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Full Length Research Paper

Population density and distribution of green monkey (*Cercopithecus aethiops*. linnus 1758) at Zugurma sector of Kainji lake national park, Nigeria

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The population densities and distribution of green monkey (*Cercopithecus aethiops*) at Zugurma sector of Kainji lake national park were investigated. Transects were taken within the vegetation zones. Animal census was carried out by using road count and ground survey between 6.30 - 12.00 h in the mornings and between 15.00 - 18.30 h for six months. Other information recorded were the number of troops, the troop size, and the vegetation where they occurred. Results were pooled together using outer bound method. The diameter at breast height (DBH) and the relative densities of the major plant species in the habitats were also recorded. The result of the study revealed that the habitat of the green monkey have been restricted to the riparian vegetation zone in this sector of the park. The population density in Zugurma sector was 0.6/ km^2. The habitats were highly threatened. The average monthly population range was 141 - 795 for the period of study. The troop size was six. The population ratio of male to female was one to two. It was also observed that the juveniles were about 40% of the population. This confirmed that the population is stable and viable. Recommendations were made on the necessary strategies for improvement on the conservation of the species.

Key words: Green monkey, population densities, direct count, transects, habitats, troop size.

INTRODUCTION

The size and composition of a population are vital information since they reveal not only that the species could be seriously endangered but that it can continue to decline despite serious efforts to protect and increase its numbers (Dasman, 1964). Dasman (1964) also pointed out that poaching or heavy hunting of animal do not lead to extinction of such species, but that factors that can make a specie go extinct among others include habitat destruction. This is so because once the habitat has been destroyed, it may take a longer period to recover, if possible, from environmental stress.

Afolayan (1976) showed that over eighty percent (80%) of the vegetation of the park is burnt indiscriminately every year; as a result, there is the need for a proper extensive investigation on the distribution, habitat utilization and the population size of the individual animal's species in the park.

This study is the first carried out at Zugurma sector of Kainji Lake National Park to assess the population densities and distribution of green monkey (*Cercopithecus aethiops*) and will provide the basic data required for planning on how to conserve green monkeys as a threatened species in the park.

MATERIALS AND METHODS

The study area was Zugurma sector of Kainji Lake National Park (1860 km^2). The study was carried out for six months. This survey was carried out using 4-wheel vehicle. The vehicle was moving at a speed of 20 - 30 km/h with three observers that records the presence and absence of green monkeys at both the left and right

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Table 1. Summary of the population and population structure of green monkeys at Zugurma sector of Kainji lake national park (April - September)

Month	No. of troops	Male	Female	Juvenile	Total	Percentage juvenile
April	110	153	251	318	722	44
May	125	183	285	277	795	29
June	122	117	284	315	776	41
July	86	123	18	223	533	42
August	60	90	134	164	388	42
September	25	29	48	64	141	45
Average	88	126	198	227	559	41

Table 2. Spatial and seasonal distribution of green monkeys at Zugurma sector of Kainji lake national park.

Block	Area	Dry season			Wet season		
		April	May	June	July	August	September
	Shaffini	12	12	12	12	6	3
1.	Adamu Attah	14	51	26	18	12	4
	Muazu Ibrahims	48	40	38	26	20	16
2	Manyara	198	262	204	136	112	32
	Old Makaide	12	12	12	6	6	10
	Ibrahim Kolo	20	17	18	12	14	8
3.	Lion Cave	90	93	69	44	32	12
	Abubakar Mashegu	12	12	12	6	6	3
	Kurmi	56	56	76	52	38	13
4.	Abdullah Idrisu	38	48	26	6	6	-
	Etsu Usman	40	50	44	31	13	14
	Foto	64	64	86	62	41	12
5	Kola Aladejana	6	6	6	6	6	-
	Kishi	44	44	270	84	64	20
	Faje	38	38	27	20	6	-
	Total	722	795	776	533	388	141

sides of the game viewing tracks of the park. Observations were made from 6:30 to 12:00 h in the mornings and from 15:00 to 18:00 h in the evenings. Also, the sector was divided into five blocks on the basis of the vegetation types. Movable transects were made within the blocks.

Records of troops and the number of individuals in each troop, number of males and females, number of adults and juveniles,perpendicular sighting distances were recorded on a data sheet. In order to reduce error in this method, all transects used were straight lines which prevents double counting. Also, all the transects were longer than 4 km as recommended by the American committee on conservation of national population and committee on non-human primates (1981). Outer bound method was used to estimate animal population, T-test, Pearson's correlation (Non-parametric Correlation) and Spearman's correlation for paired samples were used for statistical analysis.

RESULTS

Table 1 gives the summary of the monthly estimate of the population and population structure of the green monkey at Zugurma sector of Kainji Lake National Park. The Table shows that a maximum of 64 individual members were sighted in May while 14, being the least was recorded in September. The number of troops varies from 25 to 110 during the study period.

Table 2 shows the spatial distribution of green monkeys at Zugurma sector of the park during the dry and wet season. The highest number of the animals were sighted at Manyara area of the sector throughout the period of

Table 3. Lists of common trees species in the habitats of green monkey at Zugurma sector of Kainji lake national park.

Botanical name	Relative frequency	Diameter at breast height (cm)
Annona leocarpus	830	6.50
Acacia spp	5.46	4.10
Afzelia africana	4.48	9.50
Burkea africana	5.40	8.60
Combretum spp	4.20	9.10
Danielia oliveri	5.60	19.20
Disospyros mespliformis	18.60	10.80
Annona senegalensis	5.85	3.20
Ficus gardensis	7.35	2.70
Isoberlinia tomentosa	5.64	11.50
Tamarindus indica	6.45	18.10
Gardenia ternifolia	2.30	2.95
Prosopis africana	3.10	8.20
Detarium microcarpum		10.50
Vitex domiana	2.15	6.40
Xymenia Americana	5.41	4.50
Vitalaria paradoxum	8.57	12.10
Others	1.0	

study. The least number of green monkeys were sighted at Kola Aladejana.

In September, green monkeys were not sighted at all in the two areas of Kola Aledejana and Faje. The two areas were not far from the riverbanks and had become swampy or waterlogged.

Table 3 gives the list of major three species in the habitat of green monkeys at Zugurma sector. The diameter at breast height (DBH) relative frequencies was also shown. *Diospyros mespliformis* had the highest relative frequencies while *Vitex dominia* had the lowest. *Danielia oliveri* had the highest DBH while *Ficus gadensis* had the lowest.

DISCUSSION

Population densities of green monkey

By using outer bound method of animal population estimation, the upper limit of observation showed that there were 156 green monkeys at Zugurma sector. The calculated population density at Zugurma sector was 0.62/ km^2.

At Zugurma sector, about one green monkey can be sighted in every kilometer area of land covered. The population densities were not the same for the six months. This was in line with the report of Ayodele et al. (1999). Statistical analysis shows that there were significant differences between the monthly recorded densities of green monkeys.

The major reason for the declining population of green monkeys at the park could be attributed to habitat destruction. According to Barbara et al (1987), as forest disappear so too the animals that depend on them for survival. He further stated that the ultimate cause of forest destruction is the human population explosion, which is greater in the poor under-developed countries of the tropics.

Another threat to primates' conservation includes hunting and live capture for export or local trade or poaching (Russel et al., 1987). Agbelusi (1995) also reported that there is inter-relationship between primates' population and deforestation.

Spatial distribution of green monkeys

The green monkeys were spread all over the places. The areas include Shaffini, Adamu Attah, Muazu Ibrahim, Manyera, Old Makaide, Ibrahim Kolo, Lion Cave, Abubakar Mashegu, Kurmi, Abdulahi Direst, Estu Usman, Poto, Kola Aladejana, Kishi and Faje. The major reason is that these areas are located in riparian vegetation which provides cover and food (Onadeko et al, 1998). The green monkeys are very secretive and have anti-predation habit (Marina, 1987; Meduna, 1988). Another reason for the spread of the animals in this sector is that farming activities are taking place all over the areas. This favours the pest activities of the green monkeys.

Effects of season on the distribution of green monkeys

The rain started in June and was very heavy in August and September. In this sector, the number of animals sighted during the dry season was much more than in the rainy season. This can be attributed to poor viewing due to vegetation outgrowth. Most of the areas became inaccessible. Another reason which may affect the distribution of green monkeys and hence be responsible for their low population in the protected areas during the months of August and September is their pest activities.

These months have been found to coincide with the planting periods. The immaturity and non-availability of farm crops on neighboring farms forced the animals to look for food elsewhere probably outside the protected areas.

Afolayan (1976) studied the influence of seasonality on the distribution and movements of large mammals at Yankari National Park and reported that food, water, cover; minerals and burning practices were identified as the main factors influencing the movements of animals especially during the dry season.

Population structure assessment

In most cases, the ratio of male to female is 1: 2. The percentages of Juveniles in the population were in most cases above forty. These observations have indicated that the population of green monkeys at Zugurma sector was very stable and viable. The observations were in line with the report of Dunbar (1987). According to him the reasons for these observations include the fact that females attain the age of puberty and sexual maturity earlier than the males, and hence the transition from infants to adulthood usually takes shorter periods. Also during dispersal, it is the male that is usually affected and they have higher mortality rates than the females.

Troop - size

The troop-size in green monkeys was usually six, although there were few instances where about seven or eight individual members were found together in a group. Dunn (1999) stated that Tantalus monkeys could have a troop size ranging from 6 - 36. Onadeko et al. (1998) reported that monkeys could have a troop-size ranging from 13 - 61. They studied pest-activities of monkeys on crop farms, which are feeding sites. The small troop-size may be due to poor habitat condition.

In this study a group of monkeys with up to 50 individuals at a feeding site were sighted. Such groups are made up of several troops with over-lapping home ranges.

Habitat preference

In this study it was observed that the majority of the green monkeys were found in the riparian vegetation. This is in line with the reports of previous workers (Meduna, 1988; Marina, 1987; 1999).

The attributes of such habitats included availabilities of adequate food and coverage. The diameter at breast height (DBH) in Table 3 shows that the habitats of green monkeys were not woody. The riparian vegetation of the habitats has better species diversity than the wooded savanna vegetation types. The information on the DBH provides the probability of self-replacement of each species or the successional status of the vegetation. Barbara et al (1987) reported that more than 90% of world primate species occur in the tropical forests. Wolfheim (1983) reported that most monkeys inhabit the forest of West and Central Africa. He further stated that habitat preferences vary both within and between forest species. Some species are restricted to particular forest while others occur in two on more kinds of habitats.

Statistical analysis confirmed that there is a weak or insignificant correlation between the diameter at breast height and the relative frequencies of the different tree species in the habitats of green monkey in this park.

RECOMMENDATIONS

The ecology of the green Monday should be studied in details and emphasis should be placed on the habitat requirements. There should be inventory of other wildlife species in this sector of the park. The problem of illegal grazing of livestock in the park could be solved by assisting the Fulani or herd's owners to establish Fodder's Banks for the dry seasons' feeding of their animals in a grazing reserve.

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