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DIVERSITY AND ABUNDANCE OF AVIAN SPECIES OF LOBURO FOREST (REDEMPTION CAMP), OGUN STATE, NIGERIA

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ABSTRACT

Impact of religious tourism on avian species composition and abundance of Loburo Forest (Redemption camp area), Ogun State Nigeria was assessed. Bird survey was conducted using both Line transect and Area search methods. A total of Eight (8) transect lines with lengths ranging from 1km to 1.5km were walked during the survey. The survey spanned three months May, June and July with 6 repeat visits. Data obtained were analysed using both descriptive and inferential statistics. PAST Software (version 16) was used to compute bird diversity indices while differences in birds mean number between the developed and undeveloped areas were analysed using T-test. A total of 876 individual birds from 63 species, 27 families and 11 Orders were recorded in the study area. The developed area had 46 species from 24 families while the undeveloped area had 20 species from 12 families. The family Pycnonotidae had the highest number of species both in the developed (6, 13.04%) and undeveloped (6, 10.34%) areas. Mean bird density of 17.01 ±2.51 was recorded (developed area had 19.52bird/km^2 while undeveloped area had 14.5 bird/km^2). Similarly bird diversity indices (Simpson, Shannon and Evenness) was higher in the developed area than the undeveloped area (0.94, 0.69; 3.15, 1.935; 0.51, 0.3462) respectively. It can be concluded that urbanization and deforestation as a result of religious tourism has changed bird species composition to favour generalist and open habitat birds. It is therefore suggested that there should be policy that will compel such tourism to set aside conservation areas and to encourage greenness of the environment.

Keywords: Avian species, religious tourism, Loburo forest, urbanization, conservation area.

INTRODUCTION

Loss of biodiversity affects ecosystem functioning and stability, productivity at different trophic levels, nutrient cycling and erosion control (Tohru *et al*., 2010). McKee *et al*., (2003) reported that anthropogenic impacts caused by human population density accounted for 87.9% of the variation in numbers of threatened species across the tropical forest. Land-use changes are one of the most crucial human impacts on natural ecosystems, causing changes in the services obtained from the ecosystems and biodiversity (Chapin *et al*., 2000; Luck *et al.*, 2004). Increased population pressure, conversion of tropical forests to agricultural fields and infrastructural developments has continued to serve as the driving force in land-use changes (Sayer *et al*., 1992). Urbanization, defined as the process by which urban population increases in absolute number and in proportion to rural population either through the increase in population of existing cities or through the growth of new ones (Olujinmi 2011), is a major cause in the loss of biological resources. Urbanization has resulted in a large negative impact on wildlife in addition with regards to the flora and fauna communities. Habitat fragmentation and degradation may lead to loss in biodiversity and influence the life cycle of tropical tree species by lowering pollination, limiting seed dispersal and increasing seed predation (Farwig *et al*., 2007), which may affect the population sizes and distribution of avian species. Humans, including ecotourists, can be perceived as predators

(Frid and Dill, 2002). For instance, Klein (1993) found that approaching birds by foot was the most distracting thing done by visitors to a wildlife refuge. Changes in individual behavior can have substantial effects on individual reproductive success and population demography (Anthony and Blumstein, 2000).

Common ground between religions and biodiversity protection is found throughout the world in the form of sacred natural sites and religious-based behavioural control systems (Dudley *et al.,* 2005). The power of religion to check destructive behaviour in the face of challenges ranging from political instability and conflict to poverty and lack of empathy for other creatures is significant, and if it can be mobilized in support of biodiversity it would be a noteworthy achievement (Rappaport, 1999). This study therefore offers a chance to examine the impact of religious tourism from the perspective of conservation and tourism on one of the anccient sites of South western Nigeria: Loburo Forest, Ogun State which is currently hosting one of the foremost religious sites of the country: the Redemption Camp. Loburo Forest was one of the largest track of community forest in Ogun State before the construction of Lagos-Ibadan express way in 1978. The construction of the road opened up the region to religious activities pioneer by the Redemption Camp in 1982. These activities has since grown in lip and bond, leading to establishment of large communities within the area with severe consequence and high degree alteration on the ecology and land-use pattern of the area. Urbanization and habitat fragmentation are rampant all over the world. This is becoming a critical challenge in the fertile wet area of tropical Africa in which the forest of southwest Nigeria (including Loburo Forest) constitute an integral part. The magnitude of the effects of urbanization and whether they are positive or negative varies among species (Marzluff *et al*. 2001). A few species thrive under these conditions by exploiting the unique nesting and foraging opportunities that such environments provide (De Graaf and Wentworth, 1986), but many species decline or disappear as settlement intensity increases (Clergeau *et al*. 1998). This work aim at investigating the impact of these activities on avian diversity, distribution and abundance in the study area.

MATERIALS AND METHODS

The Study Area

Loburo Forest, Ogun State Nigeria (Figure 1 and 2), is situated at between kilometer 36 – 48 along Lagos – Ibadan Express Way. The community forest formed part of Owode and Sagamu Local Government Areas of Ogun State. The area occupied about 75 km^2 of virgin and graded level of secondary forest before The Redeemed Christian Church of God (Redemption Camp) started in the year 1983. Few highly remote villages were there at the time. These include Mowe in Owode Local Government Area and Simawa in Sagamu L. G. A. The study area which started as a designated site for religious activity in the year 1983 has given birth to major revivals, outreaches and establishment of other religious outfits and camp ground including the Deeper Life Bible Church and NASFAT.

The areas comprise a series of ecosystems: the Guinea forests- Lowland rainforest, the predominant habitat type of the areas identified as priority for surveys is the Guinea-Congo lowland rainforest which is found in the western most parts of southern Nigeria (Kaey, 1959; White, 1983; National Atlas, 1987; and Oates *et al* 2008). The Redeemed Christian Church of God (Redemption Camp) is situated at Loburo in Owode Local Government Area of Ogun State, Nigeria. The forest is bounded by Mowe and Loburo in the north, Sagamu Local Government to the south, Ikorodu in Lagos State to the East and Deeper Life Camp ground to the west. It is situated at kilometer 46 of Lagos Ibadan Express way.

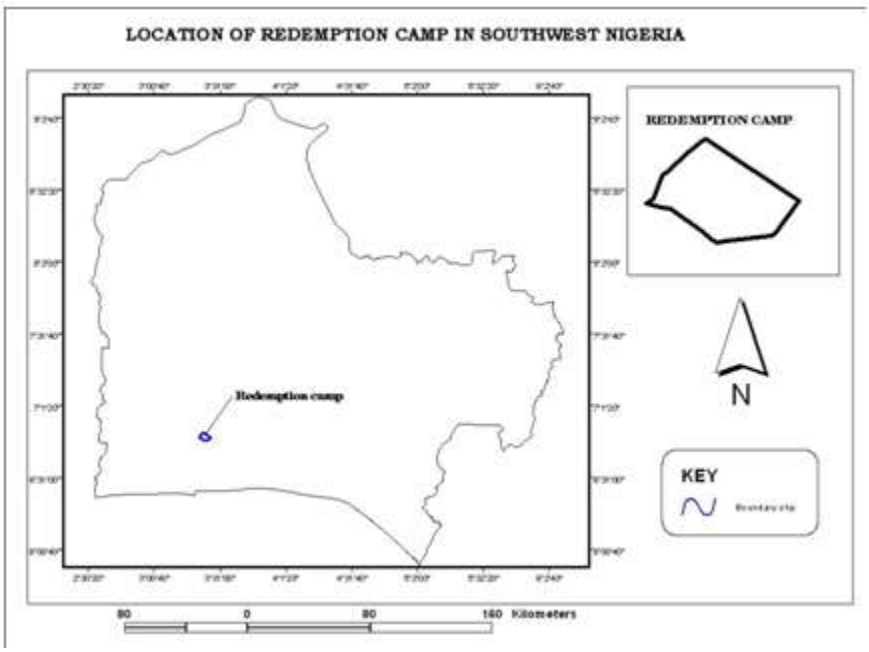

Figure 1: Map of South western Nigeria showing the location of Loburo Forest (Redemption Camp)

Data Collection

Avifaunal species assessment

Bird survey was conducted using direct count through Line transect method (Bibby and Burgess, 2001) and Area search method (Nikunj *et al*., 2013). Due to high mobility of bird, two forms of major land used were considered for their distribution; the developed area and the undeveloped (open secondary and fallow forest) area at Loburo Forest (Redemption Camp). A total of Eight (8) transect lines (four in each categories) were walked during the survey. The existing routes in the area was used as transect lines with lengths ranging from 1km to 1.5km and a fixed width of 30m in the developed area and 20m in the undeveloped area. At each site, transects were placed at least 200m apart. Transects were walked slowly making observations by a single observer. Bird species sighted directly (perching on trees or ground and flying in front) and calls heard were identified to species level with the number of individual birds encountered recorded. The survey spanned three months May, June and July with 6 repeat visits consisting morning (between 6.00hr to 10.00hram) and evening (16.00hr to 18.30hr) visits were made. Visual identification of birds was carried out with the aid of 8 × 40 binoculars alongside a field guide book for West African Birds by Borrow and Demey (2008). Birds sighted during the survey were categorized based on their Order, family and feeding guilds like insectivore, nectarivore, omnivore, scavenger, frugivore, carnivore, piscivore, and granivore according to Anjos (2001).

The Bird species Diversity Indices (Shannon-Weiner index; Evenness and Dominance) was calculated.

The species diversity index was calculated using Shannon Weiner Diversity Index:

$H' = -\sum_{i=1}^{S}(PilnPi)$…… (1)

Where:

Pi = Proportion of individual species

S= Total number of species of the site (number seen and heard).

i = no of individual species

Buzas and Gibson's evenness/Equitability: H/S

Bird density was determined as: Number of individuals/total area surveyed (in hectare).

.Data Analysis

Data obtained in the study area were analysed using both descriptive and inferential statistics. PAST ((Paleontological statistics software package for education and data analysis) statistical Software (version 16) was used to compute bird diversity indices while differences in birds mean number between the developed and undeveloped areas were analysed using T-test.

RESULTS

Avifaunal species composition of Loburo Forest

A total of 876 individual birds from 63 species belonging to 27 families and 11 Orders were recorded in the study area. The developed area camp had 46 species from 24 families while the undeveloped area had 20 species from 12 families. The family Pycnonotidae had the highest number of species both in the developed (6, 13.04%) and undeveloped (6, 10.34 %) areas, followed by the family Ploceidae (4, 8.75 %, 5, 8.62 %) in the developed and undeveloped areas respectively. However, the species such as Village weaver bird (*Ploceus cucullatus*) Swamp bulbul (*Thescelocichla leucopleura*) Didric cuckoo (*Chrysococcyx caprius*) Black caucal (*Centropus grillii*) Western nicator (*Nicator chloris*) Malachite kingfisher (*Alcedo leucurus*) and Tawny flanked prinia (*Prinia subflava*) were recorded in the developed and undeveloped areas of Loburo forest.

Bird density in the entire area was 34.02 with a mean density of 17.01 ±2.51. The developed area had higher bird density (19.52bird/km2) than undeveloped area with a density of 14.5 bird/km^2 (Figure 3). However, Red-rumped Swallow (*Cecropis daurica)* had the highest density 2.27 (n=75) in the developed area while Village weaver bird (*Ploceus cucullatus*) 7.81 (n=125) Tables 2 & 3; Figure 2. Similarly bird diversity indices (Simpson, Shannon and Evenness) was higher in the developed area than the undeveloped area (0.94, 0.69; 3.15, 1.935; 0.51, 0.3462) respectively. However, the species dominance value was higher in the undeveloped (0.06242) area than the developed area (0.3069) Table 4.

Table 1: Birds Species Recorded in The Study Area Loburo Forest (Redemption Camp)

Order	Family	Common Name	Scientific Name	DA	UA	Feeding Habit
Anseriformes	Anatidae	White faced whistling duck	*Dendrocygna viduata*	P	A	Insectivore
Apodiformes	Apodidae	African Palm-Swift	*Cypsiurus parvus*	P	A	Insectivore
Charadriiformes	Jacanidae	African jacana	*Actophilornis africanus*	P	A	Insectivore
Columbiformes	Columbidae	Laughing dove	*Streptopellia senegalensis*	P	A	Granivore
Coraciiformes	Alcedinidae	Malachite kingfisher	*Alcedo leucurus*	P	P	Piscivore
Coraciiformes	Burcerotidae	African pied hornbill	*Tockus nasutus*	P	A	Omnivore
Cuculiformes	Tytonidae	Barn owl	*Tyto alba*	P	A	Carnivore
Cuculiformes	Cuculidae	Black Coucal	*Centropus grillii*	P	P	Insectivore
Cuculiformes	Musophagidae	Western grey plantain eater	*Crinifer piscator*	P	A	Omnivore
Cuculiformes	Musophagidae	Green turaco	*Tauraco persa*	A	P	Frugivore
Falconiformes	Acciptridae	Black kite	*Milvus migrans*	P	A	Carnivore
Falconiformes	Falconidae	Grey Kestrel	*Falco ardosiaceus*	P	A	Carnivore
Galliformes	Phasianidae	Double-spurred francolin	*Francolinus bicalcaratus*	A	P	Granivore
Passeriformes	Hirundinidae	Wire-tailed Swallow	*Hirundo smithii*	P	A	Insectivore
Passeriformes	Turdidae	African Thrush	*Turdus pelios*	P	A	Insectivore
Passeriformes	Ploceidae	Viellot black weaver	*Ploceus nigerrimus*	P	A	Granivore
Passeriformes	Pycnonotidae	Common bulbul	*Pycnonothus barbatus*	P	P	Omnivore
Passeriformes	Passeridae	Grey-headed sparrow	*Passer griseus*	P	A	Granivore
Passeriformes	Cisticolidae	Tawny flanked prinia	*Prinia subflava*	P	P	Insectivore
Passeriformes	Motacillidae	Yellow throated longclaw	*Macronyx croceus*	P	A	Insectivore
Passeriformes	Estrididae	Bronze manikin	*Spermestes cucullatus*	P	A	Granivore
Passeriformes	Sturnidae	Purple Glossy-Starling	*Lamprotornis purpureus*	P	A	Omnivore
Passeriformes	Nectariniidae	Splendid sunbird	*Cinnyris coccinigastus*	A	P	Nectarivore
Passeriformes	Platysteiridae	Yellow-bellied Wattle-eye	*Platysteira concreta*	A	P	Insectivore
Pelecaniformes	Ardeidae	Cattle egret	*Bubulcus ibis*	P	A	Insectivore
Piciformes	Lybiidae	Yellow-throated Tinkerbird	*Pogoniulus subsulphureus*	P	A	Nectarivore
		Common Swift	*Apus apus*	P	A	Insectivore
		Red-rumped Swallow	*Cecropis daurica*	P	A	Insectivore
		Red-vented Malimbe	*Malimbus scutatus*	P	A	Granivore
		Pin-tailed whydah	*Vidua macroura*	P	A	Granivore
		Northern red bishop	*Euplectes orix*	P	A	Granivore

	Village weaver	*Ploceus cucullatus*	A	P	Granivore
	African Harrier Hawk	*Polyboroides typus*	A	P	Carnivore
	Swamp bulbul	*Thescelocichla leucopleura*	P	P	Frugivore
	Crison bluebill	*Pyrenestes ostiinu*	P	A	Omnivore
	Little Greenbul	*Andropadus virens*	P	A	Omnivore
	Grey-backed camaroptera	*Camaroptera brachyura*	P	A	Insectivore
	Short winged cisticola	*Cisticola brachypterus*	P	A	Insectivore
	Yellow-breasted Apalis	*Apalis flavida*	P	A	Insectivore
			P	A	Granivore
	Red eyed dove	*Streptopellia semitorquata*	P	A	Granivore
	Blue- spotted wood dove	*Turtur afer*	P	P	Granivore
	Vinaceous dove	*Sreptopelia vinacea*	A	P	Granivore
	Woodland Kingfisher	*Halcyon senegalensis*	P	A	Insectivore
	Black headed heron	*Ardea melanocephala*	P	A	Carnivore
	African pied wagtail	*Motacillia aguimp*	P	A	Insectivore
	Yellow wagtail	*Motacillia flava*	P	A	Insectivore
	Plain-backed Pipit	*Anthus leucophrys*	P	A	Insectivore
	Black and white manikin	*Spermester bicolor*	P	A	Insectivore
	Didric cuckoo	*Chrysococcyx caprius*	P	P	Insectivore
	Klaas cuckoo	*Chrysococcyx klaas*	A	P	Insectivore
	Senegal Coucal	*Centropus senegalensis*	A	P	Insectivore
Coraciidae	Broad-billed Roller	*Eurystomus glaucurus*	P	A	Insectivore
	Piping Hornbill	*Ceratogymna fistulator*	A	P	Omnivore
Corvidae	Pied crow	*Corvus albus*	P	A	Scavenger
	Variable sunbird	*Cinnyris venustus*	A	P	Nectarivore
	Superb sunbird	*Cinnyris superbus*	A	P	Nectarivore

Note: P= Present, A= Absent

Table 2: Relative abundance and density of bird's species in developed area of Redemption Camp Ogun State Nigeria

Species /Scientific Name	Number of individuals	Percentage (%)	Bird Density (33 km^2)
African Palm-Swift (*Cypsiurus parvus)*	52	8.07	1.58
Common Swift (*Apus apus*)	61	9.47	1.85
Wire-tailed Swallow (*Hirundo smithii)*	44	6.83	1.33
Red-rumped Swallow (*Cecropis daurica)*	75	11.65	2.27
African Thrush (*Turdus pelios)*	10	1.67	0.3
Ban owl (*Tyto alba*)	2	0.31	0.06
Viellot black weaver (*Ploceus nigerrimus*)	10	1.67	0.3
Red-vented Malimbe (*Malimbus scutatus)*	5	0.78	0.15
Pin tailed whydah (*Vidua macroura)*	5	0.78	0.15
Northern red bishop (*Euplectes orix)*	12	1.86	0.36
Black kite (*Milvus migrans)*	72	11.18	2.18
Common bulbul (*Pycnonothus barbatus)*	12	1.86	0.36
Yellow throated nicator (*Nicator virio)*	7	1.09	0.21
Western nicator (*Nicator chloris)*	5	0.78	0.15
Swamp bulbul (*Thescelocichla leucopleura)*	2	0.31	0.06
Crison bluebill (*Pyrenestes ostiinu)*	3	0.47	0.09
Little Greenbul (*Andropadus virens)*	5	0.78	0.15
Grey-headed sparrow (*Passer griseus)*	21	3.26	0.64
Tawny flanked prinia (*Prinia subflava)*	5	0.78	0.15

Grey backed camaroptera (*Camaroptera brachyuran)*	5	0.78	0.15
Short winged cisticola (*Cisticola brachypterus)*	5	0.78	0.15
Yellow-breasted Apalis (*Apalis flavida*)	2	0.31	0.06
Laughing dove (*Streptopellia senegalensis*)	15	2.33	0.45
Red eyed dove (*Streptopellia semitorquata*)	10	1.67	0.3
Blue- spotted wood dove (*Turtur afer)*	2	0.31	0.06
Malachite kingfisher (*Alcedo leucurus)*	1	0.16	0.03
Woodland Kingfisher (*Halcyon senegalensis)*	3	0.47	0.09
Cattle egret (*Bubulcus ibis)*	28	4.35	0.85
Black headed heron (*Ardea melanocephala*)	2	0.31	0.06
Yellow throated longclaw (*Macronyx croceus)*	2	0.31	0.06
African pied wagtail (*Motacillia aguimp)*	2	0.31	0.06
Yellow wagtail (*Motacillia flava*)	5	0.78	0.15
Plain-backed Pipit (*Anthus leucophrys)*	2	0.31	0.06
Bronze manikin (*Spermestes cucullatus*)	21	3.26	0.64
Black and white manikin (*Spermester bicolor)*	26	4.04	0.79
Black caucal (*Centropus grillii)*	3	0.47	0.09
Didric cuckoo (*Chrysococcyx caprius)*	2	0.31	0.06
African jacana (*Actophilornis africanus*)	2	0.31	0.06
Broad-billed Roller (*Eurystomus glaucurus)*	2	0.31	0.06
Gray Kestrel (*Falco ardosiaceus)*	7	1.09	0.21
Purple Glossy-Starling (*Lamprotornis purpureus*)	7	1.09	0.21
African pied hornbill (*Tockus nasutus)*	10	1.67	0.3
Western grey plantain eater (*Crinifer piscator)*	2	0.31	0.06
White faced whistling duck (*Dendrocygna viduata)*	15	2.33	0.45
Pied crow (*Corvus albus)*	53	8.23	1.61
Yellow-throatedTinkerbird(*Pogoniulus bsulphureus)*	2	0.31	0.06
Total	**644**	**100**	**19.52**

Table 3: Relative abundance of Birds Species in Open Secondary and Fallow Forest Area of Redemption Camp Ogun State Nigeria

Species /Scientific Name	Number of individuals	Percentage (%)	Bird Density (16km^2)
Piping Hornbill (*Ceratogymna fistulator)*	12	5.17	0.75
Double spur francolin (*Francolinus bicalcaratus)*	7	3.02	0.44
Common bulbul (*Pycnonothus barbatus)*	8	3.45	0.5
Western nicator (*Nicator chloris)*	9	3.88	0.56
Swamp bulbul (*Thescelocichla leucopleura)*	2	0.86	0.13
Tawny franked prinia (*Prinia subflava)*	10	4.31	0.63
Splendid sunbird (*Cinnyris coccinigastus)*	11	4.74	0.69
Variable sunbird (*Cinnyris venustus)*	10	4.31	0.63
Superb sunbird (*Cinnyris superbus*)	12	5.17	0.75
Klaas cuckoo (*Chrysococcyx klaas)*	2	0.86	0.13
Senegal Coucal (*Centropus senegalensis)*	5	2.16	0.31
Didric Cuckoo (*Chrysococcyx caprius)*	2	0.86	0.13

Black Coucal (*Centropus grillii*)	2	0.86	0.13
Village weaver bird (*Ploceus cucullatus*)	125	53.88	7.81
Vinaceous dove (*Sreptopelia vinacea)*	3	1.29	0.19
Blue-spotted wood dove (*Turtur afer)*	2	0.86	0.13
Malachite kingfisher (*Corythornis cristata)*	2	0.86	0.13
Yellow-bellied Wattle-eye (*Platysteira concreta*)	5	2.16	0.31
African Harrier Hawk (*Polyboroides typus)*	1	0.43	0.06
Green turacco (*Tauraco persa)*	2	0.86	0.13
Total	**232**	**100**	**14.5**

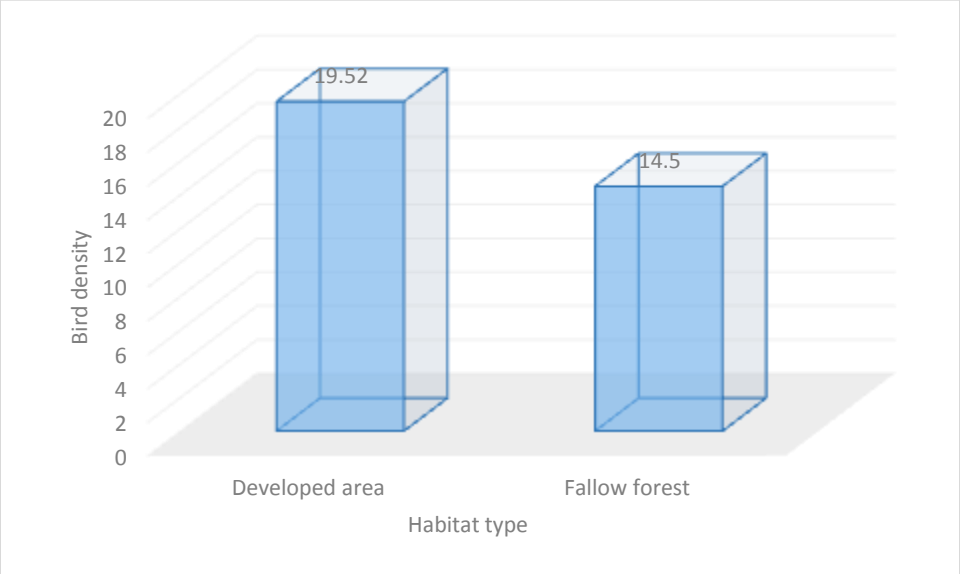

Figure 2: Bird density in the developed and undeveloped areas of Loburo forest

Table 4: Diversity indices of birds in the study area

Diversity variable	**Values**				
	Developed area	**Undeveloped area**	**T -value**	**P value**	**Significance**
Taxa_S	46	20			
Individuals	644	232			
Dominance_D	0.06242	0.3069			
Simpson_1-D	0.9376	0.6931	**7.3739**	**2.7802E-12**	
Shannon_H	3.15	1.935	**-11.373**	**2.199E-25**	
Evenness_e^H/S	0.5071	0.3462			

Table 4: Frequency of Occurrence of Bird Species Feeding Habits in The Two Habitat Types of Loburo forest (Redemption camp)

	Frequency of occurrence		
Feeding habit	**Developed Area**	**Undeveloped Area**	**Total**
Carnivore	4	1	5
Frugivore	1	2	3
Granivore	10	4	14
Piscivore	0	1	1
Insectivore	21	6	27
Nectarivore	1	3	4
Omnivore	6	2	8
Scavenger	1	0	1
Total	**44**	**19**	**63**

Significance test: t = 1.5953; p = 0.15467

Table 6: Diversity Indices of Bird Species in Different Feeding Guild/Habits Recorded in Loburo forest (Redemption camp)

Diversity variable	**Values**				
	Developed area	**Undeveloped area**	**T -value**	**P value**	**Significance**
Individuals	44	19			
Dominance_D	0.3079	0.1967			
Simpson_1-D	0.6921	0.8033	1.5053	0.13806	
			-1.5795	0.1211	
Shannon_H	1.437	1.767			
Evenness_e^H/S	0.6014	0.8365			

Source: Obateru *et al.* 2019

DISCUSSION

It is not doubtful that the environment of Loburo forest is gradually turning to urban center with the influence of emigrants from Lagos. The ever increasing human population coupled with technological development is placing stress on the environment and the world's natural resources. (Redemption Camp). The impacts of developmental activities in the study area, which has open up some areas, and the initial vegetation now replaced with ornamental trees and grasses, has change the birds species composition of the area favouring more of the birds of open habitat like Common Bulbul, Wired-tail Swallow, Pied crow, Cattle egret, Red-eyed dove and others. This is in tandem with the statement by Bird life international (2012) that urban development may affect bird communities according to their habitat requirements by changing the quantity or quality of the habitats. Similar situation was observed by Odewumi *et al*. (2015) in the Federal University of Technology, Akure. Green turaco could be referred to as the only typical forest species recorded in the area. This agrees with the statement by Trainor, (2002) that the population of forest specialist species decline as the structures of the habitat is modified through logging, fuel wood collection, farming, urbanization and grazing.According to Cam *et al*. 2000; Crooks *et al*. 2004) urban development has been linked to a decline in bird species richness and an increase in the abundance of urban associated species. This explains the higher diversity index (3.15) recorded in the developed area during this study as against 1.94 recorded in the undeveloped area. Development also facilitates the spread of urban associated species along corridors of urban land use, potentially leading to a homogenization of bird communities within and among regions (Blair 2001, McKinney and Lockwood 2001). This explains why

bird number, diversity and density was higher in the developed area than the undeveloped area.

Urban development may also affect bird communities according to their foraging guild. Redemption camp has larger numbers of black kite and pied crow that were attracted to the food remnants during and immediately after camping. Also grasses in the developed area contributed to the presence of birds like manikins, plain-backed pipit and wagtails while the remnants of fruiting trees and ornamental trees also attracted frugivores/omnivores species like plantain eater, dove, and hornbill and so on to the area. This is in agreement with the findings of Oduntan, *et al*,. (2012) who reported that Weavers, Starlings, Doves and pigeons are attracted to seeds and berries while egrets are attracted to insects. Birds of preys are attracted to airport because rodents, small birds and other small animals that are harbored by tall poorly maintained grass stands or bush are present. Waste disposal practices by restaurant and airline flight kitchen, food vendors and other airport users make organic garbage available as foods to birds like crow, pigeon and gulls and other scavenging bird species. Similar situation was recorded by Odewumi et al. (2015)at the Federal university of Technology campus, Akure. In the dam area and other wetland areas species like kingfisher, Jacana and Northern red bishop were recorded. Also, buildings provided habitat for species like sparrows, swift and swallows while the grasses and insects in the lawns provided food for species like pipit, Wagtail and cattle egret.

CONCLUSSION

These results indicated that infrastructure development and its associated activities have some impacts on the diversity and distribution of birds in Loburo forest, Redemption camp. This has greatly reduced the number of forest specialist species and increased the number of open or degraded habitat bird species. Therefore in order to sustain the remnant species, Conservation area of minimum of at least 20% of the total land acquired for the development of the Camp should be set aside for the conservation of the remaining biological diversity of the forest. This portion should be marked between the Water Works and Asegere village in order for the two main habitats (Swamp and Secondary forest habitats) should be incorporated.

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