International Journal of Innovative Biosciences Research 5(3):13-23, July-Sept., 2017

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Evaluation of the Current Habitat Condition of Kob (*Kobus kob*) in Kainji Lake National Park, Nigeria

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ABSTRACT
The current habitat condition of Kob (*Kobus kob*) was assessed during wet and dry seasons in Borgu sector of Kainji Lake National Park (KLNP) from the month of May 2015 to June 2017. In each of the habitat types, Kobs were sighted and counted. Total enumerations of woody plants were carried out, taking records of plant species in five (100m x 100m) plots. The collected data were pooled together. The result showed a total of Thirty three plant species and their distribution. Plant species recorded includes; *Vitellaria paradoxa, Anogeissus leiocarpus, Afzelia africana*, while *Terminalia glaucescens* occurs in all the habitat site. The finding on the Importance Value Index (I.V.I.) of the plant communities indicates that Vitellaria paradoxa with (27.3474) I.V percent is the leading dominance in the stands of trees. The vegetation of studied areas showed the presence of drought resistant plants and disturbed type of vegetation. The major disturbed habitat identified were the site D and E habitats having very low quality conditions. Hence kobs show preference for the less disturbed site A, B and C, in both wet and dry seasons.
Key words: Plants, Structure, Kobus kob, Utilized and KLNP

INTRODUCTION

Wild animals are dependent upon the vegetation that supports them, so changes in vegetation significantly impact wild animal populations. Sites that produce high amounts of biomass will generally support more wildlife species and larger populations than poor quality sites. The nutrient quality is one of the important characteristics of the habitat for animals such as kob (Amubode and Akossim 1989).

There are few undisturbed habitats that are left in most part of the world. Nevertheless, there is also a general desire to maintain natural habitat for our enjoyment and for the continue well-being of nature. Plant ecologist has placed increasing emphasis on a functional understanding of vegetation (Lehsten and Kleyer, 2007). The response of plant communities to environmental changes is often studied by analyzing the composition of plant characteristics across communities. Hence the habitat surveys are necessary for an adequate characterization of a plant community.

The habitat ecological survey of disturbed areas has been conducted by few researchers, in order to know the damage done to ecology of the area and also to know the diversity and dispersion status of species in the area. In Pakistan some phytosociological studies on plant communities of different areas have been conducted (Iqbal, *et al.,* (2008). Arshad, *et al.*, (2002) carried out a phytosociological assessment of natural reserve of National Park Lalsuhanra and identified three distinct types of plant communities. Ahmed and Khattak, (2001) in quantitative studies on the vegetation of Islamabad concluded that due to large scale artificial addition the original vegetation is vanishing at certain places. Hence the relative abundance of different species varied in relation to landscape composition. (Andrén 1992). The loss of a species or a change in its abundance, particularly for species that interact with many others, can have a marked effect on ecological processes throughout landscapes. Other attributes that influence the

occurrence of species include the type and quality of habitat, forest cover, fragment shape, land use adjacent to the fragment, and the extent to which the wider landscape isolates populations (Virgos 2001).
Other major problem facing wildlife conservation is the increasing rate of habitat loss or modification due to human activities (Ogunjemite *et al.*, 2007). Also ecological disasters and climatic change have resulted in loss of soil fertility and greatly reduced biological productivity (Agbelusi *et al*., 1999). Afolayan *et al.* (2004) observed that about 75% of the original wildlife habitat in Nigeria had been lost. This has affected wildlife resources within these ecological systems leaving only remnant populations of wildlife resources in protected areas including the National Parks.
Wildlife needs vary with the season and life stage of a species. Additionally, all species have preferred habitat and minimum habitat conditions. Variability of habitat quality and habitat needs makes management difficult. *K. k. kob* lives mostly in dry woodland with low grass and lowland rainforest with tall grass and also in upland forest with grassland and mangrove forest (Wanzie 1991; Amubode and Akossim 1989). Nutrient quality e.g. the extractable fats and the extent of cover from woody vegetation are among the characteristics of kob habitats (Amubode and Akossim 1989). *Kob. Kobus. kob* can reach high densities when well protected in areas of favorable habitat, ranging from 15-40 animals/km² (IUCN 2011; Amubode and Akossim 1989; Muhlenberg & Roth 1985); lowest densities recorded are less than 1/km² (Fischer and Linsenmair 2002; Sinsin *et al.* 2002). Mayaka *et al.* (2004) reported a density of 1-12 kob/km2 in Benoue National Park, Cameroon. The objective of this study is to determine the current habitat condition of Kob in terms of flora composition and structure in KLNP.

MATERIALS AND METHOD

The Study Area

Kainji Lake National Park is located between latitudes 09°40'N - 10°30'N and longitudes 03° 30'E - 5° 50'E. The park covers a total area of 5340.82sq.km. The Kanji Lake National park was established in 1979 (under decrees 46 of 29th July, 1979), thereby making Kanji lake National park one of the most important National park in Africa, as is highly endowed with many flora and fauna resources. It is made up of two non-contiguous sectors, the Borgu and Zugurma sectors with Borgu sector comprising 3,970.83 km2 (74.3%) and the Zugurma sector covering an area of 1,370 km2 (25.7%). The vegetation of the Borgu sector has been described as Northern Savanna. The six main vegetation communities in Park are (i) *Burkea africana/Detarium microcarpum woodland savanna (ii) Diospyros mespiliformis* dry forest (iii) Riparian forest and woodland (iv) *Terminalia macroptera* tree savanna (v) *Isoberlinia tomentosa* woodland and *(vi) Isoberlinia doka*, savanna woodland (Ayeni, 2007).

Study Design

Based on the methodology adopted from Akanbi (1997), which stated that an ecological survey for an area should be conducted on comparative bases, particularly the heterogeneous to indicate a long term range. The study was carried out in the Borgu sector of Kainji Lake National Park. Already existing transects and trails transects was used for this study. Out of a total of ten (10) existing/ accessible transect in the Borgu sector of Kainji Lake National Park. Five transect namely, Hussaini Masha track (Mixed *Deterium* woodland - A), Gilbert Child track (Terminalia/ Reparian woodland -B), Shehu Shagari track (Reparian /Acacia woodland -C), Mamudu Lapai track (Mixed Afzelia woodland -D), Awal Ibrahim track (Isoberlinia/ Afzelia woodland -E), were randomly selected for the study in the area. Transects length ranges between 22km to 45km.

Data Collection Techniques

Transect method was employed. Transects at the starting point were more than 200m apart from each other, decreasing the likelihood that kob will be counted on more than one transect. Transects was traversed at approximately 5-10 km/h, using both a four wheel drive and foot walk. The researcher and two field assistants aided with binoculars' traverse transects with a vehicle (four wheel drive) stopping at intervals to observe and count all groups of kobs seen from transect. The distance from the transect line to the centre of the group seen was measured and the number of kobs seen in the group recorded (Plumptre & Reynolds 1994; White 1994). Transects count was done two times in a month the work lasted for two years from May 2015- June 2017.

Vegetation Data

Point Centre Quarter Method was used, i.e. A pair of perpendicular lines erected at the random point, forming a cross with four quadrants (Mueller-Dombois and Ellenberg 1974).

For Woody Plant Assessment: A total of 200m plot each of the five transects was selected for the study. Twice a 100 X 100m plot was established at every 10km using measuring tape and ranging poles for proper measurement and alignment and also to pegged out each of the five plots while a colourful nylon was used to tag a tree at the start and end point to make the plot visible for easy woody plant species assessment. At each sample point (Pt), the following measurements were taken; the distance (d) to the nearest tree in each quadrant are measured. DBH ie the number by diameter of each tree species was recorded at 1.3m (Hill *et al.* 2005). Canopy cover i.e. the openness of the vegetation. Tree Height i.e. density of the foliage at the range of heights from ground level to upper canopy. Identified tree species were grouped into species and families and presented in tables, chats and percentages, relative frequency, relative density and Importance Value Index (IVI).

Data Analysis

Data on kob population collected were pooled together and analyzed using simple descriptive statistics and presented in Bar diagram and Table.

Data on the plant density (i.e. the expression of species per unit area) was obtained using the formula by Balslev *et al*., 1987;

$$D = \frac{\text{No of individual species}}{\text{Unit area}}$$

$$\text{Relative density} = \frac{\text{No of individual species}}{\text{No of all species}} \times 100$$

Height

The height (m) of each species was calculated using the relation, algebraic sum of the readings of the upper and base of each plant multiplied by the horizontal distance from observer to each species divided by scale factor used on the altimeter.

Basal Area

The basal area was calculated as:

$$BA = \pi\left(\frac{DBH}{2}\right)^2$$

Crown cover

This involves measuring crown diameter projection on the ground of all woody plants. A tape was laid out on the ground from one end of the crown perimeter to the other. This gives one diameter reading. A second diameter reading was taken in a similar manner but perpendicular to the first one. These gave two diameter readings which were used in calculating crown horizontal area for each plant species.

Crown cover (m^2/ha) = $d1 + d2^2 \pi /4$

The methods described by Howard (1998) which takes into consideration both the number of each range and the variety of species represented. While individual species scores for each site was summed up to derive the importance scores for each species in each site. This is mathematically stated thus;

$$= \Sigma A_1 \div B_1$$

Where A = species in any of the range which allocated the value of one.

B = the number of ranges in which it occurs.

Importance Value Index(IVI) was calculated for tree species by summing relative frequency and relative density values for all the tree species. IVI was used to identify dominant species in the study area. i.e. = relative density + rel. Frequency + relative dominance.

RESULT AND DISCUSSION

The result from this study is presented below.

Types of plants species and the habitat they occupy in the study area:

The list of tree species identified in the five selected woodland habitat of Kainji Lake National Park are presented in table 4.1, the result shows that a total of 33 different plants belonging to 19 families were inventoried in all the habitats. Habitat-site (A) contains the highest number of tree species totaled 23 species, while site (D) has the least of 5 species. The highest numbers of 32.95 and 29.36% kobs were sighted in habitat (C) during wet and dry seasons, while the least number in wet was recorded in site (D) and site (E) in the dry season as shown in (fig.1). There are variations among the different habitat sites. The plants seen in one site differs from the other site. This therefore agrees with Phillips, *et al*., (1994); Steege, *et al*., (2000) and Proctor *et al*., (1983) report that forest tree community structure and composition varies widely not only between forests on different continents but also between forests on the same continent and even between different sites within the same forest.

Table 1: Types of plants species and the habitat they occupy in the study area

S /No	Family name	Scientific name	A	B	C	D	E
1.	Anacardiaceae	*Lannea acida* A. Rich	x	x	-	-	-
2.	Anarcardiaceae	*Lannea schimperi* (Hochst. ex A.Rich.) Engl	x	x	-	-	-
3.	Annonaceae	*Anogeissus leiocarpus* (D.C) Guill. & Perr.	x	x	x	-	-
4.	Bignoniaceae	*Kigelia africana* Benth.	-	x	-	-	-
5.	Bignoniaceae	*Stereospermum kunthianum*, Cham.	x	-	-	-	
6.	Bombacaceae	*Bombax costatum* Pellegr	x	x	x	x	-
7.	*Caesalpiniacea*	*Burkea africana* Hook	-	x	x	-	-
8.	Caesalpiniaceae	Afzelia africana Sm	-	x	x	x	x
9.	*Caesalpiniaceae*	*Detarium microcarpum* Guill. Nad Perr.	x	x	x	-	-
10.	Caesalpiniaceae	*Entada africana* Guill. et Perrott	x	-	-	-	-
11.	Caesalpiniaceae	*Isoberlinia doka* Craib.	-	-	x	-	x
12.	Caesalpinioideae	*Piliostigma thonningii* (Schum.) Milne-Redhead.	x	x	x	-	x
13.	Celastraceae	*Maytenus senegalensis* (Lam.) Exell	x	-	-	-	-
14.	Combretaceae	*Combretum molle* R.Br. ex G.Don	x	-	-	-	-
15.	Combretaceae	*Combretum nigricans* Lepr. ex Guill. & Perr	-	x	-	-	-
16.	Combretaceae	Terminalia glaucescens Guill & Perr	x	x	x	x	x
17.	Combretaceae	*Terminalia laxiflora* Engl. & Diels	x	-	-	-	x
18.	Fabaceae	*Prosopis africana* (Guill. & Perr.) Taub.	x	x	x	-	-
19.	Leguminoceae Caesalpiniaceae	*Daniela oliveri* (Rolfe) Hutch and Dalz.	x	-	-	-	x
20.	Leguminosae	Tamarindus indica Linn	x	-	x	-	-

21.	Loganiaceae	*Strychnos spinosa* Lam.	x	-	-	x	-
22.	Meliaceae	*Khaya senegalensis* (Desr.) A.Juss.	-	-	x	-	-
23.	Mimosaceae	*Acacia hockii* De wild	x	x	x	-	-
24.	Mimosaceae /Fabaceae	*Acacia gourmaensis*	x	x	x	-	-
25.	Mimosaceae /Fabaceae	Acacia sayal Linn	x	x	x	-	-
26.	Moraceae	*Ficus thoningii* Linn.	-	x	x	-	x
27.	Papilionaceae	*Pterocarpus erinaceus* Poir.	-	x	-	-	-
28.	Phyllanthaceae	*Hymenocardia acida* Tul.	x	-	-	x	-
29.	Rosaceae	*Maranthes polyandra* (Benth.).	-	x	x	-	-
30.	Rubiaceae	*Crossopteryx febrifuga* (Afzel. ex G.Don) Benth	x	x	x		
31.	Rubiaceae	*Gardenia aqualla* Stapf & Hutch.	x	x	x	-	-
32.	Sapotaceae	*Vitellaria paradoxa* C.F.Gaertn.	x	x	x	-	x
33.	Sterculiaceae	*Sterculia setigera* Del	-	x	x	-	-
	Total		**23**	**22**	**20**	**5**	**8**
	%		**29.49**	**28.21**	**25.64**	**6.41**	**10.26**

From the table above + = present. - = absent
Source: Field survey

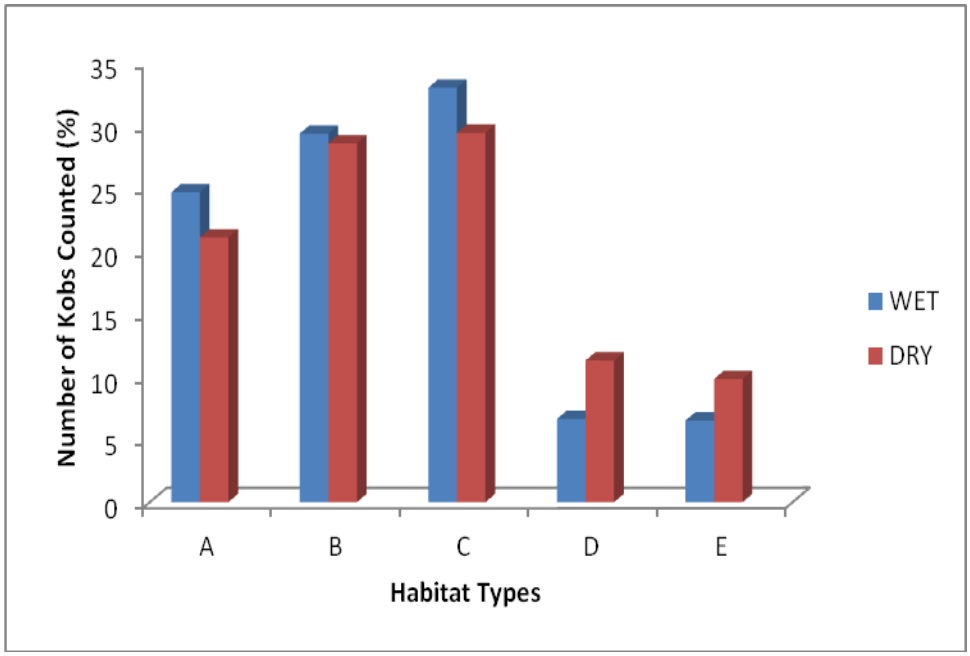

Fig 1. Number of Kobs counted in each Habitat site (%)

Relationship in the floristic structure of trees in KLNP

Table 3, 4, 5 and 6 shows the relationship in the floristic structure of trees in KLNP. The findings indicate that plant with the highest relative density is *Vitellaria paradoxa* species having a relative density of 13.86% followed by *Anogeissus leiocarpus* having a relative density of 11.75%, Hence densities of many tree species varied widely between sites with certain species among the most abundant at some sites and absent at others The overall density of plants in KLNP is very low. The vegetation is quite an open type with few plant species left at every site, because of reasons ranging from constant bush burning, small differences in elevation and rainfall to past differences in habitat alteration by humans (Chapman, *et al.* 1997).

Plant with the highest mean height is *Bombax costatum* having a total mean height of 22.44m tall, followed by *Afzelia africana* with 21.92m tall, while the least height is *Combretum nigricans having* 3.6m tall. The height class of tress found in the selected sites indicates that the highest value of 91.3% was recorded in site (A), followed by site (D) 80%, both in height class of 21 $\geq$ 30m and the least of 4.35% which is the least of values in all the ranges was recorded in site (A) in the height class of 10 $\geq$ 20m. Plants in KLNP estate are matured and some have not been cut or uprooted before hence most have attained their maximum height successfully.

The plants species with the highest basal area is *Afzelia africana* having a mean basal area of 202.08 cm^2 /ha, followed by *Vitellaria paradoxa* with a mean basal area of 177.146cm^2 /ha, while the least is *Combretum nigricans and Lannea schimperi* having *a* mean basal area of 4.094 cm^2 /ha respectively. the highest value 62.5% of basal area was recorded at site (E), in the class range of 101 and above, while the least 20% in the class range of 51 $\geq$ 100 was recorded at site (C and D) respectively (table 5). Site D and E having the highest basal area greater than 100square feet per acre, indicates that less sunlight reaches the ground in the sites. This lack of sunlight impedes growth of grasses, forbs (nonwoody, broadleaf plants), and shrubs that provide important food and cover for kobs and other wild animals. This is one reason why few kobs were sighted in the two areas.

Plant canopy shows that *Afzelia africana* and *Boxmbax costatum* have the widest canopy cover of 10.4943 m^3 wide while plant with the least canopy cover is the *Combretum nigricans* and *Lannea schimperi species* having 0.7855 m^3 canopy cover respectively. The majority of woody trees has crown covers value of 81.82% as recorded in the site (B), in the class range of 1 $\geq$ 10 followed by site (A), with a value of 78.26% in the same class range of 1 $\geq$ 10, while in the class range of 11 $\geq$ 20 site (E), has the highest50% and above this class range only site (C) recorded 4.55% canopy cover (table 6). This shows that although the all the sites has lower crown covers values in them, the habitats site A, B and C, compete favorable with each other in terms of plant species floristic composition and productivity. Hence the reason more kobs are found in them. This agrees with Amubode and Akossim (1989) assertion that the degrees of cover from woody vegetation are among the characteristics of kob habitats being favourd by open woody vegetation.

Table 3: Tree density (stems, ha^{-1}), relative density (%), mean d.b.h. (cm)

Scientific name	Number	Density(stems, ha)	Rel. density (%)	Height mean (m)	Mean DBH (cm)	Mean Basal Area (cm^2)	Mean Canopy cover (m^3)
Acacia hockii	6	0.335	0.67	14.2	3.9656	21.56	4.3359
Acacia gourmaensis	48	26.5	5.32	16.24	7.7199	117.315	4.4931
Acacia sayal	19	10.5	2.11	15.8	6.4608	72.01	4.6816
Afzelia africana	76	42	8.43	21.92	13.8383	202.08	10.494
Anogeissus leiocarpus	106	58.5	11.75	16.28	4.4558	27.02	5.5818
Boxmbax costatum	38	21.05	4.21	22.44	9.9739	107.788	10.4943
Burkea africana	23	12.5	2.55	8.25	3.5289	24.458	3.1228
Combretum molle	2	1	0.22	4.28	1.7371	11.852	2.6393
Combretum nigricans	8	4.5	0.89	3.6	1.021	4.094	0.7855
Crossopteryx febrifuga	79	43	8.76	13.02	9.4398	138.13	6.9281
Daniella oliveri	5	3	0.55	12.46	6.1235	81.68	4.5166
Detarium microcarpum	79	43.5	8.76	13.42	8.1668	94.752	6.0798
Entada africana	3	1.5	0.33	5	2.4188	22.978	1.9166
Ficus thoningii	14	8	1.55	16.6	6.9509	68.77	4.1380
Gardenia aqualla	35	19.5	3.88	13.07	8.3514	124.396	3.4138
Hymenocardia acida	6	3.5	0.67	9.3	3.2463	21.086	3.1734
Isoberlinia doka	39	21.5	4.32	13.6	8.7714	163.316	4.1003
Khaya senegalensis	5	3	0.55	6.2	4.9905	97.814	2.5764
Kigelia africana	1	0.5	0.11	6.4	3.2591	41.716	1.7909
Lannea acida	8	4.5	0.89	8.6	4.8918	48.368	2.5293
Lannea schimperi	6	3.5	0.67	7.6	2.042	8.188	1.571
Maytenus senegalensis	6	3.5	0.67	4.68	1.5442	9.366	1.6653
Maranthes polyandra	16	9	1.77	8.8	5.6015	71.928	2.0517
Piliostigma thonningii	36	19.95	3.99	18.68	6.0910	37.176	7.2266
Prosopis africana	11	6.1	1.22	18.674	4.8914	43.732	7.2329
Pterocarpus erinaceus	6	3.5	0.67	4.2	1.8459	13.384	1.3416
Sterculia setigera	5	3	0.55	13.2	5.6015	86.568	5.4105
Stereospermum kunthianum	2	1	0.22	4.4	1.2412	6.052	1.3511
Strychnos spinosa	16	9	1.77	11.2	1.8713	8.262	2.0329
Tamarindus indica	9	5	0.99	11.6	3.7747	30.196	2.1899
Terminalia glaucescens	58	32	6.43	28	10.275	90.354	6.9249
Terminalia laxiflora	6	3.5	0.67	11	4.8377	46.086	3.6353
Vitellaria paradoxa	125	69.5	13.86	20.04	12.5952	177.146	7.6885
Total	**902**		**100**	**402.75**	**177.1108**	**2119.621**	**138.114**

Table 4: Height class of tress in the five selected Sites of KLNP (m)

Park selected Sites	Percentage height class (m)			
	10 ≥ 20	21 ≥ 30	31 ≥ above	Total
A	4.35	91.3	4.35	100
B	36.36	36.36	27.27	99.99
C	5	65	30	100
D	0	80	20	100
E	0	62.5	37.5	100
Total	12.82	65.38	21.79	99.99

Table 6: Basal Area class of tress in the five selected Sites of KLNP (cm^2)

	Percentage BA class (cm^2)			
Park selected Sites	$0 \geq 50$	$51 \geq 100$	101 and above	Total
A	34.78	30.43	34.78	99.99
B	36.36	31.82	31.82	100
C	30	20	50	100
D	40	20	40	100
E	0	37.5	62.5	100
Total	30.77	28.21	41.03	100.01

Table 6: Canopy cover class of tress in the five selected Sites of KLNP (m^3)

Park selected Sites	Percentage Canopy cover class (m^3)			
	$1 \geq 10$	$11 \geq 20$	21 and above	Total
A	78.26	21.74	0	100
B	81.82	13.64	4.55	100
C	60	40	0	100
D	60	40	0	100
E	50	50	0	100
Total	70.51	28.21	1.28	100

Phytosociological summary of the community attributes Importance Value Index (I.V.I.)

The Phytosociological summary of the community attributes are given in table 7. This finding reveals a total plant species Importance Value Index (I.V.I.) of 299%. The total I.V therefore is in-line with Curtis and McIntosh, (1951) assertion that the value of IV ranges from 0 to 3.00 (or 300%). From the findings *Vitellaria paradoxa* with (27.3474) has the highest importance value hence is the leading dominance in this stands of trees. Some other species have reasonable high important values, namely *Afzelia africana* (23.0938), *Crossopteryx febrifuga*(19.1267), *Terminalia glaucescens* (17.1027) *and Detarium microcarpum*, (17.0802). From this result and looking at the overall estimate of the influence of importance of a plant species in the community therefore justified the KLNP area to be named *Vitellaria paradoxa / Afzelia africana* wood land. This is because these species currently dominates the forest structure. It also indicates that the area has a relatively rich and mature wood land soil. There is the presence of understory woody vegetation that is between 4 to 7 m in height known as (shrubs and small trees) and they fall into almost all the plants species identified in the study area while the ground vegetation is covered with new flushes of grasses especially *Andropogen gayanus* and *Hyparrhenia rufa.*

Table 8: Phytosociological summary of the community attributes

Species name	Rel. density (%)	Relative Frequency (%)	Rel. Dominance (%)	Importance Value Index (I.V.I.) (%)
Acacia hockii	0.67	3.85	1.0172	5.5372
Acacia gourmaensis	5.32	3.85	5.5347	14.7047
Acacia sayal	2.11	3.85	3.3973	9.3573
Afzelia africana	8.43	5.13	9.5338	23.0938
Anogeissus leiocarpus	11.75	3.85	1.2747	16.8747
Boxmbax costatum	4.21	5.13	5.0852	14.4252
Burkea africana	2.55	2.56	1.1539	6.2639
Combretum molle	0.22	1.28	0.5591	2.0591
Combretum nigricans	0.89	1.28	0.1931	2.3631
Crossopteryx febrifuga	8.76	3.85	6.5167	19.1267
Daniella oliveri	0.55	2.56	3.8535	6.9635
Detarium microcarpum	8.76	3.85	4.4702	17.0802
Entada africana	0.33	1.28	1.0841	2.6941
Ficus thoningii	1.55	3.85	3.2444	8.6444
Gardenia aqualla	3.88	3.85	5.8688	13.5988
Hymenocardia acida	0.67	2.56	0.9948	4.2248
Isoberlinia doka	4.32	2.56	7.7049	14.5849
Khaya senegalensis	0.55	1.28	4.6147	6.4447
Kigelia africana	0.11	1.28	1.9681	3.3581
Lannea acida	0.89	2.56	2.2819	5.7319
Lannea schimperi	0.67	2.56	0.3863	3.6163
Maytenus senegalensis	0.67	1.28	0.4419	2.3919
Maranthes polyandra	1.77	2.56	3.3934	7.7234
Piliostigma thonningii	3.99	5.13	1.7539	10.8739
Prosopis africana	1.22	3.85	2.0632	7.1332
Pterocarpus erinaceus	0.67	1.28	0.6314	2.5814
Sterculia setigera	0.55	2.56	4.0841	7.1941
Stereospermum kunthianum	0.22	1.28	0.2855	1.7855
Strychnos spinosa	1.77	2.56	0.3898	4.7198
Tamarindus indica	0.99	2.56	1.4246	4.9746
Terminalia glaucescens	6.43	6.41	4.2627	17.1027
Terminalia laxiflora	0.67	2.56	2.1743	5.4043
Vitellaria paradoxa	13.86	5.13	8.3574	27.3474
Total	100	99.98	99.9996	299.9796

Homogeneity of Communities

The frequency distribution of all communities showed heterogeneous types of vegetation, which is in accordance with the Raunkiers law of frequency, which says that the absence of certain classes in frequency distribution of all communities makes heterogeneous types of vegetation. For instance *Isoberlinia doka* is not found in most sites but found to dominate site E.

The vegetation of studied areas showed the presence of drought resistant plants and disturbed type of vegetation. The sizes of the surviving woody tree basal areas are very small and the canopy coverage too is very low. The disturbances were of various type and degree on the study sites. For instance in Hussaini Masha track, Gilbert Child track and Shehu Shagari track frequent bush burning is prevalent in the area,

while Gilbert Child and Shehu Shagari site is highly exposed to soil erosion and degradation, bare grounds are quite pronounced here. while in Mamudu Lapai track (D), Awal Ibrahim track (E), being a little closer to the forest edge and closer to the surrounding communities, deforestation, tree lopping, bush burning as well as domestic cattle grazing is prevalent in the area, here kob population were very low as a result of poaching. The phonology of the plants on disturbed areas was not good although they plant managed to survive. The plant growth and survival rate was in danger in many disturbed areas, especially in site E areas where wild fires usually affect every year. Also the domestic animal grazing and cutting down of the natural vegetation produces additional losses to flora of the area.

The frequency of kobs sightings increases from site Hussaini Masha, Gilbert Child, Shehu Shagari and decreases in Mamudu Lapai track and Awal Ibrahim track. This suggest that site Hussaini Masha, Gilbert Child and Shehu Shagari areas have been adequately protected and it is also very far from communities settlements, and the sites are also very close to two major salt lick sites and Oli river, the park water source where kobs are found in abundant.

CONCLUSION

From the study it is noted that site Gilbert Child, Shehu Shagari and Hussaini Masha habitats is the most preferred habitat for kobs in Borgu sector of Kainji Lake National Park. This indicates that these sites are still in good condition despite the challenges the park faces in the present time.

In a nut shell, all the habitat woodland of the KLNP will be of great ecotourism potential and ecological importance if the few remaining kobs as well as all other wild animal' species in the area are properly protected. Hence it is recommended that the park should extend its monitoring programme to all sectors of the Park. This will go a long way to check illegal activities such as grazing, poaching etc.

ACKNOWLEDGEMENTS

Author is thankful to research supervisors; Orsar, J. T. and Tyowua, B.T. for their valuable advice, encouragement and guidance throughout the study period. The author is highly indebted to the Conservator General National Park Service Abuja, Nigeria for granting permission to conduct research at the National Park.

Author's gratitude goes to the Conservator of Park, KLNP for his assistance and valuable support throughout the research period at the National Park. Finally author appreciate the tireless efforts of the technical assistant of the FCWM/KLNP Park Staff; Ishaya T. Dung, Yakubu Abu, Sunday Akor, Hassan Bashiru, and Mutiu .

REFERENCES

Afolayan, T. A., Agbelusi, E. A. and Ogunjemite, B. G. (2004). Resources Conservation and Your Future. In: Egunjobi, O. A., Kayode, J., Faluyi, M. A.., Mukolu, A. and Afolabi, O. (eds). Enviromental degradation, reclamation, conservation and pollution control. The Nigerian National Commission for UNESCO.

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

Ahmed, S and Khattak, Z. D (2001). Quantitativestudies on the vegetation of Islamabad. Pakistan Journal of Scientific and Industrial Research. 44(5): 279 - 285.

Akanbi, O. A. (1997): An Ecological Basis For Management of Enamania Game Reserve in Benue State, Nigeria. Ph D. Thesis unpublished, Department of Wildlife and Fisheries, University of Ibadan.

Amubode, F.O. and Akossim, C.A. (1989) Kob number and habitat characteristics of riparian vegetation in Nigeria wooded savanna. *Afr. J. Ecol.* **27:** 291-296.

Andren, H. (1992). Corvid density and nest predation in relation to forest fragmentation: a landscape perspective. Ecology **73**:794–804.

Arshad, M; Salahuddin; Rao, A (2002) Phytosociological Assessment of natural reserve of national park Lalsuhanra (Punjab, Pakistan). *Asian Journal of Plant Sciences* 1 (2): 174 –175.

Ayeni, J.S.O. (2007) Participatory Management Plan of Kainji Lake National Park: Produced by Natural Resources, Agricultural and Environment Consultants. Environ- Consult. Lagos Pg. 150.

Balslev, H.J Loteyn, B.Oligard O. and Holm, N. (1987) Composition and structure of adjacent un-flooded and flood plain forest in Amazonian Emador. Opera Botanical (92):37-57.

Chapman, C.A., Chapman, L.J., Wrangham, R., Isabirye-Basuta, G. & Ben-David, K. (1997) Spatial and temporal variability in the structure of a tropical forest. Afr. J. Ecol.35, 287-302.

Curtis, J. T; McIntosh, RP (1951) An upland forest continues in the praire forest border region of Wisconsin. *Ecology*, 32: 476 - 449.

Fischer, F. and Linsenmair, K. E. (2002) Demography of a West African kob (*Kobus kob kob*) populations. *Afr. J. Ecol.*, 40: 130-137.

Hill, D., Fashan, M.,and Tucker, G.(2005) Handbook of Biodiversity Methods: Surveys Evaluation and Monitoring Cambridge University Press, Cambridge.

Howard, P.C., Viskanic, P., Davenport, T.R.B., Kigenyi, F.W., Baltzer, M., Dickinson, C.J., Lwanga, J.S., Matthews, R.A. & Balmford, A. (1998) Complementarity and the use of indicator groups for reserve selection in Uganda. *Nature* 394: 472–475.

Iqbal, M. Z; Shah, S. Z.; Shafio, M. (2008) Ecological surveys of certain plant communities around urban area of Karachi *Department of Botany, University of Karachi,Karachi- 75270, Pakistan* J. Appl. Sci. Environ. Manage. Vol. 12(3) 51 - 60

IUCN (2011) Guideline For Using the IUCN Red List Categories And Criteria; Version 9.0. IUCN , Gland, Switzerland.

Lehsten, V: Kleyer, M. (2007). Turnover of plant trait hierarchies in simulated community assembly in response to fertility and disturbance. *Ecolgical Modelling*, 203 (3-4): 270-278.

Mayaka, T.B., Stigter, J.D., Heitkong, I.M.A. and Prins, H.H.T. (2004) A population dynamics model for the management of Buffon,s kob (*Kobus kob kob*) in the Benoue National Park Complex, Cameroon. Ecological Modeling, 176: 135-153.

Mueller-Dombois, D. and Ellenberg, I.T. (1974) *Aims and Methods of Vegetation Ecology*. John Wiley and Sons, New York.

Muhlenberg, M. and Roth, H. (1985) Comparative investigations into the Ecology of the kob antelope *Kobus kob kob* (erxleben 1777) in the Comoe National park, Ivory Coast. South African Journal of Wildlife Research, 15 (1): 25-31.

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

Phillips, O.L., Hall, P., Gentry, A.H., Sawyer, S.A. & Vasquez, R. (1994) Dynamics and species richness of tropical rain forests. Proc. Natl. Acad. Sci. 91, 2805–2809.

Plumptre, A.J. and Reynolds, V. (1994) The impact of selective logging on the primate populations in the Budongo Forest Reserve, Uganda. Journal of Applied Ecology, 31, 631- 641.

Proctor, J., Anderson, J.M., Chai, P. & Vallack, H.W. (1983)

Ecological studies in four contrasting lowland rain forest types in Gunung Mulu National Park, Sarawak. I. Forest environment, structure and floristics. J. Ecol. 71, 237–260.

Sinsin, B., Tehou, A.C., Daouda, I. and Saidou, A. (2002). Abundance and species richness of larger mammals in Pendjari National Park in Benin. Mammalia, 66(3): 369-380

Steege, T. H., Sabatier, D., Castellanos, H., Van Andel, T., Duivenvoorden, J., De Oliveira, A.A., Ek, R., Lilwah, R., Maas, P. & Mori, S. (2000). An analysis of the floristic composition and diversity of Amazonian forests including those of the Guiana Shield. J. Trop. Ecol. 16, 801–828.

Virgos, E. (2001). Role of isolation and habitat quality in shaping species abundance: a test with badgers (Meles meles L.) in a gradient of forest fragmentation. Journal of Biogeography, 28, 381–389.

Wanzie, C.S. (1991). The present distribution and status of *Kobus kob kob* in West and Central Africa. *Mammalia* **5**(1)**:** 79-84.

White, L.J.T. (1994). Biomass of rain forest mammals in the Lope Reserve, Gabon. Journal of Animal Ecology, 63, 499±512.