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Preliminary Assessment of Fauna Species Diversity in Ipinu Igede Community Range Forest in Oju Local Government of Benue State, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Authors GOY and OAO designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors GOY and OAO managed the analyses of the study. Author AAA managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Background and Objectives: Appraisal of fauna species which form an integral part of range ecology, in rangeland based protected areas is necessary before any meaningful conservation work can commence. This study was aimed at assessing the composition of fauna species in the community forest.
Methodology: Animal species were enumerated through direct on-site using four transects line of 2.0 km by 10 m broad distributed randomly, field observation and indirect indices. Data were analyzed using descriptive statistics (table, figures and plates).
Results: Fifty-six species of wild animals from 40 families were observed in the study area. There were 21 species of mammals from 15 families, 6 species of reptiles from 6 families and 29 species of birds from 19 families. A total of 1,419 sightings were recorded. The most abundant animal species found in the area were *Epixerus ebii*, *Eidolon helvum, Chlorocebus tantalus, Papio anubis,*

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Philothemus irregularis, Musophaga violacea, Numidia meleagris and *Francolinus bicalcaratus*. The status of most mammals was Low risk-conservation dependent as applicable to reptiles. All the birds are known to breed in the reserve. Transect C had the highest diversity index (0.0130) and transect A had the lowest animal diversity index (0.0061) but with the highest species count of thirty six (36) and individual animal species sighted (454).
Conclusions: The community forest support unique fauna species making it significant in terms of conservation and scientific interest and has to be protected through conservation awareness and community participation to conserve the current state and enhanced its range productivity.

Keywords: Range ecology; fauna; composition; status; Nigeria.

1. INTRODUCTION

The survival and continuity of many endemic, rare and threatened species found in a given rangeland depend on sustainable conservation through its assessment to determine its current status. The potential of range forest habitation of wild animals is grossly unexplored in many areas across Nigeria, especially local community forests [1].

According [2], survey of both flora and fauna species which form an integral part of animal and forest ecology in wildlife based protected areas is necessary before any meaningful conservation work can commence. Fauna resources are the entire wild animal of any particular region or ecosystem [3]. These wild animals can be found in all ecosystems including forests, grasslands, plains, wetlands and deserts [4]. Fauna species assessment has more concentration to national parks and game/wildlife parks. However, many local rangeland communities support unique flora and fauna species making them important in terms of conservation and scientific interest.

Approach to species listing is an important initial stage in the collection of appropriate data necessary for effective management and conservation of animals and plants in a protected rangeland [5]. Therefore, knowledge of the species composition of a protected rangeland, their status and how they relate with other components of the habitat is highly essential and as well indicate the status of most fragile, threatened species. Insight into species list and status is becoming increasingly important as conservators and rangeland managers are tasked to assists conservation biologists to construct informed management plans for endangered species. This has become critical because most fauna species live in tropical forest which is increasingly been impacted by human modification and natural occurrences [6,7,8].

The status of the population of any individual species is crucial information to the wildlife ecologists, because this information determines individual fitness to its environment and also predicts their ultimate success or failure [9]. [10] report that, wildlife is increasingly being regarded as renewable resources and man mostly is known for his high taste for exploiting its populations in the environment hence, their habituation to various rangeland and status ought to be monitored to ensure proper utilization of their habitat.

Ipinu Igede Community Forest in Oju Local Government of Benue State is one of the reserve that is rich in biodiversity, though had no appreciable ecological survey of the resources, hence, the dearth of information necessary for the development of the reserve. The area has suffered from activities of illegal logging operators and hunting thereby threatening important flora and fauna species.Also the quest for a local fauna database and the alarming rate of species loss informed the need for wildlife based inventory in the study area. Thus there is need to appraise the composition of fauna species using diversity indices to ascertain the present status of fauna species of the community forest. The objective of the study is therefore to quantify fauna species composition and abundance using diversity indices and ascertain the status of the species. It is quiet obvious that baseline data generated from the study will promote effective conservation of biodiversity and management plan within the communal forest.

2. MATERIALS AND METHODS

2.1 The Study Area

The research was carried out at Ipinu Igede Community Forest Reserve in Oju Local Government Area of Benue State, Nigeria. The community forest is an ancestral heritage site for

Igede people of Benue State stretching through three communities; Oyinyi, Andibilla and Uchenyim. The forest contains relicts of traditional worship practices in the area, although, the traditional religious worship practices are no longer strong and appreciated due to acceptance of Christianity. However, the laws and taboos governing the forest are still observed by the people of Igede.

The forest which is located in the Southern Guinea savanna belt comprise of both hilly and lowland part and lies between Longitude 8° 25' 0" E and 8° 41' 67"E and Latitude 6° 51' 0' N and 6° 85' 0' N [11]. It has an area of approximately 4 km^2 on a fairly flat land drained by four main seasonally flowing streams (Abadehe, Otuhukwu, Ekpaa and Ugbunwu) which are tributaries to River Ogbugwu. The mean annual rainfall is between 1200 mm and 1500 mm. The mean annual temperature is 30°C. Relative Humidity is between 60% and 80% wet but decreases in the early months of dry season.

It is a derived tropical rainforest characterized by luxuriant vegetation with high composition of riparian forest, of the large trees are *Cola gigantean, Elaeis guinensis, Ficus exasperatea, Khaya spp, Afzelia africana* [11]. Dominant herbaceous species include *Sphenoclea zeylanica, Pentodon pentandrus, Ageratum conyzoides, Nymphaea lotus* and *Asystasia gangetica*. The area has relatively abundant faunal resources; commonly sighted mammals are the primates (baboons and monkeys), bushbuck, oribi, grass cutter, squirrel and common duiker. Reptiles were alligator and snakes. Birds include guinea fowl, francolin, village weavers, African dwarf-king fisher, African grey hornbill, Yellow billed kite and Abyssinian roller.

2.2 Data Collection Techniques

2.2.1 Species diversity and status

Species list and diversity was determined by direct observation along four transects of 2.0 km by 10m broad (0.1ha) distributed randomly as described by [12] and indirect indices as well as through information from hunters and bush meat processing and selling centers.

Survey was carried out in the morning hours from 6:00 to 9:00 am and early evening time between 4:00 and 7:00 pm. This was to ensure counting of even the shyest animal species as the period coincides with the time the animals are most likely to search for water and preys or graze on land [13].

Status assessment of Mammals, Birds and Reptiles was based on the information from hunters and forest protection agent and follows [14] and IUCN (International Union for Conservation of Nature) Red list.

2.3 Data Analysis

Descriptive statistics (tables, chart and figures) were used to analyze species lists of mammals, reptiles and birds.

2.3.1 Status categories of mammals, reptiles and birds

Categories outlined by [14] were used to assign the status of mammals, reptiles and of birds. This is as follows;

Vu = Vulnerable (Likely to become endangered if the factor that is posing threat persists).

LR/ cd = Low risk-conservation dependent (Species in no immediate danger but survival will depend on implementation of effective conservation measures in the community forest).

NT = Near threatened (species is approaching the threshold of vulnerability)

EN = Endangered (species is unlikely to survive if the factor that is posing threat persists).

RB = Resident breeder

R {B} = Resident but breeding unproved.

PM = Palearctic migrant

Afm = Migrates within Nigeria

DD = Data deficient

2.3.2 Diversity indices

Diversity indices were calculated for each transect using Simpson's diversity index, which is a measure of heterogeneity of a site taking into consideration the number of species and density of individual species [15,16]. The index is expressed as;

$$I = \frac{q\sum n(n-1)}{N\,(N-1)}$$

Where:

I = Simpson diversity index.
N = total number of individuals enumerated.
q = number different species enumerated.
n = number of individuals of species enumerated.

3. RESULTS

Fifty-six species of vertebrates (wild animals) belonging to 42 families were identified in the study area. They belong to three classes of Mammalia, Reptilia and Aves. Twelve species of mammals were identified through direct sighting while 9 species was through their signs and activities as well as interviews of hunters and bush meat processing and selling centers**.** Three species of reptiles were identified through direct sighting while 3 were indirect assessment. All the Bird species were identified through direct sightings.

Majority of the identified mammal species were in the category of LR/cd, followed by Vu and some NT approaching the threshold of vulnerability. Most of the Reptile species were fall within the LR/cd category. Almost all the identified birds' species are resident breeders in the forest (RB). Some of the species identified and fecal droppings are presented in Plates 1 to 6.

3.1 Wild Animal Species Distribution and Abundance Across the Transects

The total numbers of individual species recorded were 1,419. The class Aves had the highest frequency (974) 68.6% followed by Mammalia (429) 30.2% and Reptilia (16) 1.1% (Fig. 1). The total numbers of animals occurrence recorded for the various transects (A, B, C and D) were 454, 332, 294 and 339 respectively (Table 2 and Fig. 2). The species with the highest abundance of class mammalian was *Epixerus ebii* (67.60%) followed by *Eldolon helvum* (15.30 %) and the least was *Tragelaphus scriptus* (0.23%). For class reptilian; the dominant species were *Philothamus irregularis* (56.25%) followed by *Elgaria coerulea* (31.25%) and the least was *Naja melanoleuca*. Class aves was *musophaga violacea* (22.59%) followed by *Numidia meleagris* (10.37%), *Crinifer piscator* (10.27%) and the lowest was *Accipiter africana* (0.10%) respectively. However, there were 18 constant species present in all the transects. This include *Arvicanthis niloticus, Epixerus ebii, Acrocephatus rufescens, Centropus sensgalensis, Colius striatus, Coracias abyssinicus, Crinifer piscator, Euplectes franciscannus, Pternistis bicalcaratus, Lamprotornis nitens, Lanchura cuculata, Musophaga violacea, Numidia meleagris Pycnonotus barbatus, Poicephalus senegalus, Streptopelia semitorquata, spilopelia senegalensis* and *Vidua macroura.*

The Simpson diversity indices of animal species showed that transect C had the highest diversity index (0.0130) and the second highest species count of thirty four (34). Transect A, on the other hand, had the lowest animal diversity index (0.0061) with the highest species count of thirty six (36) as well as individual animal species sighted (Table 3).

4. DISCUSSION

The relatively high population of vertebrates' species (wild animals) found in the area is typical of West African taxa [12]. The list of species surveyed is for the understanding of faunal dynamics in the conservancy of any protected area. This is in line with the observation by [17] at Makurdi zoological garden. More so, the high incidence of *Epixerus ebii*, *Eidolon helvum, Arvicanthis niloticus* and some primates in the community forest may not be unconnected to the fact that the species are not accepted as meat by the people in the surrounding communities. Similar observations have been made by [5] at Sambisa game reserve. The relatively low status of some mammals and reptiles in the forest such as duiker, spotted hyena, porcupine and pangolin suggests high incidence of poaching for meat and traditional medicine because of the very little effort being made to protect the resources of the forest. Snake species are of least concern however the community tends to dislike them; hence the quest to eliminate them from their surrounding environment could have being the possible cause. Generally, some wild animals have higher tolerance of hunting pressure than other because of their home range and their reproductive potentials. Some may be subjected to less hunting pressure because the taste and acceptance of their meat or their ease of preparation. Local techniques used in capturing some species also put them under varying pressures. Some animal species also response to vegetation structure that allow a clear view of their surrounding and enable them to move with speed and agility through the under growth, like ground squirrel make use of the forest edge and strip vegetation because they are not able to survive an arboreal life unlike the tree squirrel that dominate the area. Common duikers were also found in sparsely dense habitat.

Table 1. Species list, mode of identification and status of mammals, reptiles and birds in Ipinu Igede community forest

Species				Mode of identification				Status
S/N	Common names	Scientific names	Family	DS	IND	INH	PC	Category
Mammals								
1	Common duiker	*Sylvicapra grimmia*	Bovidae	X	x	X	X	VU
2	Bushbuck	*Tragelaphus scriptus*	Bovidae	X	-	X	X	LR/cd
3	Oribi	*Ourebia ourebi*	Bovidae	X	-	X	X	LR/cd
4	Waterbuck	*Kobus ellipsiprymnus*	Bovidae	-	-	X	-	LR/cd
5	Pale fox	*Vulpes pallida*	*Canidae*	-	x	X	-	LR/cd
6	Tantalus monkey	*Chlorocebus tantalus*	Cercopithecidae	X	x	X	-	LR/cd
7	Olive baboon	*Papio Anubis*	Cercopithecidae	X	-	X	-	LR/cd
8	Four-toed hedgehog	*Atelerix albiventris*	Erinaceidae	-	-	X	-	LR/cd
9	Allen's galago	*Sciurocheirus gabonenisis*	Galagidae	-	-	X	-	LR/cd
10	Spotted hyena	*Crocuta crocuta*	Hyenidae	-	-	X	-	Vu
11	Crested Porcupine	*Hystrix cristata*	Hystricidae	-	-	X	-	Vu
12	Pygmy rabbit	*Brachylagus idahoensis*	Leporidae	X	-	X	X	LR/cd
13	Giant ground pangolin	*Smutsia gigantea*	Manidae	-	-	X	-	Vu
14	African grass rat	*Arvicanthis niloticus*	Murinae	X	-	X	X	LR/cd
15	Forest giant pouched rat	*Cricetomys emini*	Nesomyidae	-	x	X	X	LR/cd
16	African straw-coloured fruit bats	*Eidolon helvum*	Pteropodidae	X	-	X	-	NT
17	Western palm squirrel	*Epixerus ebii*	Sciuridae	X	-	X	-	LR/cd
18	Striped ground squirrel	*Xerus erythropus*	Sciuridae	X	-	X	-	LR/cd
19	Greater cane rat	*Thryonomys swinderianus*	Thryonomyidae	X	-	X	X	LR/cd
20	African civet	*Civettictis civetta*	Viverridae	X	-	X	X	LR/cd
21	Common genet	*Genetta genatta*	Viverridae	-	-	X	-	LR/cd
Reptiles								
22	Northern alligator lizard	*Elgaria coerulea*	Alligatoridae	X	-	-	X	LR/cd
23	Northern green bush snake	*Philothemus iregularis*	Colubridae	X	-	X	-	LR/cd
24	Black and white spitting cobra	*Naja siamensis*	Elapidae	X	-	X	-	Vu
25	Royal python	*Python regius*	Pythonidae	-	-	X	-	LR/cd
26	Savannah monitor lizard	*Veranus exanthematicus*	Veranidae	-	-	X	X	LR/cd
27	Red adder	*Bitis rubida*	Viperidae	-	-	X	-	LR/cd

Aves (Birds)								
28	Yellow billed kite	*Milvus aegyptius*	Accipitridae	X	-	-	-	RB
29	Black kite	*Milvus migrans*	Accipitridae	X	-	-	-	RB
30	Goshawk hawk	*Accipiter africana*	Accipitridae	X	-	-	-	RB
31	African dwarf-king fisher	*Ispidina lecontei*	Alcedinidae	X	-	-	-	RB
32	African grey hornbill	*Tockus nasutus*	Bucerotidae	X	-	X	-	RB
33	Little ringed plover	*Chardrius dubius*	Charadriidae	X	-	-	-	RB
34	Common ringed plover	*Charadrius hiaticula*	Charadriidae	X	-	-	-	RB
35	Speckled mousebird	*Colius striatus*	Coliidae	X	-	-	-	RB
36	Laughing dove	*Spilopelia senegalensis*	Columbidae	X	-	X	-	RB
37	Mourning collared dove	*Streptopelia decipiens*	Columbidae	X	-	-	-	RB
38	Yellow eyed-pigeon	*Columba eversmanni*	Columbidae	X	-	-	-	RB
39	Abyssinian roller	*Coracias abyssinicus*	Coraciidae	X	-	-	-	RB
40	Piapac	*Ptilostomus afer*	Corvidae	X	-	-	-	RB
41	Senegal coucal	*Centropus sensgalensis*	Cuculidae	X	-	X	-	RB
42	Black throated coucal	*Centropus leucogaster*	Cuculidae	X	-	-	-	RB
43	Bronze manikin	*Lanchura cucullata*	Estrildidae	X	-	-	-	RB
44	Violet turaco	*Musophaga violacea*	Musophagidae	X	-	X	X	RB
45	Western plantain eater	*Crinifer piscator*	Musophagidae	X	-	-	-	RB
46	Double-Spurred francolin	*Pternistis bicalcaratus*	Phansianiddae	X	x	X	X	RB
47	Helmeted guineafowl	*Numida meleagris*	Phansianiddae	X	-	X	X	RB
48	Green woodhoopoe	*Phoeniculus purpureus*	Phoeniculidae	X	-	-	-	RB
49	Common bulbul	*Phynonotus barbatus*	Phynonotidae	X	x	-	-	RB
50	Northern Red bishop	*Euplectes franciscannus*	Ploceidae	X	-	-	-	RB
51	Village weaver	*Ploceus cucullatus*	Ploceidae	X	-	-	-	RB
52	Senegal parrots	*Piocephalus senegalus*	Poicephalus	X	-	-	-	RB
53	Cape starling	*Lamprotornis nitens*	Sturnidae	X	-	-	-	RB
54	Rufus cane warbler	*Acrocephatus rufescens*	Sylviidae	X	x	-	-	RB
55	Pin-tailed whydah	*Vidua macroura*	Viduidae	X	-	-	-	RB
56	coastal indigo	*Indigofera miniata*	Viduidae	X	-	-	-	RB

Field Survey, 2017, In the above table; DS = Direct Sighting, IND = Indices (Animals sign and activities), INH = Interview of hunters, PC = Bush meat processing and selling center, — = Absent, X = Present

Table 2. Wild animals species distribution and abundance according to transect

S/N	Scientific names	Common names	Tran. A	Tran. B	Tran. C	Tran. D	Total	Abundance
Mammals								
1	*Arvicanthis niloticus*	African grass rat	4	3	5	1	13	3.03
2	*Chlorocebus tantalus*	Tantalus monkey	38	-	-	-	38	8.56
3	*Civettictis civetta*	African civet	2	-	1	-	3	0.79
4	*Eidolon helvum*	African straw-coloured fruit bats	38	2	-	26	66	15.38
5	*Epixerus ebii*	Western palm squirrel	110	40	59	81	290	67.60
6	*Brachylagus idahoensis*	Pygmy rabbit	1	-	1	-	2	0.47
7	*Ourebia ourebi*	Oribi	1	1	-	-	2	0.47
8	*Papio Anubis*	Olive baboon	-	-	-	4	4	0.93
9	*Sylvicapra grimmia*	Common duiker	4	-	-	-	4	0.93
10	*Thryonomys swinderianus*	Greater cane rat	1	1	1	-	3	0.79
11	*Tragelaphus scriptus*	Bushbuck	-	-	-	1	1	0.23
12	*Xerus erythropus*	Striped ground squirrel	1	1	1	-	3	0.79
Total			**200**	**48**	**68**	**113**	**429**	**100%**
Reptiles								
13	*Elgaria coerulea*	Northern alligator lizard	3	-	-	2	5	31.25
14	*Naja meleneleuca*	Black spitting cobra	1	-	1	-	2	12.50
15	*Philothemus irregularis*	Northern green bush snake	3	-	6	-	9	56.25
Total			**7**	**-**	**7**	**2**	**16**	**100%**
Aves								
16	*Accipiter africana*	Goshawk hawk	-	-	1	-	1	0.10
17	*Acrocephatus rufescens*	Rufus cane warbler	13	8	7	11	39	4.00
18	*Centropus leucogaster*	Black throated coucal	-	2	1	2	5	0.51
19	*Centropus sensgalensis*	Senegal coucal	12	12	14	17	55	5.65
20	*Charadrius hiaticula*	Common ringed plover	-	-	3	7	10	1.03
21	*Chardrius dubius*	Little ringed plover	-	-	2	-	2	0.20
22	*Milvus migrans*	Black kite	4	-	-	4	8	0.82
23	*Colius striatus*	Speckled mousebird	7	11	9	1	28	2.87
24	*Coracias abyssinicus*	Abyssinian roller	2	1	2	8	13	1.33
25	*Crinifer piscator*	Westrn plantain eater	26	39	19	16	100	10.27
26	*Euplectes franciscannus*	Northern red bishop	9	4	4	1	18	1.85
27	*Pternistis bicalcaratus*	Double-Spurred francolin	14	13	12	19	58	5.95

S/N	Scientific names	Common names	Tran. A	Tran. B	Tran. C	Tran. D	Total	Abundance
28	*Ispidina lecontei*	African dwarf-king fisher	-	-	4	13	17	1.74
29	*Lamprotornis nitens*	Cape starling	4	6	3	2	15	1.54
30	*Lanchura cucullata*	Bronze manikin	11	9	7	6	33	3.39
31	*Milvus aegyptius*	Yellow billed kite	4	6	1	-	11	1.13
32	*Musophaga violacea*	Violet plantain eater	57	70	48	45	220	22.59
33	*Numidia meleagris*	Helmeted guineafowl	20	32	26	23	101	10.37
34	*Phoeniculus purpureus*	Green woodhoopoe	2	-	11	-	13	1.33
35	*Phynonotus barbatus*	Common bulbul	16	8	18	11	53	5.44
36	*Piocephalus senegalus*	Senegal parrots	5	3	6	1	15	1.54
37	*Lamprotornis nitens*	Village weaver	4	5	4	-	13	1.33
38	*Ptilostomus afer*	Piapic	-	2	-	2	4	0.41
39	*Streptopelia decipiens*	Mourning collared dove	12	-	2	3	17	1.75
40	*Streptopelia semitorquata*	Red eyed pigeon	8	11	5	4	28	2.87
41	*Spilopelia senegalensis*	Laughing dove	3	11	5	9	28	2.87
42	*Tockus nasutus*	African grey hornbill	11	27	-	13	51	5.24
43	*Indigofera miniata*	Costal indigo	2	-	2	-	4	0.41
44	*Vidua macroura*	Pin-tailed whydah	1	4	3	6	14	1.44
Total :			**247**	**284**	**219**	**224**	**974**	**100%**
∑Total: Animals/Reptiles/Aves			**454**	**332**	**294**	**339**	**1419**	**-**

Field survey, 2017

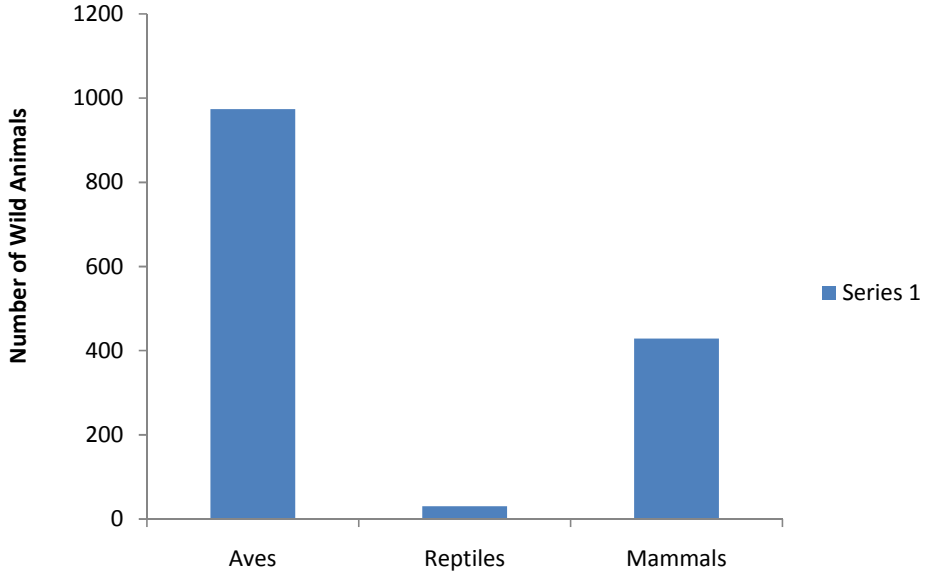

Fig. 1. Class distribution of wild animals in Ipinu Igede Community Forest

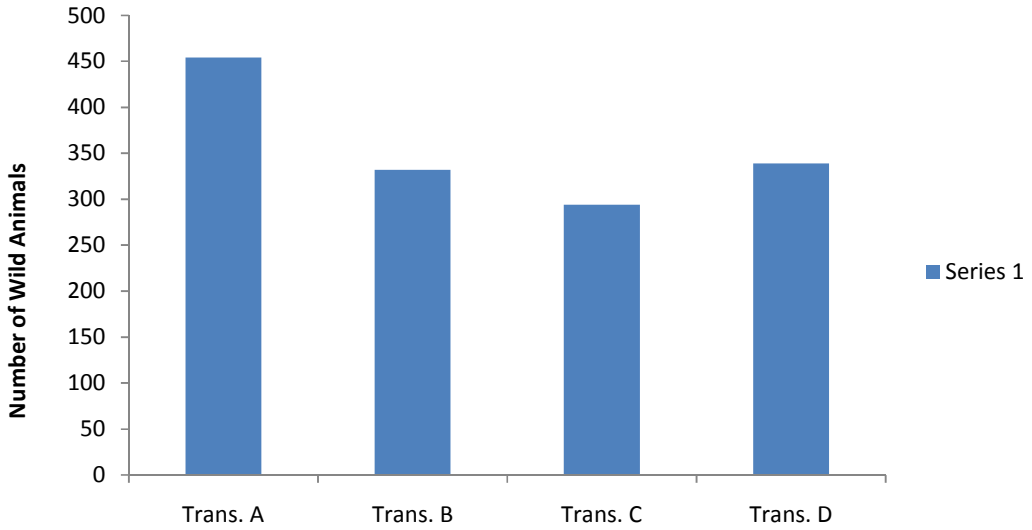

Fig. 2. Distribution of wild animals according to transect

Table 3. Simpson diversity index of wild animal species in the transect

Transect	Individual species (n)	Total of species (N)	Diversity index
A	36	454	0.0061
B	27	332	0.0064
C	34	294	0.0130
D	29	339	0.0071

Plate 1. *Pternistis bicalcaratus*

Plate 2. *Xerus erythropus*

Plate 3. *Thryonomys swinderianus*

Plate 4. *Veranus niloticus*

Plate 5. Feather of *Musophaga violacea*

Plate 6. Dropping of *Sylvicapra grimmia*

Bird life in the study area is largely recorded in relation with trees ranging from the violet plantain eater, western plantain eater, helmeted guineafowl, African grey hornbill, rufus cane warbler, African dwarfking-fisher, double-spurred francolin, village weaver which normally winter around the streams. A large number of birds live on seeds, fruits, buds, and nectar or insects that are found in the arboreal environment. These include western plantain eater and African dwarfking-fisher. The high bird species diversity in the area could be due to the fact that the area acts as a sanctuary from the degraded habitats surrounding it and nesting materials and availability of edible fruits bearing tress. This observation is in line with the report by [18] at GRA and Ankpa quarters Benue State.

In a comparative form, the total number of twenty-one mammalian species is just about 8.5% of 247 species reported for Nigeria [19]. The number is also lower than either of the 123 species reported for Guinea Savannah or 97 species for Sudan Savanna of Nigeria [19]. So, the species richness of the forest might not be unconnected with its size which is relatively small compared to the size of Guinea Savannah (473,904 km^2) or Sudan Savannah (927,338 km^2). This observation agrees with [20] report, that species diversity is often affected by the size of habitat and that diversity is positively correlated with habitat size. Biodiversity assessment and conservation management purposes, distribution or pattern of occupancy is very important and this has been found to vary with different environmental location and condition for a given species.

5. CONCLUSION

Different levels of disturbance have different effects on animal diversity in the study sites. Reliable information on the status and trends of forest fauna resources help give decision makers the prospective necessary for orienting wildlife policies and programs. Domestication of animal species should be advocated both for poverty alleviation in the communal lands of the area, and for a balance to be maintained in the ecosystem.

ETHICAL APPROVAL

As per international standard or university standard, ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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