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Identification of forage species most preferred by different giraffes animals in sumu wildlife park of Bauchi state, Nigeria

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Abstract
The study identified different forage species most preferred by different Giraffes in Sumu Wildlife Park, Bauchi State, Nigeria. The Park was sub-divided into six sites; one plot of one hectare was randomly selected from each of the site. Direct observation and total count was used in noting the forage species consumed by giraffes. The most preferred forage species were obtained following the time spent on (5 to 10 minutes and 30 minutes to 1 hour) grazing/browsing on each forage species. Descriptive statistics, Pearson's product moment, correlation coefficient and t-test were used to compare the seasonal feeding behaviour, while proximate analysis was adopted in determination of feed quality. A total of 16 different forage species (11 trees and 5 grasses) belonging to 6 families were obtained seasonally. The result obtained showed that Acacia albida showed the highest dry matter (83.3%) value with lowest ether extract value (4.1%). Balanites aegyptiaca had the highest moisture content (60.1%) value compared with ether extract (1.4%) which had the lowest value. The proximate analysis of moisture content of Pennisetum purpureum is higher (75.9%) than that of Mimosa asperata (64.2%) but lower in ether extract (3.9%) than Mimosa asperata (4.7%). The results of the correlation coefficient between food availability and utilization by giraffes showed a direct relationship between food availability and utilization by giraffes during the wet and dry seasons. A test of significance of the r values showed ($p< 0.05$) a significant and none-significant correlation coefficient for wet and dry season respectively. Further research on the nutrient contents of other plants is recommended.

Keywords: forage species, giraffe animals, feeding behaviour

Introduction

Giraffe (*Giraffa camelopardalis)* is one of the tallest land animal with an average height of up to 5.5m (males), 4 to 4.5m females to top of head 1100kg (800 to 1930), females 700kg (550 to 11800) (9) for male and female respectively. Neck elongated, with a short, erect mane, shoulders much higher than croup but limbs of nearly equal length. It has a tail, Hock with long black terminal turf and Horns. The pair is up to 13.5cm, borne by both sexes, the ends knobbed and hairless in adult males, thin and tufted in females and young; a median, lumpy horn and smaller bumps in males only. Coloration: ground color brown to dark chestnut (sometimes black), broken up into patches and blotches by a network of light-colored hair, the pattern individually unique; males darken with age. Scant glands: possible a pod -crane glands on eyelids, nose, adult males have a pungent odor (Richard, 1992; Williams, 2011).

The Giraffe has an enormously long neck which allows it to exploit the leaves and vegetation that are too high up for other animals to find. Despite their length, the neck of the Giraffe actually contains the same number of bones as numerous other hoofed mammals but they are simply longer in shape. The Giraffe's elongated neck leads into a short body, with long and thin, straight legs and a long tail that is tipped with a black tuft that helps to keep flies away. The Giraffe tends to be white in color with brown or reddish markings that cover its body (with the exception of their white lower legs). The markings of each Giraffes are not only unique to that individual but they also vary greatly between the different Giraffe species in size, color and the amount of white that surrounds them. All Giraffes though have large eyes that along with their height give them excellent vision, and small horn-like ossicones on the top of their heads. (Lorraine, 2002)**.**

Giraffe occupy a wide range of environments across the African continent. However, the Namibia Desert is at their ecological limit. The northern Namibia Desert is characterized by extreme climatic conditions, including highly variable and patchy rainfall (<50 mm per annum) and a seasonal temperature range from 0C^{o} to over 40C°. While rainfall is highly variable, precipitation in the form of fog is as much as three times more reliable and is an invaluable water source for flora and fauna. Within the Namibia Desert and throughout southern Africa, the behavioral ecology social organization of resident ungulates has been linked closely with precipitation and, consequently, with forage quality and quantity (Lorraine, 2002).

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Previously found even in North Africa, today the remaining Giraffe populations are restricted to parts of sub-Saharan Africa with the largest concentrations being found in National Parks. Giraffes inhabit open woodlands and savannah where using their height they are able to see for great distances around them to watch out for approaching danger. The nine different Giraffe species are found in varying countries on the continent, each exploiting their local ecological niche. Due to the fact that Giraffes feed on vegetation that is high in the trees but also too woody for the mouths of smaller herbivores, they are able to remain in areas where domestic grazing has obliterated the plant species close to the ground, forcing the species that feed on them to move on. Giraffes throughout Africa though have been drastically affected by the loss of vast regions of their natural habitat (Lorraine, 2002).

The large size of the Giraffe means that it must spend a great deal of time eating which it tends to do the most during the more tolerable heat of the morning and evening. During the hot midday sun, Giraffes rest in more shaded regions where they (like a number of their relatives) regurgitate their food known as cud, before then consuming it again. Small herds comprised of a number of females and their young spend both the day and night together to protect their offspring from predators, but male Giraffes are much more solitary often roaming over large areas in search of a fertile female. If, however they come into contact with a rival male, the two will begin to bump heads and interlock their necks as a way of establishing a dominance hierarchy, with the winner earning the right to mate with the local female (Lorraine, 2002)**.**

Study Area

1. Location of the study area

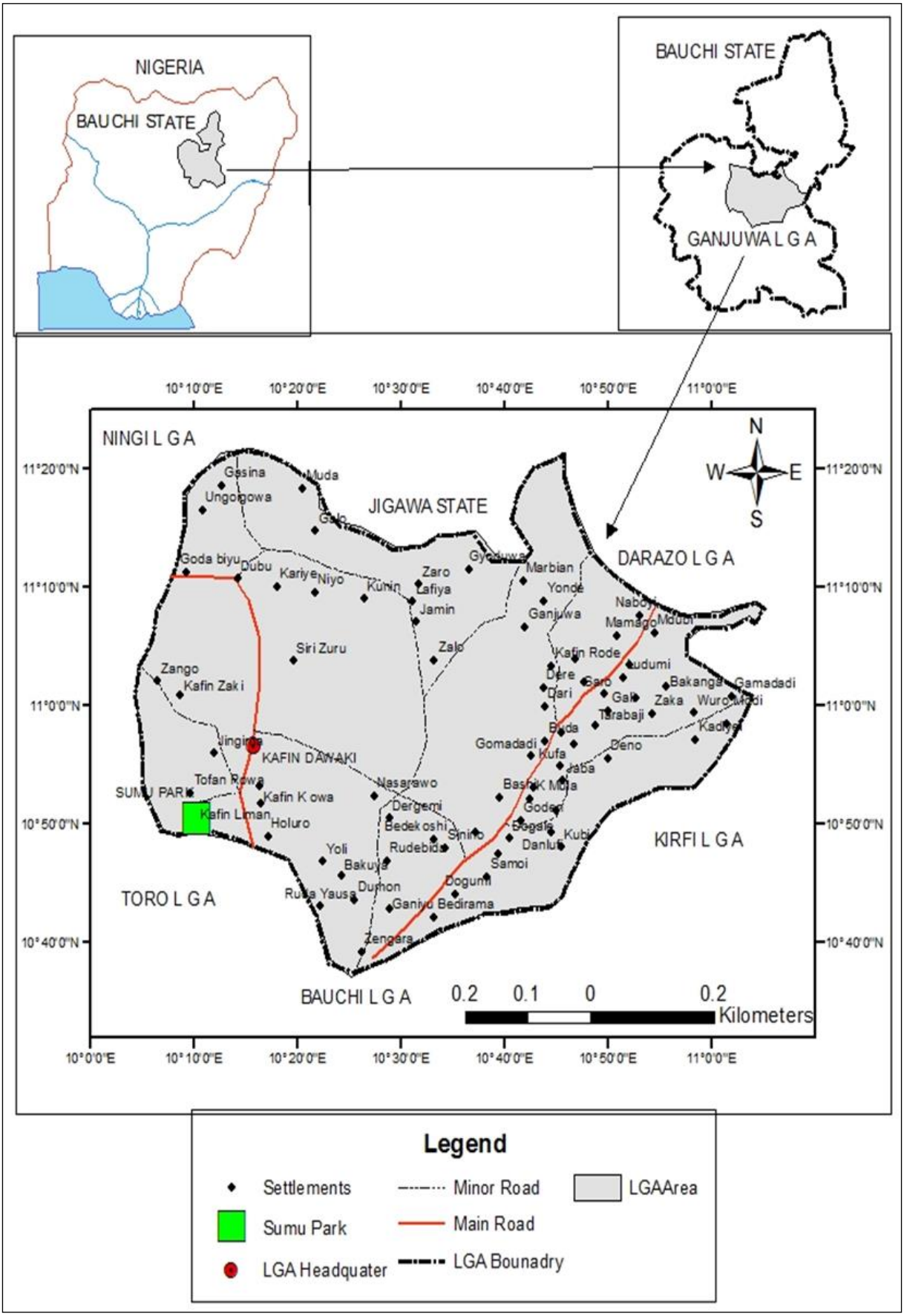
Sumu Wildlife Park lies in the heart of Lame Burra Game Reserve along the Kano Federal Highway, barely 59 square kilometres from Bauchi town It lies between the latitudes $10^0$40' and $11^0$20', North longitudes and $10^0$09'East and $11^0$30'Eastward as shown in (Figure 1). It was created in 2006 and has been visited by Bill Clinton who attested to its potential. Although 82 sq km is allocated to the Reserve, only 12 square kilometres has been fenced off. Of which, 8 square kilometre belongs to Sumu Wildlife Park. It may seem as no remarkable feat to visit Sumu to see just six species of animals, but there are a few reasons why Sumu Wildlife park is worth the trip. One reason is you get to experience a drive through the Sudan Savannah to see Nature growing untamed and the animals roaming free; it is no secret that Bauchi State caters to both the Sudan and Sahel Savannah in its 46 thousand square kilometre mass of land. The road leading to Sumu Wildlife Park is untarred with nothing but grass-covered hills and scattered little farms by the friendly people of Kafin Madaki headquarters of Ganjuwa Local Government Area, Bauchi State., (Bauchi State Government Diary [BASGD] 2013).

1.1 Climate

Ganjuwa has a Tropical Climatic condition. In wet/rainy season there is much more rainfall in the study area than is in the dry season. The average annual temperature is 26.8^0C while the average annual rainfall is 1021mm.The driest month is December with zero rainfall. Most precipitation falls in August with an average of 2410mm.The warmest month of the year is April with an average temperature of 30.3^0C. In December, the average temperature is 24.6^0C. It is the lowest average temperature of the whole year (BASGD 2013).

1.2 Vegetation

The vegetation of the Sumu wildlife park comprises of various types of forage species such as *Acacia seyal, Acacia senegalensis, Anona senegalensis, Combretum molle, Acacia hebeclada* etc. While herbaceous plants like *Andropogon spp, Imperata cylindrical, Aristida spp, Pannicum maximum, Pennisetum purpureum,* among others. Grass species abundant in the Open Woodland included several species with a high grazing value such as *Andropogon gayanus, Panicum maximum* and *Digitaria eriantha* (Van Oudtshoorn 1999; Matthews *et al*., 2001: Ibrahim, *et al.,* 2012; Sauer 1983). Growing tall gave the giraffes access to a 2m band of foliage beyond reach of all other large browsers but elephant aided by its 45mm tongue and a modified atlas-axis joint that enables the head to tilt to the vertical, a giraffe can be seen feeding on crowns of small trees. Big bulls can reach up to 5.8m, nearly a meter higher than cows. Where a choice exists between high and low browse, there is a clear ecological separation between the sexes, the bulls browse on the high trees, while females concentrate on regenerating trees and shrubs below 2m. The sexes of distant giraffes can usually be predicted by whether the animals are feeding high or bending low. Differences in feeding ecology as well as lower vulnerability to predators (based on size and absence of parental responsibility) allow males to enter taller and denser woodland more readily than females, leading also to measure



Source: BASGD, (2016)

Fig 1: Map of the Study Area

spatial separation of the sexes, (Richard,1992). Individual plants can exhibit a multitude of responses to herb ivory. Among the most conspicuous of these strategies are. Induced responses may constitute an allocation cost, whereby resources that otherwise would be devoted to growth or reproduction are used to defend the individual from attack by herbivores. Where (and when) herbivores occur, it follows that induced responses should mitigate the negative effects of herb ivory, if not provide a net benefit to individuals. By contrast, induced responses are unnecessary where herbivory is absent (Brown *et al*., 2007). The habitat of ungulates provides them with food, water and cover and the feeding styles of each species are therefore of primary importance in determining their preferred habitat (Van Rooyen 1990). The giraffe has suffered a major reduction in population size across its range primarily due to habitat loss, commercial overutilization, and severe poaching, and such decline continues unabated. The Federal Endangered Species Act has a duty to protect the iconic giraffe by listing the species as endangered under the Federal Endangered Species Act, which would meaningfully contribute to giraffe conservation by strictly regulating the import, export, and interstate commerce in giraffes and their parts and products. As mentioned earlier the giraffes nowadays are not as geographically widespread in Africa as they used to be.

Data collection techniques

Direct observation of the types of forage species eaten by giraffes seasonally was assessed in each of the selected plot. Data on quantity of herbaceous plants consumed were collected using quadrat of 1m x1m. The total count of the most preferred forage plant species eaten by the giraffes was adopted following Sutherland (1999) method. Data on the forage most preferred by the giraffes were obtained following the time spent on sighting the giraffe's browsing on each of the species among the individuals. Time spent browsing was measured between 5 to10 minutes, 30 minutes to 1 hour on a species preference and also the percentage availability was determined by dividing the mean number of each forage species in the six (6) plots by the total mean of all the species x 100.The food availability is assessed in terms of the density of each species relative to every other species as outlined by Mitchell and Skinner (2004).

Preference Ranking Percentages of Forage Species Consumed by Giraffes in the dry Season in Sumu Wildlife Park.

The Preference Ranking Percentages showed that *Acacia albida* was more preferred forage species in the dry season and followed in this order: *Acacia albida* (3.21%), *Acacia hebeclada* (1.96%) *Mimosa pudica* (0.94%) *Pannicum maximum* (0.80%), *Balanites aegyptiaca* (0.79%), *Mimosa asperata* (0.74%) *and Andropogon gayanus* (0.52%).

Table 1: Preference ranking of utilization and availability percentages of forage species consumed by giraffe in the dry season.

Forage species	% Utilization	% availability	preference	Preference ranking
Acacia albida	36.54	11.35	3.21	1
Acacia hebeclada	31.21	15.88	1.96	2
Balanite aegyptiaca	13.91	17.51	0.79	5
Mimosa pudica	8.50	9.02	0.94	3
Grass species				
Andropogon gayanus	6.70	12.82	0.52	7
Pannicum maximum	8.53	10.61	0.80	4
Mimosa asperata	8.73	11.71	0.74	6

Source: Field Survey (2018)

Table 2: Preference ranking of utilization and availability percentages of forage species consumed by giraffe in the wet season.

Forage species	% Utilization	% availability	preference	Preference ranking
Trees				
Acacia sieberiana	7.41	9.13	1.23	3
Acacia nilotica	11.01	9.49	1.16	4
Acacia sayel	22.81	13.79	1.65	**2**
Acacia senegal	23.71	13.35	1.77	**1**
Ziziphus mucronata	6.50	12.25	0.53	***7***
Combretum hebeclada	4.70	10.46	0.44	**9**
Combretum molle	7.40	9.13	0.81	**6**
Diospyrus mespiliformis	10.49	10.10	1.03	**5**
Grass species				
Pannisetum purpureum	6.58	12.92	0.50	**8**

Source: Field survey (2017)

Fig 1

Conclusion

The findings of this study indicated that giraffes forage resources in the study area is presently adequate in terms of diversity, variability and availability, and nutritional content distribution. Sixteen forage species were identified which are available either in the wet or dry seasons. The density and the percentages of the important forage species is adequate. Therefore, feed abundance may be attained in the study area if the available trees are protected from fire and indiscriminate cutting by fuelwood collectors. However, regeneration or enrichment planting should be encouraged in the study area. This in turn will increase the carrying capacity of the habitat with the attendant increase in giraffe's population. Thereby increasing tourism potentials of the Sumu Wildlife Park.

Recommendations

In view of the findings from this study the following recommendation are made:

1. Judging from the number of available forage species, the study area is moderately species rich. However, indiscriminate cutting of trees and shrubs in the area should be checked to prevent the depletion of these resources.
2. Further research on the nutrient content of all the forage species eaten by giraffe in the study area could be done, especially on the carbohydrate, potassium and phosphorus.
3. Therefore, further data on the concentration of micronutrients in the plants eaten should be of great interest to draw conclusions on the functions of browsing/grazing in giraffes in Sumu Wildlife Park.
4. Enrichment planting of the forage plant species most preferred by giraffe in the study area should be encouraged.
5. More food supplementation should be sustained during the drought periods and salt licks should also be provided. This is presently being done in Sumu Wildlife Park.

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