Journal of Research in Forestry, Wildlife & Environment Vol. 16(2) June, 2024
E-mail: jrfwe2019@gmail.com
http://www.ajol.info/index.php/jrfwe

ISBN: 2141 – 1778
Somoye et al., 2024

POPULATION STRUCTURE AND SEASONAL HOME RANGE OF FREE RANGING VERVET MONKEYS (*Chlorocebus Pygerythrus*) WITHIN FEDERAL UNIVERSITY OF AGRICULTURE, ABEOKUTA (FUNAAB ZOO PARK) ZOOLOGICAL PARK, OGUN STATE, NIGERIA

Somoye O. J.[1,4]*, Egbetade A. O.[3,] Jayeola O.A.[1], Ademolu K.O.[2], Bamidele, A.O.[2], Emmanuel, N. F.[4]

[1]Department of Forestry and Wildlife Management, Federal University of Agriculture Abeokuta, Email: somoyeoj@funnab.edu.ng
[2]Department of Biological Sciences, Federal University of Agriculture Abeokuta.
[3]Department of Veterinary Medicine, College of Veterinary Medicine, Federal University of Agriculture, Abeokuta.
[4]FUNAAB ZOO Park, Abeokuta
***Corresponding author:** somoyeoj@funaab.edu.ng, +234 7032484259

ABSTRACTS

In order to provide baseline information for the management of free-range primates in a touristic environment, an ecological study to determine the population structure and estimates of home range of Vervet monkeys (Chlorocebus pygerythrus) in Federal University of Agriculture, Abeokuta, Zoological Park was conducted. Direct count method was used for animal census and morphological indices were enlisted to identify and classify the monkeys into age and sex categories. Identified troops were followed and coordinates of their movement were taken with the aid of GPS. Descriptive statistics was used to analyse the population encountered across months and season. Chi square was used to compare population encountered by season, sex. Coordinates collected were plotted into Aeronautical Reconnaissance Coverage Geographic Information System (ArcGis) software to estimate the area covered during the dry and wet season forming a backdrop to generate a bounding area of range covered. The results showed total number of Vervet monkeys encountered was higher in wet season (2,260) than in dry season (2,010) in twenty (20) encounters. Similarly, monthly trends of the population revealed that the females were more than males all through. The trends seem similar as the population of both sexes peaked together in the month of August (Male=100; Female=240). Also, their age structure indicated that Adults > Juvenile > Infants throughout the period of the study. There was no significance difference (p>0.05) in the sex, and age structure of the monkeys throughout the period of the study (Male p=0.91; Female P=0.96; Adult p=0.99; Juvenile p=0.94; Infant p=0.97) respectively. The home range of the study troop was numerically higher in dry season (6.4ha) than in wet season (6.3ha) but there was no significant difference in the area covered by the study troop seasonally (p>0.05). The study concluded that population structure of vervet monkeys in terms of sex was similar and there was similarity in their home range across the two seasons. It is therefore recommended that the areas frequently used by the vervet monkeys should be monitored more in order to ensure continued existence of this free-range monkeys within the park and document changes in pattern of movement and growth as this will modulate management policies within the park.

Keywords: conservation, home range, population structure, vervet monkeys

Correct Citation of this Publication

Somoye O. J., Egbetade A. O., Jayeola O.A., Ademolu K.O., Bamidele, A.O.Emmanuel, N. F. (2024) Population Structure and seasonal home range of free ranging vervet monkeys (*Chlorocebus Pygerythrus*) within Federal University of Agriculture, Abeokuta (Funaab Zoo Park) Zoological Park, Ogun State, Nigeria. *Journal of Research in Forestry, Wildlife & Environment*, 16(1): 160 – 170.

INTRODUCTION

Primates are one of the most ancient mammalian lineages that are currently alive. Their origins date back to the dinosaur age, over 65 million years ago; fossil evidence suggests first anthropoids appeared around 30 to 35 million years ago (Dunbar and Barrett, 2000).). As climate changes occurred around 12 million years ago, a new fruit-and seed-eating monkey lineage emerged – the cercopithecines, including baboons, macaques, guenons and their relatives (Dunbar and Barrett, 2000). *Chlorocebus*

pygerythrus, commonly known as vervet monkeys, are considered to be one of the most successful African primate species due to their ability to inhabit a wide range of habitats, including savannah, woodlands, and forests, according to Allan (2005). While they are highly adaptable and intelligent, their tendency to raid crops, orchards, and even human dwellings has resulted in their classification as pests by some humans, as noted by Lee *et al.* (1986) and Saj (1999).

Despite the negative perception held by some humans who view vervet monkeys as vermin, these primates being frugivorous play a crucial role of seed dispersal in the ecosystem that often goes unnoticed (Foord *et. al*., 1994). Vervet monkeys serve as valuable biomedical models in behavioural and biomedical research. (Freimer, 2007). These monkeys are also one of the most popular primates exhibits in zoological settings.

Vervet monkeys share habitats with other species and are influenced by seasonal changes in day length, which can have a significant impact on their activity patterns. This has been observed in various studies such as Hill *et al.* (2003). One important aspect of primate behavior is their population structure and home range, whic provide insight into social organiz reproduction, and resource use. The size and location of a primate's home range can provide insight into the distribution and abundance of resources in their habitat (Di Fiore and Campbell, 2007).

Vervets frequently raise management issues and human –wildlife conflicts in both protected and non-protected areas, particularly where commercial enterprises and protected areas are contiguous or adjacent to one another. There is the need to monitor the activities of vervets on free range when there are little or no pressure in the environment. The presence of free ranging vervet monkeys within and around the Federal University of Agriculture Zoo Park offer ample opportunity to study this monkey. Information from this study will proffer insight into their normal ecology (routes, nutrition and population trends) and make deviations from observed and documented profiles shifts noticeable. This will serve as a basis for making scientific and sound management decisions as regards the management of this animals within the Zoo Park and invariably the University community.

MATERIALS AND METHODS

Study Area

Free ranging Vervet monkey, *C. pygerythrus* troops were studied for their population structures and their movement pattern within the premises of Federal University of Agriculture, Abeokuta Zoological Park (FUNAAB Zoo Park). The Park lies between longitude 7° 13' 21"N and 7° 13' 31"N and latitude 3° 26' 38" E and 3° 26' 50" E (Figure 1). FUNAAB Zoo Park was commissioned for use on the 23rd of May 2012. The Park covers an area of 62 hectares within the university and it harbours both introduced inmates and resident populations of Wildlife such as Bushbuck, Red Flanked and Maxwell Duikers, Grasscutters, Cusimanse Mongoose, Several species of reptiles, amphibian, birds, insects and of course the Vervet Monkey.

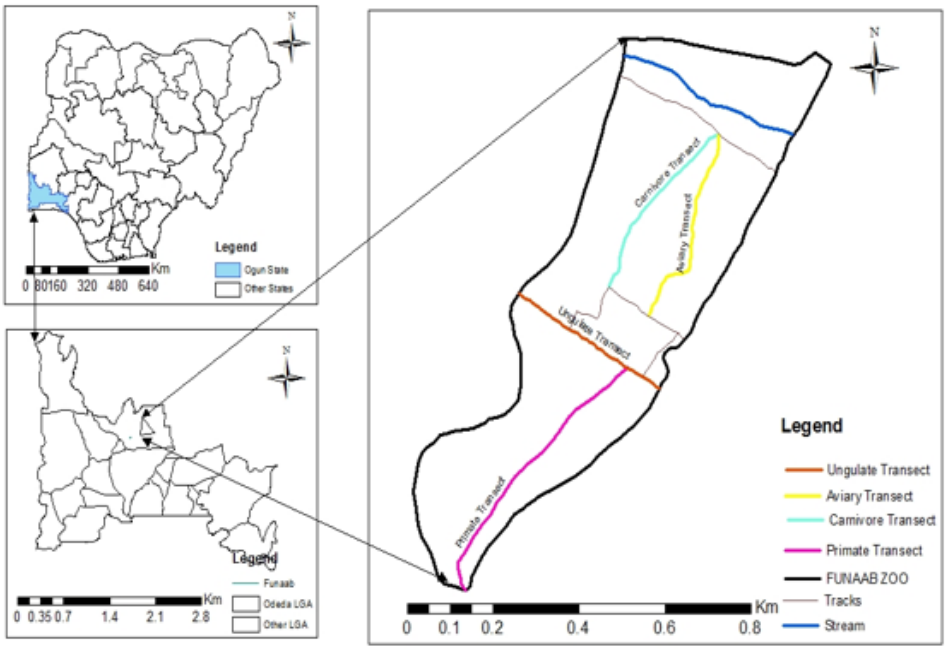

Figure 1: Map of FUNAAB Zoo Park showing the study area. Inset are the map showing the location of the Zoo Park within the Odeda Local Government area inside Ogun State and that of Ogun State inside Nigeria

Data Collection

The study was carried out for 12 months (October to September 2021). The population counts of the free range Vervet monkeys in the study area was carried out using line-transect method. Five established trails in the park where these monkeys were frequently found were used as transects. Each transects was visited twice a day; morning (7:00am – 10:00) and evening (4:00pm – 7:00pm). With the aid of binoculars (Nikon Aculon A211 12x50 Germany), detailed observations of the troop were made to classify individuals into respective age groups as adults, juveniles, and infants. Adult individuals were further identified into their sex categories. Clues such as body size, Scrotum colouration (blue for adult) and mostly protruded red penis served as means of identification and to distinguish adult males from juvenile males. In adult female, pair of elongated nipples in the chest region was conspicuous. Some adult females were seeing with infants sometimes clinging on their belly or on foot at close distance (Cheney and Seyfarth, 1992).

Whenever a troop was located, co-ordinates of their center of mass were marked and subsequently every five minutes as they were being followed until they stopped moving for a continuous period exceeding 10 minutes (Dunbar and Barrett, 2000). The co-ordinate of their new location was then taken as the end point. This was done as long as the vervets were seen moving to provide estimates of home range area.

Data Analysis

Data was analysed using descriptive statistics. Chi square statistical analysis was used to compare number of Vervet monkeys encountered by season and gender. Paired sample T-test was used to compare mean number of Vervet monkeys between gender and between age structure. P – value less than 0.05 was considered to be statistically significant.

RESULTS

Population Structure of Vervet Monkeys Encountered during the Dry and Wet Season by Sex and age.

Figure 2 shows the total number of Vervet monkeys encountered seasonally by sex and age structure. A total of 4270 Vervet monkeys were sighted in twenty (20) encounters during the 12 months' study period. However, the number of Vervet monkeys sighted was higher in the wet season (2260) than the dry season (2010).

Similarly, number of male and female Vervet monkeys sighted were higher in the wet season (M=633, F=1307) than the dry season (M=580, F=1153). However, there were more female Vervet monkeys (F= 2460) sighted than the males (M=1213) irrespective of the season. Also, there were more adult Vervet monkeys (A=3564) sighted than the juvenile (J=425) and infants (I=281) respectively.

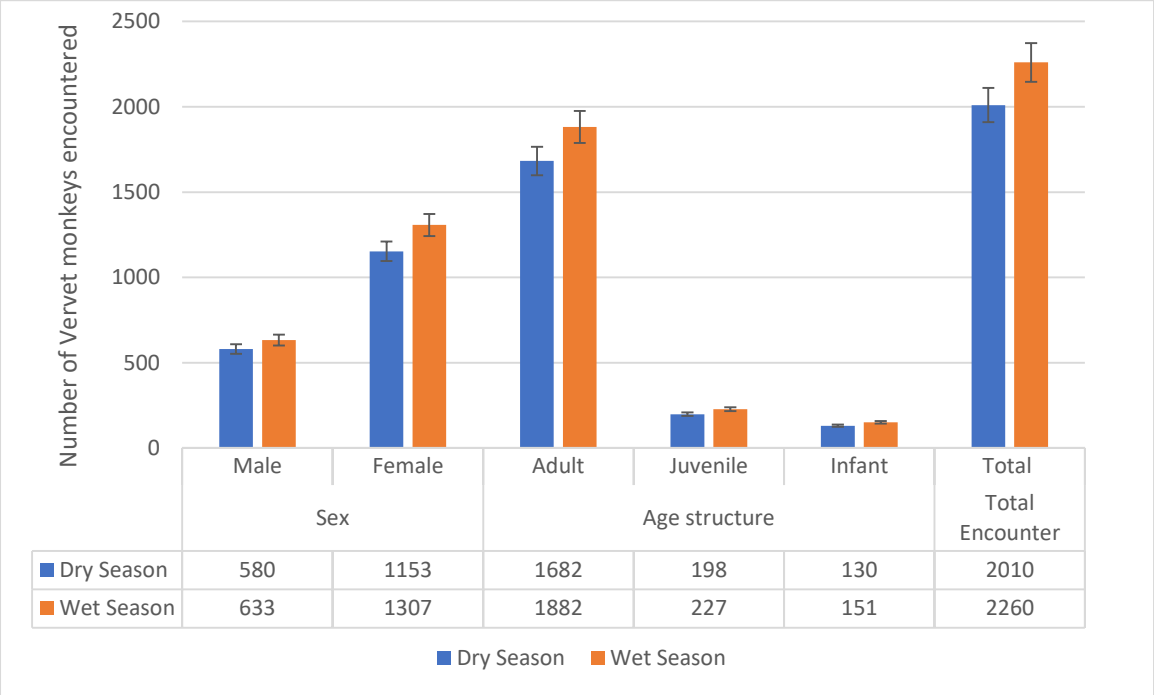

Figure 2: Total number of Vervet monkeys encountered during the dry and wet seasons by sex and age structure

Sex structure of Vervet monkeys encountered monthly between October 2020 and September 2021

Figure 3 shows the Sex structure of the vervet monkeys encountered monthly throughout the study period. Populations of female Vervet monkeys encountered were higher than those of the males across all the study months during the wet and dry seasons. The population of male and female Vervet monkeys encountered followed similar trend across the study month. These were lowest in the month of October and peaked in the month of May. There was no significant difference in the number of male (χ^2= 0.568, p = 0.91) and female (χ^2= 0.833, p = 0.96) Vervet monkeys across the study months during the wet and dry seasons (Table 1). On the other hand, the monthly number of Vervet monkeys encountered were significantly different ($p < 0.05$) between the male and female Vervet monkeys (Table 3).

Age structure of Vervet monkeys encountered monthly between October 2020 and September 2021

Figure 4 shows the monthly encounter of vervet monkeys by age structure during the wet season and dry season. Number of adult Vervet monkeys encountered were appreciably higher than the juvenile and infant Vervet monkeys during the wet season and dry season respectively. Number of adult Vervet monkeys were also observed to be lowest in October and peak in the month of May. There was no significant difference recorded in the number of adult (χ^2= 1.100, p = 0.99), juvenile (χ^2 = 1.333, p = 0.94) and infant (χ^2 = 1.500, p = 0.97) Vervet monkeys encountered across the study months during the wet and dry seasons (Table 1). However, the number of adult Vervet monkeys encountered was significantly ($p < 0.05$) different from the number of juvenile and infant

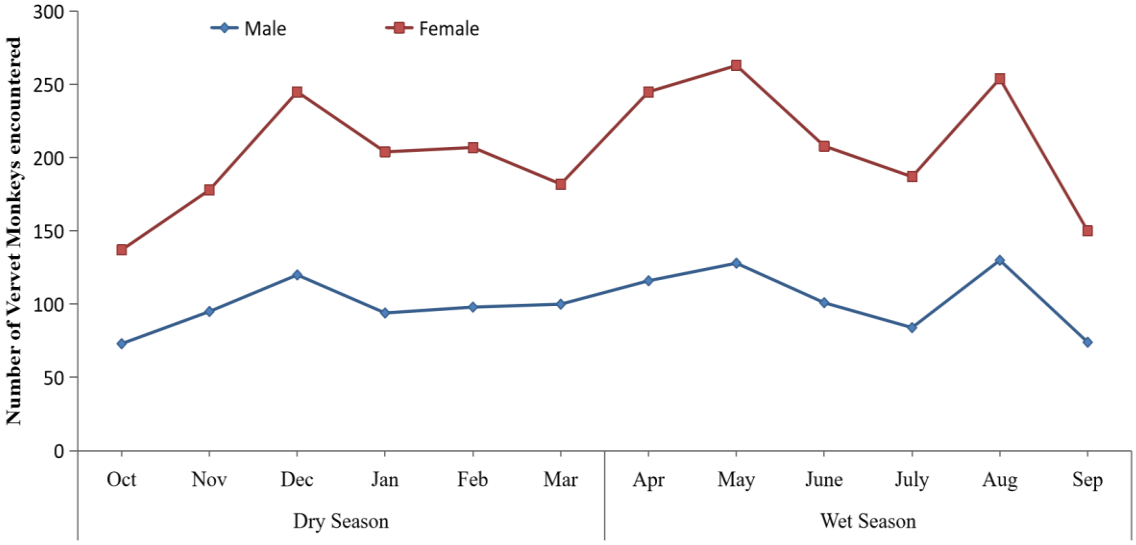

Figure 3: Monthly encounter of Vervet monkeys during the dry and wet seasons by sex

Table 1 Statistical differences of sex and age structure of vervet monkeys encountered on monthly basis.

		Chi-Square	df	p-value
Sex	Male	0.568	11	0.91
	Female	0.833	10	0.96
Age structure	Adult	1.100	11	0.99
	Juvenile	1.333	9	0.94
	Infant	1.500	8	0.97

**Statistically significant at p < 0.05; df = degree of freedom*

Table 2 Statistical differences within the sex and age structure of vervet monkeys encountered on monthly basis.

		T – value	Df	p-value
Sex	Male – Female	15.667	11	0.01*
Age structure	Adult – Juvenile	17.462	11	0.01*
	Adult – Infant	17.867	11	0.01*
	Juvenile – Infant	6.588	11	0.03*

**Statistically significant at p < 0.05; df = degree of freedom*

Vervet monkeys (Table 2). Similarly, the number of juvenile and infant Vervet monkeys encountered was significantly different.

Seasonal home range of the Vervet monkeys encountered

The movement pattern of Vervet monkeys encountered during the wet season and dry season is shown in Figure 5 and Figure 6, respectively. Figure 7 and 8 also represent the areas covered by Vervet monkeys during the wet and dry seasons, respectively. The average area covered by the Vervet monkeys was calculated as 6.3 ha during the wet season (Figure 7). On the other hand, the average area covered by the Vervet monkeys during the dry season was calculated as 6.4 ha

(Figure 8). However, overall, the total area covered by the Vervet monkeys during the one-year study period was calculated as 7.3 ha (Figure 9). This is about 10% of the total area of FUNAAB Zoo park.

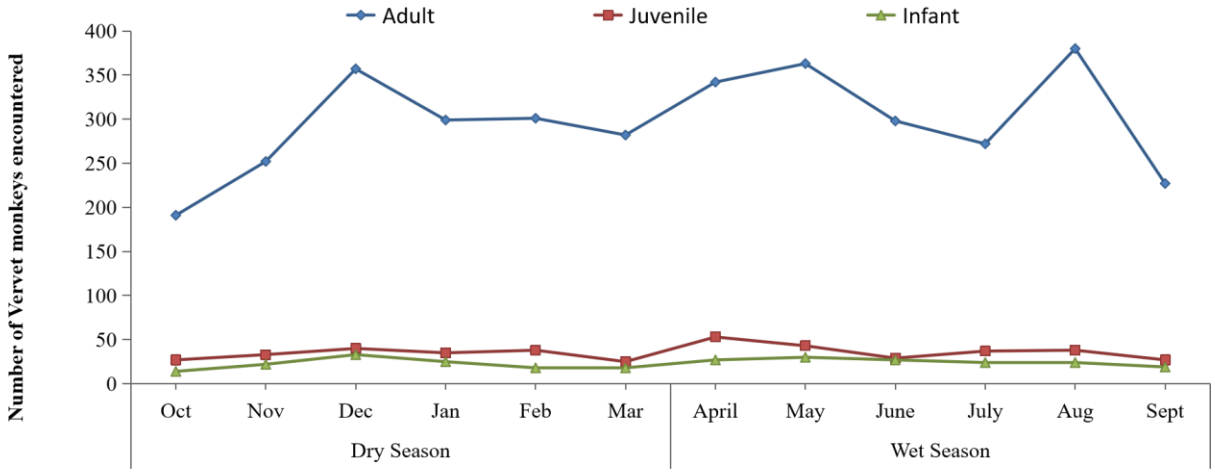

Figure 4: Monthly encounter of Vervet monkeys during the dry and wet seasons by age structure.

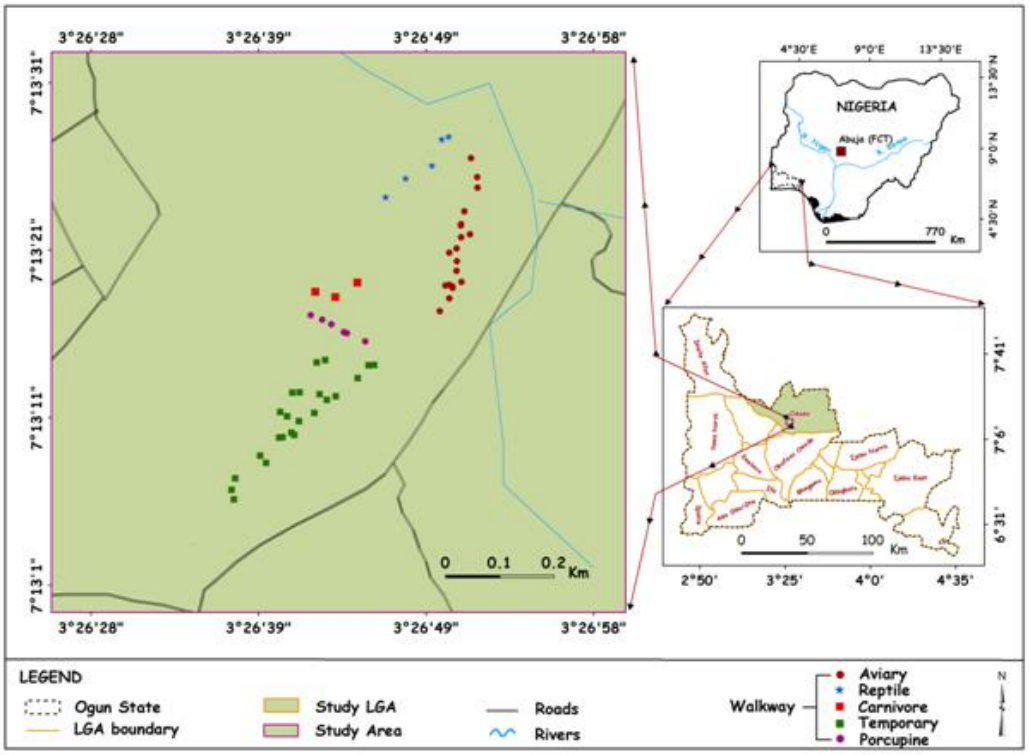

Figure 5 Spatial distribution of Vervet monkeys encountered during the wet season

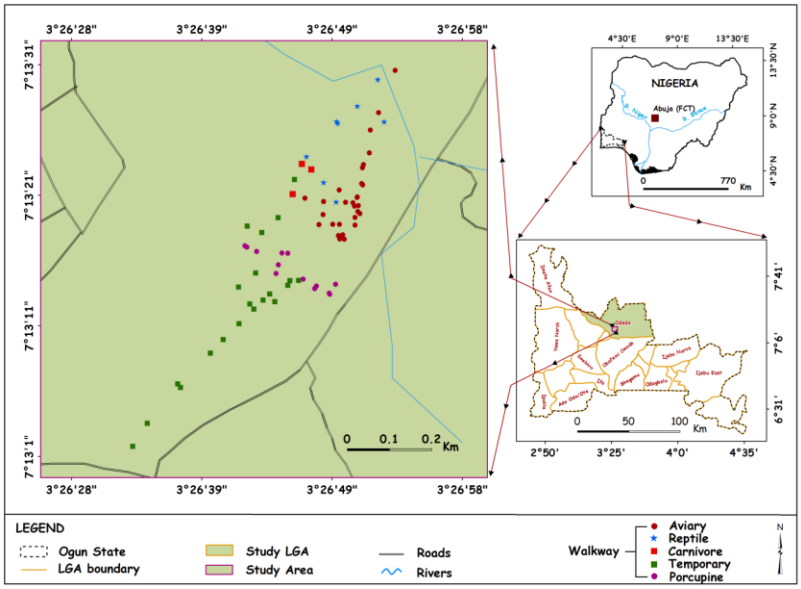

Figure 6 Spatial distribution of Vervet monkeys encountered during the dry season

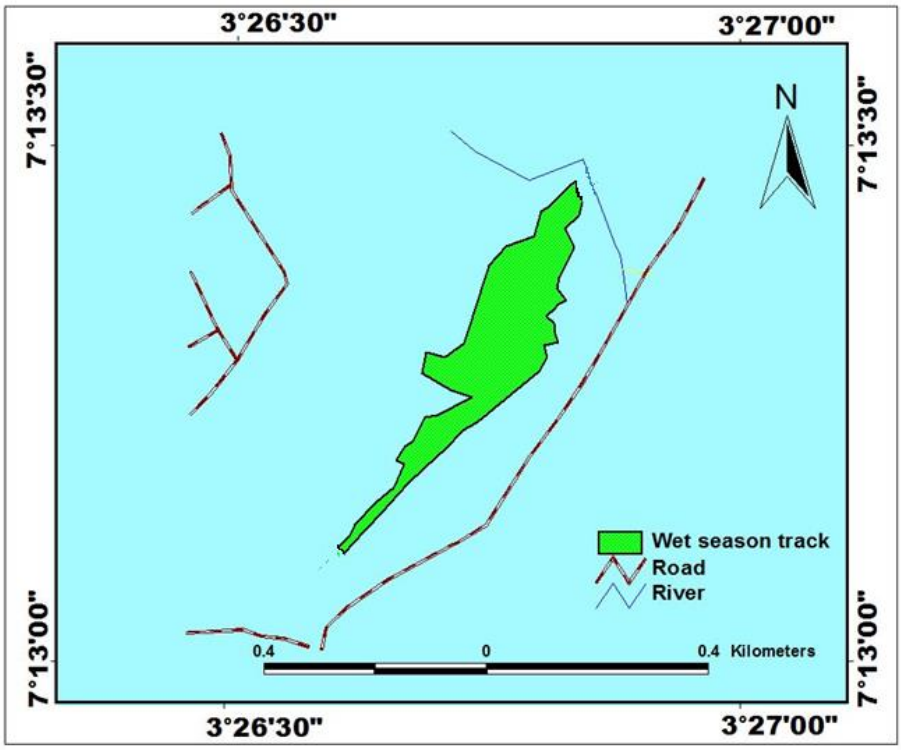

Figure 7 Convex bounding polygon showing the area covered by Vervet monkeys encountered during the wet season (6.3 ha).

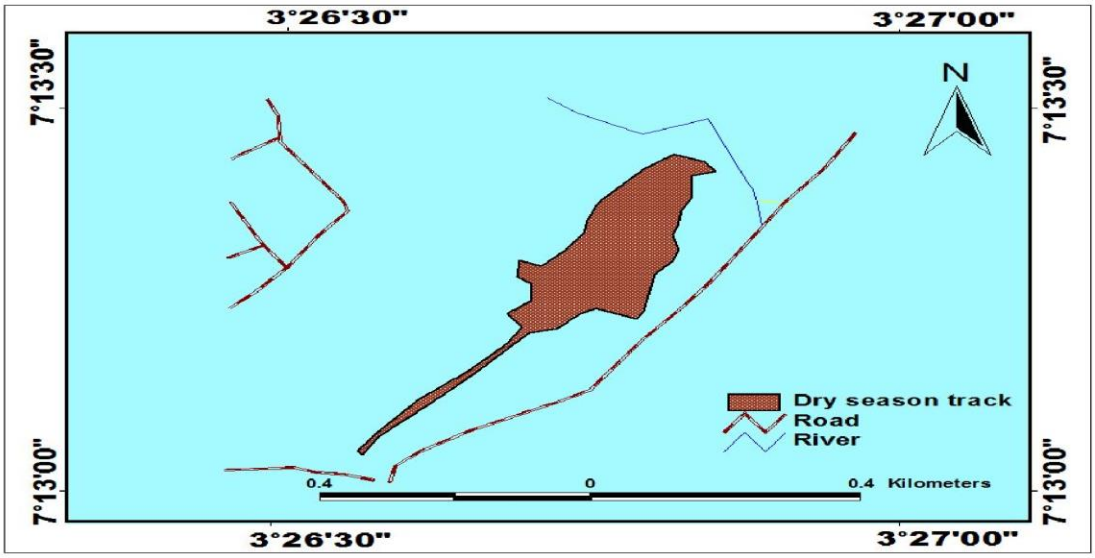

Figure 8 Convex bounding polygon showing area covered by Vervet monkeys encountered during the dry season (6.4 ha).

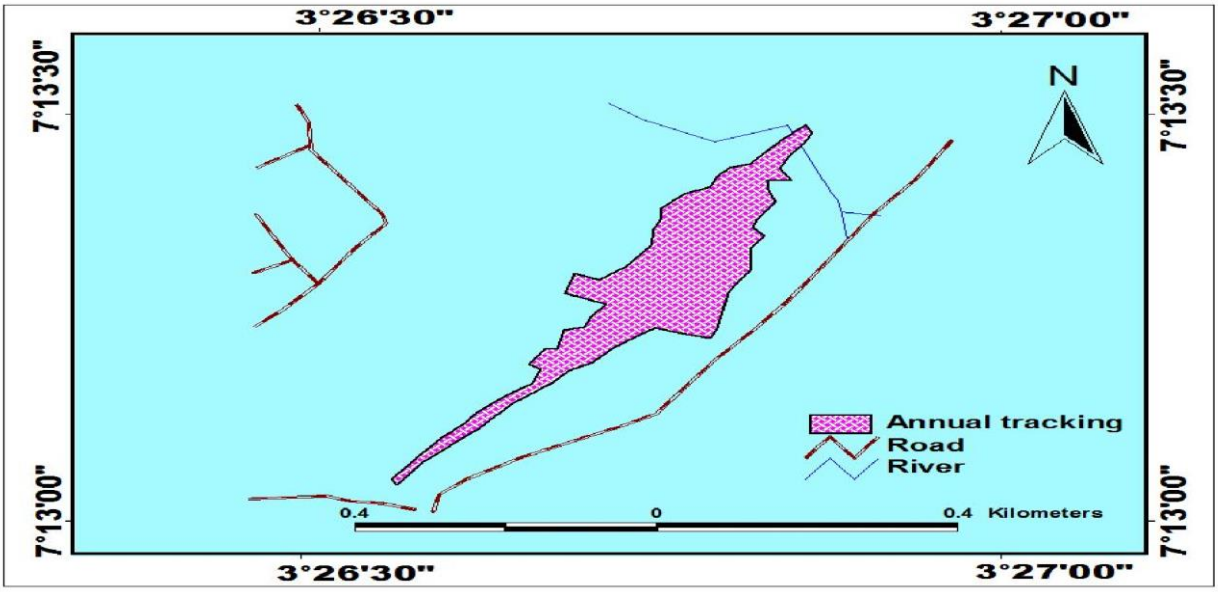

Figure 9 Convex bounding polygon showing the total area covered by Vervet monkeys encountered during the study period (7.4ha)

DISCUSSION

The result of the study indicated that the population structure of free-range Vervet monkeys in FUNAAB Zoo Park is influenced by seasonal changes. The higher number of Vervet monkeys encountered in the wet season compared to the dry season could be attributed to the availability of food and water resources during the wet season, which could increase the survival, reproductive rates and attraction of Vervet monkeys within the area under study.

The finding that there were more female Vervet monkeys than males, irrespective of the season, is consistent with the study by Henzi *et al*. (2019)

which reported that female Vervet monkeys have a higher survival rate and reproductive success than males. The higher number of adult Vervet monkeys compared to juveniles and infants could be attributed to the higher mortality rate of the latter due to predation, diseases, and other environmental factors.

A recent study by Faust *et al.* (2021) on the population dynamics of Vervet monkeys in South Africa reported similar findings, with a higher number of female Vervet monkeys than males and a higher number of adults than juveniles and infants. However, the study also reported that the sex ratio of Vervet monkeys varied across different habitats, with a higher male to female ratio in urban areas compared to rural areas. This could be due to differences in food availability, predation pressure, and human activities in urban and rural habitats. Furthermore, the result shows that the population of both male and female Vervet monkeys encountered during the study period followed a similar trend, with the lowest population occurring in October and the highest in May. This trend could be attributed to factors such as food availability, breeding season, and migration patterns. For instance, May is the peak of the breeding season for most primates (Isbell, 1994), including Vervet monkeys, and this could account for the higher population observed during that month. The availability and abundance of food resources such as fruits and leaves may influence the movement and distribution of Vervet monkeys.

The result on seasonal home range indicates that the Vervet monkeys in FUNAAB Zoo Park have a relatively small seasonal home range. The average area covered during both the wet and dry seasons was 6.3 ha and 6.4 ha, respectively. The total area covered by the Vervet monkeys during the one-year study period was also relatively small at 7.3 ha, which is only about 10% of the total area of FUNAAB Zoo Park. This seasonal home range covered is relatively small when compared to the result from Vervet studies in other regions. Comparing these findings with other studies on Vervet monkeys, O'Brien and Kinnaird (2017) in Kenya, and Johnson et al. (2018) in South Africa found that the average home range of Vervet monkeys in their region was 27.6 ha and 15.4 ha respectively which are larger than the home range found in FUNAAB Zoo park. However, it is important to note that the habitat and environmental factors of each study site may differ, which could influence the home range size of the Vervet monkeys. One of the reasons for the small home range of Vervet monkeys in FUNAAB Zoo park is the availability of food resources that are relatively well distributed within the park which can discourage the monkeys to venture further to find food. Another possible reason limiting the range of the Vervet monkeys could be the activities of visitors in the park. For example, a study by Holmes et al. (2021) found that the presence of visitors and their activities significantly impacted the spatial distribution and behavior of primates in a park in South Africa. Similarly, a study by Li et al. (2020) observed that the presence of tourists reduced the range of activity and foraging behavior of Sichuan snub-nosed monkeys in China. Thus, it is possible that the limited range observed in the Vervet monkeys in FUNNAB Zoo Park could be due, at least in part, to the presence of visitors and their activities. We opine that these limitations might also be due to regular presence of human activities but relative reduction in disturbance of the monkeys within the smaller range and availability of food sources.

CONCLUSION

This study concluded that the population structure of free-range Vervet monkeys in FUNAAB Zoo Park is influenced by seasonal changes, with higher numbers observed during the wet season due to increased availability of food and water resources. Female Vervet monkeys were observed to have a higher survival rate and reproductive success than males, and the higher number of adult Vervet monkeys compared to juveniles and infants was attributed to higher mortality rates of the latter due to diseases, competition for resources, and other environmental factors. The Vervet monkeys in FUNAAB Zoo park have a relatively small seasonal home range, which could be due to the availability of food resources that are well-distributed within the park and the activities of visitors in the park. It is important to note that the habitat and environmental factors of each study

site may differ, which could influence the home range size of the Vervet monkeys.

RECOMMENDATIONS

i. Conservation measures should be put in place to ensure the availability of food and water resources throughout the year, especially during the dry season when these resources are limited. This will help to sustain the population of Vervet monkeys and maintain their population structure.

ii. Further studies should be conducted to investigate the factors responsible for the higher
mortality rate of juveniles and infants among Vervet monkeys. This will help to identify and mitigate the factors that contribute to the decline in the population of these age groups.

iii. Efforts should be made to minimize the impact of visitors' activities on the spatial
distribution and behaviour of Vervet monkeys in the park. This can be achieved by creating designated areas for visitors and restricting their activities from areas where the Vervet monkeys are known to inhabit.

iv. Visitors to the Zoo park should be educated on the impacts of their activities on the
behaviour and distribution of primates in the park.

REFERENCES

Alan, K. and Herbert, R.L. 2005. The Ecology of Foraging Behavior: Implications for Animal Learning and Memory. Avian Cognition Papers, 15pp.

Barton, R.A., Whiten, A., Strum, S.C., Byrne, R.W. and Simpson, A.J. 1992. Habitat use and resource availability in baboons. *Animal Behaviour*, 43: 831-844.

Bronikowski, A.M. and Altmann, J. 1996. Foraging in a variable environment: weather patterns and the behavioural ecology of baboons. *Behavioral Ecology and Sociobiology* 39: 11-25.

Cheney, D.L. and Seyfarth, R.M. 1992. How Monkeys See the World – Inside the Mind of Another Species. Chicago: University of Chicago Press.

Di Fiore, A. and Campbell, C. J. 2007. The Atelines: Variation in Ecology, Behavior, and Social Organization. In C. J. Campbell, A. Fuentes, K. C. MacKinnon, M. Panger, and S. K. Bearder (Eds.), Primates in Perspective (pp. 155-185). Oxford University Press.

Dunbar, R. and Barrett, L. 2000. Cousins Our Primate Relatives. London: BBC Worldwide Ltd. 3rd ed. pp (126).

Faust, L. J., Barrett, L., and Henzi, S. P. 2021. The population dynamics of vervet monkeys (*Chlorocebus pygerythrus*) in South Africa: Insights from long-term research. In S. Kappeler and K. B. Jones (Eds.), Long-term field studies of primates (pp. 303-321). Springer Nature.

Foord, S. H., VAN Aardee, R. J. and Ferreira, S. M. 1994. Seed dispersal by Vervet monkeys in rehabilitating coastal dune forests at Richards Bay. Mammal Research Institute, Department of Zoology, University of Pretoria, 0002 Republic of South Africa, 24(56).

Freimer, N. B. 2007. A vervet monkeys (Cercopithecus aethiops) genetic map. University of California, Los Angeles. 2ed 87 pp.

Henzi, S. P., Lusseau, D., Weingrill, T., van Schaik, C. P., and Barrett, L. 2019. Do female vervet monkeys gain indirect benefits through social bonds with the dominant male? Behavioral Ecology, 30(5), 1285-1294.

Hill, R.A., Barrett, L., Gaynor, D., Weingrill, T., Dixon, P., Payne, H. And Henzi, S.P. 2003. Day length, latitude and behavioural flexibility in baboons (*Papio cynocephalus* ursinus). Behav. Ecol. Sociobiol, 53: 278-286.

Holmes, A. N., Forrestel, E. J., and Chapman, C. A. 2021. The effect of human visitors on the behavior of red-tailed guenons (*Cercopithecus ascanius*) in Kibale National Park, Uganda. *American Journal of Primatology*, 83(3), e23258.

Isbell, L. A. (1994). Predation on primates: ecological patterns and evolutionary consequences. Evolutionary Anthropology: *Issues News, and Reviews,* 3(2), 61-71.

Johnson, R. L., Kuehl, H. S., and Louis, E. E. 2018. Spatial ecology and ranging behavior of vervet monkeys (Chlorocebus pygerythrus) in a South African savanna. Primates, 59(2), 139-147.

Li, B., Zhao, Q. K., Grueter, C. C., and Fan, P. F. 2020. The impact of tourism on activity budgets and range use in a group of Sichuan snub-nosed monkeys (*Rhinopithecus roxellana*) in Shennongjia National Nature Reserve, China. Primates, 61(2), 217-227.

Lee, P.C., Brenan, J.P., Else, J.G. and Altman, J. 1986. Ecology and behaviour of vervet monkeys in a tourist lodge habitat. In: Else J.G., Lee P.C. (Eds). Primate ecology and conservation. Selected Proceedings of the 10th Congress Int. Primatological Society, Nairobi, Kenya (July 1984). Cambridge University Press, Cambridge, U.K: chap. V.3, 229-236.

O'Brien, T., and Kinnaird, M. 2017. Spatial ecology and ranging behavior of vervet monkeys (*Chlorocebus pygerythrus*) in response to seasonal variation in food resources. African Journal of Ecology, 55(1), 76-84.

Saj, T., Sicotte, P. and Paterson, J.D. 1999. Influence of human food consumption on the time budget of Vervets. Int. J. Primatology, 20: 977-994.