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POPULATION DENSITY AND STRUCTURE OF THE RED-EARED GUENON (*CERCOPITHECUS ERYTHROTIS CAMERUNENSIS*) IN AFI MOUNTAIN WILDLIFE SANCTUARY (AMWS), NIGERIA.

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ABSTRACT

An estimate of Red-eared guenon's population density and structure was carried out in Afi Mountain Wildlife Sanctuary (AMWS), Cross River State, Nigeria. Line transect method of data collection was used to conduct census. The study was conducted to determine the population density and structure of Red-eared monkeys. Census was conducted in the two sectors of the sanctuary using Ten transects (1.0km length, 0.02km width) and spaced at an interval of 0.5km. Direct method of animal sighting was used. Population density of Red-eared monkeys in the two sectors of Afi Mountain Wildlife Sanctuary was 5/km^2 and 2/km^2 respectively. However, the mean population density of red-eared monkeys in AMWS was ~ 4/km^2. This shows that the population density is similar to previously reported for the monkey species in the study area implying that the population has not increased significantly over time. The variation of Red-eared monkeys in the study area showed that the population structure is composed more of Juveniles than adult (3:1 and 6:1 respectively) implying that there is potential for the population to increase with adequate conservation efforts. The statistical test of significance between the Northern and Southern populations showed no significant difference. (T-tab = 0.482 < t-cal = 0.840 @ p = 0.05). It was therefore recommended that efforts through regular patrols by the rangers should be encouraged to protect the increasing population of guenons in the study area.

Keywords: Guenons, Red-eared, Population structure, Line, Afi Mountain, Nigeria.

INTRODUCTION

The rainforest of Cross River State is one of the richest in species diversity and endemism in the world, and it is home to endangered primates, such as the Cross River Gorilla (*Gorilla gorilla diehli*), the Drill monkey (*Mandrillus leucophaus*), and the Nigerian-Cameroon chimpanzee (*Pan troglodytes elliotii*) (Edet, 2011). The quality of a habitat can be determined by the presence or absence of certain species of wildlife (Eniang and Egwali 2010). According to (Bukie, Nchor; Ebu and Mgbang, 2016) Primates are important indicator species because; these species are visible, often threatened, and endangered, have great public appeal and can be sensitive indicators of low-level disturbance. Also according to Oates, 2011 (as cited in Bukie *et al.,* 2016), if there is a full complement of primate species present and at high population density then the forest habitat is providing the require resources and hunting is not excessive. However, if some species are missing or population densities are depressed, then adverse conditions are affecting primates and probably other wildlife species as well. The Red-eared monkey, sometimes referred to as the Russet monkey, is a member of the Guenon family, and, as the name suggests, they are distinct due to the red splotch of fur on their ears. Red-eared monkeys are found in Western and Central Africa throughout densely forested regions. These monkeys are arboreal and use the heavy tree cover to hide from predators and to forage for food. They tend to be frugivorous but will supplement their diets with leaves, insects, nuts and seeds. Because of their love for fruits and seeds, they likely play a role in seed dispersal (Cronin, Woloszynek, Morra, Honarvar, Linder, Gonder, O'Connor, and Hearn, 2015). These primates generally live in groups of between 12 and 30 animals, led by one adult male who will breed with all of the adult females (Cronin *et al*., 2015). As with some other guenons, females will remain with their natal group for their entire lives, while adolescent males will leave their natal group and join another group for genetic diversity. The adult male is charged with finding food, protecting the females, and most importantly- signalling to the others when there is danger. They are often called "cowardly monkeys" due to their frequent alarm calls. One of the most notable things about red-eared monkeys (other than their red splotch of fur on their ears) is their communication structure. Red-eared monkeys can be sympatric with other monkeys such as Diana monkeys (*Cercopithecus diana*), Mona Monkeys (*Cercopithecus mona*), Putty-nosed monkey (*Cercopithecus nictitans*) and Drill monkey (*Mandrillus leucophaus*) meaning that they can overlap in territory with minimal conflict. Primatologists suspect that, despite competition for food, Diana monkeys (the more dominant species) allow smaller red-eared groups to hang around for predator detection – especially crowned eagles, leopards or chimpanzees. There is evidence to suggest that Diana monkeys can meaningfully interpret some of the more

distinct red-eared predator calls, and males from both species have been observed fending off crowned eagle attacks together (Ikemeh, 2013).

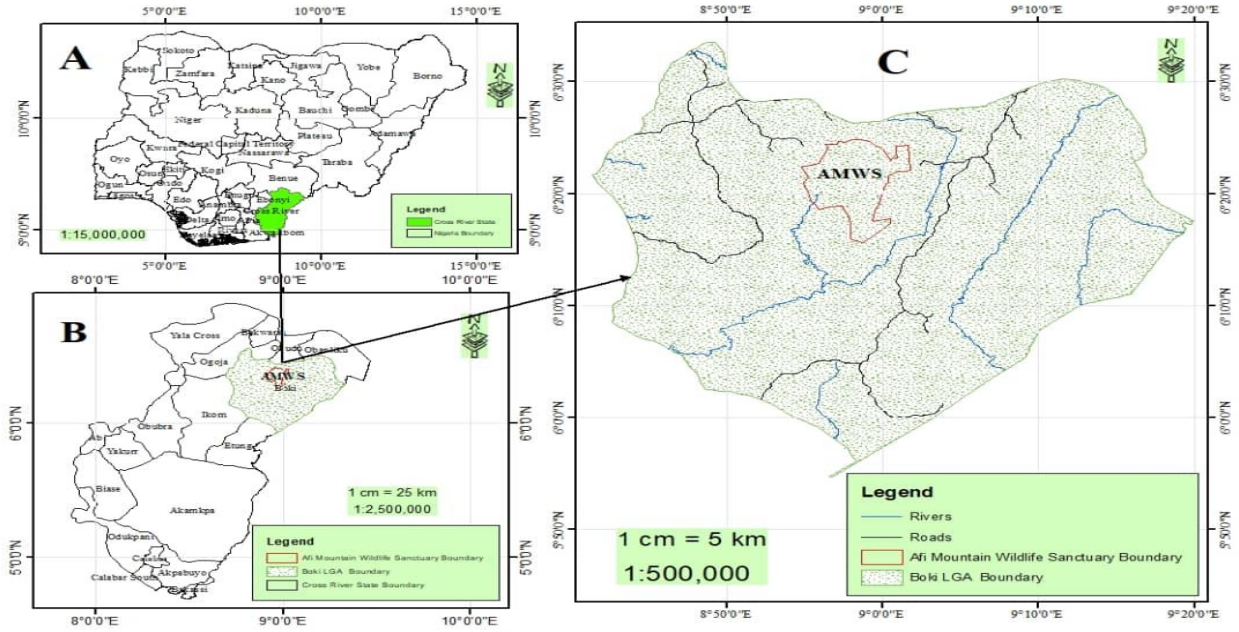
Statement of the Problem

The bush meat market is bustling more so today than it was morethan two decades ago, when Hearn and Morra (2001), began what is now one of the region's longest continuously running studies of commercial hunting activity. At the peak of recorded activity in 2001, on any given day more than 30 freshly killed primates, such as Bioko and Nigeria red-eared monkeys and drills, were brought to market and sold to shoppers seeking such high-priced delicacies. Also, habitat lost due to illegal clearing of protected areas has been on the increase posing a threat to the survival of these animals. Therefore, the main objective of this study was to assess the population density and structure of the red-eared guenons in the study area.

MATERIALS AND METHODS

Study area:

This study was carried out in Afi Mountain Wildlife Sanctuary, Cross river State, Nigeria. The study area lies geographically between Latitude 6°25' and 6°30' North and Longitude 8°45' and 9°15' East. The sanctuary is approximately 100km^2 in size and made up of rocks. It was created from the Afi River Forest Reserve in year 2000 following renewed international interest to protect the endangered Cross River Gorilla, Nigeria chimpanzee and the Drill Monkeys Figure 1.



Source: Bukie et al., 2021

Figure 1: Map of the study area showing: A map of Nigeria, showing Cross River State; B map of Cross River State, showing Boki L.G.A. C map of Boki L.G.A., showing the study area; Afi Mountain Wildlife Sanctuary (AMWS).

Data Collection

The Line Transect method was used for the population density and structure of the Red-eared monkey as used by (Bukie, Ayanbem, Obwe, and Afolasade, 2024). Ten transects (five from each of the two blocks were mapped. Transect length of 1.0km and width of 0.02km and systematically spaced approximately 0.5km from each other in accordance with the guidelines of Peres, (1999). Distances along transects were marked with flagging tapes at intervals of 0.5km for easy identification of animal locations on transects. Each transect was covered by an observer and census was done simultaneously in all the ten transect, with the use of an electronic stop watch, which each observer had. This was done to reduce the incidence of double counting. The census started simultaneously at an agreed time, date and pace (1km/hr). During the census, each observer was equipped with a binocular for easy observation and field notebook to record the following information:

1. Transect number.
2. Approximate right angle distance to the path of observation walked by observer.
3. Approximate distance of observer to animal sighted.
4. Number of Red-eared monkeys sighted.
5. Population structure of the sighted animals

Using the information above, the population density of Red-eared monkeys was determined using the formula:

$D = \frac{N}{2LW}$ ... eq.1

Where:
D = animal population density (Number/Km^2)
N = number of animals sighted
L = Transect Length
W= Effective strip width
Ten (10) individuals conducted simultaneous surveys in the two blocks of Afi Mountain Wildlife Sanctuary in 2024. Rangers of Afi Mountain Wildlife Sanctuary were involved in the surveys

Data Analysis

The student'-test (test of independent means) was used to test the results of red-eared Monkey population density and structure in the two selections. The test criterion is given as:

$$t = \frac{|x_1 - x_2|}{\sqrt{Sp^2\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}} \quad \text{---- eq.2}$$

Where;
*X*1= Density of Northern site population
*X*2 = Density of Southern site population
Sp2 = Pooled variance
*n*1 = Frequency of sight in Northern population
*n*2 = Frequency of sight in Southern population
Pooled variance Sp2 =s

Pooled variance Sp^2

$$= \frac{\left[\sum X_1^2 \frac{(\sum X_1)^2}{n_1}\right] + \left[\sum X_2^2 \frac{(\sum X_2)^2}{n_2}\right]}{(n_1 - 1) + (n_2 - 1)}$$

Or
… eq.3

$$\text{Pooled variance } Sp^2 = \frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{(n_1 - 1) + (n_2 - 1)}$$

Source: (Ajayi, Edet, and Bukie, 2011)

Where;
$S_1^2 and\ S_2^2$ are variances for the first and second censuses respectively. The statement of hypothesis (in the null form) showed that there is no significant difference in the densities of the two censuses

RESULTS AND DISCUSSION

Population density of the Red-tail monkeys in the study area:

The results of the Population density of red-eared monkey seen at different transects are presented in Table 1 and Table 2. Table 1 showed that, the Northern sector of Afi Mountain Wildlife Sanctuary (AMWS) had the highest population density. While table 2 showed that, the southern sector had the lowest population density of the study species.

The population density of the Red-eared monkeys reported in this study, 5/km^2 for the north and 2/km^2 for the south is similar to that of ~4/km^2 reported by Bukie (2015) in the study area. The fact that the population density has not increased much over a seven year period implies that hunting pressure is high Bukie *et al*., (2024). Several other factors such as illegal logging, as reported by (Bukie, Ityavyer, and Inah, 2021) has led to the reduction in large trees species and possibly leading to a reduction in the food resources of the primates in the study area since primates rely mostly on fruit bearing trees.

Table 1: Population Density of Red-eared monkeys in the Northern Sector.

Transect	Number Species	Number of Monkey sighted (N)	Area (Km^2)	Population Density (Number/Km^2)
T 1		0	11.8	0
T2		0	11.8	0
T3		26	11.8	2.20
T4		20	11.8	1.69
T5		10	11.8	0.85
Total		**56**	**59**	**4.74**

The population density in the northern sector is **~5/km^2**
Source: Field survey, (2024)

Table 2: Population Density of Red-eared in the Southern Sector.

Transect Number	Number of Monkey sighted (N)	Area (Km^2)	Population Density (Number/Km^2)
(T1)	0	8.2	0
(T2)	0	8.2	0
(T3)	0	8.2	0
(T4)	5	8.2	0.60
(T5)	9	8.2	1.10
Total	**14**	**41**	**1.70**

The population density in the southern sector is**~2/km^2**
Source: Field survey, (2024).

The structure of Red-eared monkey's population in the study area:

The results of the structure of Red-eared monkey's population in the study area are presented in Tables 3 and 4.Both tables indicating that there were more juvenile red-eared monkeys in the study area. These findings are similar to those reported by Yager et al., (2018) of Primates in Pandam Wildlife Park, Plateau State Nigeria, where juvenile primates constituted the majority of the population.

Statistical test of significance

The result of the statistical test of significance between the Red-eared monkeys population in the study area showed no significant difference (T-tab = 0.482 < t-cal = 0.840 @ p = 0.05).

Table 3: The structure of Red-eared monkey's population in the Northern Sector.

Measurements	Number of Monkey sighted	Relative Frequency	P-value
SEX			
Male	7	0.125	0.04
Female	49	0.821	0.96^{ns}
AGE			
Infant	3	0.053	0.14
Juvenile	30	0.464	0.41^{ns}
Adult	23	0.482	0.45^{ns}

Source: Field survey, (2024)

Table 4: The structure of Red-eared monkey's population in the Southern Sector.

Measurements	Number of Monkey sighted	Relative Frequency	P-value
SEX			
Male	1	0.072	0.05
Female	13	0.928	0.95^{ns}
AGE			
Infant	1	0.072	0.05
Juvenile	12	0.929	0.95^{ns}
Adult	1	0. 072	0.05

Source: Field survey, (2024).

CONCLUSION AND RECOMMENDATION

The population density of the red-eared Monkeys in Afi Mountain Wildlife Sanctuary is ~4/km^2 implying that this species population in the wildlife sanctuary has not increased significantly over the years due to anthropogenic activities. The mean population structure of the red-eared Monkeys in the study area was predominantly by juveniles, implying that there are growth potentials.

Recommendation: The following recommendations were made.

Regular population assessment of primates in the Afi Mountain Wildlife Sanctuary should be conducted to ascertain the population trend for effective management policies and conservation.There is need to carry out research on the nutritional requirements and biology of the red-eared monkey, to ascertain the survival possibility of the species. Government, NGOs and individuals should encourage research on the red-eared monkey through adequate logistics and financial support.

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