



THE POPULATION ESTIMATE OF MONA MONKEY (*CERCOPITHECUS MONA*) IN OBAN EAST RANGE OF CROSS RIVER NATIONAL PARK, NIGERIA

YADUMA ZB ^{a*} • MIDAU A ^b • KAHINDE OW ^a • GAWAISA SG ^a

^a Modibbo Adama University of Technology, Yola, Department of Forestry and Wild Life

^b Adamawa State University, Department of Animal Production, Adamawa State, Nigeria

*Corresponding Author's E-mail: alexmidau@yahoo.com, zachariaby@yahoo.com

ABSTRACT: This study the Population Estimate of Mona Monkey in Oban East Range of Cross River National Park was aimed to estimate the absolute population density, abundance, the activity budget and preference of plant species utilized as food by Mona monkey in Oban East Range of Cross River National Park, Survey was used to collect data. The result revealed that the absolute population density of Mona monkey is estimated to be 2.5 ± 0.7 individual/km² with co-efficient variation of 20.02 and confidence interval of 3.838 4 – 154.00. The population density of Mona monkey in Oban East Range is relatively low, this might be as a result of some anthropogenic activities, hence need for the intervention of the management of National Park and the Federal Government of Nigeria. Regular monitoring of the population trends of Mona monkey is advocated. This will enable the management of the park to promptly notice any further decline in the population density of the animal and to take drastic actions.

Keywords: Density, abundance transect, population, zones Mona monkey

Received: February 19, 2017 • Returned in Revised form: July 20, 2017 • Accepted: July 25, 2017

1. INTRODUCTION

Mona monkey (*Cercopithecus mona*) belongs to the Kingdom animalia, phylum: chordata, order: primata, class mammalian, family Cercopithecidae and genus *Cercopithecus*. The family Cercopithecidae has the largest number of species and widest distribution of all the primates in Nigeria (Oates 1988). Mona monkeys are found in secondary forests, montane forests, mangrove forests and primary forests. Mona monkey is a brightly patterned decorative monkey. Head slatish blue from nostril to outside edge of the eyes, muzzle whitish grey broad, white super orbital band: cheeks with long yellowish white fur excepts for black band between eye and ear crown of head blackish, each hair tipped with yellowish green, shoulders black and flanks chestnut, each hair grey at the base; legs dark grey to black. Chin, throat, chest, ventral pelage and outside of leg white. Prominent white patch on each buttock. Tail black above grey below (Oates 2011).

Due to their wide geographical distribution, relatively large body, size, high level of frugivory and exploitation of both arboreal and terrestrial habitats. According to Kaplin and Lambert, (2002) Mona

monkeys have the potential to be effective seed dispersers and may be particularly important in the regeneration of degraded forests In order to increase our understanding of how disturbed an ecosystem and communities are structured, it is necessary to obtain information on species richness and distribution patterns in intact rain forest (Wilson 1988) and to explain response of typical species and ecosystem to landscape modification (Lugo 1988; Estrado *et al.* 1993). This can help in the design of protected areas more efficiently and lead to strategies for maintaining biological diversity and natural ecosystem integrity in human – dominated ecosystem (Field *et al.* 2004).

The biome with the greatest abundance and diversity of species is the tropical moist forest and species diversity within habitats varies greatly and it is more so in lowland equatorial rainforest than anywhere else (Ayodele and Lameed 1999). Primate has a diverse range of values. In terms of ecological value, they play an important role in pollination and seed dispersal in tropical forest. If they disappear, then the viability of some forest communities must be in human dominated ecosystem (Field *et al.* 2004). There is a growing concern worldwide over the destruction and eventually

the disappearance of valuable Fauna and Flora species in the tropical forest. Estimate suggest that the annual bush meat harvested from African tropical forest may now exceed one million. Despite the protection being given to the wildlife species within the conservation areas, there are still wide spread of poaching activities in Cross River National Park. There are activities such as hunting, logging, collection of Non-Timber Forest Products (NTFP), water pollution and farm encroachment. These activities are having negative effects on the park resources; therefore, need for information on the abundance and population density of Mona monkey cannot be over emphasized. The information will also be useful in developing appropriate strategies for the management and conservation of the Mona monkeys in the park.

2. MATERIALS AND METHODS

2.1 Study Area

Cross River National Park lies between latitudes 5° 05' and 6° 29' N and longitudes 8° 15' and 9° 30' E, in the South –Eastern corner of Nigeria, in Cross River State. It covers an area of about 4,000 km² of primary tropical moist rainforest ecosystem in the south and central parts and montane mosaic on the Obudu Plateau as shown in Cross River National Park 2008). Cross River National Park is an important ecological gene pool containing one of the oldest rainforest in Africa. It lies in the Guinea-Congolian rainforest refugia with close canopy and scattered emergent trees. It has been designated as one of the biodiversity hotspots in the World. Cross River National Park has two distinct, non-contiguous Divisions: Oban and Okwangwo

The Oban Division, about 3,000 km² is the larger of the two divisions. It is ecologically contiguous with Korup National Park in the Republic of Cameroon and is subdivided into Ranges: Oban East Range, Orem Range, Ifunkpa Range and Nsofang Range (CRNP 2008). About 1,568 plant species have been documented in Oban Division, 77 of which are endemic to Nigeria. It is also rich in epiphytes, ferns and orchids. Okwangwo Division has about 1,545 documented species of plants in 98 families. Two species of plant: *Anceistocladus korupensis* and *Prunus africana* generally regarded to have high medicinal properties effective against HIV/AIDS and prostate cancer respectively occur in this sector of the park (CRNP 2008).

Fauna division is also home to the Cross-River Gorilla (*Gorilla gorilla diehli*) as well as 17 other primates. These scientific discoveries have brought world attention to the park necessitating its being nominated recently by the United Nation as a World Heritage Site (CRNP 2008).

2.2 Study Design and Data collection

One landmark was randomly picked as the starting point of each of the transects. Global Positioning System (GPS Garmin 60 CSX) was used to take co-ordinates, two (2) kilometres line transect of one (1) meter width constructed and cleared. The clearing of the transects was done in late June (24 – 27, 2015) while census began in July. Binoculars (Miranda 10 x 50) were used for observations and confirmations. The vegetation of the study area is primarily rainforest. In view of this, the method of establishment of line transects by Dunn, (1993) and Gawaisa (1997) was adopted. The study area was divided into three (3) zones: Oban (1), Aking (2) and Osanmba (3). Two transects of 2 – km was laid in each of the zone.

Surveys were carried out on each day from 6:00 to 12:00am in the morning and 4:00 to 6:00pm in the evening. The survey commenced approximately the same time each day. In all observations, there were one researcher and a ranger who is acquainted with the area. The observer moved slowly at the rate of 1 to 1.5km/hr stopping occasionally to listen and look for Mona monkeys. When Mona Monkeys were sighted, the records were documented as follows: Time of sighting, number in a group, activities when sighted, sighting distance, group spread (estimate of the diameter occupied by the group), perpendicular distance, category of sighting (group or solitary), tree species where the monkeys were sighted, weather condition and sighting angle as shown in Fig. 1 To reduce the potential biases resulting from differential habitat used by primates and from direction of travel by observer, observer began at the opposite direction during sequential census along the same routes as used by Dunn (1993).

The density and abundance of Mona monkey (*C. mona*) was estimated using the computer software, Distance, 5.0 adopting Laeke *et al* (1993). The Distance programme modelled the perpendicular distance from the transect to animal using the half normal function with a cosine and hermite polynomial adjustment and the hazard rate key with cosine and simple polynomial serves expansion which allow the density of Mona monkey to be estimated as follows.

$$D = \frac{E(n)F(0)E(s)}{2(g)}$$

Where:

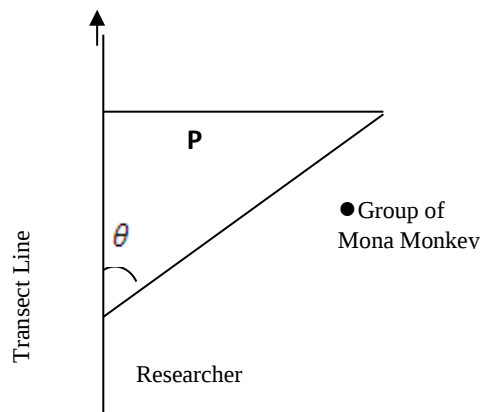
D = the density of object per unit area

E (n) = the expected number of animals in the study area

E(S) = the expected number of cluster size for the population

F (0) = the estimated probability density function evaluated at zero distances from the line transect

g = probability of detection on the line transect usually assumed to be 1



Key: θ = Sighting Angle, P = Perpendicular Distance
 Fig 1: Field Measurement of Line Transect

3. RESULTS

3.1 Absolute population density and abundance of Mona monkey in Oban Range

Table 1 shows the density and abundance of Mona monkey in zone 1 which is Oban area of Cross River National Park. This entails Mberetum and Kwa river areas of Oban East Range. The result revealed that the absolute population abundance is 69 with density of 1.7 ± 0.7 individuals/km² and percentage co-efficient of 41.25 with co-efficient interval of 0.59858 - 4.9362.

Table 1: Absolute Population Density and Abundance of Mona monkey in Oban Range

Parameter	Point estimate	Standard error	% C.V	95% Confidence intervals
F(O)	0.1250 (EO)	0.38683 E-02	30.94	0.63730-02 - 0.24522 E
P	0.99990	0.30940	30.94	0.50974 - 1.0000
ESW	79.992	24.752	30.94	40.770 - 156.91
D	1.7189	0.70899	41.25	0.59858 - 4.9362
N	69.000	28.460	41.25	24.000 - 197.00

Source: Field survey, 2015. D = Density, N = Abundance, P = Probability of observation, ESW = Effective Strip Width, F (0) = Value of pdf at zero for line transect.

Table 2: Absolute Population Density and Abundance of Mona monkey in Aking Range

Parameters	Point estimate	Standard error	% C.V	95% Confidence intervals
F(O)	0.17607E-01	0.36098 E-02	20.50	0.11358E - 010.27294 E-02
P	0.63674	0.13055	20.50	0.41075 - 0.98707
ESW	56.797	11.645	20.50	36.639 - 88.047
D	3.0811	24.99	7.06	1.7234 - 5.5085
N	123.00	24.99	7.06	69.000 - 220.00

Source: Field survey, 2015: D = Density, N = Abundance, P = Probability of observation, ESW = Effective Strip Width, F (0) = Value of pdf at zero for line transect.

3.2 Absolute population density of Mona monkey in Aking Range

Table 2 shows the density and abundance of *C. mona* in Zone 2 (Aking area) of Cross River National Park. This involves Mangor and Ime river areas of Oban East Range of the Park. The result showed that the absolute population density of *C. mona* is 6.6 ± 3.1 individuals/km² with percentage co-efficient variation of 7.06 with co-efficient intervals of 1.7234 - 5.5085. Furthermore, the abundance of *C. mona* in zone 2 is 123.

3.3 Absolute population density of Mona monkey in Osomba Range

Table 3 presents the Density and Abundance of *C. mona* in Zone 3, Osomba area of Cross River National Park. This entails Sajem and Ewong-Offong areas of Oban East Range of the park. The result revealed that the absolute population density of *C. mona* is 2.5 ± 2.3 individuals /km² with percentage co-efficient variation of 46.39 and co-efficient intervals of 0.39204 - 15.262. The table also revealed that the abundance of *C. mona* is 98 in zone 3.

Table 3: Absolute Population Density and Abundance of Mona monkey in Osomba Range

Parameter	Point estimate	Standard error	% CV	95% Confidence Intervals
F(O)	0.15053 E-01	0.39053E-02	25.94	0.86320 E-02 - 0.26250 E-01
P	0.92267	0.23938	25.94	0.52910 - 1.0000
ESW	66.432	17.235	25.94	38.095 - 115.85
DS	2.4461	1.1348	46.39	0.39204 - 15.262
D	2.4461	1.1348	46.39	0.39204 - 15.262
N	98.000	45.466	46.39	16.000 - 610.00

Source: Field survey, 2015: D= Density, N = Abundance, P = Probability of observation, ESW = Effective Strip Width, F (0) = Value of pdf at zero for line transect.

Table 4: Overall Population Density and Abundance of Mona Monkey in the Study Area

Parameter	Point estimate	Standard error	% CV	95% Confidence intervals
F(O)	0.16052E-01	0.24007 E-02	14.96	0.11876E-01 - 0.71697E-01
P	0.69840	0.10445	14.96	0.51669 - 0.94401
ESW	62.297	0.3168	14.96	46.088 - 84.206
DS	2.5416	0.50892	20.02	1.6829 - 3.8384
D	2.5416	0.50892	20.02	1.6829 - 3.8384
N	102	20.424	20.02	67.000 - 154.00

Source: Field survey, 2015. D = Density, N = Abundance, P = Probability of observation, ESW = Effective Strip Width, F (0) = Value of pdf at zero for line transect.

3.4 Overall density and abundance

Table 4 shows the overall population density and abundance in the study area. The result revealed that the absolute population density of *C. mona* is 2.5 ± 0.7 individuals/km² with percentage co-efficient variations of 20.02 with confidence interval of 1.6829 – 3.8384.

4. DISCUSSION

The frequency distribution of sighting as presented in Fig. 6 and 7 indicated the detections function of Mona monkey. The red lines are the best fit of functions. The result of the study indicated that the pooled population density (2.5 ± 0.7) of *Cercopithecus mona* at the three sites of Cross River National Park is low when compared with the value (15.0 ± 0.2) reported by Gawaissa (1997) for Gashaka Gumti National Park. The result may not be unconnected with the report of Lammed *et al.* (2015) that there was high hunting intensity in Oban hill (Oban sector) which involved the use of unsustainable hunting method like the use of shot guns and wire snares. He further reported that primates are the second most hunted wildlife species in Oban hill of Cross River National Park.

The result also agrees with the report of Linder and Oates (2011) that relatively large-bodied living-group or ecologically specialized primates are vulnerable to the growing commercial trade in wild meat and that their populations are at the greatest risk of significant declines in the near future. Zone 2 (Aking area) has the highest number (123) of Mona monkey followed by zone 3 (Osomba Area) with 98. This might be connected with the topography (chain of hills) of the area that made the area to be somehow difficult for hunting expedition because most hunters prefer hunting around the valleys, rivers and streams. Their abundance in the zone (Aking) may also be connected with the availability of *Anisophyllum* species and *Cola* species as food, for monkeys. This agrees with the report of Anthony *et al.* (2007) that the environment in which a species is more relatively abundance than others serves as its niche. Its conservation in that environment usually meet with success. More Mona monkey were observed when they were closer to the transect lines than when they were far away. This agrees with the report of Dun (1993) that visibility is

low in the rain forest. This perhaps account for the low number of Mona monkey observed by the censuses carried out in the three study zones.

5. CONCLUSION

1. The result obtained, showed the population density of Mona monkey is low, hence, need for the intervention of the management of Cross River National Park.
2. Furthermore, feeding and playing had the highest percentage in its daily activities.
3. The selection of *Anisophyllum* species more than *Cola edulis* was based on palatability.
4. Regular monitoring of the population trends of Mona monkey and other animals is advocated. This will enable the management of the park to promptly notice any further decline in the population density of the animal and to take drastic actions.

REFERENCES

- Anthony RE, Sinclair MS and Graem (2007). *Wildlife Ecology Conservation and Management*. Second editions. Blackwell Publishing.
- Ayodele IA and Lameed GA (1999). *Biodiversity Management*. Joachin Publisher, Ibadan.
- CRNP (2008) An annual report of Cross River National Park, Cross River State, Nigeria
- Dunn A (1993). A manual of census techniques for surveying large animals in Tropical Forest. Report for Wildlife Fund for Nature (WWF). UK 1-20.
- Estrada A, Dennis MJ and Rosamond C (1993). Foraging by Parrots (*Amazona autumnalis*) on fruit of *sternmadiadonnel-smithii* (Apocynaceae) in the tropical rain forest of Los Tuxtlas, Mexico. *Journal of Tropical Ecology Issue* 9:121-124. Cambridge University Press.
- Field J, Friis I and Vollensen K (2004). Flora of Sudan – Uganda border area East of Nile. *Bird Conservation International* Vol. 9: pp. 47-62.
- Gawaissa SG (1997). The status of large mammals and the impacts of human activities on Gashaka Gumti National Park. Unpublished B.Tech, project, Federal University of Technology, Yola. PP 1-62.
- Kaplin BA and Lambert JE (2002). Effectiveness of seed dispersal by *Cercopithecus* monkeys:

- implication for seed input into degraded areas. In D. J. Levey, W.R. Silva and M. Galetti (eds). CAB International. PP 351-364
- Kaplin BA (2001). Ranging behavior of two species of forest guenon (*Cercopithecus lhoesti* and *C. mitisdogetti*) in the Nyungwe Forest Reserve.
- Laake JP, Buckland ST, Anderson DR. and Buraham KP (1993). *Distance. Users guide* Colorado Fish and Wildlife Research Unit: Fort Collins: Colorado State University Press.
- Lameed GA, Omifolaji JK, Abere AS and Ilori SO (2015). Hunting intensity on wildlife population in Oban sector of Cross River National Park. *Natural Resources*, 6, 325 – 330. [Http://dx.doi.org/10.4236/nr2015/4029](http://dx.doi.org/10.4236/nr2015/4029)
- Lugo AE (1988). Estimating reductions in the diversity of tropical forest species cited in biodiversity, eds E.D Wilson and F.M. Peter Washington D.C: National Academy Press. 1988. Pp 58-70.
- Oates JF (1988). *The Distribution of Cercopithecus Monkeys in West African Forest*. In A. GuntieHion, F. Bourliere, J. F. Guntier and J. Kingdom (eds) *A Primate Radiation Evolutionary*. Biology of the African Guenons. Cambridge University press, Cambridge. U. K. Pp 79-103
- Oates JF (2011). *Primates of West Africa*. A field Guide and Natural History Conservation International. USA. Pp. 278 – 527.
- Ogunleye OA (2002). *An Introduction to Research Method in Education and Social*
- Wilson DE (1988). Maintaining bats for captive studies. In: *Ecological and behavioural methods for the study of bats* (T.H. Kunz, ed.) Smithsonian Institution Press. Pp 247-264.