Check List and Population Densities of Mammals in the University of Agriculture Makurdi Wildlife Park, Benue State, Nigeria

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Authors' contributions

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

Article Information

Original Research Article

ABSTRACT

Appraisal of fauna species which form an integral part of ecology, in protected based areas is necessary before any meaningful conservation work can commence. This study was undertaken in the wildlife park of the University of Agriculture, Makurdi, to produce the species list and determine the population density of mammals in the park. The species list was obtained using both direct and indirect methods while density of mammals were determined using the kings census method. The park was stratified into two vegetations types, the riparian and woody vegetations. Result obtained showed that 19 species of mammals were identified while the density of some of them ranged from $1.0/km^2$ to $10.0/km^2$ in both the riparian and woody vegetations in the park. The park supports

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unique fauna species making it significant regarding conservation and scientific interest and has to be protected through fencing, conservation awareness and community participation to conserve the current species and enhanced its range productivity.

1. INTRODUCTION

Habitat destruction and overexploitation are the factors driving much of the current global biodiversity extinction crisis and threatening the essential benefits, or ecosystem services, that human derive from the functioning ecosystems [1]. However, the survival and continuity of many endemic, rare and threatened species found in a given area depend on sustainable conservation through its assessment to determine its current status [2].

Mammals are one of the biodiversity groups showing the most rapid decline worldwide [3]. Large mammals are those animals being larger than 3 kg by weight [4]. They are fundamental element in many ecosystems as they regulate the structure and function of the ecosystem in which they occur [5], Some include Elephant (*Loxodonta african)*, Lion (*Pathera leo*), Buffalo (*Syncerus caffer)*, *Chimpanzee (Pan troglodytes*), Giraffe (*Giraffa camelopadalis)*, Leopard (*Panthera perlus*, Bush Buck (*Tragelaphus scriptus*), Warthog (*Phacocoerus aethiopicus)*, and Gorilla (*Gorilla gorilla).*

The establishment of many National Parks, Game Reserves, Zoological gardens, Wildlife Sanctuaries and Natural history museums backed up by promulgation of wildlife laws, decrees and edicts are clear indication to conserve and manage wildlife resources [6]. This has become critical because most fauna species live in a tropical forest which is increasingly been impacted by human modification and natural occurrences. The development of wildlife programmes such as National parks and game reserve has brought about a new form of recreation for the people. They have a tremendous value of attracting both local and international tourists for the purpose of recreation and have been accepted as places of entertainment and mental relaxation. It makes a substantial contribution to rural development by enhancing the aesthetic and recreational values of natural resources [7]. Wild animals especially large mammals add to the natural beauty of the forest and grasslands in which they are found.

They feature in many of our folktales, customs and traditions [8].

Wild animals have great educational and aesthetic value, many biology, zoology, and ecology and evolution classes from primary schools to Universities use animals as an example to illustrate biological principles and theories. According to Alo et al. [9], wildlife and natural institutions are materials for education and scientific studies. The wildlife biologist does not lack interest in individual animals, for this form the basis for understanding the larger group. However, the conservation, destruction or management of wildlife demands interest in wildlife population and the ways in which these respond to changes in the environment.

The University of Agriculture Makurdi, in 1998 established a wildlife park, though had no appreciable ecological survey of the fauna resources at moment, hence, the dearth of information necessary for the development and continuity of the park necessitate this study. The area has suffered from activities of illegal hunting, and farmland encroachment thereby threatening important flora and fauna species.

2. MATERIALS AND METHODS

2.1 Study Area

The research was carried out at the Wildlife Park of the University of Agriculture Makurdi, located in Makurdi. It lies within the Southern Guinea Savannah Zone between latitude 07° 49' N and 07° 52' N and longitude 08° 40' E and 08° 38' E [10]. The study area is located at the North Eastern part of the University. It is about 1.5 km on the way to Gbajimba Local Government and shares a common boundary with five villages namely: Tse Dei, Anyam, Vambe, Tse Yauu and Tyodugh. The park covers an area of about 24.2 km^2 [10]. The terrain of the area is basically an undulating plain. Its relief ranges from 83 m to 167 m above mean sea level. The drainage system in the park comprises of several streams having water only during raining seasons. These major streams, which are tributaries of River

Benue, include Baa and Najime streams. The climate of the study area is a tropical climate with a clear distinct dry and wet season. Rainfall in the wet season (April to October) is about 1.240 mm – 1.440 mm. The monthly temperature is about (28.5°C – 36°C) and may rise to 38°C in March to April. Three types of soils are found in the study area namely; alluvial, clay, loam, and sandy soil. The vegetation has been described as open woodland with trees having broad leaves. The riparian vegetation occurs in areas that are frequently flooded during rains. Areas previously cultivated referred to as grassland vegetation have the emergent of trees. The wildlife park contains most of the animals' species of typical western Guinea Savannah Zone. The area has subjected to intense hunting pressure for a long time and animals are less frequently seen during the day time, but their foot prints and droppings can be seen. Some of the animals and avifauna that roamed the study area and to some extent be seen include; Grimm's duiker *Sylvicapra grimma* Red-flanked duiker *Cephalophus patas* Warthog *Phaccorus aethipicus* Grass cuter *Thryonomys swinderianus* Giant ponchal rat *Cricetonuys gambionus* Monitor lizard *Varanus nitolticus* Guinea fowl *Numida meleagris* Bush fowl *Francolinus albogulanis* [11].

2.2 Data Collection Techniques

The population estimate of the University Agriculture wildlife park large mammals were assessed using line transect method as outlined by Sutherland [12]. Four transects (2 each from the riparian and woodland vegetation were established). Transects length of 1 km and 3 meters in width were laid in each vegetation type. Each transects was walked twice a day for 15 days within an interval of 30 days. The census took place in the morning from 6.00 am to 9.00 am and in the evening between 3.00 p.m. and 6.00 p.m. The census commenced at the same time each day. The surveys took place for 180 times within the period of six months. In each case, four observers (the researcher and 3 game guard) were involved in the census.

The census took place in the dry season from 1st February to 30th, April 2015, and during the raining season, the census was conducted from 1st July to 30th September 2015. Observers moved at the rate of 500m/h, stopping occasionally to observe for animals (direct observation). When an animal or group was sighted the sighting distance from the observed

was noted. Other information obtained include the name of the animal species, number sighted, group spread, activity when sighted, habitat type and weather condition.

Indirect indices as well as through information (oral interview) from Hunters (IFH), local people (IFLP), through two elders and hunters each from the five adjacent communities, who live in the area for atleast 30 years. Bush meat processing and selling centre (IFBPSC) and from Literature (IFL), on the presence of mammals in the study area as outline by [2].

2.3 Data Analysis

(i) The species list of the mammals was analysed using descriptive statistics.
(ii) The absolute densities of the mammals was determined using the model outlined by Bukie, [13] as stated below;

$$D = \frac{n}{2L\hat{w}}$$

Where;

D = Absolute density of the population species.
n = Total number sighted
L = Total length of transect walked
Ŵ = Average sighting distance

The statistical test of significance between the absolute densities of mammals in the two vegetation type of the wildlife park was tested using the student's test.

3. RESULTS

A total of nineteen mammalian species were identified, and majority was through information from the local people and about 11 out of the number were through direct observation (Table 1). The result of population densities of mammals in Park are presented in Tables 2 and 3 revealed that, six species with 17 observations were made at riparian part of the park and *Cephalophus rufilatus* had the highest density estimate of 600/Km^2 *Crocuta crocuta* and *Thryonomys swinderianus* at 100/Km^2. At the woodland part, five species were encountered with 12 observations; however, *Erythrocebus patas* had the highest density estimate of 500/Km^2 *Hystrix africanus* and *Genetta poensis* had the least at 100/Km^2.

Table 1. Species list of mammals in Wildlife Park University of Agriculture Makurdi

	Common name	Scientific name	Methods of identification				
			DO	IFH	IFLP	IFBPSC	IFL
1	Bush buck	*Trageluphus scriptus*	X	-	X	X	X
2	Grimm's duiker	*Sylvicopra grimmin*	X	-	-	-	-
3	Red flanked duiker	*Cephalophus refilatus*	X	-	X	-	-
4	Spotted hyena	*Crocuta crocuta*	X	-	-	-	-
5	Grass cutter	*Thryienomys swimderianus*	X	X	X	X	-
6	Fox	*Vulpes spp*	X	-	-	X	-
7	Hare	*Lepus corpensis*	-	X	X	-	-
8	Red patas monkey	*Erythrocebus patas*	X	X	X	-	-
9	Tantalus monkey	*Cercopithecus aethiops*	X	X	X	X	-
10	Bush baby	*Galango spp*	-	-	-	-	X
11	Crested porcupine	*Hyshiy spp*	X	X	X	X	X
12	Bush pig	*Phacocoems aethiopicus*	X	X	X	X	X
13	African civet cat	*Vivera civetta*	-	X	X	-	-
14	Hunting dog	*Lycaon pictus*	-	X	X	-	-
15	Lion	*Panthera leo*	-	-	X	-	-
16	Maxwell duiker	*Cephalophus maxwelli*	-	X	X	-	X
17	Ground squirrel	*Xyrus retilus*	-	X	X	-	-
18	Forest Genat	*Genetta poensis*	X	-	X	-	-
19	African hedgehog	*Atelerix. algirus*	-	X	X	-	-

Legend: X – Applicable; - Not Applicable; DO - Direct Observation; IFH - Information from hunters; IFLP - Information from Local People; IFBPSC - Information from Bush meat Processing and selling centers; IFL - Information from literature

Table 2. Population densities of mammals in riparian vegetation of the Wildlife Park

S/N	Common name	Scientific name	Frequency of observations	Estimated mean density per km²
1	Red flanked duiker	*Cephalophus rufilatus*	6	600
2	Grimm's duiker	*Sylvicapra grimminii*	3	300
3	Bush Buck	*Tragelaphus scriptus*	2	200
4	Spotted Hyena	*Crocuta crocuta*	1	100
5	Fox	*Vulpes spp.*	4	400
6	Grass cutter	*Thryonomys swinderianus*	1	100
	Total		17	1700

Table 3. Population densities of mammals in woodland vegetation of the Wildlife Park

S/N	Common name	Scientific name	Frequency of observations	Estimated mean density per km²
1	Tantalus monkey	*Cercopithecus aethiops*	3	300
2	Red patas monkey	*Erythrocebus patas*	5	500
3	Bush pig	*Phacocaerus aethiopicus*	2	200
4	Crested Porcupine	*Hystrix africanus*	1	100
5	Forest Genet	*Genetta poensis*	1	100
	Total		12	1,200

4. DISCUSSION

4.1 Species List of Mammals in UAM Wildlife Park

Nineteen (19) different species of mammals were documented ranging from the smallest, the African Hedgehog (*Atelerix. algirus*) and the biggest, the Lion (*Panthera leo*). The species reported in this study have been reported by several authors as savanna species [13,14]. More so, the red flanked duikers (*Cephaluphus rufilatus*) had the highest frequency observation and the Grass cutter (*Thryonomys swinderianus*)

had the least. The implication of this finding could be because the Grass cutters species are nocturnal in behaviors hence the sighting was accidental or opportunistic and the hyena too, this could have accounted for the low frequency of sight of these two species. However, these populations' densities for all species are smaller than that observed by Tawo et al. [15] in a fragmented forest in Cross River State. Vegetation makes up the habitat of wild animal species without which the animals will go extinct and it provides food, cover and escape cover for wild animal species [10]. The woodland vegetation of the wildlife park recorded patas monkey (*Erythrocebus patas*) as the highest species encountered and the crested porcupine (*Hystrix africanus)* and the forest genet (*Genetta poensis*) the least. These densities though low, are however higher than those observed by Yager et al. [16] in Pandam Wildlife park, a location in the same ecological region as the study site. This observation agrees with Mbaya and Malgwi [17] 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 [18]. The need to plan fauna resources assessment and management on the basis of accurate inventory and take protective measures to ensure that the resources do not become exhausted are the concept of modern conservation. The Wildlife Park of the University of Agriculture, Makurdi, is created for conservation of flora and fauna of Benue state and research activities of the University in biodiversity.

5. CONCLUSION

Different levels of disturbance have different effects on animal diversity in the study sites. Reliable information on the status of fauna resources help give decision makers the prospective necessary for orienting wildlife policies and programs. Survival of wildlife resources can also be achieved by adequately involving the residents of the neighbouring communities in the management of park resources. This is true because they are the cardinal factors towards its success or failure. Result of the study has shown the presence of mammals in the park, although large mammals like elephant and lion, were not sighted directly in the park, however small and medium-size mammals were found during the census and although even though their mean population densities were low, these were still higher than that of some protected areas in the same ecological region.

There is need to exercise caution in the utilisation of the land of the park to ensure the habitat improvement of the area. This strongly points to the need proper for fencing; also imbibe community participatory approach to enhance the protection of biodiversity in the park.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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