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PANGOLIN HABITAT CHARACTERIZATION AND PREFERENCE IN OLD OYO NATIONAL PARK, SOUTHWEST NIGERIA

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ABSTRACT

The study assessed Pangolin habitat characteristic features in Old Oyo National Park (OONP) Nigeria between August, 2016 and February 2017.Three ranges were selected for the study. Data were collected using field observations (Random search and quadrat methods) where woody species and other characteristic features of pangolin habitat were recorded. Data were described using frequency and charts and one-way ANOVA. Diversity indices of tree species were calculated using PAST Software (Version 16). A total of two hundred and forty-four individual tree species belonging to nineteen families were recorded in three ranges. The woody tree species diversity indices varied slightly in the three ranges. DBH class 61-90cm had the highest frequency of 51 (20.9%) while DBH class>180cm recorded the lowest frequency of (23) (9.43%). Height class 11-15m had the highest frequency of 92 () followed by height class 6-10m with a frequency of 73 (29.92%) while height class >20m had the least frequency of 19 (7.79%). Locations where pangolins were sighted are similar in plant species composition and structural arrangement in the three ranges. The animal was found close to sources of water. The result of this study is therefore important to the conservation of the population of pangolin species in OONP.

Key words: Pangolin, habitat features, conservation, OONP

INTRODUCTION

The name, pangolin, comes from the Malay word, pengguling, meaning "something that rolls up" with large keratin scales covering its skin. It is found naturally in tropical regions throughout Africa and Asia (Helwig, 2007). Pangolin is also referred to as a scaly anteater that belongs to the order Pholidota. The Asian species are distinguished from the African species by the presence of hair between their scales. (Pangolin Specialist Group, 2012). Four species inhabit sub-saharan Africa: *Temminck's* Ground Pangolin *Simutsia temminckii*, White-bellied Pangolin *Phataginus tricuspis*, the Black-bellied Pangolin *Phataginus tetradactyla* and giant ground pangolin *Simutsia gigantean* (Gaudin *et al*., (2009), Challender *et al.*, (2012). *Simutsia temminckii* is found in central and southern Africa, *P. tricuspis* in West and Central Africa, *P. tetradactyla* and *S. gigantea* in West Africa.

Habitat use is the way an animal uses the physical and biological resources in a habitat. Habitat may be used for foraging, cover, nesting, escape, or other life history traits. These categories divide habitat but overlap occurs in some areas. An area used for foraging may be comprised of the same physical characteristics used for cover (Litvaitis *et al.*, 1994). The various activities of an animal require specific environmental components that may vary on a seasonal or yearly basis (Morrison *et al.*, 1985). Habitat preference is the consequence of habitat selection, resulting in the disproportional use of some resources over others. It is most strikingly observed when animals spend a high

proportion of time in habitats that are not very abundant on the landscape.

Pangolins are found in a variety of habitats including tropical and flooded forests, thick bush, cleared and cultivated areas, and savannah grassland. In general, they occur where large numbers of ants and termites are found (Helwig, 2007). Their populations are increasingly under threat throughout their range due to domestic and international demand for live pangolins, their skin, scales and meat (Mohapatra and Panda, 2013). This has led to pangolins being presently rated as near threatened on IUCN Red Data Book (Soewu, 2006; IUCN, 2014). All three western African species of pangolins are protected in Nigeria under Schedule 1 of Decree No. 11 (1985) on the Control of International Trade in Endangered Wild Fauna and Flora, while all four African species are listed in Class B of the 1986 African Convention on Nature and Natural Resources (Soewu, 2006). There has been little or no research into diversity, and habitat use/preference of pangolin species found in southwest Nigeria. This study seeks to provide adequate information about pangolin species diversity, distribution, and habitat characteristic features in Old Oyo National Park Nigeria.

MATERIALS AND METHODS

Study Area

Old Oyo National Park is located in the west-central part of Nigeria in northern Oyo state. It has a total area of is 2,512sq.km. It lies between longitude 3^{o} $35^{"}$ - 4^{o} $20^{"}$ E and latitudes 8^{o} $10^{"}$ – 9^{o} $05^{"}$ N (Figure 1). The Park derives its name from ruins of Oyo-Ile, the political capital of ancient Oyo Empire. A high forest and dense savannah mosaic woodland characterize the ecosystem. It is rich in fauna and flora resources. Old Oyo National Park is one of the seven National Parks in Nigeria created by decree number 36 of 1991, which was later repealed and replaced with Act 46, of 1999. Before then, the area had existed first as two contiguous forest reserves namely, Upper Ogun and Oyo-Ile gazette in 1936 and 1941 respectively. The temperature ranges between 21^{o}Cand 34^{o}Cwhile the annual rainfall ranges between 1500mm and 3000mm.The entire Park lies in the southern part of southern guinea savanna. There are four sub-types of vegetation made up of dense woodland and forests outlier in the southeastern part, Mixed open savanna woodland in the central part, outcrop vegetation in the northeast and riparian grassland and fringing woodland occupying the forest plains and valleys along the Ogun River (Afolayan*et al.,* 1997).Fauna species are relatively more abundant in the southern part of the Park e.g *Hippotragus equinus*, *Alcelaphus buselaphus*, *Cephalophus rufilatus*, *Ourebia ourebi*, *Kobus kobus*, *Syncerus caffer*, *Sylvicappra grimmia*, *Tragelaphus scriptus*, *Papio anubis*, and a wide variety of birds.

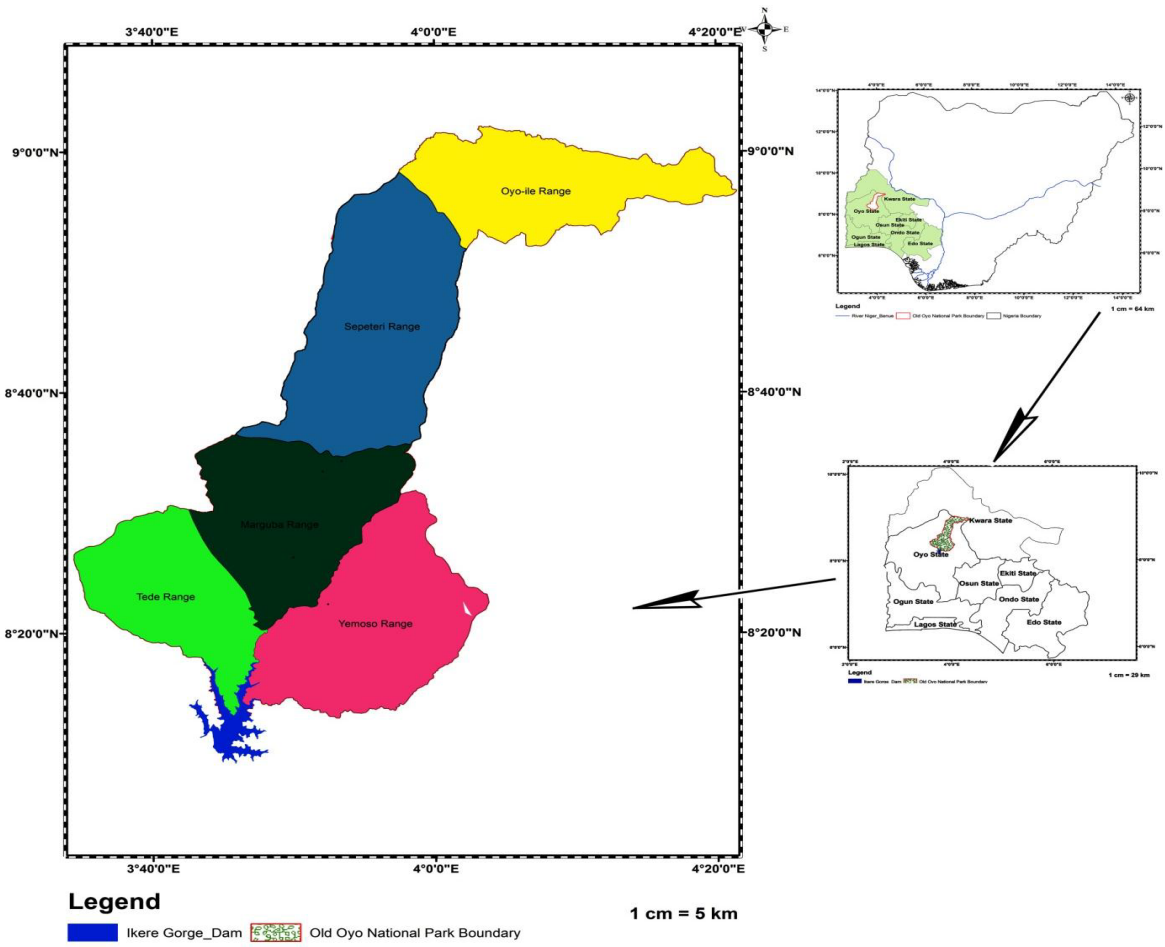

Figure 1: Map of Old Oyo National Park indicating the Ranges
Source: Azeez, (2017)

Methods of data collection

Field observation was carried out in three selected ranges (Maguba, Sepenteri, Yemoso). Random search according to Prakash *et al.*, (2014) and Newton, (2007) and plot sampling technique (quadrant method) according to Ogunjemite, *et al.*, (2005); Newton 2007). The random/extensive search was done by combing the forest looking for features that can attract pangolin such as termitarium, dead wood and water course to check for pangolin as well as the signs (scats, footprints and trace of tail) and activities of pangolins. The GPS reading was taken where indices and other related matters of Pangolins were found.

Assessment of Vegetation Structure and Other Characteristic Features of Pangolin Habitat

The assessment of vegetation structure and other characteristic features of Pangolin habitat was done where pangolins were sighted or the activities and indices of pangolins were seen using plot sampling technique (Ogunjemite, *et al.*, (2005); Newton 2007). Fifteen plots (five per range), 100 m x 100 m each were laid and characteristic features such as termite hill, hollow tree, dead wood and distance to water source were recorded. Within each of the plots another 50m x 50m sub-plots were laid for the total enumeration of the woody trees found around the pangolin activity areas. The species name, height and diameter at breast height (DBH) of woody trees were recorded. Shannon-Wiener (Magurran, 1988) index of species diversity was

used to evaluate diversity. Shannon's Evenness (E) calculated from the ratio of observed diversity to maximum Shannon- Wiener diversity. The survey was done for three months in the raining season (August to October 2016), and three months in the dry season (December 2016 to February 2017).

Statistical Analyses

The data obtained from the survey were analyzed using descriptive statistics such as frequency, percentage frequency, pie and bar charts. Difference in vegetation structure within each range was analyzed using One-way Analysis of Variance (ANOVA). PAST software was used to compute and compare woody species diversity indices in the three ranges.

RESULTS

Woody Trees Species richness and family diversity

A total of two hundred and forty four individual tree species belonging to nineteen families were recorded in three ranges studied in Old Oyo National Park (Table 1). This made up of 100 individual species representing eighteen families in Yemoso range, 77 species in fifteen families in Marguba Range and sixty sevenspecies (67) in fifteen families in Sepeteri range. The family Fabaceae had the highest number of species (9) followed by the family Combretaceae with 5 species while 13 families had one species each. Eighteen species were common to the three ranges.

The woody tree species diversity indices(Figure 2) varied slightly in the three ranges and are given as:Shannon wiener's index (3.21 for Yemoso range, 3.15 for Sepeteri range, and 2.89 for Margubarange); Evenness (0.78 for Yemoso range, 0.72 for Marguba range and 0.7 for Sepeteri range); Equitability (0.93 for Yemoso range, 0.9 for Marguba range and 0.9 for Sepeteri range).Test of homogeneity revealed that there is no significant difference (P=0.724182) between diversity indices of tree species in pangolin habitats in OONP.

Height and DBH classes distribution of woody trees in pangolin habitat in OONP

The total frequency distribution of woody trees in the three ranges (Table 2) revealed that DBH class 61-90cm had the highest frequency of 51 (20.9%) followed by DBH class 31-60cm with a frequency of 48 (19.67%) while DBH class>180cm recorded the lowest number of occurrence (23) (9.43%). In Marguba range DBH class61-90cm had the highest frequency of 21 (26.92%) while the lowest frequency of 6 (7.69%) were recorded in the DBHclasses1-30 cm and 151-180cm.The dbh classes 31-60cm and 121-150cm had the highest frequency of 16 (19.75%) while DBH class >180cm recorded the lowest number of occurrences 7(8.64%) in Sepeteri range. In Yemoso range, the DBH class 31-60cm had the highest frequency of 18 (22.22%) while DBH class>180cm recorded the lowest frequency of 5 (6.17%). There is no significant difference (P=0.967) in the mean DBH between the three ranges.

Height class 11-15m had the highest frequency of 92 (37.7%) followed by height classs 6-10m with a frequency of 73 (29.92%) while height class >20m had the least frequency of 19 (7.79%). In Marguba, Sepeteri and Yemoso ranges height class 11-15m had the highest frequency (24, 35 and 34 respectively). There is no significant difference (P=0.9357) in the mean height between the three ranges.

Other Characteristic features and frequency of occurrence in Pangolin Habitats in OONP

The result of other features found in the habitat of pangolin revealed that Yemoso had the highest number of dead wood (n=30) found around the location sampled in OONP followed by Sepeteri having (n=25) dead woods found around. Marguba had least occurrence of dead woods found around (n=18). Maguba had the highest number of termite hill occurrence in the sample area (n=7), followed by Sepeteri (n=5) while Yemoso range had the least termite hill occurrence (n=2) Table 3. Majority of

the locations are closer to water source (10 m) except for location 1in Maguba, Sepeteri and Yemoso that were farther with distances of 230m, 20m, and 20m respectively to water source.

Table 1: Woody plants Diversity in Habitat types where pangolin was sighted in OONP

Species	**Families**	**Marguba**	**Sepeteri**	**Yemoso**
Acacia gumensis	Fabaceae	-	-	+
Acasiaspp	Fabaceae	-	-	+
Afzeliaafricana	Fabaceae	+	+	-
Pterocarpus erinaceous	Fabaceae	+	+	+
Benillialiandropholia	Fabaceae	+	+	-
Prosopsisafricana	Fabaceae	-	-	+
Daniellaoliveri	Fabaceae	+	+	+
Detariummicrocarpum	Fabaceae	+	+	-
Diospyrosmespiliformis	Fabaceae	+	+	-
Burkeaafricana	Caesalpiniaceae	+	+	+
Crossopteryxfebrifuga	Rubiaceae	+	+	+
Cussoniabarteri	Araliaceae	+	+	+
Anogeissusleiocarpus	Combretaceae	+	+	+
Pteleopsissuberosa	Combretaceae	+	+	+
Terminaliamacroptera	Combretaceae	+	+	+
Terminaliaalbida	Combretaceae	-	-	+
Terminaliaglycoscen	Combretaceae	+	+	+
Hymenocardiaacida	Phyllanthaceae	-	-	+
Brideliamicrantha	Phyllanthaceae	+	+	-
Hymenocardiaacida	Phyllanthaceae	-	-	+
Ficuscapensis	Moraceae	-	-	+
Ficussur	Moraceae	-	-	+
Maranthespolyandra	Chrysobalanaceae	-	-	+
Parinaripolyandra	Chrysobalanaceae	+	+	+
Elaisguinnensis	Arecaceae	+	+	-
Gmelinaaborea	Verbenaceae	-	-	+
Khayasenegalensis	Meliaceae	+	+	+
Kigeliaafricana	Bignoniaceae	+	+	+
Lanneaacida	Anacardiaceae	+	+	+
Lophiralanceolata	Ochnaceae	+	+	+
Mytheneoussenegalensis	Celastraceae	+	+	+
Vitellariaparadoxa	Spapotaceae	+	+	+
Vitexdoniana	Mombassae	+	+	+
Parkiabiglobosa	Mimosaceae	+	+	+
Piliostigmathornigii	Araliaceae	-	-	+
Pterospermumkuntianum	Sterculiaceae	-	-	+
Uknown	Unknown	+	+	+

Note: (+) means woody trees species present; (-) means woody trees species absent

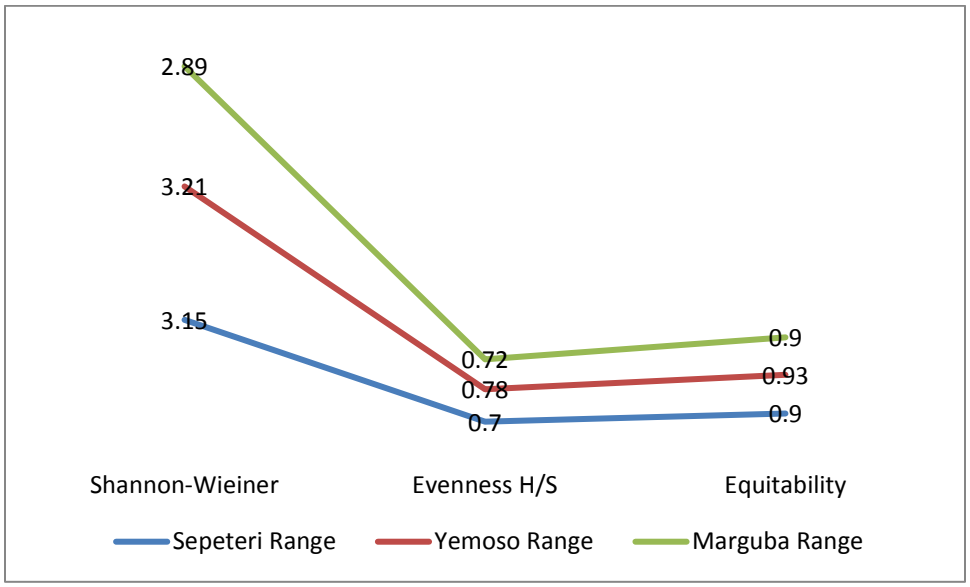

Figure 2: Diversity indices of woody trees in pangolin habitat in OONP

Table 2: Percentage Distribution of the DBH and Height of woody tree species in pangolin habitat in OONP

DBH classes (cm)	**Maguba**		**Sepeteri**		**Yemoso**		
	No of trees	**Mean±SD**	**No of trees**	**Mean±SD**	**No of tree**	**Mean±SD**	**Total**
1-30	6	20.64±1.05	8	20.21±1.05	10	20.43±1.05	24
31-60	14	44.22±1.03	16	44.45±0.03	18	45.21±1.25	48
61-90	21	71.8±2.51	14	79.32±2.51	16	74.32±2.05	51
91-120	9	108.55±0.5	9	98.55±1.25	14	101.11±3.55	32
121-150	11	130.14±0.03	16	122.45±1.38	12	128.45±2.45	39
151-180	6	165.38±1.25	11	160.23±2.38	10	162.75±2.38	27
>180	11	198.85±3.12	7	187.57±1.03	5	190.22±1.45	23
Total	**78**	**105.64**±3.12	**81**	**101.83**±2.45	**85**	**103.21**±2.38	**244**
≤5	10	4.14±0.17	5	4.37±0.03	2	4.82±0.05	24
6-10	17	8.3±0.21	27	9.01±0.58	20	9.05±0.15	73
11-15	30	14.57±1.25	35	14.31±0.15	32	12.22±0.35	93
16-20	15	19.01±1.38	11	17.65±1.36	15	18.04±0.58	35
>20	6	24.15±1.12	3	21.5±2.38	16	22.1±1.36	19
Total	**78**	**14.03**±1.38	**81**	**13.39**±1.25	**85**	**13.25**±1.36	**244**

Table 3: Frequency of occurrence of indices of pangolin sighted in plot sampled in Pangolin habitats in OONP

Maguba Range	**Location 1**	**Location 2**	**Location 3**	**Location 4**	**Location 5**	**Total**	**Mean**
No of Dead wood around	4	2	0	8	4	18	3.6
No of termite hill found	1	3	2	1	0	7	1.17
Distance to water source	30m	10m	10m	10m	10m	70m	14m
Sepeteri							
No of Dead wood around	10	5	2	8		25	6.25
No of termite hill found	3	0	0	2		5	1.25
Distance to water source	20m	10m	10m	10m		50m	12.5m
Yemoso							
No of Dead wood around	10	12	2	10		30	7.5
No of termite hill found	0	1	0	1		2	0.5
Distance to water source	20m	10m	10m	10m		50m	12.5m

DISCUSSION

Bright and Morris (1990), stated that the architectural arrangement of vegetation influences the distribution of fauna species. The woody plants recorded in the pangolin habitat were among the important woody species recorded by Ogunjemite*et.al.*,(2012) in OONP. Shannon wiener indexes of community similarities value in plant composition and mean family diversities obtained in the study areas were an indication that the key plant species were similar in each of the site. The characteristics of these habitats agreed with the description of Skinner and Chimimba, (2005) that Pangolin was present in various woodland and savanna habitats. V*itex doniana* was key to the distribution and presence of pangolin in OONP because ants are always found on the tree which provides food for pangolin. In fact, all the signs of pangolin claws on live tree were found on V*itex doniana.* The mean height and girth size distribution in the ranges showed no significant differences. The results of the study therefore supported the view of Peteirson *et. al.,* (2014) that vegetation structure and plant diversity strongly influenced the distribution of pangolin in their habitats.

Dead wood was more common than termite hills in areas where Pangolin activities (feeding) were sighted. This is due to the fact that ants and insect larvae are more commonly found on dead woods. This is in accordance with the statement by Peiterson, *et. al.,* (2014) that pangolins are terrestrial animals that lived inside woody plant holes, piles of plant debris, earthen burrows, and caves so their distributions are bound to be influenced by plant species that formed their primary habitat. Also, it was observed that higher percentage of pangolins signs were sighted not far from water source (River). This agrees with Challender *et al*., (2015), Akpona *et al*., (2008) that *Manis tetradactyla* were never far from permanent water and water courses as they were also known to inhabit older or abandoned tree plantations.

CONCLUSION

The information gathered in locations where pangolins were sighted is similar in plant species composition and structural arrangement. These locations were not far from water source of water (river and stream). Pangolins were used as source of food and medicine. The result of this study site is of management importance to the population of the pangolin in OONP and other parts of southwest Nigeria. Therefore, the management of pangolin habitats in the study areas should be given priority for effective management of the species.

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