Research Article

Evaluation of Vegetation Types and Utilization in Wildlife Park of the University of Agriculture Makurdi, Nigeria

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ARTICLE INFO	ABSTRACT
	The vegetation types in the Wildlife Park of the University of Agriculture, Makurdi was evaluated to determine its plant species composition and percentage distribution, structure in terms of diameter at breast height (DBH) and utilization level. The point- centered quarter method (PCQ) and step-point line technique (SPLT) were used in the survey. There were 31 woody plants species in the park. The common species in the woodland vegetation type were *Daniellia oliveri* (14.17%), *Vitex doniana* (12.00%), Khaya senegalensis (9.33%), while in the Riparian vegetation, *Vitex doniana* (17.00%) was the prominent species. *Acacia polyacantha* (24.00%), *Combretum molle* (23.00%) and *Prosopis africana* (31.00%) were the commonest species in the Grassland vegetation. *Syzigium guineense, Diospyros mespiliformis* and *Elaeis guineense* occurred only in the Riparian Vegetation. The result on structure revealed that DBH class> 100 cm had the highest number of woody plants in the Riparian vegetation and was significantly ($P<0.05$) different from the Woodland and Grassland vegetation types. For DBH 1-10cm, the woodland was significantly different ($P<0.05$) from the Riparian and Grassland vegetations. The results of plant utilization level by wild animals showed that 15 plant species were utilized: 3 highly, 6 moderately and 6 lightly.

INTRODUCTION

The vegetation of an area is a product of the plant material available and the environmental condition prevailing which include both the physical environment, land forms, soils, climate and factors such as the use of fire and grazing including the modification of the environment by the vegetation itself through transpiration, circulation of minerals and plant decay (Causton, 1988). Vegetation makes up the habitat of wild animal species without which the animals will go extinct and it provides food, cover and escape cover for wild animal species (Afolayan and Agbelusi, 1997).It is therefore important to regularly assess the health of the vegetation and when necessary to manipulate it to suit wildlife management needs (Ayodele et.al., 1999). The need to plan natural resources management on the basis of accurate inventory and take protective measures to ensure that the resources do not become exhausted are the concept of modern conservation. The Wildlife Park of the University of Agriculture, Makurdi, is created for conservation of flora and fauna of Benue state and research activities of the university in biodiversity. There is no adequate quantitative data on the vegetation of the area and since wild animals depend on the vegetation in order to provide useful information for effective management of wildlife resources. The objectives of the study were to determine the species composition and percentage distribution of woody plants, structure in terms of diameter at breast height (dbh) distribution and plant utilization by wild animals.

MATERIALS AND METHODS

Study area

The study was conducted at the Wildlife Park of the University of Agriculture, located in Makurdi, Nigeria. It lies within the Southern Guinea Savanna zone (Keay, 1959) between latitude $07^0 49'$N and $07^0 52'$N and longitude$08^0 36'$ and $08^0 40'$E. The park shares a common boundary with five villages namely; Tse Dei, Anyam, Vambe, Tse Yauv and Tyodugh. It covers an area of about 24.2km^2. The terrain of the area is basically an undulating plain. Its relief ranges from 82 m to 167 m above mean sea level. The climate of the area is tropical with a clear distinct dry and wet season. Rainfall in wet season (April to October) is about 1240 – 1440 mm. Dry season lasts from November to March. The monthly temperature is about 28.5^0C – 36^0C in March to April. Three types of soils are found namely; alluvial, clayey loam and sandy soils.

The Wildlife Park contains most of the animal species of typical Guinea savanna zone. The area has been subjected to intense hunting pressure for a long time, and animals are unlikely to be seen during the daytime or at all. Nevertheless, their footprints and droppings can be seen. Some of the animals and avifauna found in the study area include Grimm's duiker (*Sylvicapra grimmia*), Red-flanked duiker (*Cephalophus rufilatus*), Red patas monkey (*Erythrocebus patas*), cutting grass (*Thryonomys swindarianus*), Giant pouched rat (*Cricetomys gambianus*), Ground squirrel (*Xerus erythropus*), Spotted mouse (*Lemniscomys striatus*), Pygmy mouse (*Mus minutoides*),Nile rat (*Arvicanthis niloticus*),African civet (*Viverra civetta*), African hedgehog (*Atelerix albiventris*), Hare (*Lepus capensis*),Hooded vultures (*Necrosyrtes monachus*), Black kites (*Milvus migraus*)   and Monitor lizard (*Varanus niloticus*) (Joel,2001).

METHODOLOGY

A reconnaissance survey was carried out to identify the vegetation types present in the park. Based on structural appraisal and dominant features of the environment, vegetation was grouped into Woodland, Riparian and Grassland. Eight transects were randomly selected for the study; three transects were selected each for the woodland and Riparian vegetation types while two transects were selected for the Grassland vegetation type because of their limited coverage. The point-centered quarter (PCQ) method by Pollard (1971) was used to conduct the survey. A maximum of 20 samples were taken on each of the transect at 25 m interval along the gradient properly aligned with a prismatic compass. At each sampling station, 4 right- angled wooden crossbar (divided into four equal parts) was used, which was properly orientated with one axis in the direction of the transects. Within each quadrant, the nearest tree (individual plant above 1m) was selected and the following information recorded: each woody species was identified in each quadrant to determine its species composition; the dbh of each tree species above 1.3 m measured using a metre tape to determine the stage of maturity of species in each vegetation type. Each woody species was examined qualitatively for possible utilization through any sign of damage and scored as follows: lightly – only best plants grazed moderately (little or no use of poor plants) and properly – forage plant correctly utilized. Observations were also made on faecal droppings of animals. Similarly, on each of the transect selected for woody plants surveyed, the Step-Point line technique (SPLT) (Riney, 1982) was used to determine the herb layer in which case at 50 step point hit, the plant was examined for any sign through the leaves, stem, bark and roots and scored. The formula by Ayodele *et al.,* (1999) was used to calculate the percentage   frequency   of   woody   plants   thus,

% Frequency of woody plants $= \dfrac{number\ of\ times\ a\ species\ occurred}{Total\ number\ of\ sampling\ stations} \ x \ \dfrac{100}{1}$

Data on woody plant structure in terms of girth size (class) in the three vegetation types was subjected to analysis of variance (ANOVA) procedure for Randomized complete Block Design (RCBD) using the SPSS 10.0 version. Duncan (1955) multiple range test was used for follow up procedure at the 5% level.

RESULTS AND DISCUSSION

The vegetation types in Wildlife Park of the University of Agriculture, Makurdi, have been evaluated. The results in Table 1 shows that the plants species composition were the same as that in the Guinea savanna of West Africa (Keay, 1959). The common woodland vegetation species were *Daniellia oliveri* (14.17%), *Khaya senegalensis* (9.33%), *Vitellaria paradoxa* (8.33%) and *Vitex doniana* (12.0%). This agrees with the findings of Afolayan (1977), Ayeni *et al.,* (1982) and Imumorin *et al.,* (1995) who also reported the presence of these species in the Guinea savanna zone of Nigeria. Riparian vegetation recorded *Syzigium guineense* (0.05%), *Diospyros mespiliformis* (2.67%) and *Elaeis guineensis* (1.50%) as the only species occurring in this vegetation type. Geerling (1973) reported that the Riparian vegetation are unique vegetation containing species that has more characteristics of the forest zone, such as *Elaeis guineensis, Syzigium guineense* and *Diospyros mespilifomis, Prosopis africana, Acacia polyacantha* and *Combretum molle* were found in the Grassland vegetation. A higher mean number of woody plants occurred in the Riparian vegetation than in the woodland and Grassland vegetation type but the differences were not significant (P>0.05) with Grassland vegetation type (Table 2). For dbh > 100 cm, the Riparian vegetation differed significantly (P<0.05) from the woodland and Grassland vegetations. For dbh 1 – 10 cm, the woodland was significantly (P<0.05) different from the Riparian and Grassland vegetations (Table 2). The result on dbh in terms of structure clearly shows that there are bigger woody plants in the Riparian vegetation than the Woodland and Grassland vegetation types. Also the result indicates that there are smaller woody plants in the Woodland vegetation and the Grassland vegetation than the Riparian vegetation types. The highest mean value of woody plants that occurred in dbh class above 100 cm in the Riparian vegetation explained that there was little germination as a result of canopy suppression and variation in climate. The highest mean value of woody plants that occurred in dbh 1-10 cm in the Woodland vegetation indicated that there was continuity in growth; conditions were favorable for seed establishment.

The plant utilization by wild animals is presented in Table 3. The result showed that wild animals utilized 15 plants species. Three of the plants, *Pericopsis laxiflora, Andropogon gayanus* and *Pennisetum polystachion* were highly utilized. *Vitellaria paradoxa, Vitex doniana, Panicum maximum, Fadogia cienkowskii, Abutilon angulatum* and *Andropogon tectorum* were moderately utilized while *Afzelia africana, Elaeis guineensis, Lonchocarpus laxiflorus, Imperata cylindrical, Hyparrhenia rufa* and *Tridax procumbens* were lightly utilized. The result on plants utilization by wild animals showed that most of the plants utilized were the herbaceous type. The plant utilization levels by animals depend on many factors among which are the feeding preferences of a given species of animal. Some animals are primarily grazers while others are browsers, and some are very strict grazers or browsers while others are very flexible. The Red-flanked duiker, Grimm's duiker, Red patas monkey, Hare and Giant pouched rat. Heady (1964) reported that food habits of most herbivores are influenced by the growth stage of available vegetation and the abundance of the species while Coppock *et al.,* (1986) suggested that the selection is on palatability and taste difference. It is quite clear from the result obtained on plant utilization that most of the animals in the wildlife park are grazers subsisting on grasses while few are browsers.

Table 1: Species composition and percentage (%) distribution of woody plants in the vegetation types of the University of Agriculture, Makurdi Wildlife Park

S/NO	SPECIES	VEGETATION TYPE		
		Woodland (%)	Riparian (%)	Grassland (%)
1.	*Afzelia africana*	3.67	5.33	-
2.	*Acacia polyacantha*	4.33	7.67	24.00
3.	*Albizia zygia*	0.33	7.00	-
4.	*Allophylus africanus*	1.67	5.00	-
5.	*Anogeissus leiocarpus*	1.17	8.67	-
6.	*Bridelia ferruginea*	4.67	-	-
7.	*Combretum molle*	6.00	-	23.00
8.	*Combretum nigricans*	2.67	7.33	-
9.	*Daniellia oliveri*	14.17	4.67	5.00
10.	*Diospyros mespiliformis*	-	2.67	-

11.	Elaeis guineense	-	1.50	-
12.	Ficus sur	5.00	5.67	-
13.	Kigelia africana	0.33	2.17	-
14.	Khaya sensgalensis	9.33	8.67	-
15.	Lonchocarpus laxiflorus	5.50	1.50	-
16.	Lophira lanceolata	3.33	-	-
17.	Margaritaria discoidea	0.83	3.67	-
18.	Parkia biglobosa	0.83	1.17	7.50
19.	Maranthes polyandra	0.33	-	-

Table 1 continues

S/NO	SPECIES	VEGETATION TYPE		
		Woodland (%)	Riparian (%)	Grassland (%)
20.	Pericopsis laxiflora	1.33	-	-
21.	Prosopis africana	3.67	-	31.00
22.	Spondia mobin	0.17	1.00	-
23.	Stereopermun kunthianum	0.17	-	-
24.	Sterculia setigera	0.33	3.00	-
25.	Strychnos innocua	2.17	-	-
26.	Syzigium guineense	-	0.50	-
27.	Terminalia schimperiana	6.00	4.50	-
28.	Terculia emetic	1.33	-	-
29.	Vitellaria paradoxa	8.33	0.50	8.00
30.	Vitex doniana	12.00	17.00	-
31.	Zanthoxylum zanthoxyloides	0.33	0.83	-

Table 2: Mean number of woody plants in different girth classes occurring in the three Vegetation types.

	Girth (d b h) classes of woody plants in cm											
Vegetation Types.	>100	10.1-20	1-10	20.1-30	50.1- 60	60.1-70	40.1-50	30.1-40	70.1-80	90.1-100	80.1-90	Mean
Riparian	63[a]	15[b]	5[b]	13[b]	19[a]	17[b]	10[a]	13[a]	10[a]	9[a]	5[a]	16.36[a]
Woodland	25[b]	29[a]	41[a]	20[a]	11[b]	10b	12b	8b	6b	5b	5a	15.64a
Grassland	5[c]	16[b]	4[b]	3[c]	1[c]	3[c]	2[b]	2[c]	2[c]	3[b]	1[b]	3.45[b]

Means followed by the same letters are not significantly different at P=0.05 according to Duncan's multiple range test

Table 3: Plant Utilization level by Wild Animals in the University of Agriculture, Makurdi Wildlife Park

S/NO	SPECIES	UTILIZATION LEVEL	PARTS UTILIZED
1.	Afzelia africana	X	Leaf
2.	Acacia polyacantha	0	-
3.	Albizia zygia	0	-
4.	Allophylus africanus	0	-
5.	Anogeissus leiocarpus	0	-
6.	Bridelia ferruginea	0	-
7.	Combretum molle	0	-
8.	Combretum nigricans	0	-
9.	Daniellia oliveri	0	-
10.	Diospyros mespiliformis	0	-
11.	Elaeis guineense	x	Fruit
12.	Ficus sur	0	-
13.	Kigelia africana	0	-

S/NO	SPECIES	UTILIZATION LEVEL	PARTS UTILIZED
14.	*Khaya sensgalensis*	0	-
15.	*Lonchocarpus laxiflorus*	x	-
16.	*Lophira lanceolata*	0	-
17.	*Margaritaria discoidea*	0	-
18.	*Parkia biglobosa*	0	-
19.	*Maranthes polyandra*	0	-
20.	*Pericopsis laxiflora*	xxx	Leaf
21.	*Vitellaria paradoxa*	xx	Leaf

Table 3 continues

S/NO	SPECIES	UTILIZATION LEVEL	PARTS UTILIZED
22.	*Vitex doniana*	xx	Fruit/Leaf
22.	*Andropogon gayanus*	xxx	Stem/Leaf
23.	*Imperata cylindrical*	x	Rhizome
24.	*Andropogon tectorum*	xx	Stem/Leaf
25.	*Hyparrhenia rufa*	x	Leaf
26.	*Panicum maximum*	xx	Stem/Leaf
27.	*Tridax procumbent*	x	Leaf
28.	*Fadogia cienkowskic*	xx	Leaf
29.	*Abutilon angulatum*	xx	Leaf
30.	*Andropogon tectorum*	xx	Stem/Leaf
30.	*Pennisetum polystachion*	xxx	Stem/Leaf

Key:
X   -   Lightly utilized
XX   -   Moderately utilized
XXX   -   Heavily utilized
0   -   Not utilized

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