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RESEARCH ARTICLE

Preliminary Assessment of Diurnal Primate Community of Queen's Plot, Akure Forest Reserve, Ondo State

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ABSTRACT

Strict nature reserve is created and managed for research and protection of large, unspoiled areas of wilderness in other to preserve its biological diversity and as essential reference areas for scientific work and environmental monitoring. The assessment of the diurnal primate community of Queen's plot in Akure Forest Reserve was carried out to evaluate the density and abundance of each primate species, determine the sighting frequencies and investigate their species composition using standard methods. A total of five line transects ranging between 0.6 km and 1.2 km were traversed in the morning and evening totaling 17.6 km. Four primate species in two families were present with red-capped mangabey (*Cercocebus torquatus*) and mona monkey (*Cercopithecus mona*) detected through direct sighting while interview schedule confirmed the presence of putty nosed monkey and chimpanzee in the study site. Sightings were frequent in the morning than the evening but were not statistically significant (Kruskal–Wallis = 0.43, $P = 0.51$). The estimated encounter rate, density, and abundance for *C. torquatus* were 0.17 animal km^{-1}, 0.003 animals km^{-2}, and 18 individuals, respectively, while *C. mona* had 0.85 animal km^{-1}, 0.016 animals km^{-2}, and 96 animals, respectively, in the queen forest with the total landmass of 6000 hectares. This finding recorded a very low encounter rate for the two primate species sighted, thereby casting doubt in the general well-being of the primate community in Akure Forest Reserve. It is, therefore, recommended that adequate protection which was enforced on the flora part of the reserve be extended to the fauna and the conflict of interest between forestry and wildlife management should be resolved so that both fields could complement each other in flora and fauna protection of the forest resources.

Key words: Abundance, protection, red-capped mangabey, strict nature reserve

INTRODUCTION

Large mammals, as well as primates in Africa, are facing a decline in population growth due to destruction to their habitat and this is of great concern to many interest organizations[1,2] because Africa continent still holds the remaining great community of primate in the globe. Studies on these large mammals had been concentrated largely on grassland communities in the West Africa subregion[3,4] while very little is known of the rainforest mammalian species including the primate groups.[5,6] Information on primate's distribution and abundance may be very essential to capture their significance as an ecological driving force. This information is also vital in answering questions about their conservation significance, tourism capability for recreation viewing purposes, the nature, and degree of wildlife conflicts, and sustainable harvesting of bushmeat by the neighborhood communities.[7,8]

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The continued existence of non-human primates whose close resemblance to humans provides humans with the capacity to probe into the primitive age of man is, therefore, of great importance.[9] There is a need to get in clear terms the diversity, abundance, distribution, and sighting frequencies of these animals for their proper management in their natural habitat.[10] Buckland *et al*.[11] posited that the actual methods that detect the presence, diversity, and abundance and reliably detect changes in population size are important tools in the management of these animals.

In Nigeria, the major challenge facing wildlife conservation is the growing rate of habitat loss or modification due to human activities Ogunjemite[12] and Orimaye *et al*.[13] with absolute confidence that there were massive scale destruction and mismanagement of the forest ecosystem of Nigeria. Ecological disasters and climate change have resulted in lack of soil fertility which, in turn, has greatly reduced biological productivity.[14] Afolayan *et al*.[4] asserted that approximately 75% of the unique wildlife habitat in Nigeria had been lost which has affected wildlife resources within these ecological structures leaving only remnant populations of wildlife resources in our protected areas.

Akure Forest Reserve is among the few remnants of forest reserves that contain the relics of the primary rainforests in Southwest Nigeria ecozone[13] and it is the major hope for the long-time survival of the remaining biological diversities of the region. Within the forest reserve, an area of about 600 hectares of forest was demarcated as the strict nature reserve (SNR), popularly called "Queen's plot". It is one of the Strict Nature Forest Reserves in Nigeria.. SNRs and wilderness areas are protected areas that are created and managed mainly for research or for the protection of large, unspoiled areas of wilderness with the primary purpose of preserving biological diversity and as essential reference areas for scientific work and environmental monitoring. By the IUCN category, SNRs are generally established exclusively for scientific fieldwork. Its usage and intrusion are strictly controlled. As a result, SNRs often form the core zones, with wilderness areas acting as a buffer zone, similar to the concept used for national parks (which are IUCN category II), but also for UNESCO World Heritage Sites.[15]

The Southwest ecozone, west of Niger, and between Dahomey Gap are of special ecological consideration.[6] Most of the endemic and rare species of the region are on the verge of extinction.[6] It is an irony that those regions where the greatest diversity of life suffers that the heaviest threats are considered a hotspot.

Although much work had been done in Queen's plot – Onyekwelu *et al*.[16] worked on tree species diversity and soil status of Queen's forest, Adekunle *et al*.[17] worked on tree species diversity and structure of Queen's forest while Adeduntan[18] examined the influence of human activities on diversity and abundance of insects in the forest, but none had been done on the diurnal primate composition of the reserve. Hence, there is the need to survey to access the various primate community of Queen's plot, Akure Forest Reserve. This study is done to assess the primate community of Queens' plot in Akure Forest Reserve by evaluating the density and abundance of each primate species and determine their sighting frequencies in Queen's plot, Akure Forest Reserve, Ondo State.

MATERIALS AND METHODS

Study area

This study was carried out in Queen's plot (SNR and enrichment plot) located within Akure Forest Reserve in the Ondo East Local Government Area of Ondo State, Southwest Nigeria. It lies between latitudes 7°16′ and 7°18′ N of the Equator and longitudes 5° 9′ and 5°11 ′E of the Greenwich Meridian. It was constituted as a reserve in 1936 and the total land area covered is 69.93 km^2. Politically, it lies in Ondo State in Southwest Nigeria and shares border with Osun State in the Northeast, surrounded by five Local Government Areas in Ondo State, namely: Ile Oluji, Oke-Igbo, Ifedore, Akure South, Idanre, and Ondo East. The climate of the area is humid tropical indicating that it is basically within the tropical rainforest ecological zone dominated by broadleaved hardwood trees that form dense, layered canopy.[19]

Methodology

A total of five nature's trails were repeatedly traverse between February 18 and April 9, 2017, twice a week covering a total of 17.6 km. Reece

lines were traversed in the morning between 6.30 h and 10.30 h and evening between 16.00 h and 19.00 h daily during the survey periods. Transect lines were walked at a speed of 1.0 km/h, with regular stops every 50 m for 1 min, to carefully screen all forest strata and detect any movement or sound/noise,[20] noting all primate species encountered, time, locality, GPS coordinates, and mode of detection (heard or seen). As much as possible, the height of the tree if it was sighted on a tree, the sighting distance, and the number of individuals seen were recorded. The recce surveys obtained presence/absence information and group encounter rates (ER = Frequency of groups sighted/distance walked per km). An attempt was made to record vocalizations by the monkeys using an improvised voice recorder. The following data were recorded for monkeys observed along the transect:

- Time of sighting
- The initial cue of detection (auditory or visual)
- The location along census route
- Species sighted
- Number of monkey present
- Perpendicular transect to animal distance, and
- Observer to animal distance
- The GPS coordinates of the location where the animals were sighted, and
- The length of each transect line was equally recorded.

Data analysis

Sighting frequency of each primate species identified was calculated using the formula suggested by Burnham and Anderson,[21] for the calculation of densities:

$$D = N/2dl$$

Where, D = the density (groups/km^2)
N = the number of sightings of each species
l = accumulated transect length and
d = the mean perpendicular distance from transects.

Abundance is calculated using:

$$D*A$$

Where, D = Density, A = total area covered
Sighting frequency is calculated using:

$$N/L$$

Where, N = no of primate sighted (for each species), L = total length of transect lines
Student's *t*-test was used to test the mean of sightings between morning and evening and the Kruskal–Wallis test was used to test the significance of the median between morning and evening sightings while descriptive statistics such as frequency counts and percentages were used to describe the results.

RESULTS

Primate species composition of Queen's plot

Table 1 shows the primate species composition of Queen's plot in the Akure Forest Reserve. Four diurnal primates in two families were present in the study area. Two of these primates were detected through direct sighting. The third and the fourth were discovered through the interview with hunters in the adjoining villages which confirmed that three species of monkeys (Owe = *Cercocebus torquatus*; Lambe or Obo = *Cercopithecus mona,* and Oto = Putty nosed monkey) were present in the reserve. Some of the hunters interviewed also affirmed that very few chimpanzees could still be present in the forest because they seldom hear the vocalization of the animal.
Table 2 presents transect covered and observation of primate in the study area. Five transects ranging between 0.6 km and 1.2 km were traversed in the morning between 6.30 h and 10.30 h and between 16.00 h and 19.00 h in the evening for 10 days. In all, a total of 17.6 km transect were achieved. Three groups of monkeys were sighted with one observation in the morning (transect 1; *n* = 8 individuals) and transect 3 (*n* = 6 individuals) while the remaining one group (*n* =4 individuals) was sighted in the evening

Table 1: Primate species composition of Queen's plot

Family	Species	Common name	Discovery mode	Local name
Cercopithecidae	*Cercocebus torquatus*	Red-capped mangabey	Sighting/call	Owe
	Cercopithecus mona	Mona monkey	Sighting	Lambe, obo
	Cercopithecus nictitans	Putty-nosed monkey	Interview	Oto
Hominidae	*Pan troglodytes*	Chimpanzee	Interview	Inaki

Table 2: Transect covered

Transects covered	Length (km^2)	Morning observation	Evening observation	Total troops	Total individuals
Transect 1	1.1	1	0	1	8 (m=6; rc=2)
Transect 2	0.8	0	0	0	0
Transect 3	1.2	1	0	1	6 (m=5; rc=1)
Transect 4	0.6	0	1	1	4 (m=4)
Transect 5	0.7	0	0	0	0

m: Mona monkey, rc: Red-capped mangabey

on transect 4. The sighting was more in the morning than in the evening but was not statistically significant at $P > 0.05$ (Kruskal–Wallis = 0.43; $P = 0.51$).

Encounter rate, density, and abundance of observed primates in the study area

Table 3 presents the density, abundance, and encounter rate of observed primates in the study area. A total of 17.6 km transect length were covered and three red-capped mangabeys were sighted which gives an estimated encounter rate of 0.17 animal/km, density, 0.003 animals/km^2, and abundance of 18 individual animals while 15 mona monkeys sighted gave estimated encounter rate of 0.85 animal/km, the density of 0.016 animal/km^2, and abundance of 96 animals in the entire queen's forest with the total landmass of 6000 hectares.

Table 3: Density, abundance, and encounter rate of observed primates in the study area

Species	Encounter rate	Density	Abundance
Red-capped mangabey	0.17	0.003	18
Mona monkey	0.85	0.016	96

DISCUSSION

The Queen's plot, a SNR portion of Akure Forest Reserve, is characterized by an excellent habitat with large, fully grown trees, a beautiful river course that makes timber exploitation in the reserve impossible and lacked large mammals as a result of human impact. The results of this work show a forest that is synonymous with the "Empty forests" described by Redford.[22] By definition, SNR is created and managed for research and protection of large, unspoiled areas of wilderness in other to preserve its biological diversity and as essential reference areas for scientific work and environmental monitoring. This assertion is not true of Queen's plot, a SNR in Akure Forest Reserve which seems to protect the flora with no attention to the fauna diversities. Mona monkey and red-capped mangabey were directly encountered during the study period. The encounter rate of primates was generally low in this rainforest. Although, the encounter rate of mona monkey is higher when compared with the encounter rate of the animal in Okomu National Park with 0.22 sighting/km as reported by 24. Sighting of primate species in the morning is significantly different from evening sightings corroborating the work of Ogunjemite *et al*[23] and Akinsorotan *et al*.[24] and Orimaye *et al*.[25] on the sighting of non-human primates in Southwest Nigeria. The 0.17 group/km of red-capped mangabey sighted in this forest was lower than the one reported by 24 with 0.10 group/km in Okomu National Park. Struhsaker[26] reported that this species was common in both Douala-Edea and Korup National Parks, in Cameroon. Since then, the encounter rate has gradually reduced to 0.23 groups/km in 1999; 0.14 groups/km in 2000;[27] 0.01 groups/km in 2004 and 2005;[28] 0.02 groups/km in 2006, 2007, and 2008;[29] 0.07 group/km in Omo Biosphere Reserve; and 0.05 group/km in Idanre Forest Reserve, Southwest Nigeria.[30] This reducing encounter rate may have been due to the intensive hunting of the species for bushmeat by the adjoining villages around the SNR. IUCN categorized mona as "Least Concern" indicating that the species is common and can adapt to a wide variety of habitats.[31] Oates *et al*.[6] reported that the animal is widespread due to its ability to adapt to a variety of habitat. On the other hand, red-capped mangabey is now categorized as "Endangered" (En) by the 2017 unpublished review of IUCN (Wallis pers. Com.). Others were not sighted directly but respondents reported that chimpanzees still exist in the forest. Greengrass[32] has earlier reported that she heard

the vocalization around the forest reserve which resembled chimpanzees but was not sure. The gross mismanagement of Nigeria's rainforest ecosystem has led to the loss of rare and endemic biodiversity including primates that are large bodied.[33] Therefore, there is a need for conservation measures to take place to prevent the relics of non-human primate diversities from extinction.

CONCLUSION AND RECOMMENDATIONS

This research has established that only two non-human primate species were encountered in Queen's plot, two were through calls while the remaining two were through interaction with the hunters and farmers around the reserve. Animals' population within the forest is generally low as evidenced by the low encounter rate of the species encountered in the study area. It is believed that the forest that is under the strict surveillance of the Ministry of Agriculture (Forest Department) should be filled with wildlife including primates, but the densities and encounter rates of primates were generally low casting doubt on the overall well-being of fauna species of Akure Forest Reserve. It is, therefore, necessary that conservation measures be taken to prevent the extinction of the endangered species in the forest.

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