# A Preliminary Study on the Diversity of Monkeys in Nnamdi Azikiwe University Awka and Its Environs

Okeke, J. J.      Umeaniebue, A. C.      Ufele, A. N.      Mogbo, T. C.      Nwosu, M. C.
Bio-conservation Unit, Department of Zoology, Nnamdi Azikiwe University Awka, Anambra State, NIGERIA

## ABSTRACT

Monkeys are among the prominent animal species found in the Nnamdi Azikiwe University Awka forest areas and its environs; thus, a 3-month reconnaissance and transect survey was carried out to determine the diversity of these monkeys and the ecological features that support their abundance and distribution. Six sample sites designated 'A' to 'F' were carefully chosen, transected and closely monitored for monkeys' presence. A total of 116 monkeys, all of the super- family Cercopithecoidae but of four different species were observed. A total of 47 *Chlorocebus aethiops* with a relative abundance of 40.5% was recorded, it was followed by 34 (29.3%) *Chlorocebus sabaeus*; 25 (21.6%) *Chlorocebus tantalus*; and the least is *Erythrocebus patas,* 10 in number and relative abundance of 8.6%. The distribution of each species in a given site showed that site A recorded the highest number of monkeys 55(47.4%),it was followed by site B with 21(18.1%)monkeys; then site E 16(13.8%); 11(9.5%) in F; 7(6.0%) in site C and the least is 6(5.2%) in site D. The Simpson's index of biodiversity was 0.7.

## INTRODUCTION

Despite centuries of fascination with monkeys, reflecting to our intuition, recognition of their close biological relationship to human species and the ecological niche they share have attracted many attentions. Many similarities between man and these non-human primates have made monkeys the focus of research in a variety of scientific disciplines (Lee and Bowman, 1995). All primates that are not prosimians (Lemurs and Tarsiers i.e. ape) are monkeys. The 264 extant monkey species represent two of the three groupings of simian primate - the old and the new world monkeys. The third group belongs to the 21 species of apes. The new world monkeys (Super-family Ceboidae) are classified within the parvorder platyrrhini whereas the old world monkeys (super family Cercopithecoidae) form the part of the parvorder catarrhini which also include the hominoids (apes and humans); thus, scientifically speaking, monkeys are a paraphyletic group (Cooper, 1992; Harper, 2004). Monkeys are among the most highly developed of the animal kingdom (Harlow, 1949). They are generally considered to be intelligent, as a social animal, they communicate vocally, as well as with body languages and with facial expression. Izawa (1979) noted that the internal workings of the monkey are in principle the same as those of other mammals. Monkeys have long tail (though some are shortened) and are warm blooded with body covered of fur. They have limbs; two fore limbs for gripping, walking, eating, scratching and so on, and are thus referred to as hands; the hind limbs are muscular, modified for walking standing, jumping and gripping (Brennan *et al.,* 1985). Monkeys have flat broad noses and are downward in most species ranging from size to size. Monkeys exhibit sexual dimorphism; the males are larger than the females in weight and body length (Skinner, 1992; Napier, 1981). Primatology has shown that there are two feeding habits among monkeys, some feed at night and others in the day (Rod and Ken, 1992). Vervets eat primarily vegetarian diets, living mostly on wild fruits, flowers, leaves, seeds and seed pods. In agricultural areas, vervets become problem animals, as they will raid bean crops, peas, plants, vegetables, fruits, grain crops (Hill, 2000). With the ever-increasing stress on the natural environment which includes farming, deforestation, habitat destruction, urbanization and other human activities, the number is dwindling. In spite of low predator population in many areas, human development has encroached on wild territories, and some species (vervets) are killed by electricity pylons, vehicles, dogs, pellet guns, poisons and bullets and is trapped for traditional medicines, bush meat and biochemical researches (Foggo, 2008; Zinner *et al.,* 2009; Carlsson *et al.,* 2004). Monkeys are important to man as some are kept as pets and model organisms in the laboratories or in space mission (Cawthon, 2006). Alexander (1974) also noted that monkeys serve as meat, research objects, agents of seed dispersal and pollination, revenue generators and companion to man. In addition to very interesting behavioural research on natural population, vervet monkeys serve as a non-human primate model for understanding genetic and social behavior of humans; They have been noted for having hypertension, anxiety and social and dependent alcohol use (Palmouri *et al.,* 1997). Vervets are highly adaptable and able to persist in secondary and or highly fragmented vegetation, including cultivated areas, and sometimes found in both rural and urban environments (Kingdon, 1997). Thus, this study was aimed at ascertaining the diversity of the monkey species in the study area; the features of adaptation that enable them survive here.

## MATERIALS AND METHODS
STUDY AREA
The study was carried out in the Nnamdi Azikiwe forest areas and its environs, Awka, Anambra state Nigeria. It

falls within the geographical co-ordinates of $06^0\ 14^1\ 58^{11}$ N and $07^0\ 06^1\ 59^{11}$ E and is located within the humid area of the South Eastern Nigeria (wikimapia.org). The area has an average rainfall of 2169.8mm and an ambient temperature of about $29^0$C and $34^0$C maximum. The vegetation is of guinea savannah, and the sites chosen were the quietest areas used mainly for farming, while some were left fallow for years where as others are just reserved areas that turned forest.
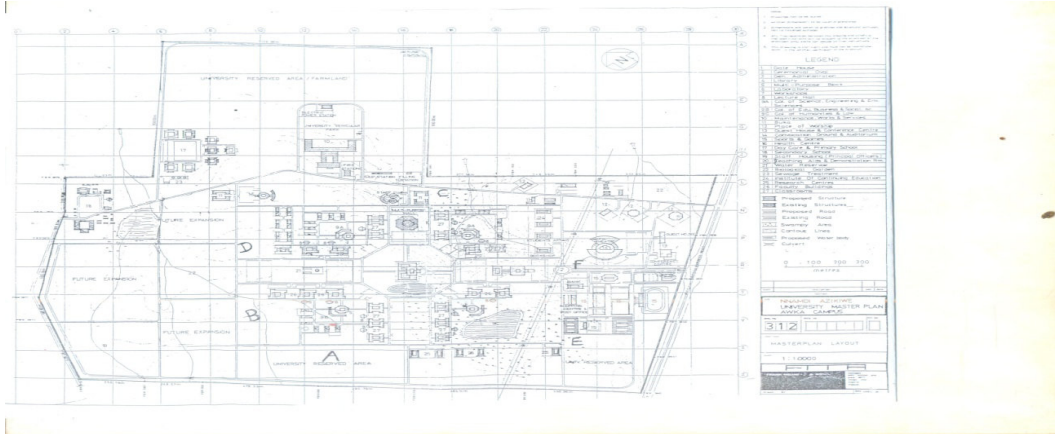


THE PHSICAL PLAN OF THE STUDY AREA SHOWING THE VARIOUS SITES

THE STUDY TIME
The study was carried out thrice daily, Morning (5-11 a.m), Afternoon (12-3 p.m), and Evening session (5-7 p.m).

RECONNAISSANCE STUDY
A careful study and assessment of the entire study area, searching for suitable sites where monkeys could be seen during the study was done and six sites were randomly selected.

TRANSECT STUDY
The monkeys were observed in their natural state in the various transects. Close range and some few but clearly captured images of the animals were taken using 5.0MP Nikon digital camera.

IDENTIFICATION AND CLASSIFICATION
The captured images were taken to and classified in Nekede Zoological laboratory and library in Owerri North Local Government Area, Imo state using Primates of the world Reference books and Pictorial Guides (Napier, 1981; Rowe, 1998; Nowak, 1999; Skinner, 1990; Kingdom 1997; Rod and Ken, 1992)

STATISTICAL ANALYSIS
The relative abundance of the species observed was calculated and the relative distribution of the species in the given sites was also obtained using the formula

R.D =   Total number of a given species in a given site
        Total number of all species observed in that site

The result of the study was subjected to Simpson's Index of Diversity to quantify the biodiversity of the area using

 1  -  D
 Where:

D = Simpsons Index given as $D = \sum (n/N)^2$

Where n = total number of each species observed

N = total number of all the species

$\sum$ =summation

**RESULTS**
The result of the study showed that a total of 116 monkeys belonging to the Super-family Cercopithecoidae but of four distinct species were observed. A total of 47 *Cercopithecus aethiops* was observed having a relative abundance of 0.4052. It was followed by *Chlorocebus sabaeus* which has an abundance of 34 and relative abundance of 0.2931, then *Chlorocebus tantalus* 25(0.2155); and the least is 10(0.862) *Erythrocebus patas* as shown in table 1.

Site A recorded the highest number of monkeys 55(47.4%), it was followed by site B with 21(18.1%) monkeys; then site E 16(13.8%); 11(9.5%) in F; 7(6.0%) in site C and the least is 6(5.2%) in site D as seen in table 2.

More so, out of the 55 monkeys observed within site A, 17(30.9%) were *Chlorocebus aethiops,* and was the highest in number, it was followed by *Chlorocebus sabaeus* 15(27.3%); then 13(23.6%) *Chlorocebus tantalus* while the least was *Erythrocebus patas,* 10(18.2%). In site B, a total of 21 monkeys were observed, the

highest number of species recorded was 12(57.1%)-*Chlorocebus sabaeus*; while the remaining 9(42.9%) were *Chlorocebus aethiops.* In site C, only 7(100%) *Chlorocebus aethiops* was observed while in site D also, only 6(100%) of same species was recorded in the overall sampling. Site E showed that 10(62.5%) were *Chlorocebus tantalus* and the rest 6(37.5%) were *Chlorocebus aethiops.* In site F, 9(81.8%) were *Chlorocebus sabaeus* whereas the remaining 2(18.2%) were *Chlorocebus aethiops.* All the four species were all represented in site A; site C and D each has a composition of only a species each while 10 *Erythrocebus patas* was only observed in site A.

## TABLES
## TABLE 1: SHOWS THE RELATIVE ABUNDANCE OF THE FOUR SPECIES

| SPECIES | NUMBER OBSERVED | RELATIVE ABUNDANCE(%) |
|---|---|---|
| *Chlorocebus aethiops* | 47 | 40.5 |
| *Chlorocebus sabaeus* | 34 | 29.3 |
| *Chlorocebus tantalus* | 25 | 21.6 |
| *Erythrocebus patas* | 10 | 8.62 |
| **Total** | **116** | |

## Table 2: SHOWS THE DISTRIBUTION OF THE VARIOUS SPECIES IN GIVEN SITES

| S SPECIES | SITES | | | | | | TOTAL |
|---|---|---|---|---|---|---|---|
| *Chlorocebus aethiops* | 17 | 9 | 7 | 6 | 6 | 2 | 47 |
| *Chlorocebus sabaeus* | 13 | 12 | - | - | - | 9 | 34 |
| *Chlorocebus tantalus* | 15 | - | - | - | 10 | - | 25 |
| *Erythrocebus patas* | 10 | - | - | - | - | - | 10 |
| | **55** | **21** | **7** | **6** | **16** | **11** | |
| GRAND TOTAL | **116** | | | | | | |

## TABLE 3: SHOWS THE NUMBER OF MONKEYS RECORDED AT THE DIFFERENT TIMES

| SPECIES | MORNING | AFTERNOON | EVENING |
|---|---|---|---|
| *Chlorocebus aethiops* | 35 | 3 | 9 |
| *Chlorocebus sabaeus* | 17 | 7 | 10 |
| *Chlorocebus tantalus* | 12 | 9 | 10 |
| *Erythrocebus patas* | 6 | - | 4 |
| **TOTAL** | **70** | **19** | **27** |
| **GRAND TOTAL** | | **116** | |
| **% TOTAL** | **60.3** | **16.4** | **23.3** |

## TABLE 4: SHOWS THE DIVERSITY TABLE OF THE MONKEY IN THE AREA

| SPECIES | n | n(n-1) |
|---|---|---|
| *Chlorocebus aethiops* | 47 | 2126 |
| *Chlorocebus sabaeus* | 34 | 1122 |
| *Chlorocebus tantalus* | 25 | 600 |
| *Erythrocebus patas* | 10 | 90 |
| TOTAL | 116 | 3974 |

$$\frac{\sum n(n-1)}{n(n-1)} = \frac{3974}{116(115)} = 0.3$$

Thus, Simpson's Index of Biodiversity

$$1 - D$$
$$1 - 0.3 = 0.7$$

## DISCUSSION

From the study, *Chlorocebus aethiops* was the most prevalent monkey species in the study area. It was followed by *Chlorocebus sabaeus,* then *Chlorocebus tantalus* and the least is *Erythrocebus patas.* The reasons for the high

abundance of monkeys in the study area might be as a result of the more favourable habitat conditions provided by fruiting trees, farmlands, water courses and traditional restriction on their hunting in study area. These might also be as a result of monkeys' wide range of adaptation in Africa. *Chlorocebus aethiops* was more abundant in site A and was least in site F. *Chlorocebus sabaeus* was found in only three sites A, B, and F; *Chlorocebus tantalus* was found in site A and E. *Erythrocebus patas* was only spotted in site A only. The reason for the confinement of *E. patas* was as a result of its patchy distribution over its extreme geographic range probably due to its need to drink water daily as there is the presence of stream in the site as noted by Kingdon *et al.* (1998). The total number of monkeys observed in the morning and evening sessions ware higher than that of the noon, the reason for this might be as a result of monkeys' diurnal lifestyles as reported by Rods and Ken (1992). More so, as the anthropogenic activities increases by the day time, they tend to go to safer places.

**CONCLUSION**

The Simpsons index of diversity which is at 0.7 showed that there is average diversity using the four species found in the area.

**REFERENCES**

Alexander, R. K. (1974). The Evolution of Behavior, *Am. Rev. Eco System,* 5:325 – 383

Biodiversity Occurence Data provided by Field Museum of Natural History, Mu- seum of Vertebrate Zoology, University of Washington Burke Museum and University of Turkey (accessed through GBIF Data Portal, www.gbif.net. 2010- 06-18

Brennan, E. J., Else, J. G., Altmann, J. (1985). Ecology and Behavior of a Pest Primate: Vervet Monkeys in a Tourist- Lodge Habitat. *African Journal of Ecology*, 23: 35-44

Carlsson, H., Shapiro, S., Hau, J.(2004). Use of Primates in Research: A Global Overview, *Am. Jour. Of Primatology*, 63(4):225-237

Cawthon, Lang KA (2006). Primate Factsheets: Vervet (*Chlorocebus*) Taxonomy, Morphology and Ecology; Retrieved 2008-11-12, http://pin.primate.wisc.edu/factsheets/entry/vervet/taxon

Cooper, J. C. (1992). Symbolic and Mythological Animal: London Aquarian Press, Pp. 161-163

Dunbar, R. (1974). Observation of the Ecology and Social Organization of theGreen Monkeys, *C. sabaeus* in Senegal, *Primates,* 14(4) 341-350

Foggo, D. (2008). Germ Warfare over African Monkeys Taken to Iran, *The Times* (London); Retrieved 2013-3-27

Groves P. C., Wilson, D. E., Reeder D. M. (2005). Mammals Species of the World, 3rd edtn, Baltimore, John Hopkins University Press, Pg 160

Harlow, H. F. (1949). Age mate or Peer Affection System, In: Advanced Study of Behavior, 10: 91-95

Harper, D. (2004). Monkeys 'On line', Etymology Dictionary, Retrieved 2013-04-10

Hill, C. M. (2000) *International Journal of Primatology,* 21(2):299-315

Izawa, K. (1979). Foods and Feeding Behavior of Wild black capped capuchin  (*Cebus paella*) Primate 19:422-633

John, G. F. and Harcourt, B. A. (1988). Primate Adaptation and Evolution, Jovanoviah Publishers New York pg 486

Kingdon, J. (1997). The Kingdon Guide to African Mammals, Academic Press Ltd, London ISBN 0-12-408355-2

Lee, P. C. (1999). Comparative Primate Sociology. University Press London Pg 412

Lee, P. C. and Bowman, J. E. (1995). Influences of Ecology and Energetic in Primate Mothers and Infants, University Press London

Napier, P. H. (1981). "Part 11: Family cercopithecidae, subfamily Cercopithecinae" Catalogues of Primates in the British Museum (Natural History) and Elsewhere in the British Isles-London:British Museum(Natural History), pg 208

Nowak, R. M. (1999). Walkers Mammals of the World 6th edtn, Baltimore and London; the John Hopkins Press ISBN 978-0801857898

Palmouri, R., Mulligan, J., Howbert, J. Jeffry, Ervin, F. (1997). "Of Monkeys and Men: Vervets and the Genetics of Human-like behaviours" *Am. Jour. of  Hum Genet*, 61(3):481-448

Rod, P. and Ken, P. M. (1992). Primates of the World, Blendford, an Impurit of Cassel Plc, London UK, Pg 191

Rowe, N. (1996). The Pictorial Guide to the Living Primates, East Hampton, NY; Pogomas Press

Skinner, J. D. (1990). The Mammals of the Southern African Sub- Region (New Edtn) ISBN 6-86979-802-2.

Wikimapia.org/17004531/Nnamdi azikiwe University Awka Geo-cordinates: Downloaded 2011-8-2

Zinner, D., Gonedele, S., J. Koffi., Bene, E., Anderson Bitty, I. Kone (2009).Distribution of Green Monkeys (*Chlorocebus sabaeus*) in the Coastal Zone of  Cóte d'voire. *Primate Conservation,* 24: 1 – 7