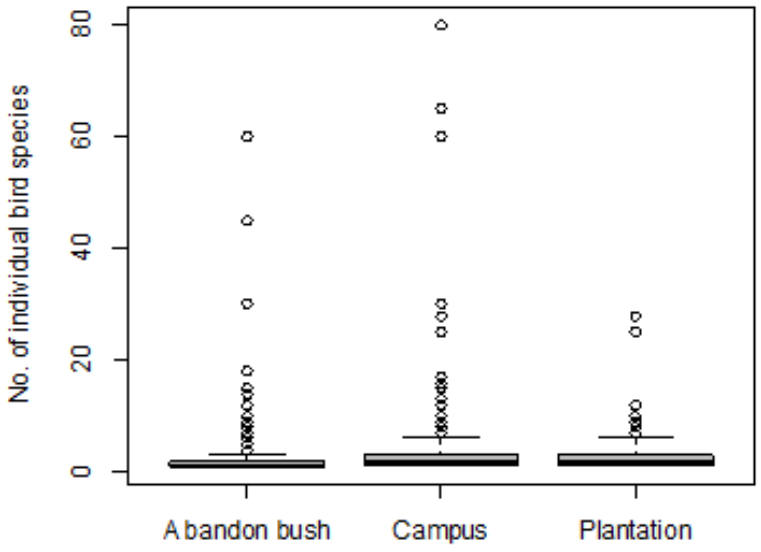

Figure 1: Boxplot showing number of individual birds observed in each land use

Abundance of Birds Species Recorded in each Landuse

The highest species abundance, (296; Yellow billed kite (*Milvus migrans parasitus*) is found on campus, followed by plantation (249); yellow billed kite (*Milvus migrans parasitus*) and the least abundance was observed on the abandon bush (118; Bronze mannikins (*Spermestes cucullatus*) (Figure 2).

Analysis of variance of Bird species variables under the three different landuse types

Table 2 Shows that the distribution are significantly different from one another under different land use in the study site at 0.04 and 0.02 level of significance ($p<0.05$).

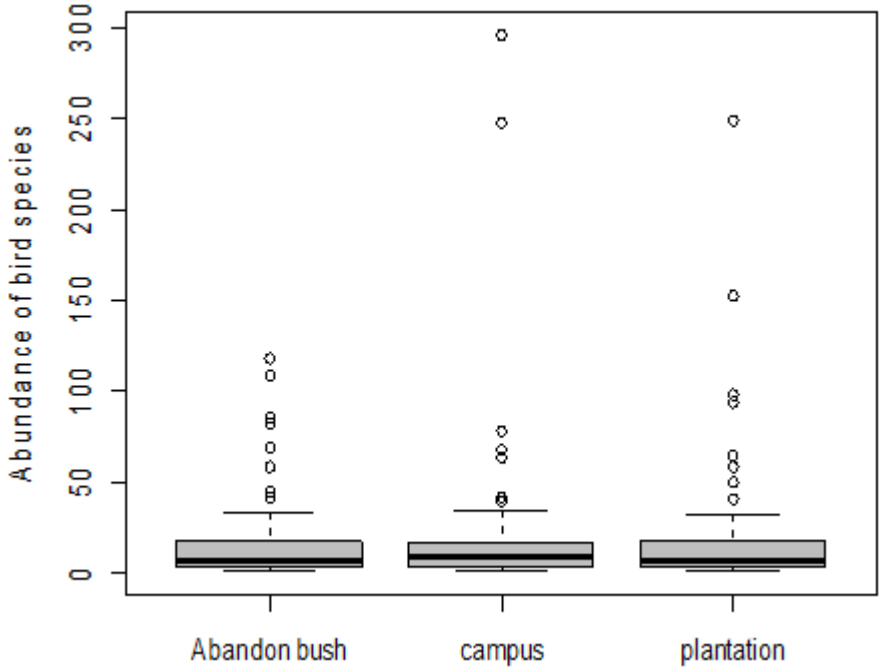

Figure 2: Boxplots showing bird species abundance per land use.

Table 2: Analysis of Variance of Bird Distribution across the three Landuse types

Number of individual bird	Landuse types	SV	df	SS	MS	F	P-level
Abundance	Campus	2	120	60.01	3.20		0.0407*
	Abandoned bush	2	1519	28412	18.71		0.021*
	Plantation	2	1048	0.38	1.57		0.021*
	Error		81	5400	666.5		

As the p-value (0.0407and 0.021) is less than the significance level 0.05, we inferred that there are significant differences in the of birds species distribution across the three different land use types in the study area.

Comparisons of Bird Species Variables under the three different Landuse types

There was a significant difference between the mean distribution of bird species in campus and abandon bush land use at (p= 0.046) since p >0.05, while there was no significant difference in the distribution of birds between Plantation and abandon bush likewise between Plantation and Campus since (p value= 0.95; 0.09) respectively which is greater than 0.05 as presented in Table 3. Residential birds like African trush (*Turdus pelios*), Common bulbul (*Pycnonotus barbatus*), Laughing Dove (*Streptopelia senegalensis*), Speckled Pigeon (*Columba guinea*), Ethiopia Swallows (*Hirundo aethiopica*) and Northern-gray headed Sparrow (*Passer griseus*) were mostly found within the campus and 24 species belonging to 32 families were also found this could be due to their mode of adaptation to a modified environment and availabilities of food either from plant or human leftover while birds from the neighboring communities e.g African green pigeon (*Treron calvus*) visit seldomly and tall tree like – serve as nesting site for Raptors (yellow-billed kite *Milvus migrans porasitus*) witting the campus.

Table 3 Comparisons of Bird Species Variables under the three different Landuse types.

Land Use Types	Diff	Lower	Upper	P-level
Campus-Abandon_bushes	0.65	0.0081	1.30	0.046
Plantation-Abandon_bushes	0.075	-0.539	0.69	0.95
Plantation-Campus	-0.58	-1.24	0.08	0.099

**Significant (P < 0.005)*

Species Richness in Dry and Rainy Season

Higher species (80) was observed in dry season while lower species (60) was observed in the rainy season. Higher species was observed due the scanty leaves, availability of food and migration (see fig.3).

Species Abundance in Dry and Rainy Season

Higher abundance (501) was observed in dry season while lower abundance (296) was observed during the rainy season. Higher abundance during the rainy season can be due to presence of food, and breeding season (see Figure 4).

Test of Season on Variables of Bird Distribution

With the p value (0.00096; 0.031) less than0.05, it shows that season significantly influence the distribution of birds on the study site (table 4).

Bird Abundance in each of the Landuse

Table 5 shows that campus has the highest bird total and mean abundance followed by Plantation and the least at the abandon bush.

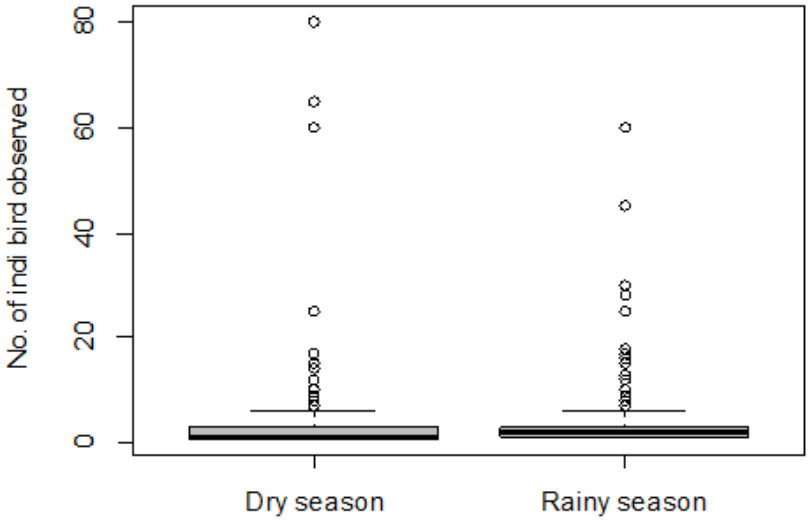

Figure 3: Boxplot showing number of species richness in dry and rainy season

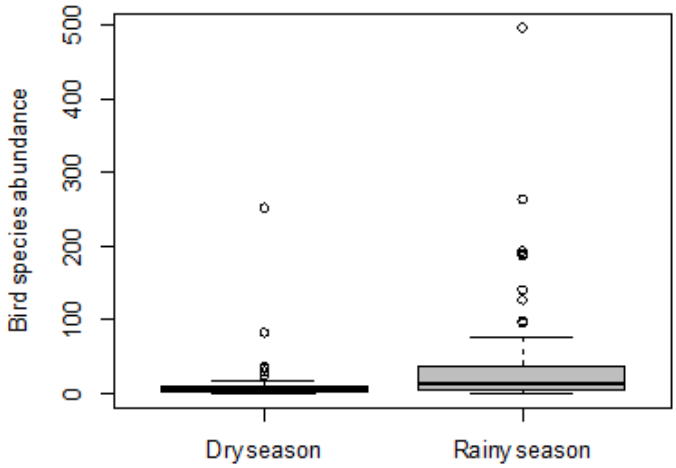

Figure 4: Boxplot showing species abundance in dry and rainy season

Table 4: Relationship between Season and the Variables Bird Distribution

Variables	**Estimate**	**SE**	**T**	**R2**	**F**	**P**
No of individual bird	-1.02	0.30	-3.30	0.006	10.94	0.0096***
Abundance	3.01	6.01	5.01	0.049	80.32	0.031*

*Significance: ***P< 0.001; **P < 0.01; *P <0.05; ns = not significant.*

Table 5: Summary of Bird Abundance in each Landuse

Land use	**Maximum**	**Mean**	**Stand deviation**	**Minimum**
Abandon bush	118	17	25	1
Campus	296	25	52	1
Plantation	249	23	42	1

Table 6: **Summary of bird variables during the two timing of survey at FRIN**

Time	**Total Abundance**	**Frequency**	**Species richness**	**No. of flyover**	**No. of calls**
Morning	2,040	785	66	302	207
Afternoon	1,628	619	53	227	101

Table 7: Summary of wildbirds sighted in FRIN

Common Name	Scientific Name	Family	Abundance	Frequency	Relative Abundance	Sighting Index (%)	Sighted	Called
Cattle Egret	*Bubulcus ibis*	Ardeidiae	34	12	0.008656	0.8656	√	-
Black-shouldered Kite	*Elanus caeruleus*	Falconidea	12	9	0.003055	0.3055	√	√
Yellow billed kite	*Milvus migrans parasites*	Accipitridae	501	228	0.1275	12.7546	√	√
Shikra	*Accipiter badius*	Accipitridae	2	1	0.0005092	0.05092	√	√
Black Sparrowhawk	*Accipiter melanoleucus*	Accipitridae	18	17	0.004582	0.4583	√	√
Lizard Buzzard	*Kaupifalco monogrammicus*	Accipitridae	12	12	0.003055	0.3055	√	√
Long-crested Eagle	*Lophaetus occipitalis*	Accipitridae	5	4	0.001273	0.1273	√	-
Common Kestrel	*Falco tinnunculus*	Falconidae	32	26	0.008147	0.8147	√	√
Grey Kestrel	*Falco ardosiaceus*	Falconidae	40	17	0.01018	1.01833	√	√
African Goshawk	*Accipiter tachiro*	Accipitridae	5	2	0.001272	0.1273	√	-
Double-spurred Francolin	*Francolinus bicalcaratus*	Phasiandae	74	28	0.01884	1.8839	√	√
African Green Pigeon	*Treron calvus*	Columbidae	25	2	0.006364	0.6364	√	-
Tambourine Dove	*Turtur tympanistria*	Columbidae	77	52	0.01960	1.9602	√	√
Blue-spotted Wood Dove	*Turtur afer*	Columbidae	5	4	0.001273	0.1273	√	√
Speckled Pigeon	*Columba guinea*	Columbidae	18	7	0.004582	0.4582	√	-
Red-eyed Dove	*Streptopelia semitorquata*	Columbidae	113	56	0.02877	2.8768	√	√
Laughing Dove	*Streptopelia senegalensis*	Columbidae	68	35	0.01731	1.7312	√	√
Senegal Parrot	*Poicephalus senegalus*	Psittacidea	3	1	0.0007638	0.07637	√	-
Rose-ringed Parakeet	*Psittacula krameri*	Psittacidae	11	6	0.0005092	0.05092	√	-
Western Grey Plantain-eater	*Crinifer piscator*	Musophagida	71	39	0.01808	1.8075	√	√
Common Cuckoo	*Cuculus canorus*	Cuculidae	5	5	0.001273	0.1273	√	-
Dideric Cuckoo	*Chrysococcyx caprius*	Cuculidae	4	3	0.001018	0.1018	√	√
Yellowbill	*Ceuthmochares aereus*	Cuculidae	5	3	0.001273	0.1273	√	√
Senegal Coucal	*Centropus senegalensis*	Cuculidae	89	47	0.02266	2.2658	√	√
African Palm Swift	*Cypsiurus parvus*	Apodidae	9	2	0.001018	0.1018	√	√
Yellow-crowned gonolek	*Laniarius barbarus*	Malaconotidea	2	1	0.0005092	0.05092	√	-
Blue-breasted Kingfisher	*Halcyon malimbica*	Alcedinidae	27	16	0.006874	0.6874	√	√
Woodland Kingfisher	*Halcyon senegalensis*	Alcedinidae	52	34	0.01324	1.3238	√	√
African Pygmy Kingfisher	*Ceyx pictus*	Alcedinidae	19	17	0.004837	0.4837	√	√
White-throated Bee-eater	*Merops albicollis*	Meropidae	98	14	0.02495	2.4949	√	√
Broad-billed Roller	*Eurystomus glaucurus*	Coraciidae	9	9	0.002291	0.2291	√	√
Green Wood-hoopoe	*Phoeniculus purpureus*	Phoeniculidae	10	5	0.002546	0.2546	√	-
African Pied Hornbill	*Tockus fasciatus*	Bucerotidae	45	27	0.01146	1.1456	√	√
African Grey Hornbill	*Tockus nasutus*	Bucerotidae	69	8	0.01756	1.7566	√	√
Double-toothed Barbet	*Lybius bidentatus*	Capitonidae	9	5	0.002291	0.2291	√	-
Grey Woodpecker	*Dendropicos goertae*	Bucerotidae	11	2	0.0028004	0.28004	√	√
Ethiopian Swallow	*Hirundo aethiopica*	Hirundinidae	10	4	0.002546	0.2546	√	-
Plain-backed Pipit	*Anthus leucophrys*	Motacillidae	18	2	0.004582	0.4582	√	√
Red-shouldered Cuckoo-Shrike	*Campephaga phoenicea*	Campephagidae	9	3	0.002291	0.2291	√	-
Little Greenbul	*Andropadus virens*	Pycnonotidae	3	1	0.0007636	0.07637	√	√
Slender-billed Greenbul	*Andropadus gracilirostris*	Pycnonotidae	44	6	0.01120	1.1202	√	-
Leaf-love	*Pyrrhurus scandens*	Pycnonotidae	21	7	0.005346	0.5346	√	√

Common Bulbul	*Pycnonotus barbatus*	Pycnonotidae	206	85	0.05244	5.2444	√	√
Western Nicator	*Nicator chloris*	Pycnonotidae	26	22	0.006619	0.6619	√	√
Snowy-crowned Robin-Chat	*Cossypha niveicapilla*	Turdidae	11	9	0.002800	0.2800	√	√
African Thrush	*Turdus pelios*	Turdidae	191	103	0.04863	4.8625	√	√
Simple leaflove	*Chlorocichla simplex*	Pycnonotidae	56	21	0.01426	1.4257	√	√
Red-faced Cisticola	*Cisticola erythrops*	Sylviidae	1	1	0.0002546	0.02546	√	√
Green-backed Camaroptera	*Camaroptera brachyuran*	Sylviidae	6	4	0.001527	0.1527	√	√
Olive-green Camaroptera	*Camaroptera chloronota*	Sylviidae	9	8	0.002291	0.2291	√	√
Red-bellied Paradise Flycatcher	*Terpsiphone rufiventer*	Monarchidae	24	19	0.006109	0.6101	√	√
Collared Sunbird	*Hedydipna collaris*	Nectariniidae	10	7	0.002546	0.2546	√	√
Variable Sunbird	*Cinnyris venustus*	Nectariniidae	43	28	0.01095	1.094701	√	-
Splendid Sunbird	*Cinnyris coccinigastrus*	Nectariniidae	16	14	0.004073	0.4073	√	-
Olive sunbird	*Cyanomitra olivacea*	Nectariniidae	22	20	0.005601	0.5601	√	√
Yellow-billed Shrike	*Corvinella corvine*	Prionopidae	104	47	0.02648	2.6477	√	√
Tropical Boubou	*Laniarius aethiopicus*	Malaconotidae	10	6	0.002546	0.2546	√	-
White Helmet-Shrike	*Prionops plumatus*	Prionopidae	35	15	0.0089103	0.89103	√	√
Black-winged Oriole	*Oriolus nigripennis*	Oriolidae	4	1	0.001018	0.1018	√	-
Shining Drongo	*Dicrurus atripennis*	Dicruridae	4	2	0.001018	0.1018	√	-
Fork-tailed Drongo	*Dicrurus adsimilis*	Dicruridae	22	11	0.005601	0.5601	√	√
Velvet-mantled Drongo	*Dicrurus modestus*	Dicruridae	268	85	0.06823	6.8228	√	√
Pied Crow	*Corvus albus*	Corvidae	145	44	0.03691	3.6914	√	√
Piapiac	*Ptilostomus afer*	Dicruridae	2	1	0.0005092	0.05092	√	√
Purple Glossy Starling	*Lamprotornis purpureus*	Sturnidae	378	20	0.09623	9.6232	√	√
Splendid Glossy Starling	*Lamprotornis splendidus*	Sturnidae	9	1	0.002291	0.2291	√	√
Northern Grey-headed Sparrow	*Passer griseus*	Passeridae	22	13	0.005601	0.5601	√	√
Red-vented Malimbe	*Malimbus scutatus*	Ploceidae	59	15	0.01502	1.5020	√	√
Blue-billed Malimbe	*Malimbus nitens*	Ploceidae	6	5	0.001528	0.1528	√	-
Red-headed Malimbe	*Malimbusru bricollis*	Ploceidae	141	55	0.03581	3.5896	√	√
Black-necked Weaver	*Ploceus nigricollis*	Ploceidae	4	1	0.001018	0.1018	√	-
Village Weaver	*Ploceus cucullatus*	Ploceidae	11	7	0.002800s	0.2800	√	√
Yellow-mantled Weaver	*Ploceus tricolor*	Ploceidae	29	11	0.007383	0.7383	√	-
Chestnut-breasted Negrofinch	*Nigrita bicolor*	Estrildidae	2	2	0.0005092	0.05092	√	-
Western Bluebill	*Spermophaga haematina*	Estrildidae	3	2	0.0007638	0.07637	√	-
Bronze Mannikin	*Spermestes cucullatus*	Estrildidae	219	24	0.05575	5.5754	√	-
Black-and-White Mannikin	*Spermestes bicolor*	Estrildidae	24	9	0.006101	0.6101	√	√
Village Indigobird	*Vidua chalybeate*	Viduidae	2	1	0.0005092	0.05092	√	-

Key: √ *means yes*

\- *Means no*

DISCUSSION

A total of 78 bird species belonging to 35families were encountered on the entire FRIN site. Yellow-billed kite (*Milvus migrans parasitus*) highest abundance, the highest frequency and sighting index, followed by Purple glossy staling (*Lamprotornis cupreocauda*) with abundance while Red-Faced Cisticola *(Cisticola erythrops*) had the least(1) because it was sighted once. The overall, Shannon Wiener diversity index was H` = 3.52, Simpson diversity index D=0.95, which indicates the entire site is highly diverse in bird species.

Of the three land use type, campus has the highest bird total and mean abundance followed by Plantation and the least at the abandon bush. Abandoned bush has the highest species richness, which can be attributed to minimal human disturbance and variety in vegetation, followed by Campus and the least in plantation respectively. This goes in line with the findings of Adeyanju and Adeyanju (2012) which state that with increases in ground cover, average bird diversity increases because birds mostly found in my study are insectivores.

Abandon bush had the highest diversity index (0.9532), Simpson diversity index (3.4778), which shows it has the highest species diversity followed by Campus (0.9208: 3.065) while the plantation has the least species diversity (0.8913; 2.9155) and this relate with the findings of Adeyanju and Adeyanju (2012) which state that forest habitat had the relatively higher in species as result of abundant supply of resources for wild birds. In dry season Larger numbers of forest birds like Long-crested Eagle (*Lophaetus occipitalis*), Snowy–crowned Robin chart (*Cossypha niveicapilla*), African Pygmy's kingfisher (*Ceyx pictus*), Western bluebill (*Spermophaga haematina)*, Collard sunbird (*Hedydipna collaris*), Velvet-mantled drongo (*Dicrurus modestus*) and Red-bellied paradise fly catcher were found in the abandoned bushes and bird diversity drastically reduced as most of the land were used for farming by the people from the neighboring community(idi-ishin and Odo-ona) and this goes with the findings of (Okosodo *et al.*, 2016) which states that Bird species diversity is higher in the Fallow Area than farmland. Lameed (2011) also stated that Grazing, fishing and logging were the main illegal activities that might be of detrimental effect to bird species diversity at long term.

The numbers of birds sighted decreases as the canopy cover increased during the rainy because birds stayed under the cover and only their calls were recorded and later played back for identification. Despite the large area of land used for plantation, the least numbers of birds were recorded within the plantation because most of the trees are exotic and the environment is unfavorable to birds. My findings goes in line with the findings of (Bolwig *et al.* 2009) which concluded that progressive loss of species richness with intensification, particularly in combination with large-scale plantation agriculture but that native tree species support a larger numbers of birds than exotic do**.** Towards the end of the dry season, migratory birds like Yellow-billed kite *(Milvus migrans parasitus)*, White Helmet shrike (*Prionops plumatus*), Purple glossy Starlings (*Lamprotornis purpureiceps)* always gathered in large number and at the beginning of the rainy season they migrated as this could be due to unfavorable weather condition for reproduction and or any other reasons such as scarcity of food etc. while residential birds like African Trush (*Turdus pelios*), Common Bulbul (*Pycnonotus barbatus*), Velvet Mantled Drongo (*Dicrurus modestus*) and Laughing Dove (*Streptopelia senegalensis)* were sighted and recorded throughout the research period.From this result, I discovered that not all birds sited during my reconnaissance survey were found during my research period e.g Yellow-billed Oxpecker (*Buphagus africanus*), Orange-cheeked waxbill (*Estrildamelpoda*), Bar-breasted firefinch (*Lagonostic tarufopicta*) and Pin-tailed whydah (*Vidua togoensis*).

Yellow-billed Oxpecker (*Buphagus africanus*) is a blood sucker and was not found due to the reduction in flock size in the College cattle ranch and Orange-cheeked waxbill (*Estril damelpoda*), Bar-breasted firefinch (*Lagonostic tarufopicta*) and Pin-tailed whydah (*Vidua togoensis)* all left due the continuous cleaning of environment by slashing the bushes within the campus and these

birds are mostly seed-eaters especially elephant grass. So I conclude that the demise of these birds was as aresult of lack of food. While birds like Red shouldered cuckoo-shrike (*Campephaga phoenicea*), Tropical Boubou (*Laniarius aethiopicus*), Shining Drongo (*Dicrurus atripennis),* African Pygmy Kingfisher (*Ceyx pictus*), Rose-ringed Parakeet (*Psittacula krameri*) were not sited during my reconnaissance survey but were sited during the field work. But Woodland Kingfisher (*Halcyon senegalensis),* White-throated Bee-eater (*Merops albicollis),* African Pied Hornbill (*Tockus fasciatus),* Ethiopian Swallow (*Hirundo aethiopica),* African Thrush (*Turdus pelios*) and Pied Crow (*Corvus albus)* were sited during the reconnaissance survey and the research period.

Highest number of individual bird species (80) was observed during the dry season because of the scanty leave in the bush and most trees had wiltered their leaves, while the lower (60) was observed during the rainy season, high observed individuals birds in dry season can be due to visibility, scanty vegetation and high rate of wilting coefficient in trees.mDespite the fact that some species like Yellow-billed kite (*Milvus migrans parasitus*) migrated before rainy season, higher species abundance (501) was observed in rainy season while lower abundance (296) was observed during the dry season. Higher abundance during the rainy season can be due to presence of food, and breeding season.

Higher number of bird species (66), flyover (302) and calls (207) were recorded in the morning, while lower number of bird species (53), flyover (227) and calls (101) were recorded in the afternoon (see table 6), pointing to the effect of timing in the distribution of birds in the study area. Higher number of birds recorded in the morning was due to bird habit of searching for food, very early in the morning. Higher calls recorded in the morning was also due to birds calling for mates, timing, security alerts and other purposes. I concur with the findings of Aniekan-abasi (2015) and Adeyanju and Adeyanju (2012) which stated that time of visit for each habitat types was slightly higher than that of the evening. Birds usually go out in search for food and other activities in the early hours. Bird activities were reduced as the sun goes up but returned in the evening when heat of the sun is reduced. This is due to the high rate of transpiration and most bird would not risk the high energy of demand of the sunny hours so they decided to stay under the canopy but Larger birds especially the raptors (bird of prey) always search for food and Western-grey plantain eater were seen to be active in the afternoon as well as the sunbirds where the photosynthesis process is high.

Petersen and Westmark (2013) reported that bird species richness and diversity within wetlands were positively correlated with percent cover of trees. Bird abundance and varieties rise with increase in food availability. The higher abundance of birds in terrestrial habitat could also be due to the composition of the vegetation that forms the main element of their habitat (Salah and Idris, 2013).

CONCLUSION

Based on the result of this work, Yellow-billed kite (*Milvus migrans parasitus*) had the highest abundance, the highest frequency and sighting index, followed by Purple glossy staling (*Lamprotornis cupreocauda*) while Red-Faced Cisticola *(Cisticola erythrops*) had the least (1) because it was sighted once, this survey showed that the Wildbird diversity in Forestry Research Institute of Nigeria (FRIN) is low as expected due to the increasing human activities by the people living in FRIN and neighboring communities. Eradication of our native tree species and replacing with exotic trees causes habitat destruction and this can lead to the demise of our native birds a species. The lower the presence of indigenous tree species the lower the species richness observed in the environment.

Recommendations

In other to conserve our indigenous birds species:

i. Efforts should be put in place to increases the number of indigenous tree species in the study area.
ii. Depleted habitat of indigenous bird species should be restored by planting our native tree species in FRIN.
iii. Further studies should be carried out on the diversity of Wildbird in FRIN.

iv. Portions of FRIN land should be set aside as Important Bird Area (IBA) in other to conserve our indigenous bird's species.

v. Individual species should be researched upon to monitor the relationship in population of wildbird to changes in habitat and,

vi. Most of the exotic tree species should be replaced with the indigenous tree species because planting of exotic tree species may lead to the demise of our indigenous bird species.

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