

Ecology of Patas Monkey (*Erythrocebus Patas*) in Buffer Zone Ranges, Old Oyo National Park, Nigeria

Shafiu Kilishi Halidu

Federal College of Wildlife Management, Forestry Research Institute of Nigeria, P. M. B. 268, New-Bussa, Niger State, Nigeria

Olaoluwa Ayodeji Adebayo

Federal College of Wildlife Management, Forestry Research Institute of Nigeria, P. M. B. 268, New-Bussa, Niger State, Nigeria, oriobatemyl@gmail.com

Jude Chikezie

Federal College of Wildlife Management, Forestry Research Institute of Nigeria, P. M. B. 268, New-Bussa, Niger State, Nigeria

Azeez Olalekan Ibrahim

Federal College of Wildlife Management, Forestry Research Institute of Nigeria, P. M. B. 268, New-Bussa, Niger State, Nigeria

Olushola Emmanuel Adedeji

Federal College of Wildlife Management, Forestry Research Institute of Nigeria, P. M. B. 268, New-Bussa, Niger State, Nigeria

Follow this and additional works at: <https://corescholar.libraries.wright.edu/jbm>



Part of the [Behavior and Ethology Commons](#), and the [Biodiversity Commons](#)

Recommended Citation

Halidu, S., Adebayo, O., Chikezie, J., Ibrahim, A., & Adedeji, O. (2021). Ecology of Patas Monkey (*Erythrocebus Patas*) in Buffer Zone Ranges, Old Oyo National Park, Nigeria, *Journal of Bioresource Management*, 8 (2).

DOI: <https://doi.org/10.35691/JBM.1202.0178>

ISSN: 2309-3854 online

(Received: Feb 8, 2021; Accepted: Mar 26, 2021; Published: Apr 23, 2021)

This Article is brought to you for free and open access by CORE Scholar. It has been accepted for inclusion in Journal of Bioresource Management by an authorized editor of CORE Scholar. For more information, please contact library-corescholar@wright.edu.

Ecology of Patas Monkey (*Erythrocebus Patas*) in Buffer Zone Ranges, Old Oyo National Park, Nigeria

Cover Page Footnote

The authors are grateful to the Nigeria Parks Service, Old Oyo National Park, Nigeria for the permission, support given, and for providing an enabling environment to carry out this study successfully. We thank the Old Oyo National Park Game Guards for the invaluable suggestions, assistance, care, esprit de corps, and suave conduct of the field research during the sampling and data collection periods.

© Copyrights of all the papers published in Journal of Bioresource Management are with its publisher, Center for Bioresource Research (CBR) Islamabad, Pakistan. This permits anyone to copy, redistribute, remix, transmit and adapt the work for non-commercial purposes provided the original work and source is appropriately cited. Journal of Bioresource Management does not grant you any other rights in relation to this website or the material on this website. In other words, all other rights are reserved. For the avoidance of doubt, you must not adapt, edit, change, transform, publish, republish, distribute, redistribute, broadcast, rebroadcast or show or play in public this website or the material on this website (in any form or media) without appropriately and conspicuously citing the original work and source or Journal of Bioresource Management's prior written permission.

ECOLOGY OF PATAS MONKEY (*ERYTHROCEBUS PATAS*) IN BUFFER ZONE RANGES, OLD OYO NATIONAL PARK, NIGERIA

SHAFIU KILISHI HALIDU, OLAOLUWA AYODEJI ADEBAYO*, JUDE CHIKEZIE,
AZEEZ OLALEKAN IBRAHIM, OLUSHOLA EMMANUEL ADEDEJI

*Federal College of Wildlife Management, Forestry Research Institute of Nigeria,
P. M. B. 268, New-Bussa, Niger State, Nigeria*

*Corresponding author: adebayo.olaoluwa@pg.funaab.edu.ng

ABSTRACT

The buffer zones of Nigerian protected areas are poorly managed. Patas monkey (*Erythrocebus patas*) was studied in fact owing to its dearth of information on its ecology and existence in South-West Nigeria National Park. Therefore, it was necessary to examine *E. patas* spatial distribution and population structure in the Old Oyo National Park buffer zone ranges, situated in South-West Nigeria and as well know its dietary uptake alongside delineating its various activities. Observations were positioned on direct census methods. A total of 60 individuals of *E. patas* (23 female, 21 male, and 16 young individuals) were sighted within the study period (March to July). The results showed that the highest number of sighted *E. patas* (18 individuals) was recorded in the month of March while the Marguba range had the highest percentage of sighted *E. patas* (31.7%). Thirteen plant species were identified as food matters of *E. patas* while the major activity observed by the majority of *E. patas* was found feeding on the identified food matters. The food matters consumed were plant parts which included the leaves, flowers, gum, enflamed spikes, and fruits. Actions to uphold and guard the remaining populace of *E. patas* in the Park and buffer zones should be adequately fortified.

Keywords: *Erythrocebus patas*, Patas Monkey, wildlife ecology, buffer zone, National Park

INTRODUCTION

Wild animals together with primates are becoming endangered. Its process of their threat is tending towards their extinction at an alarming speed. This has called for a consistent account of all species. Adequate information on the resources of the park is based on the management's work plan of its park. Similarly, statistics on the checklist of flora and fauna in the wild and the existing evaluations of their protection status is always of major significance to the tourists visiting the park. By this means, Ayodele (1989) and Nakagawa (2000) emphasized the need for an unvarying catalogue of wild creatures in protected areas. Thus, this will form the foundation for a comprehensive management and

ecotourism protocol. In other words, a systematic register will likewise provide information about the population of the animals in the wild.

The conservation status of wildlife species talked about the populace of the wild animals in their natural environment (Ajayi and Hall, 1975) mainly in the protected and conserved areas Chism et al. (1983), for instance, the game reserves, national parks and strict nature reserves. It provides the extant state of richness and tolerability for facsimile. The motive for ordered inventories is to attain data on the recent estimations of the level of conservation and preservation of the wild animals due to the harms triggered by alteration in their surroundings (Barbara et al., 1987).

An indispensable notion in the management of game and range utilization control is the distribution of animals vis-à-vis their environment. Afolayan et al., 1983 and Bond and Keeley (2005) reported that the dispersal and actions of wild animals are commonly la-di-da by the disposal of water, diet, shelter and bush burning predominantly for the period of the dry season. Bond and Keeley (2005) disclosed that over eighty percent of the flora of the park is burnt arbitrarily each year. The consequence of misapplication of fire in the park by poachers has occasioned in soil erosion and total elimination of forage grasses. This has led to a certain portion of the park to vegetation alterations that are found to sway the wildlife population and distribution inside the park.

Primate population has momentarily decreased in the wild for the reason that their habitation has stood beneath the burden for the mining of minerals (Bond and Keeley, 2005), clear-felling of timbers (Cooke et al., 2001), intense agricultural activities (van Langevelde et al., 2003), construction of roads and other human undertakings (Williams et al., 1999). Onadeko et al., (1998) annotations disclosed that habitat damage is the utmost imperative factor intimidating the presence of wild animals and primates. Russel and Dorothy (1987) concluded that these and other issues make the population status of wild animals including the primates in specific unbalanced.

Adedoyin et al., 2018 stated that the Patas monkey (*Erythrocebus patas*) is characterized as a medium-sized primate dispersed through the semi-arid regions of Western Africa to Eastern Africa. It is documented by its diverse appellations, for example, the Red or Hussard monkey (De Jong et al., 2009). The name is given owing to its red-brown in addition to its silver-grey morphological colour (Galat-Luon, 1992). It is similarly called the crying monkey because of the crying

noises of its offspring (Rowe, 1996). The animal is a semi-land-dwelling primate (Groves, 2018). Characteristically, it lives in multi-feminine or single-masculine social clusters comprising of seventy-five individuals (Shefferly, 2004). Wolfheim (1983) indicated that *E. patas* are not controversial animals.

E. patas is identified to show a twofold character to mankind either positively through medical research and ecotourism or negatively through their invasion as well as the destruction of farmland Ayodele (1989). There is not enough information on its distribution, population structure, diet and activities on *E. patas*. As a consequence, this may perhaps be a key stumbling block to managing methods for its safeguarding (Orimaye, 2019). In doing so, the necessity of having a piece of updated information with respects to its distribution, population structure, diet and activities and in this manner, making a worthwhile submission on their conservation efforts (Onadeko et al., 1998). However, this study is correspondingly imperative for a better understanding, knowledge, behaviours and the conservation of the *E. patas* species requirements and offers an extrapolative base for the game viewing plan and park development.

The *E. patas* is an enormous primate and a consumer of resin (Nash, 1986) with the mature females weigh up between four kilogramme and eight kilogramme while the full-grown males weighs between seven kilogramme and thirteen kilogramme (Isbell and Pruetz, 1998). *E. patas* is not a nocturnal animal but could expend approximately twenty percent of its active period eating (Nash, 1986; Isbell and Pruetz, 1998). In Kenya, eighty-three percent of *E. patas* diet are harvests from *Acacia drepanolobium* (Isbell and Pruetz, 1998) and from other varieties of *Acacia* species (Nash, 1986; Nakagawa, 2003). Gum, mushrooms, flowers, seeds, pods, mature enflamed spikes of *Acacia* and ants like the

Crematogaster and *Tetraoponera*, constitute between forty percent and fifty percent of *E. patas* diet (Nash, 1986; Isbell and Pruettz, 1998; Isbell, 2007). Unsurprisingly, they feed on the ground, habitually upright with their two hindmost limbs (Nash, 1986). They move with an average speed of four kilometer per day looking for little food matters they could consume within the shortest possible period (Isbell and Pruettz, 1998).

However, the Old Oyo National Park is acknowledged as a conservative forest known for the abode of *E. patas* which was a central primate species few years ago. International Union for Conservation of Nature had listed *E. patas* as a species of Least Concern but then its populace is diminishing swiftly every year owing to tensed human actions inside and around the park (IUCN, 2004). Thus, in the light of the fast anthropogenically altered scenery of primate habitat nations, thereby triggering a certain fraction of the secondary forests to upturn at the detriment of the primary forests, primate habitats are pebbledash organizational and forceful modifications disturbs the forest structure and species abundance (Wright, 2005). Therefore, the need to enhancing our understanding on primates is much crucial and necessary (Corlett, 2011) because primate species are been forced to get by with great transferals associated with diet resources and ecological circumstances (Marsh et al., 2013).

As a result, this study was designed to systematically investigate the ecology of patas monkey (*Erythrocebus patas*) in Old Oyo National Park buffer zone ranges in Nigeria. The study aimed to confirm the distribution, population structure, diet and activities of patas monkey (*Erythrocebus patas*) in Old Oyo National Park buffer zone ranges in Nigeria.

MATERIALS AND METHOD

Nigeria is blessed and has varied mammalian wildlife reserve of nearly two

hundred and fifty species comprised of thirteen orders, forty-two families and one hundred and thirty-three genera (Happold, 1987). Afolayan (1983) and Ayodele (1989) indicated that out of the sixty-five mammalian species that are found in Old Oyo National Park, twenty-one of these species are primates and *E. patas* is inclusive. Regardless of the significance of biodiversity of the ecological system to the human being, man has make happen the extinction of species through their hostile ecological goings-on which consist of obliteration of flora and fauna habitations, unmaintainable agrarian practices, industrial development, bush burning, poaching alongside hunting, over-utilization of forest and wildlife resources. All these destructive actions remain a grave danger to the improvement and sustainable livelihood.

The Old Oyo National Park is one of the hoariest conservation space in Nigeria. It is the fourth biggest national park in Nigeria and is located in the South-Western part of Nigeria, specifically Northern part of Oyo State. Its total land area is approximately 2,512 sq. kilometre and an average rainfall of 1,100mm per annum (Orimaye, 2019). The park lies between latitudes 8°15'N and 9°00'N of the equator and longitudes 3°35'E and 4°42'E of the Greenwich meridian (Adedoyin et al., 2018). There are many wild pisces, avian, reptiles, amphibians, mammals, woody, plants and grass species in the park.

The Old Oyo National Park got its forename from the wrecks of Oyo-Ile, (Old Oyo) which was the primordial administrative centre of the Yoruba Realm. The profusion of cultural structures within and outside the Park with the blend of environmental and biodiversity locations put the Park in a very distinctive and expedient locus as a possible tourism destination. The park is well-thought-out as a diverse legacy site with exceptional natural and cultural values that when reconnoitered, it would function as a base

for its mobilization on the UNESCO world heritage list as the first diverse heritage site in Nigeria (Oladeji et al., 2012).

A non-probability sampling (purposive random sampling technique) was carried out in the selection of four sites out of the five proposed sites (Marguba, Ogun-Tede, Oyo-Ile, Sepeteri and Yemoso). This was based on the features of the population and the purposes of the investigation. This form of selection is beneficial in circumstances when the investigator desires to attain a targeted sample swiftly and in the case that a proportional sampling is not the focal worry (Tongco, 2007; Adebayo and Halidu, 2019).

A 3km by 2.5km transect was positioned in the four selected (Marguba, Ogun-Tede, Oyo-Ile and Sepeteri) Old Oyo National Park buffer zone ranges. An area of 30 sq. kilometre was the total operative research capacity covered. After the creation of transects which was done before the beginning of the collection of data, the respective transects were permitted to repose for five days. This was to lessen the human disruption and thereby allowing the wild animals to come back to their preliminary home-based range.

The four transects were passed through for the duration of the study periods. These were between the hours of 7.00 am to 1.00 pm and 4.00 pm to 7.00 pm. They move at an average mobile speed of 1.85 kilometre per hour. The time of movement was combined with a moment of silence; lookout and wait to upturn the chances of spotting the animals that may hide or run away upon the approach and movement of the investigators and viewers. The respective transects were monthly traversed two times for a period of five months (March to July).

Conservatively, only the individual *E. patas* seen were counted. The count and identification of the study animal species were with the aid of a pair of Vortex Optics Diamondback 10x42 Roof Prism

Binocular. This was used to detect their presence and identify the animals. *E. patas* sighted were recognized as defined and termed by Jean and Pierre, (1990). The information collected on *E. patas* sighted included their sex status, sighting distance (m), population structure, the food they consumed (diet) and their actions (activities).

In all, the assumptions suggested by Burnham (1980), Seber (1982) and Dunn (1993) were considered. These assumptions are that *E. patas* position directly over the transect line is not missed, *E. patas* is seen before they flee, none of the *E. patas* observed is counted twice, the sighting of each *E. patas* or group of *E. patas* are done with certainty and all *E. patas* are distributed at random to the transects. The transect points were properly geo-referenced. A Garmin™ 12 Geographic Positioning System (GSP) was used to spot every point. The size of the *E. patas* body, figure, genital organs and udders were used in the determination of the population structure.

RESULT AND DISCUSSION

Table 1 showed the spatial distribution of *E. patas* across the study months (March to July 2019) in Old Oyo National Park in the four ranges selected. The month of March recorded the highest number of observations of *E. patas* individuals sighted, followed by April while July recorded the least frequency count of *E. patas* individuals sighted. Marguba range had the highest percentage of sighted *E. patas* individuals, followed by Sepeteri Range while Oyo-Ile range recorded the least percentage of sighted *E. patas* individuals. Table 2 showed the population structure of *E. patas* in the study area. It was revealed that the highest frequency count was the female *E. patas*.

Table 1: Spatial distribution of *E. patas* across study periods.

Tracks	March	April	May	June	July	Total	Percentage
Marguba	7	5	2	3	2	19	31.7
Sepeteri	3	5	3	2	3	16	26.7
Ogun-Tede	5	3	2	3	1	14	23.3
Oyo-Ile	3	2	2	2	2	11	18.3
Total	18	15	9	10	8	60	100

Table 2: Population Structure of *E. patas* in the study area.

Tracks	Male individual sighted	Female individual sighted	Young individual sighted
Marguba	6	9	4
Sepeteri	7	5	4
Ogun-Tede	5	4	5
Oyo-Ile	3	5	3
Total	21	23	16
Percentage	35.00	38.33	26.67

Thus, a two-fifth of the female *E. patas* individuals was sighted. Though, seven-twentieth of the male *E. patas* individuals was sighted while nearly a one-third of the young *E. patas* individuals were sighted.

Thirteen (13) plant species were identified as food matters of *E. patas* in the study area. Table 3 showed the swift of food matters in the diet of *E. patas*. The forage utilization showed that fruits are the most utilized part of the plant they feed on.

Table 3 presented the activities of *E. patas* in the study area. Majority of the individual *E. patas* were found feeding on food matters which were mainly plant parts. This constituted a one-third of the total individuals seen at the study sites. About one-fifth of the individual *E. patas* were found moving around. Further activities observed on the field were self-grooming, resting, allogrooming and other activities such as alarm calls and sucking of their young from adult female *E. patas*.

Table 3: Identified plant species as food matters in the diet of *E. patas*.

Plant species	Plant part ate
<i>Acacia seyal</i>	Flowers, Gum, Enflamed spikes
<i>Annono senegalensis</i>	Fruits
<i>Cercocephalis laurifolis</i>	Fruits
<i>Ficus species</i>	Fruits
<i>Isoberlina tomentosa</i>	Fruits
<i>Mangifera indica</i>	Fruits
<i>Nuclear latifolia</i>	Fruits
<i>Parkia biglobosa</i>	Fruits
<i>Piliostigma thonigii</i>	Fruits
<i>Piper guineensis</i>	Fruits
<i>Prosopis africana</i>	Fruits
<i>Tarminrandus indica</i>	Fruits
<i>Vitellaria paradoxa</i>	Leaves, fruits

Table 4: Activities of *E. patas* in the study area

Activity	Percentage
Feeding	33.3
Moving	18.3
Allo-Grooming	10
Self-Grooming	16.7
Resting	15
Other activities	6.7

A sum up aggregate of sixty (60) *E. patas* were seen in all the tracks with the highest observation been recorded at Marguba and Sepeteri ranges. The high value of individuals seen at the considered locales in these ranges may be associated with the truth that the tracks give sufficient nourishment, liquid, shelter and breeding space for natural life species all through the year. Moreover, the nearness of anti-poaching watch post in these tracks might have encouraged satisfactory assurance of natural life populace within the tracks thereby assisting the increment within the populace of natural life in these tracks and at the matching period expanding food properties of the prevailing populace of creatures within the tracks. This reflection bolsters the the assessment of Harris and Chapman (2007) that great quality territories may have an advancement within the creature populace and their conveyance. This demonstrates that accessibility of nourishment, liquids, hiding place and breeding capacities impacted the conveyance of wild creatures in a specific track as watched by Benton et al., 2003, Manu (2003) and Ramchandra (2013).

The observations made at Oyo-Ile and Ogun-Tede territories may be as a result of the truth that these tracks are found along the stop boundaries, subsequently encountering genuine environment unsettling influence extending from poaching, illicit cultivating and unlawful logging. This may not be detached with the truth that within the dry season, numerous shrubberies and vegetation must have been uncovered

through foliate goal subsequently expanding reflectiveness for amusement seeing, subsequently making locating of wild creatures simpler, though within the rainy season the vegetation is more often than not congested, making locating of wild creatures exceptionally troublesome due to exceptionally destitute visibility.

The populace structures of *E. patas* appeared a sign that the creature has the prospective to preserve and supports its populace potential in the blink of an eye, given countless prohibited human exercises within the park are tended to. The waterways within the park which does not dry up totally within the heat period (dry season) gives all the essential environmental prerequisites for the creatures particularly amid the dry season, subsequently, pulling in primates' species and other wild creatures within the park.

Thirteen (13) plant species were identified as food matters eaten by *E. patas* in the study area. These are mostly fruits. However, *E. patas* could serve as an agent of afforestation in its activities of fruits–seed dispersion in the study area.

CONCLUSION

This study identified thirteen food matters of *E. patas* in Old Oyo National Park and they are mostly fruits which form part of their daily diet. It also established its spatial distribution with March recording the highest number of observations and Marguba range having the highest percentage of sighted individuals. The study animal was found to be engaged in various activities during the study.

Sequel on this premise, the study concluded that Old Oyo National Park is endowed in *E. patas* species. The findings from this study indicated that Old Oyo National Park should be well protected, managed and monitored against poaching, wildlife habitat destruction, indiscriminate burning of vegetation and grazing to shield

this specie population against frequent attack from man.

Likewise, the management of the park should consider the protection of the identified family of plant species in the habitat for effective conservation of the animals. This will in turn help in the conservation of *E. patas* specie population in Old Oyo National Park at large. Actions to uphold and guard the remaining populace of *E. patas* in the Park and its buffer zones should be adequately fortified.

ACKNOWLEDGEMENTS

The authors are grateful to the Nigeria Parks Service, Old Oyo National Park, Nigeria for the permission, support given, and for providing an enabling environment to carry out this study successfully.

We thank the Old Oyo National Park Game Guards for the invaluable suggestions, assistance, care, esprit de corps, and suave conduct of the field research during the sampling and data collection periods.

REFERENCES

- Adebayo OA, Halidu SK (2009). Avifauna Species Diversity and Abundance in Kainji Lake National Park, Niger State, Nigeria. *J Wildl Biodivers.*, 3(4): 16-26.
- Adedoyin SO, Aremu OT, Emelue GU (2018). Preliminary survey of primates in Old Oyo National Park Buffer Zone, Nigeria. *J Res Wildl Environ.*, 10(1): 49-55.
- Afolayan TA, Milligan KRN, Salami SO (1983). Abundance and distribution of large mammals, in the Upper Ogun Game Reserve, Oyo State, Nigeria. *Int J Stud Anim Probl.*, 4(1): 33-44.
- Ajayi SS, Hall KM (1975). A management Plan for Borgu Game Reserve. Technical paper, Ministry of Agriculture and Natural Resources, Kwara State, Nigeria: Pp 4-16.
- Ayodele IA (1989). Impact of socio-economic activities on wildlife resources in Old Oyo National Park. Proceedings of the Ecological Society of Nigeria, 14-18 August 1989, Ibadan, Nigeria: Pp 46.
- Barbara BS, Derothy L, Cheneg RM, Seyfartn RW, Wrongham T (1987). *Primate Societies*, University of Chicago Press: Pp 1-578.
- Benton TG, Vickery JA, Wilson JD (2003). Farmland biodiversity: is habitat heterogeneity the key? *Trends Ecol. Evol.*, 18: 182-188.
- Bond WJ, Keeley JE (2005). Fire as a global “herbivore”: the ecology and evolution of flammable ecosystems. *Trends Ecol. Evol.*, 20: 387-394.
- Burnham W (1980). Estimate of density line transect sampling of biological population. *Wildlife/Monogr.*, 71: 202.
- Chism J, Rowell T, Olson D (1983). Life history patterns of female patas monkeys (M. Small, Ed.), Alan R. Liss, New York: Pp: 175-190.
- Cooke P, Choquenot D, Bowman D (2001). Fire ecology and Aboriginal land management in Central Arnhem Land, Northern Australia: a tradition of ecosystem management. *J Biogeo.*, 28: 325-343.
- Corlett R (2011). How to be a frugivore (in a changing world). *Acta Oecologica.*, 37(6): 674-681.
- De Jong YA, Butynski TM, Isbell LA, Lewis C (2009). Decline in the geographical range of the southern Patas monkey (*Erythrocebus patas*) in Tanzania. *Oryx* ., 43: 267-274.
- Dunn A (1993). A manual of census techniques for surveying large mammals in tropical rainforests,

- unpublished report, WWF/UK: pp 27-34.
- Galat-Luong A (2018). Monkeys in the Pirang forest, Hamburg: Orstom Fonds Documentire.
- Groves C (2018). An Overview of the Primates. Intech Open: 11-27.
- Happold DCD (1987). The Mammals of Nigeria. Oxford Publishers, Clarendon Press: Pp: 402.
- Harris TR, Chapman CA (2007). Variation in diet and ranging of black and white colobus monkeys in Kibale National park, Uganda. *Primates.*, 48: 208-211.
- International Union for Conservation of Nature (2004). The Durban Action Plan: Vth IUCN World Parks Congress, Durban, South Africa; IUCN, Gland, Switzerland.
- Isbell LA, Pruett JD (1998). Differences between vervets (*Cercopithecus aethiops*) and patas monkeys (*Erythrocebus patas*) in agonistic interactions between adult females. *Int J Primat.*, 19(5): 837-855.
- Isbell LA, Young TP, Jaffe KE, Carlson AA, Chancellor RL (2007). Erratum to: demography and life histories of sympatric patas monkeys (*Erythrocebus patas*) and vervets (*Cercopithecus aethiops*) in Laikipia, Kenya. *Int J Primat.*, 32(1): 268-269.
- Jean D, Pierre D (1990). A field guide to the large mammals of Africa, Collins St. James publication, London. Pp: 342.
- Manu SA (2003). Effects of habitat fragmentation on the distribution of forest birds in South Western Nigeria with particular reference to Ibadan Malimbe and other malimbes, University of Oxford, Oxford, England. Pp.:44.
- Marsh LK, Chapman CA, Arroyo-Rodriguez V, Cobden AK, Jacob CD (2013). Primates in fragments 10 years later: once and future goals. *Primates in fragments: complexity and resilience*, Springer, New York: pp 503-523.
- Nakagawa N (2000). Seasonal, sex, and interspecific differences in activity time budgets and diets of patas monkeys (*Erythrocebus patas*) and tanzania monkeys (*Cercopithecus aethiops tanzania*), living sympatrically in Northern Cameroon. *Primates* 41:161-174.
- Nakagawa N (2003). Difference in food selection between patas monkeys (*Erythrocebus patas*) and tanzania monkeys (*Cercopithecus aethiops tanzania*) in Kala Malou National Park, Cameroon, in relation to nutrient content. *Primat.*, 44(1): 3-11.
- Nash LT (1986). Dietary, behavioral, and morphological aspects of gummivory in primates. *J Phys Anthropol.*, 29: 113-137.
- Oladeji SO, Agbelusi EA, Afolayan R (2012). Anthropogenic activities threatening the management of the ecotourism resources in Old Oyo National Park, Nigeria. *Ethio J Environ Stud Mgt.*, 5(1): 100-111.
- Onadeko SA, Shotuyo ALA, Meduna AJ (1998). Farm Wildlife Management: observation on some medium sized primates and smaller mammals. *Nig J Forst.*, 28(2): 66-70.
- Orimaye JO (2019). The Feeding Ecology of Red-Patas Monkey (*Erythrocebus patas*) in Old Oyo National Park, Southwest Nigeria. *J Ecol Nat Res.*, (3): 000167.
- Ramchandra AM (2013). Diversity and richness of bird species in newly formed habitats of Chandoli National Park in Western Ghats, Maharashtra State, India. *Biodiv J.*, 4(1): 235-242.
- Rowe N (1996). *The Pictorial Guide to the Living Primates*, Pogonias Press,

- East Hampton (NY), ISBN 0-9648825-0-7.
- Russel AM, Dorothy LC (1987). Conservation of Primates and Their Habitats. Primates Soc. ,Pp: 477-479.
- Seber GAF (1982). The estimation of animal abundance and relative parameters (second edition), Macmillan, New York: pp 332.
- Shefferly N (2004). *Papio anubis*. Animal Diversity Web. Retrieved 2007-01-27.
- Tongco MDC (2007). Purposive Sampling as a Tool for Informant Selection. *Ethnobotany Res Applic.*, 5: 147-158.
- van Langevelde F., van de Vijver CADM, Kumar L, van de Koppel J, de Ridder N, van Andel J, Skidmore AK, Hearne JW, Stroosnijder L, Bond WJ, Prins HHT, Rietkerk M (2003). Effects of fire and herbivory on the stability of savanna ecosystems. *J Ecol.*, 84: 337-350.
- Williams RJ, Cook GD, Gill AM, Moore PHR (1999). Fire regime, fire intensity and tree survival in a tropical savanna in Northern Australia. *Austr J Ecol.*, 24: 50–59.
- Wolfheim JH (1983). *Primates of the World: Distribution, Abundance, and Conservation*, University of Washington Press, Seattle, Pp: 9-21.
- Wright SJ (2005). Tropical forests in a changing environment. *Trends in Ecol. Evol.*, 20(10): 553-560.