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ASSESSMENT OF SEASONAL VARIATION IN *Guenon* species IN THE COASTAL REGION OF AKWA IBOM STATE, NIGERIA

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ABSTRACT

This study analysed the seasonal shifts in the species composition of the guenons in the coastal rainforest habitat of Akwa Ibom State, Nigeria. Twelve locations were chosen using the point survey method of sampling. The data from the survey was analysed using descriptive statistics such as means, bar charts, and the T-test was employed to differentiate across groups of means. The results showed that guenon species were present in 10 of the forest patches, with the exception of the Ekiebong and Esukudo patches, at a mean seasonal animal-observer distance of 183m and 251m for the wet and dry seasons respectively, although these differences were not statistically significant ($p>0.05$). A total of 224 individuals were encountered during the wet season, with *C. mona* being the most numerous species (188 total individuals), followed by *C. sclateri* (21) and *C. ascanus* (13). Udimebe and Oduo patches with 32 individuals (*C. mona* only) had the highest population, followed by Offiuda with 25 individuals (3 species). Mean species occurrence in the wet season showed a significant difference ($P<0.05$) between *C. mona* and other species. Dry season had 95 individuals encounter, with *C. mona* being the most numerous species. *C. mona* was the most abundant *Guenon* species (275), and it differed significantly ($p<0.05$) from *C. ascanius* (0.74) and *C. sclateri* (1.09). However, there was no statistically significant difference ($t = 0.286$, $p > 0.05$, $df = 2$) in the total number of guenons seen during the dry season (95, 31.66) and the wet season (224, 74.00). Based on a comparison of the two seasons, zone B had more guenons (130) than Zone A (94) although not significantly different ($t = 0.116$, $p > 0.05$, $df = 2$). Therefore, the study confirms the presence of guenon population in the coastal areas of Akwa Ibom State, Nigeria. Strong monitoring and management procedures are recommended to ensure adequate conservation of these *guenon* species

Keywords: Guenons, Coastal Region, Population density, Survey, Akwa Ibom, Nigeria

Introduction

In Africa, Nigeria is considered one of the most biologically diverse country and ranked second in terms of primate endemism worldwide (Jacob, 2016; Jacob, 2012; Egwal *et al*., 2005). In spite of its status in diversity, the Nigerian environment is still being exposed to forces engendering species losses (Ukpong *et al*., 2018; Jacob *et al*., 2015a; Jacob and Nelson, 2015). Accordingly, Nelson *et al*. (2019), Jacob *et al*. (2018a) and Jacob *et al*. (2015b), Egwali *et al*, (2005), Eniang, (2001) listed urbanization, agriculture and deforestation as the major forces responsible for species extinction. At the community levels, primates are currently threatened (Jacob *et al*., 2013a) and this is likely to increase in effects as human population grows. Consequently, the conservation of primates living in forest patches depends on its ability to withstand anthropogenic forces (Onderdonk and Chapman, 2000). A worrisome situation is the escalating bush meat crisis (Ukpong *et al*., 2018; Jacob *et al*., 2015a; Ewgali *et al*, 2005), which has led to an empty forest with evidences given by Revkin (2000) in the extinction of *Procolobus badius* from Ghana and Cote d' Ivoire.

In Nigeria, the forests are being cleared in an indiscriminate manner, while wildlife habitats are destroyed (Nelson *et al*., 2019; Jacob *et al*., 2018b; Ijeomah and Aiyeloja, 2010) for urbanization and industrialization, primate species therein are in danger of extinction (International Union for Conservation of Nature (IUCN), 2010; Eniang, 2003; Ceballos and Ehrlich 2002). Moreover, for the rural poor people with no other way to earn a living, hunting and logging may seem to be their only survival option (Jacob *et al*., 2018c; Jacob *et al*., 2013b). Stoner (2009) emphasized that hunting and habitat loss affect more wildlife populations in our forest ecosystem. The rate of bush burning activities for infrastructural revolution and agriculture has claimed large hectares of (Nelson *et al*., 2020; Nelson *et al*., 2013; Jacob *et al*., 2012). Also, between 1986 and 2016, the state lost a total of 86726.84ha of forest cover implying an annual loss of 2890.89ha (Nelson *et al*., 2019). This modification results not only in forest size reduction, but also in fragmented forest patches. Such modification in ecosystems, threatens endemic species locally, and on a national scale (Jacob *et al*., 2020a; Jacob *et al*., 2015c; Chapman and Peres, 2001). The understanding of the true conservation value of these forest patches may represent opportunities to make sustainable conservation gains since primate diversity in Mbo is concentrated in forest patches.

Primates called guenons are rain forest dwellers, widely distributed across Akwa Ibom State (Daniel *et al*., 2016; Jacob *et al*., 2015a; Jacob and Nelson, 2015; Eqwali *et al*., 2005). They are characterized by bold markings of bright

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colours and body length of about 42-56cm (16-22 inches). They play important role in seed dispersal and the stability of the ecosystem, serving as an important agent of seed dispersals in the forests (Albert *et al*., 2014). Andresen *et al*. (2018) reported that the species are able to spread thousands of seeds per year. It is an act that actually helps degraded forest areas to regrow. Moving along forest fragments, they dispersed seeds and unconsciously account for 78-92% of the removal of the seeds (Stoner, 2009). Species like *Alouatta* spp. and chimpanzees move an average of over 34,000 seeds in a square kilometre in a day (Lambert, 2014; Ukpong *et al*., 2013) and many of those seeds grow into trees used by local people for fruit, food and for medicinal purposes (Udofia *et al*., 2018; Nelson *et al*., 2015; Udoakpan *et al*., 2013).

In spite of its benefits and distribution across different forest types, some *Guenon* species for example *Cercopithecus mitis*, do not tolerate fragmentation (Lawes, 2004). They are reluctant to disperse over open ground and exist in declining populations in which local extinctions are caused by the reduction in forest area, hunting, and declining habitat quality which reduced movement among forest corridors and makes smaller population more vulnerable. These make their distribution confined and predispose many other species to increased risk of extinction in modified habitats (Alsterberge, 2017). As a result, conservation of many guenons will depend on the capacity of patches to support their populations. Therefore, this study was desirable to understand patches capacity to sustain population of guenons in Mbo LGA by assessing the seasonal variation in guenon population in forest patches in the study area.

Material and Methods

Study Area

Mbo Local Government Area (LGA) is one of the coastal communities in Akwa Ibom State with one of the largest water body in the Local Government areas other than the Ibeno River. It is located in the South-South geopolitical region of Nigeria extending from Latitudes 4°C 32′ N - 4°C 45′ N and longitudes 8°C 12′ E – 8°C 20′ E with a land area of about 372.13km^{-2} and population of 102,173 (NPC, 2006). The Local Government Area consists of forty-seven (47) villages/fishing ports (i.e. 34 villages and 13 fishing port), as shown in Figure 1. Being predominantly fishing settlements, Mbo LGA is bounded on the East by Udung Uko LGA, on the South by Atlantic Ocean and the Republic of Cameroun, on the west by Esit Eket and Ibeno LGAs (another fishing settlement) and on the North by Urue Offong/ Oruko LGA. Mbo LGA is covered by beach ridge sands and mangrove swamps with recent alluvial accumulations.

The area is characterized by two distinct climates - the rainy and the dry season. The rainy season begins from April and ends in October, when day-time temperature reaches 28^0-30^0. In dry season, day time temperatures rise to 38^0 and night temperature can drop to 14^0. It is marked with double maxima of rainfall, with the heaviest rainfall in June - August and the driest period in January. The Local Government Area experiences annual rainfall of over 2,000mm (AKS, 1989) with the dominant vegetation being the fresh and salt water mangrove swamp forests. Daily average temperature ranges from 25^{o}C – 30 ^{o}C. Harmmattan weather of the area starts from December to February during which night temperature are low.

The major economic activities of the inhabitants are hunting, fishing, fuel wood exploitation, fishing processing/trading and subsistence farming. Major biological resources include tree species such as Mahogany (*Khaya ivorensis),* Red and white Mangrove *(Rhizophora spp*), Black/white aphera (*Terminalia ivorensis*), camp/red wood *(Baphia nitida),* cedar (*Cordilia mellinia*), Ebony (*Diospyros erycoma*), Abura (*Mitragyna ciliata*) etc, and fauna species like monkeys, and birds (Ikurekong *et al*., 2009).

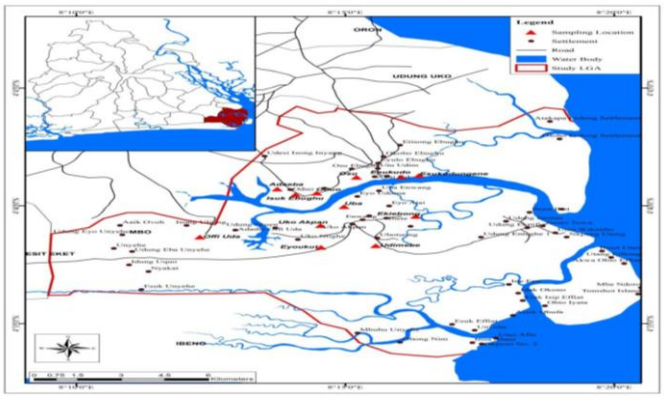

Figure1: Map of Mbo Local Government Area
Source: Dept. of Geography and Regional Planning, University of Uyo, Akwa Ibom State 2019.

Survey Method

Direct counting method was employed to meet the objectives of the study. Detailed reconnaissance survey was carried out in the thirty-four upland villages of the Local Government Area excluding fishing ports before grouping them into two zones of A and B using the central bridge in-between as a demarcation boundary, at each zone, six sites (forest patches) from six villages were selected randomly. Thus, a total of twelve (12) patches were surveyed (i.e. six sites per zone), The selected villages/sites were Adaeba, Esukodungene, Esukudo, Isukebughu, Oduo and Osu for Zone A and Eyoukut, Ekiebong, Uba, Udimebe, Offiuda and Ukoakpan for Zone B. The survey exercise was conducted between April and December, 2019.

Study Design

In determining the population structure and density, the classification of guenons was visual (eye and/ or using monocular visualization) estimation which placed guenons in two group sizes, as Adults and juveniles. *Guenon* species were monitored two (2) days in a week in all the located point as used by Powell (2003), and Buckland (2006) for twenty four (24) weeks from 6:00am when their activities began to 7:00pm local time when foraging stops and sleep

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set in and spanned over a period of six (6) months comprising both the wet (3 months) and dry (3 months) seasons. Serious rain and dark- cloudy days were often avoided. The researcher and three other research assistants were involved in the collection of data for this research. The study was conducted at approximately the same time on each survey day. During the survey, it was observed that all the patches for zone B were continuous vegetation except Eyoukut while patches in zone A had stepping stone vegetation and majority of the patches bounded in water ways/ river while a few bounded with farmlands. For some patches, 100 m away each point was often observed in other to gain a quantitative impression of guenons of the area. This method used was expected to represent a larger area under survey and not to contain bias. In estimating the number of groups per sites, animal call which indicated the presence/ territory of guenons in that site were used. Each call was recorded with an estimate of its distance from that point. Due to the irregular and bad terrain and swampy nature of many patches, no transect was laid rather a point count method was applied, as outlined in Hanya *et al.* (2003) taking into account the observer animal distance. All guenons sited were documented appropriately.

Data Collection

The data on Guenon species were collected in order to understand their diversity, structure and densities. The equipment used during the survey included the Boshile monocular (10×100×32mm), 30m tape, digital camera, geographical positioning system (GPS), field note, pencil, and machete. The guenons in each of the sites were identified using Conservation International Tropical Pocket Guide Series (Primates of West Africa Pocket Identification Guide by Oates (2010). A focal watch method where the observers sat at a viewable distance of the selected sites and observe which species inhabits the sites was employed for the survey.

Data Analysis

Both the descriptive (mean, bar charted and standard deviation) and inferential (T-test and one-way analysis of variance) statistics were used in the analyses of data obtained. The list of all the species of primates identified in the study area was analyzed using Frequency Distribution Tables. The average count from the two days records was used for the analysis. The data for objectives four were analyzed using Margalef's formula, to ascertain Species Abundance; While Species diversity index was analyzed using Shannon-weiner and Simpson's formula as presented.

(a) Species Richness (Magalef's formula) is expressed as:

$$d = \frac{S-1}{In(N)} \quad (1)$$

Where D = Magalef's index.
S= Number of Species.
N = Total number of individuals encountered.
In = Naperian loge

(b) Simpson's index formula can be expressed mathematically as:-

$$D=\sum_{i=1}^{S} \frac{n(n-1)}{N(N-1)} \quad (2)$$

Where D = The Index of diversity.
N = Total number of individuals encountered.
n = Number of individuals of the i^{th} species encountered.

(b) Shannon-weiner (H) can be represented as:-

$$H = \frac{NlogN-\sum f_i Log f_i}{N} \quad (3)$$

Where H= total number of individuals
∑fi= sum of individuals species
N= total number of species

(d) Test of Significance

A two-sample test was used to test if there was significant difference between specie's diversities of the study area, using the formula below;

$$t = \frac{(\bar{H}_1-\bar{H}_2)}{\sqrt{(S^2H_1-S^2H_2)}} \quad (4)$$

Where t = Test
H_1= Shannon diversity for zone A
H_2 = Shannon diversity for zone B
S^2H_1= Pool variance for zone A
S^2H_2= Pool variance for zone B.

Density was calculated using the formula

$$D = \frac{N}{OL} \quad (5)$$

Where D= density
N= Total number of individual's sighted
OL=Total animal observer length.

Results

i. Seasonal variation in detection distances

Guenon detection was in 10 of the forest patches in the dry season, while detection was only observed in 8 of the forest patches. There was no detection in Ekiebong and Esukudo forest patches in both dry and wet season. Total animal-observer distances measured in the different sites for the wet and dry seasons were 183 m and 251 m respectively. The distance between observer and animal at first sight during wet and dry season indicates that the dry season detection distance was higher than that of the wet season (Figure 2). However, in the wet season enumeration, the least and highest encountered distance was in Adaeba (6m) and Udimebe (45 m) forest patches respectively, while for dry season, the least and highest detection distance was in Uba (11 m) and Udimebe (45 m) forest patches respectively. Mean detection distances per season was 15.3 and 21 for wet and dry season respectively. However, although the mean detection distance in the dry season was higher than the wet season, they were statistically the same as there was no significant difference between them ($t = 0.744$, $p > 0.05$, $df = 2$).

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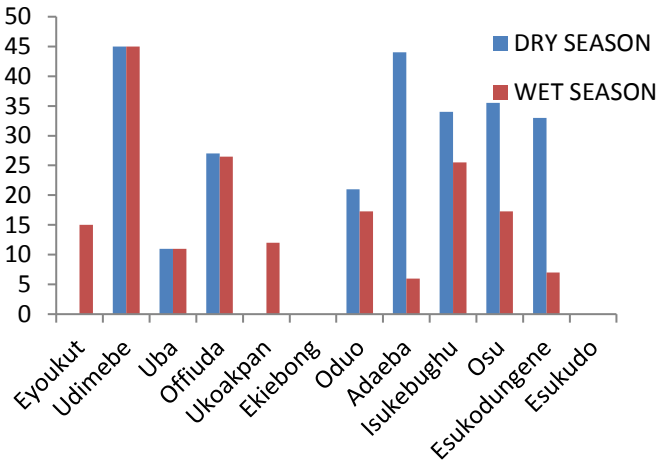

Figure 2; seasonal variation in distance of encounter rate of guenons in different sites of the Study area.

ii. Wet season composition of *Guenon* species

The results in Table 1 indicates the wet seasonal compositions of Guenon species distributed across the study sites. A total of 224 individuals were recorded for this season with *C. mona* being the most abundant species recorded (188), followed by *C. sclateri* (21) and *C. ascanus* was the least sighted species with 13 individuals. The forest patches in Udimebe and Oduo recorded the highest (32) individuals respectively with only *Cercopithecus mona*, while Offiuda recorded 25 with three (3) species. However, two (2) sites (Ekiebong and Esukudo) recorded no individual guenon species while Adaeba recorded only 3 individuals of *Cercopithecus sclateri* (Figure 3). In general, C. mona was recorded in 9 villages, C. sclateri in 5 and C. ascarinus in 4 villages. The mean occurrence of the species indicated that *C. mona* (15.67, SE: 11.30) was significantly different (F = 15.813, p<0.01) from *C. sclateri* (1.75, SE: 3.29) and *C. ascarinus* (1.08, SE: 2.68), although both of them were not significantly different from each other (Table1).

Table 1**:** ANOVA of Wet Seasonal Composition of Guenons Species

Variables	C. mona	C. sclateri	C. ascarinus
Total	188	21	13
Mean	15.67^{a} (1S.D11.30)	1.75^{b} (1S.D 3.29)	1.08^{b} (1S.D 2.68)
F-Stat	15.813***		

*** = p< 0.01; Subscripts with the same letter means that the figures are not significantly different from each other

iii. Dry season composition of *Guenon* species

The dry season composition of Guenon species (Table 2) indicates that a total of 95 individuals within 3 species of guenons were recorded in the study area. Site with the highest number of guenon individuals was Udimebe (25) followed by Adaeba and Uba with 21 and 14 individuals respectively (Figure 4). *Guenon* species were recorded in only seven (7) sites,with two sites (Adaeba and Isukebughu) having 3 species of guenons, while the remaining five (5) sites had only *C. mona*. No guenon ws detected in Eyoukut, Ukoakpan, Ekieobong, Eskogungene and Esukudo. However, *C. mona* was the dominant species and significantly different (F = 8.747, p<0.01) with 87 individuals, while the composition of *C. ascanius* and *C .sclateri* was not significantly different (p > 0.05) from each other as they both recorded 4 individuals respectively during the dry season (Table 2)

Table 2: ANOVA of Dry Seasonal Composition of Guenons Species

Variables	C. mona	C. sclateri	C. ascarinus
Total	87	4	4
Mean	7.9^{a} (1S.D 8.30)	0.34^{b} (1S.D 0.89)	0.34^{b} (1S.D 0.78)
F-Stat	8.7468***		

*** = p< 0.01; Subscripts with the same letter means that the figures are not significantly different from each other

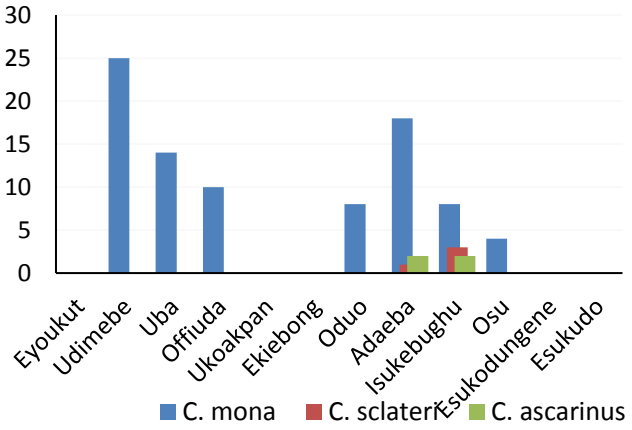

Figure 4: Dry season composition of guenon species

iv. Seasonal Population Diversity indices of Guenons population

The results in Table 3 indicates that across the two seasons (dry and wet), *C. mona* was the most sighted guenon species (N=275) and was significantly different (11.96, F=21.248, p < 0.01) from *C. ascanius* (0.74) and *C. sclateri* (1.09). However, the population density of both *C. ascanius* and *C .sclateri* was not significantly different (p > 0.05) from each other (Table 3). Moreover, across both seasons, the total number of guenons sighted in the dry season (N=95, 31.66±47.92) was not significantly different (t = 0.286, p > 0.05, df = 2) from the wet season (N=224, 74.00±98.81). Seasonal diversity indices of the guenon population indicated that the dry season had a higher index for species richness (0.439) and the Simpson index (3.919) than they wet season with 0.370 and 2.918 respectively. However, the wet season recorded a higher Shannon-wiener index (2.234) than the dry season with 0.151. Nevertheless, statistical analysis indicated that despite the variation in diversity indices between the wet and dry season, both of them were not significantly different (t = 0.4340, p > 0.05, df = 2) from each other.

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Table 3: Seasonal variation of Guenon populations and diversity indices

Variables	**Dry**	**Wet**	**Total**	**Mean**	**F-Cal**	**F-Tab**	**Sig. Level**
C. mona	87	188	275	11.96[a]	21.248	3.129	***
C. sclateri	4	21	25	1.09[b]			
C. ascarinus	4	13	17	0.74[b]			
Total	95	224					
Mean	31.66 (1S.D 47.92)	74.00 (1S.D 98.81)			0.286	2.302	NS
Variables	**Species richness (d)**	**Shannon-wiener index (H)**	**Simpsons index (D)**				
Dry	0.439	0.151	3.919		0.4340	4.3026	NS
Wet	0.370	0.234	2.918				

*** = Significant at P < 0.01; NS = Not significant; Subscripts with the same letter means that the figures are not significantly different from each other.

v. Seasonal variation of Guenons population for zones

The total population of Guenons sighted for the wet and dry seasons for Zone A and B is presented in Table 4. In the wet season, Zone B had the highest number of guenon species (N = 130) sighted compared to 94 individuals in Zone A. Across the two zones, *C. mona* was the dominant species sighted (A = 81, B = 107), followed by *C. sclateri* (A = 6, B = 19), while *C. ascarinus* was the least (A = 7, B = 4). However, further analysis indicated that despite the variation in the number of guenons sighted in both zones, they were not significantly different (t = 0.888, *p* . 0.05, df = 2) from each other. In the dry season, Zone B equally had the highest number (N = 49) of *Guenon* species sighted compared to Zone A (N = 46). Similarly, *C. mona* was the dominant species in both zones with 38 and 49 individuals sighted Zone A and B respectively, while *C. sclateri* and *C. ascarinus* with 4 individuals respectively was sighted in Zone A and none sighted in Zone B (Table 4). However, statistically, no significant difference (t = 0.116, p > 0.05, df = 2) existed between the zones.

Table 4: Seasonal composition of Guenons population within zone A and B

Variables	**Wet Season**		**Dry Season**	
	Zone A	**Zone B**	**Zone A**	**Zone B**
C. mona	81	107	38	49
C. sclateri	6	19	4	0
C. ascarinus	7	4	4	0
Total	94	130	46	49
Mean (SD)	31.33 (1S.D 43.02)	43.33 (1S.D 55.60)	15.33 (1S.D 19.63)	16.33 (1S.D 28.30)
T-Cal	0.888		0.116	
T-Tab	2.920	NS	2.920	NS

vi. Within zone seasonal Diversity of Guenons

Table 5 shows the alpha (within zone) seasonal diversity of guenons of the study area. For the wet season, zone B had a higher diversity of species with Shannon-Weiner (H = 0.238) than zone A (H = 0.216) while Simpsons dominance index was higher in zone A (D= 8.977) than B (D = 7.852). Furthermore, dry season, indexes show Shannon and Simpsons values of zone A to be higher than that of zone B, A (H=0.253, D= 12.273) and B (H= 0.002, D= 1.000). However, t- test calculated shows significance variation between zone A and B of the two seasons. t.cal. 11.827 ≥ t.tab. 2.0.13 at 0.05 level of significant in dry season and t.cal. 7.185 ≥ t.tab. 1.986 for wet season.

Table 5: within zones seasonal Diversity variation.

SEASON	Zones	Species richness (d)	Shannon-Weiner index (H)	Simpsons index (D)	t- cal	t- tab
DRY	A	0.522	0.253	12.273		**
	B	0.000	0.002	1.000	11.827	2.013
WET	A	0.440	0.220	8.977		**
	B	0.411	0.240	7.852	7.185	1.986

Note ** = significant at p < 0.05; NS= Not significant

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Discussion

The low number of guenons sighted in the study can be attributed to the high anthropogenic activities occasioned by increased human population, expansion in farmland and infrastructural development (Nelson *et al*., 2019). These results contradicted the report of Ekaye and Ogoanah (2022) who reported sighting over 1391 guenons in Okomu National Parks. The reason for the huge variation in the number of sighted guenons could be associated with the protection status of the various study areas. According to Jacob and Nelson (2021), Ver and Jacob (2021) and Jacob *et al*. (2020a, 2020b and 2020c), a National Park is owned and managed by a country specifically created for biodiversity conservation, hence human interference is restricted unlike the protected forest which is state-owned and has little restriction for human interference. The ease of access and exploitation of resources in these state-owned forest leads to indiscriminate resource exploitation and eventual degradation of the area.

The higher population density of guenons recorded in the wet season can be associated with the socio-ecological models of the primate species. This assertion is in accordance with the report of Daniel *et al*. (2016) and Jacob (2012) who reported that time spent on resting by guenons and other primate species is a function of the seasonal changes concurring in their habitat. Also, Jacob and Imaobong (2015) and Korstjens *et al*. (2010) argued that time spent by sclater guenon on resting was higher during dry season when their consumption of leaves was low and ambient temperature higher. Hence, irrespective of habitat types, visual detection of guenons was higher in the wet season than in the dry season with a mean record of 18.69 and 7.96 for wet and dry seasons respectively. However, the results of more sighting of guenons in the wet season differs from the report of Ekaye and Ogoanah (2022) who reported a higher sighting of *Cercocebus torquatus*, *Cercopithecus erythrogaster* and *Cercopithecus nictitans* in the dry season. Accordingly, the higher sighing of the species in the dry season than the wet season was linked to the high rain during the wet season, which enhances the regeneration and growth of herbaceous and ground vegetation in the study area, thereby providing a thicket for the monkeys to blend in and become difficult to sight. In addition, some of trees in the dry season will be fruiting, thereby constraining the monkeys from traveling far in search of food (Jacob 2016; Daniel *et al*., 2016). However, Bempah *et al*. (2021) reported a direct association between an animal's activity budget and its bioenergetic allocation. According to the authors, any alteration in the activity budget of an animal could have a negative impact on its bioenergetic allocations thereby resulting in decreased probabilities of the individuals to survive and reproduce.

The variation in population composition of the zonal sighting of guenons implied the abundance of food and favourable habitat in Zone A than B (Jacob *et al*., 2015a; Balcomb *et al.,* 2000), food availability maintains higher overall primate densities and other ecological resources such as water source and cover as a result of the presence of more understory plants in zone B than A. Thus, contributing to more species abundance and accommodation of more individual populations. Studies such as Nelson *et al*. (2020), Nelson and Jacob (2017), Daniel *et al*. (2016) and Daniel *et al*. (2015) had confirmed that forest cover loss is a major determinant in species declining populations. Since habitats cover cannot exceed its carrying capacity, zone with large and quality forest cover is likely to accommodate more species than others. Moreover, species abundance in zone A in the dry season could also be attributed to fluctuation in ecological requirement for the species such as scarcity of food resources such like fruits in Zone B. The presence and absence of guenons may be constrained by temperature variation, annual temperature and the relationship between rainfall and temperature through their effects on resting and moving time, which is in line with the result of an ecological niche model presented by Korstjens (2018). A good number of fruit trees species are important to sustain life of guenons that wholly or partially depend on them as their diet either throughout or during the major part of the year. Thus, resources available in time determine the level of interaction between the components that configure an ecosystem to a domain level and a shift in domain can occur in ecosystem when processes that make it resilient to surprises are disturbed, unbalanced or even unavailable at a time needed (Ali, 2015). Graham *et al* (2016) predicted that climate change result in increased warming and decrease rainfall as such changes will lead to lower quality of leaves as protein and fiber ratio will decrease according to Rothman *et al*. (2014). Thus, reduced leaf quality will result in greater resting time and will make several locations that are currently suitable for guenons unsuitable. This support the conclusion of Shameer *et al*. (2022) that species changes in their composition and population of their communities when their associated ecological niches are changed.

Conclusion

This study concluded that there are still remnants of guenon in the coastal region of Akwa Ibom State. However, the guenon population faces a serious threat of extinction if nothing is urgently done to conserve it. This was occasioned by its habit destruction due to oil exploration and other anthropogenic activities. The area still seemed to have a lot of forest patches where the guenons could live. A number of threats to the animal species had cut its population down to a very low level. Less than 250 individuals comprising three species are still alive. Every effort should be made to keep and improve the few populations that are left. This is because these populations are the key to a better understanding of the animal's taxonomy and conservation in the region. The situations that threaten the animal must be fixed as soon as possible on all fronts in order to keep the animals from going extinct in the area.

In view of the findings of this study, the following conservation approaches are recommended:

- Regular assessment of patches should be encouraged as this will help in understanding the basic ecological requirement and most importantly species living therein.
- Intensive re-afforestation should be carried out to ensure that guenon's habitat is sustained.
- Conservation and management measure such as awareness education / sensitization on guenon population should be our reminder to motivate interest in sustainability process.

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