Journal of Research in Forestry, Wildlife & Environment Vol. 14(2) June, 2022
E-mail: *jrfwe2019@gmail.com; jfewr@yahoo.com*
http://www.ajol.info/index.php/jrfwe
jfewr ©2022 - jfewr Publications
ISBN: 2141 – 1778
Ekaye and Ogoanah,2022

SEASONAL VARIATION, DIVERSITY AND POPULATION DYNAMICS OF FOUR SPECIES OF MONKEY IN OKOMU NATIONAL PARK, EDO STATE, NIGERIA

***Ekaye, S. A. and Ogoanah S. O.**

Biodiversity and Conservation Unit, Department of Animal and Environmental Biology
Faculty of Life Sciences, University of Benin, P.M.B 1154, Benin City, Nigeria
***Correspondence:** *seseowei.ekaye@uniben.edu*; +234806 122 8766

ABSTRACT

The aim of this work is to ascertain the diversity, seasonality and dynamics of four monkey species in Okomu National Park, a lowland rainforest ecosystem of Edo State, Nigeria. It covers a land mass area of approximately 200km square, making it the smallest of the National Parks in Nigeria. Daily surveys of monkeys were carried out between 7:00am and 11:00am while evening surveys were between 03:00pm - 06:00pm for 8 months covering 4 months of wet season and 4 months of dry season. Each trail was traversed twice daily with an average walk speed of 1.0 km/hr. Sightings was aided with binoculars, digital camera and acoustic detection. Results showed that a total of 1391 monkeys were sighted, six hundred and sixty-two (662) in the wet season and seven hundred and twenty-nine (729) in the dry season. The results also show that the percentage abundance is Cercopithecus mona > C. erythrogaster > Cercocebus torquatus > Cercopithecus nictitans. The overall percent composition of the species showed that C. mona had the highest of 48.5%, followed by C. erythrogaster 27.12%, C. torquatus 18.85% and the least was C. nictitans 12.75%. This study confirms the prevalence of four (4) species of Monkey in Okomu National Park which are Cercopithecus mona, Cercopithecus erythrogaster, Cercopithecus nictitans and Cercocebus torquatus. Biological indices indicate that Cercopithecus erythrogaster is the most diverse and the richest species in Okomu while the least diverse species is Cercocebus torquatus. Cercopithecus nictitans is the most evenly distributed monkey species in Okomu National Park. We recommend continuous survey and monitoring of primate species in this area and encourage community-based conservation policies to protect the already threatened primates and habitat.

Keywords: Cercopithecus, erythrogaster, nictitans, torquatus, Cercocebus, Okomu National Park

Correct Citation of this Publication
Ekaye, S. A. and Ogoanah S. O. (2022). Seasonal Variation, Diversity and Population Dynamics of four Species of Monkey in Okomu National Park, Edo State, Nigeria. *Journal of Research in Forestry, Wildlife & Environment,* 14(1): 1 - 10

INTRODUCTION

Monkeys make up two broad groups namely, the old-world monkeys (in Africa and Asia) and the new-world monkeys (in the Americas) and can be easily distinguished by the differences visible on their heads and tails (Groves, 2019). The old world monkeys are characterized by tear drop-shaped nostrils pointing downwards and close together, some species have cheek pouches to carry food, tails are never prehensile, hairless callous pads on their rumps, dental formula of 2.1.2.3 while their new world counterparts are characterized by nostrils round, pointing outwards and wider apart, absence of pouches, prehensile tails, i.e., tails that are capable of being used as 'third hands' for holding onto branches and supporting their bodies, bottoms completely covered with fur, and dental formula of 2.1.3.2. or 2.1.3 (Ojo, 2016).

Okomu National Park, a protected forest of the Nigerian Niger Delta environment is home to several species of wildlife and monkey species. Several researchers (Oates and Anadu, 1982; Akinsorotan *et al*., 2011; Ajayi *et al*., 2011; Ajayi *et al*. 2012; Ajewole, 2017; Ekaye *et al*., 2022) have carried out assessment of different

monkey species in the Okomu National Park (ONP). There is currently paucity of information on the seasonal variation, diversity and population dynamics of monkey species in the Park. What is even more worrisome is the fact that, Oates, (1995) assertion of the Okomu Forest Reserve as one of the least damaged areas of remaining natural forest and still supports a small population of forest elephants and several threatened primates, is becoming a non-reality.

In Nigeria, a major problem facing wild life conservation is the increasing rate of habitat loss or modification due to human activities (Ogunjemite *et al*., 2007). Ecological disasters and climatic change have resulted in loss of soil fertility and greatly reduced biological productivity (Agbelusi *et al*., 1999). Afolayan *et al*. (2004) observed that about 34% of the original wildlife habitat in Nigeria had been lost. This has affected wildlife resources within these ecological systems leaving only remnant populations of wildlife resources in a protected area, including wildlife sanctuaries, games reserves and national parks. Reports by IUCN (2022) shows that there are about 625 distinct kinds of primates' species and sub-species, and almost all are endangered.

Okomu Reserve contains a high degree of biodiversity in terms of fauna, and it provides habitat to the endemic white-throated monkey (*Cercopithecus erythrogaster*) and several other animals on the Nigeria endangered species decree No. 11 of 1985 (e.g., the forest elephant (*Loxodonta africana cyclotis*), leopard (*Panthera pardus*), forest buffalo (*Syncerus caffer*), yellow backed duiker (*Cephalophus sylvicultor*), chimpanzee (*Pan troglodytes*), red-capped mangabey (*Cercocebus torquatus*) and the African dwarf crocodile (*Osteolaemus tetraspis*). Other animals include Mona Monkey (*Cercopithecus mona*) and the putty-nosed guenon (*Cercopithecus nictitans*). Galago (*Galago demidovii*) and potto (*Perodicticus potto)* are very common and there is a healthy population of red river hog (*Potamochoerus porcus*) (Nigerian National Park Service, 2022). There is also an impressive variety of bird life in the reserve.

Records of all Primates species available at Okomu National Park were collected from tour guards and include amongst others; West African Chimpanzee (*Pan troglodytes verus)*, Olive colobus (*Procolobus verus)*, Black and white colobus, Western pied colobus (*Poliocolobus polipomus*), Pennants red colobus (*Poliocolobus pennant*), Red capped mangabey (*Cercocebus torquatus*), Mona monkey (*Cercopithecus mona*), Putty nosed (*Cercopithecus nictitans*), Sclaters monkey (*Cercopithecus sclateri*), White throated monkey (*Cercopithecus erythrogaster*), Potto monkey (*Peridicticus potto*), Damidoffs galago (*Galago demidoff*), Thicked tailed galago (*Otelemur crassicaudatus*)(Nigerian National Park Service, 2022).

MATERIALS AND METHODS

Study Area

The study was carried out on three ranges (Arakhuan, Igwuowan, Julius Creek) in Okomu National Park, a lowland rainforest ecosystem. It is located between latitude 6°15' and 6°25`N and longitude 5°9` and 5°23`E in Ovia South-West Local government Area of Edo State, Nigeria. It has previously been described by several researchers (Akinsorotan *et al*., 2011; Ajayi *et al*., 2011; Ajayi *et al*. 2012; Ajewole, 2017; Ibrahim, 2017; Ekaye *et al.,* 2022).

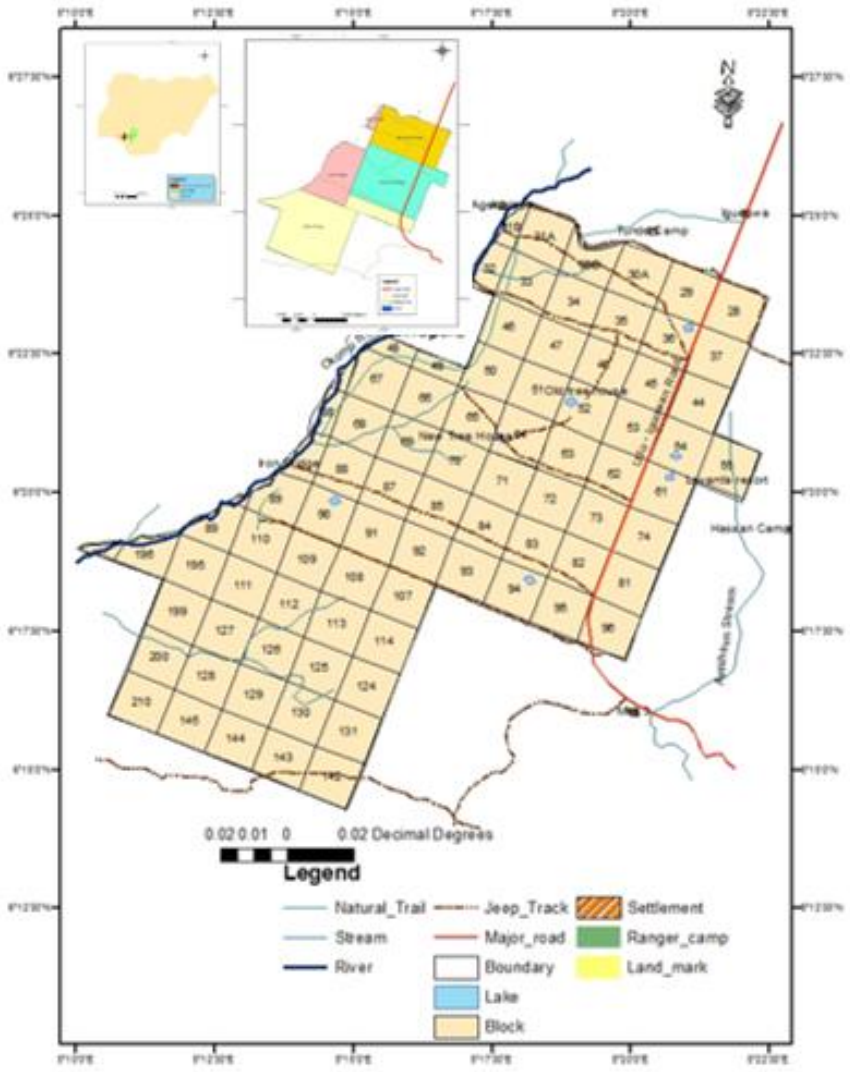

Fig. 1. Okomu showing the different compartments (inset. (a) Nigeria showing Edo State and Ovia South West LGA (b) Okomu NP showing the Ranges

Field Survey

Reconnaissance survey was conducted to get acquainted with the terrain of Okomu National Park. Existing trails were walked during the reconnaissance survey. Primary data was obtained between June 2018 and March 2019 to cover for the two seasons; dry season sampling (November to February) and wet season sampling (June to September). The sampling methods were previously described by Plumptre & Cox, (2006); Kuhl, *et al.* (2008); Buckland *et al*., (2010). Sighting was aided with binoculars, digital camera and acoustic detection. Daily survey of monkeys was carried out between 7:00am and 11:00am hours while evening survey were between 03:00pm - 06:00pm for 8 months with the assistance of a research officer and a ranger from the park in each selected compartment/block during the wet and dry season. Each trail was traversed twice daily with an average walk speed of 1.0 km/hr as described by Aremu *et al*. (2009). The number of individuals for the four abundant species was recorded for both dry and wet season.

Data Analysis

Data obtained randomly from the study were used to estimate the number of individuals of the species. Measurement of diversity, richness and evenness were done using Paleontological statistical software (PAST 3.0), 2013 version. Graphs were plotted using Microsoft Excel, 2019.

RESULTS

Seasonal Variation, Occurrence, Composition and Abundance

A total of 1391 monkeys were sighted/detected in the course of the study which were the predominant species in the park and they include, *Cercopithecus mona*, *Cercocebus torquatus*, *Cercopithecus erythrogaster* and *Cercopithecus nictitans.* The mean numbers of monkey, number of sighting/detection and percentage composition is shown in Table 1 which revealed that the percentage composition is *Cercopithecus mona*>*Cercopithecus erythrogaster*>*Cercocebus torquatus*>*Cercopithecus nictitans*. The overall percent composition of the species showed that *Cercopithecus mona* had the highest of 41.34%, followed by *Cercopithecus erythrogaster* 27.10%, *Cercocebus torquatus* 18.84% and the least was *Cercopithecus nictitans*, 12.72%. Six hundred and sixty-two (662) monkeys were detected in the wet season while 729 were detected in the dry season (Table 2). The results also showed that the monkey species, apart from *Cercopithecus mona* (seen more in the wet season) were more readily seen in the dry season than during wet season (Fig. 2)

Cercopithecus mona had the highest percentage of sighting, 46.68% (Fig. 3) during the wet season. This was followed by *Cercopithecus erythrogaster* with 26.74% sighting, *Cercocebus torquatus* with 14.65% of sightings and *Cercopithecus nictitans* with the least percentage of sighting,11.93%. Also, the percentage frequency of sightings shows that *Cercopithecus mona* was highest with 43.59%, *Cercopithecus erythrogaster*, 23.08%, *Cercocebus torquatus*,20.51% and *Cercopithecus nictitans* with 12.82% percentage frequency of sightings.

Cercopithecus mona also had the highest percentage of sightings during the dry season, 36.49% (Fig. 4). The percentage of sighting also followed the wet season sighting pattern, *Cercopithecus erythrogaster* 27.43%, *Cercocebus torquatus* 22.63% and *Cercopithecus nictitans* 13.44%. The percentage frequency of sightings also followed same pattern, 25.86%, 25.86%, 24.14% and 24.14% respectively.

Table 1: Mean number, number of sighting and percentage composition of Monkeys in Okomu National Park

Species	No of monkeys	Mean number	No of sighting	% composition
Cercopithecus mona	575	11.7	49	41.34
Cercopithecus erythrogaster	377	11.8	32	27.10
Cercocebus torquatus	262	8.13	31	18.84
Cercopithecus nictitans	177	7.34	24	12.72
Total	**1391**	**10.22**	**136**	**100**

Table 2: Number of sighting and mean number of Monkeys in wet and dry seasons

	Wet Season			Dry Season		
Species	No of monkeys	Mean Number	No of sighting	No of monkeys	Mean number	No of sighting
Cercopithecus mona	309	8.94	34	266	17.73	15
Cercopithecus erythrogaster	177	9.83	18	200	14.28	14
Cercocebus torquatus	97	6.04	16	165	11	15
Cercopithecus nictitans	79	7.9	10	98	7	14
Total	**662**	**8.47**	**78**	**729**	**12.57**	**58**

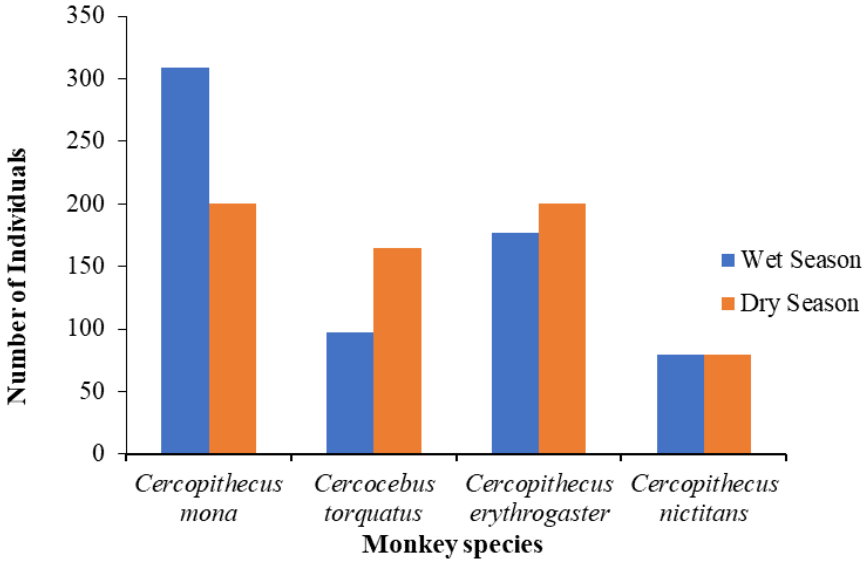

Fig. 2: Comparative abundance of monkey species in both seasons in Okomu NP

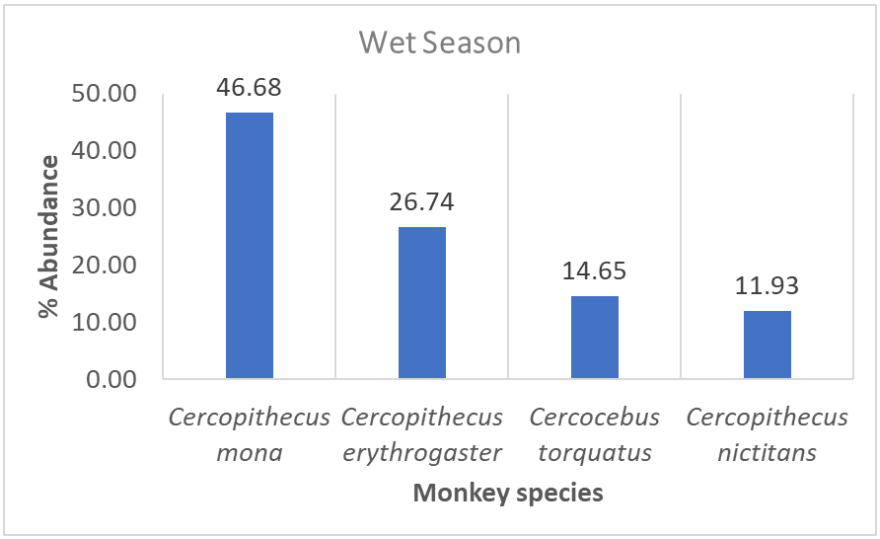

Fig. 3. Percentage composition of monkey species during the wet season

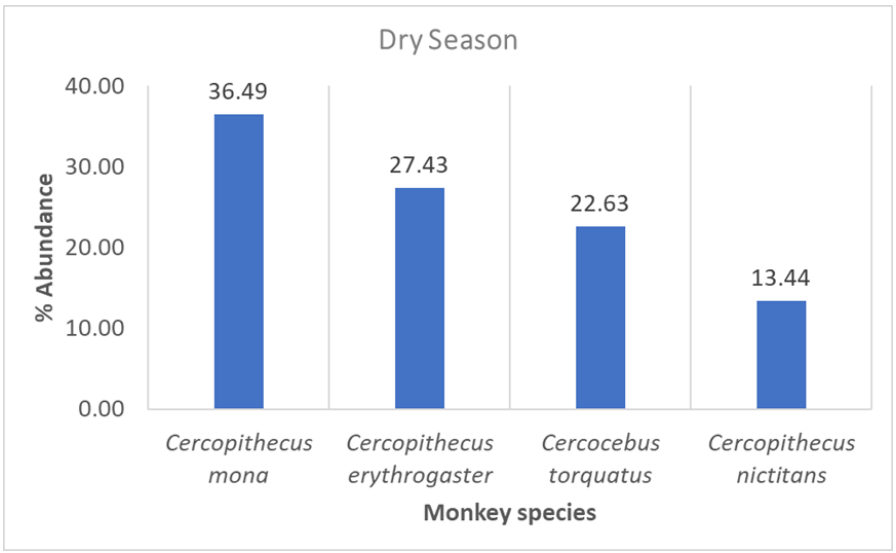

Fig. 4. Percentage composition of monkey species during the dry season

Monkey Diversity

Measurement of diversity

The most diverse species in Okomu throughout the year is *Cercopithecus erythrogaster* (Shannon H', 2.03) while the least diverse species is *Cercocebus torquatus* (Shannon H', 1.64) (Table 3a). Other species diversity indices also show this trend (Simpsons D, 0.15; Simpson 1-D, 0.85). In the wet season months however, *Cercopithecus mona* was the most diverse of the monkey species (Simpsons D Index, 0.19; Simpson 1-D Index, 0.81) (Table 3b) while *Cercopithecus nictitans* is the lease diverse species (Simpsons D Index, 0.27; Simpson 1-D Index, 0.73). *Cercocebus torquatus* was the most diverse (Simpsons D Index, 0.20; Simpson 1-D Index, 0.80) during the dry season months while the least was *Cercopithecus nictitans* (Simpsons D Index, 0.51; Simpson 1-D Index, 0.49) (Table 3c).

Measurement of species richness

The most dominant species of monkey in Okomu National Park across wet and dry season combined is *Cercopithecus erythrogaster* (Margalef's Index, 1.35, Menhinick's, 0.46) (Table 3a) while the least dominant species is *Cercocebus torquatus* (Margalef's Index, 0.90) is the least diverse. Using both the Margalef and Menhinick species richness indices, *Cercocebus torquatus* was the most dominant species during the wet season (Table 3b) while *Cercopithecus nictitans* was the least dominant species. *Cercocebus torquatus* was still dominant during the dry season's months (Table 3c).

Measurement of evenness

In terms of Species evenness, *Cercopithecus nictitans* is the most evenly distributed monkey species in Okomu for both seasons combined. During the wet season, *Cercopithecus mona* was the most evenly distributed monkey species and *Cercopithecus nictitans* the most evenly distributed during the dry season (Table 3a, b, c).

Table 3. Species diversity of Monkey in Okomu National Park

Diversity Indices	*Cercopithecus mona*	*Cercocebus torquatus*	*Cercopithecus erythrogaster*	*Cercopithecus nictitans*
(a) All season (wet and dry season combined)				
Shannon H	1.74	1.61	2.03	1.65
Simpsons D	0.20	0.23	0.15	0.22
Simpson 1-D	0.80	0.77	0.85	0.78
Margalef	0.94	0.90	1.35	0.97
Menhinick	0.29	0.37	0.46	0.45
Evenness E	0.81	0.84	0.84	0.86
(b) Wet season				
Shannon H	1.72	1.55	1.59	1.33
Simpsons D	0.19	0.26	0.25	0.27
Simpson 1-D	0.81	0.74	0.75	0.73
Margalef	0.87	1.09	0.97	0.69
Menhinick	0.34	0.61	0.45	0.45
Evenness E	0.99	0.78	0.82	0.95
(c) Dry Season				
Shannon H	1.50	1.69	1.50	0.68
Simpsons D	0.24	0.20	0.25	0.51
Simpson 1-D	0.76	0.80	0.75	0.49
Margalef	0.72	0.94	0.76	0.24
Menhinick	0.31	0.43	0.35	0.25
Evenness E	0.89	0.90	0.90	0.99

DISCUSSION

This study was undertaken to ascertain the seasonal variation, species richness and diversity of Monkey species in Okomu National Park. A total of 1391 monkeys were sighted/detected in the course of the study which were the predominant species in the park and they include, *Cercopithecus mona*, *Cercopithecus erythrogaster*, *Cercocebus torquatus* and *Cercopithecus nictitans* in order of species richness and abundance.

The estimated seasonal abundance of 575 count for mona monkey was highest recorded for a monkey species in Nigeria, compared to 247 recorded by Odewumi and Ogunjemite (2016), 333 reported by Olaleru (2020) in Lekki Conservation Area, 375 reported by Williams (2017) also in Lekki Conservation Area. However, number of sightings for mona monkeys were more during the wet season as compared to dry seasons sightings. It is generally suggested that the presence of anti-poaching patrol post may have enhanced some protection of primate's population thereby supporting the increase of their population in National Park. This research finding is in consonance with the works of Hanya and Chapman (2013). They observed that ecological factors determine the distribution of primates' population. Also worthy of note is the presence of River Okomu and various natural lakes which are situated around the National Park, ensuring constant provision of drinking water for animals throughout the season. The evergreen forest along river bank provides additional breeding site and grounds for numerous wildlife species in the park, most especially the dry season when some water bodies may have dried up. Availability of water, food and breeding space have been shown to influence the distribution of wild animals in a particular range (Chapman *et al.*, 2007).

Estimated abundance for *Cercopithecus erythrogaster* was 377. Although several research (Campbell *et al*. 2008, Nobimè *et al*. 2009) on *Cercopithecus erythrogaster* have not reported estimated abundance of red-bellied guenon, but rather on the presence and absence of the species. Suggestions are indicative of population densities lower than what we discovered in Okomu National Park. Campbell, (2005), Campbell *et al.,* (2008) had lower densities for *Cercopithecus erythrogaster erythrogaster* when compared to current study. The higher densities in this work may not be unconnected with the fact that primates are greatly influenced by habitat stability in terms of food availability, cover and safety (Decker, 1994; Clarke *et al*., 2002; Wong & Sicotte, 2006, Hohman *et al*., (2010) and Bukie*et al*. (2015). This rising human population has increased habitat loss and hunting pressure evident in Okomu. Some researchers (Oates 1985; Akinsorotan *et al*. 2011, Ikemeh, 2015, Goodwin *et al*. 2017) have shown a decline in the number of monkey species generally.

Cercocebus torquatus is listed as Endangered (IUCN, 2022), as it has been heavily impacted by both habitat loss and hunting in most of its range. Estimated abundance for *Cercocebus torquatus* was 262 in this study. Dry seasons sighting of *Cercocebus torquatus* in this study was 165 sightings as compared to 97 sightings during the wet season. This is in conformity with the works of Orimaye *et al*., (2017), where he observed that *C. torquatus* was more frequent in dry seasons than in wet seasons. The researchers suggested that the excessive rain during the wet season, which obviously boosts up regeneration and growth of herbaceous and ground vegetation, might have provided thick cover for the animals, which makes their sighting difficult. Furthermore, few numbers of fruiting trees during the dry season constrained the animal to travel far in search of food accounted for more sighting in the dry season than the wet season.

There is paucity of information of the population's status of *Cercopithecus nictitans*, however, our study estimated an abundance of 79 and 98 sightings during wet and dry season respectively. This variance of seasonal sightings may not be unconnected with the observations of Orimaye *et al.* (2017), suggesting heavy vegetation cover and closeness to food during the wet season as fruits mostly blossom during this period. However, Cronin *et al.,* 2019 suggested that small populations of *C. n. insolitus* may still be around in Idanre Forest Reserve, Omo Forest Reserve, Oluwa Forest Reserve, Ise Forest Reserve, Akure-Ofosu Forest Reserve and within the central Niger Delta it can still be readily observed in the Apoi Creek Forest Reserve and in several community forests.

A total of 662 primates were sighted in the wet season while 729 primates were sighted in the dry season. This may be due to the fact that in the dry season, vegetation and floristic composition are exposed thereby enhancing visibility and making sighting easier, while during the wet season the thick vegetation makes sighting very difficult. This might have been as a result of increase in the availability of water and food in the park during the wet season making population to disperse in search of food and water as noted by Chapman *et al.* (2007); Hanya and Chapman (2013). Also, the evergreen forest along the River Okomu which do not dry up completely in the dry season provide all necessary ecological requirements for primates thereby attracting them to move out of their place of cover in the Park (Hanya and Chapman 2013). In the course of this research, it was observed that the activities of primates begin between early hours in the morning and late afternoon. They spend their time to drink water daily before they go for late night rest. Equally, they rest on top of tree canopies in the noon. This observation is also in accordance with the report given by Ogunjimite (2007) that primate such as the white throated monkey drink water to meet its body requirements and regulates its body temperature.

CONCLUSION

This study shows the prevalence of four (4) species of Monkey in Okomu National Park which are *Cercopithecus mona, Cercopithecus erythrogaster*, *Cercopithecus nictitans* and *Cercocebus torquatus*. The most diverse and the richest species in Okomu is *Cercopithecus erythrogaster* while the least diverse species is *Cercocebus torquatus*. *Cercopithecus nictitans* is the most evenly distributed monkey species in Okomu National Park.

REFERENCES

Afolayan, T.A., Agbelusi, E.A. and Ogunjemite, B.G. (2004). Resources conservation and your future, In: Egunjobi, O.A., Kayode, J., Faluyi, M.A., Mukolu, A. and Afolabi, O. (eds). *Environmental degradation, reclamation, conservation and pollution control*. The Nigerian National commission for UNESCO. 21pp

Agbelusi, E. A., Ogunjimite, B. G. and Afolayan, T. A. (1999). A survey of the primates of Ondo and Ekiti states.*Journal of Tropical Ethnoforestry***2**(1): 100-106.

Ajayi, S., Edet, D.I., Bukie, J.O. (2011). Population Density of the White Throated Monkey (Cercopicthecus erythrogaster) in Okomu National Park, Edo State. Nigeria Journal of Agriculture, Forestry and the Social Sciences. 9(2): 175-182.

Ajayi, S., Eniang, E. A. and Bukie, J. O. (2012). Effect of hunting activities on the population of White-Throated monkeys (*Cercopithecus erythrogaster*) in Okomo National Park, Edo State, Nigeria. CRUTECH Journal of Science and Engineering and Technology, 1(2):1-6.

Ajewole, O. C. (2017). Food and feeding habit of red capped mangabey (*Cercocebus torquatus*) in Okomu national park, Edo State, Nigeria. M.Tech Thesis, Federal University of Technology, Akure, Nigeria. 201p.

Akinsorotan, O. A., Ogunjemite, B. G., & Afolayan, T. A. (2011). Assessment of the large mammals of Arakhuan range, Okomu National Park, Nigeria. Ethiopian Journal of Environmental Studies and Management, 4(3), 25-37.

Aremu, O. T., Ero, I. I., Modugu, W. W., and Osayimwen, F. E. (2009). Prospects for sustainable utilitization of flora and fauna resources of Amahor forest reserve, Edo State, Nigeria. Research Journal of Agriculture and Biological Sciences, 5(4), 518-523.

Buckland, S. T., Plumptre, A. J., Thomas, L., &Rexstad, E. A. (2010). Design and analysis of line transect surveys for primates. *International Journal of Primatology*, *31*(5), 833-847.

Bukie, J. O., Ebu, V. T. &Nchor, A. A. 2015. Population Ecology of the White-Throated Monkey (*Cercopithecus*

erythrogaster) in Afi Mountain Wildlife Sanctuary (AMWS), Cross River State, Nigeria. *International Journal of Agriculture and Forestry*, 5: 245-248.

Campbell, G. 2005. Distribution, Census and Habitat Preferences of Primate Species in the Dahomey Gap (West Africa), with Particular Emphasis on the Red-bellied Guenon (*Cercopithecus erythrogaster* erythrogaster). MA thesis, University of Calgary, Canada.

Campbell, G., J. Teichroeb & J.D. Paterson. 2008. Distribution of diurnal primate species in Togo and Benin. *Folia Primatologica 79*:15-30

Chapman, C.A., and Naughton, T.L., Lawes, M.J., Wasserman, D.M., and Gillespie, T.R. (2007). The conservation value of forests fragments: Explanations for population declines of the Colobus of western Uganda. *International Journal of Primatology*, 30: 149-161.

Cronin, D.T., Maisels, F., Gadsby, E., Gonedelé Bi, S., Ikemeh, R. &Imong, I. 2019. *Cercopithecus nictitans*. The IUCN Red List of Threatened Species 2019:

Decker, B. S. (1994). Endangered primates in the Selous Game Reserve and an imminent threat to their habitat. *Oryx*, *28*(3), 183-190.

Ekaye S.A, Dedekuma, O. N. and Oke C. O. (2022). Preliminary study on some aspect of the ecology of Cercopithecus erythrogaster pococki (Grubb, Lernould and Oates, 2000) in Okomu National Park, Edo State, Nigeria. *Journal of Research in Forestry, Wildlife & Environment*, 14(1): 85 - 92

Goodwin, R. M., Orimaye, J. O., Okosodo, F. E., Ogunjemite, B. G., &Houngbedji, M. G. (2017). The first sightings of the red-bellied guenon (*Cercopithecus erythrogaster* erythrogaster) on the Western edge of southwestern Nigeria. *African Primates*, *12*, 37-54.

Groves, C.P. (2019). *Monkeys*. EncyclopaediaBritannica.com.https: available at www.britannica.com/ animal/monkeys. Assessed 14th July 2019

Hanya, G., and Chapman, C.A. (2013). Linking feeding ecology and population: A review of food resource limitation on primates. *Ecological Research***28** (2): 183-190.

Hohmann, G., Potts, K. N'guessan, A. 2010. Plant foods consumed by Pan: Exploring the variation of nutritional ecology across Africa. *American Journal of Physiology and Anthropology*,141: 476–485.

Ibrahim, B. O. (2019). Biodiversity of Large Mammals in Okomu National Park: A Geographical Information System Approach. M.Sc EQM Thesis University of Benin Library, Benin City, Nigeria 211pp

Ikemeh, R.A. (2015) Assessing the Population Status of the Critically Endangered Niger Delta Red Colobus (*Piliocolobusepieni*). Primate Conservation, 29, 87-96.

IUCN. (2022). The IUCN Red List of Threatened Species. Version 2020-1. https://www.iucnredlist.org (Accessed 15 March , 2022).

Jayaraman, K. (1999). *A statistical manual for forestry research*. Food and Agriculture Organization of the United Nations (FAO) Regional office for Asia and Pacific, Bangkok. pp 191-196.

Kühl, H. (2008). *Best practice guidelines for the surveys and monitoring of great ape populations* (No. 36). IUCN.

Kuhl, H., Maisels, F., Ancrenaz, M. and Williamson, E.A. (2008). *Best practice guidelines for survey and monitoring of great ape populations* (No. 36). IUCNSSC Primate Specialist Group (PSG), Gland, Switzerland. 22pp

Linder, J. M., Astaras, C., Oates, J. F., Abanyam, P. A., Abwe, E. E., Betobe, E. N., … Ormsby, L. J. (2021). Population Status of the Critically Endangered Preuss's Red Colobus Monkey (*Piliocolobuspreussi*Matschie 1900) and Recommendations for Its

Conservation. International Journal of Primatology, 42(2), 262–282.

Nigerian National Park Service, NNPS (2022).Okomu National Park (nigeriaparkservice.gov.ng)/retrieved on March 05 2022.

Nobime, G., Sinsin, B., andLernould, J. M. (2009). Ecological factors determining the distribution of the red-bellied guenon Cercopithecus e. erythrogaster in Benin and Togo. *International Journal of Biological and Chemical Sciences, 3*(3).

Oates J.F. and Anadu P.A (1982). The status of wildlife in Bendel state, Nigeria, with recommendations for its conservation. Report to the Bendel State Ministry of Agriculture and Natural Resources, Benin. The Ministry of Agriculture, Abuja. The world Wildlife fund, Washington DC.

Oates, J. F. (1985). The Nigerian guenon, Cercopithecus erythrogaster: ecological, behavioral, systematic and historical observations. Folia Primatologica, 45(1), 25-43.

Oates, J. F. (1995). The dangers of conservation by rural development – a case-study from the forests of Nigeria. Oryx, 29(02), 115.

Odewumi, O. S., &Ogunjemite, B. G. (2016). Mona Monkey (*Cercopithecus mona*): A candidate in urban wildlife Management in Nigeria. *Department of Ecotourism and Wildlife Management, Federal University of Technology, PMB, 704*.

Ogunjemite, B.G. (2008). A survey of the primate of Ifon Forest Reserve, Ondo State, Nigeria. *Nigeria Journal of Forestry***37**(1&2), 18-22.

Ogunjemite, B.G., Ajayi, B. and Agbelusi, E.A. (2007). Habitat structure of Chimpanzee communities in Nigeria: A comparison of site. *Acta Zoological Sinica***53** (4) 579-588.

Ojo, F. T. (2016). Assessment of the population dynamics of diurnal primates in Old Oyo National Park, Nigeria. International Journal of Scientific Research and Education, 9, 48-90.

Olaleru, F., Onadeko, A. B., Ogunjemite, B. G., Egonmwan, R. I., & Lambert, J. E. (2020). Diet and Nutritional Profile of the Mona Monkey (*Cercopithecus mona*, Schreber, 1774) in Okomu National Park, Nigeria: Preliminary Study. *African Primates, 14*, 1-10.

Orimaye JO, Ogunjemite BG, Agbelusi EA. (2017). Density and abundance of the red-capped mangabey (*Cercocebus torquatus*) in omo biosphere reserve and idanre forest reserve, south western Nigeria. MOJ Proteomics Bioinform.;5(2):63–67

Plumptre, A. J., & Cox, D. (2006). Counting primates for conservation: primate surveys in Uganda. *Primates, 47*(1), 65-73.

Williams, A. R. (2017). Preliminary studies of abundance and feeding habitat of Mona monkeys in Lekki Conservation Centre. Thesis presented for the degree of Masters of Natural Resources and Conservation, Department of Zoology University of Lagos.

Williamson, E.A., and Feister, A.T.C. (2011). Habituating primates: processes, techniques, variables and ethic. In Satchel, J.M., and Curtis, D.J. eds. *Field and laboratory methods in primatology: A practical guide* pp. 3-49.

Wong, S. N., Saj, T. L., & Sicotte, P. (2006). Comparison of habitat quality and diet of Colobus vellerosus in forest fragments in Ghana. *Primates, 47*(4), 365-373.