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Relative Abundance and Local Uses of Wild Trees Species in Ukohol Community, Guma Local Government Area of Benue State, Nigeria

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Abstract: *The study sought to estimate the relative abundance and uses of wild tree species in Ukohol community. Six transects were laid at a range of 500m within a 5km baseline through fallowlands in the community. On each transect, 4 plots of 50m x 50m were marked and the total number of each species in the plots was counted and recorded. A semi-structured questionnaire was also administered to 40 respondents in four out of six villages in the study area to obtain information on uses of the tree species. A total of 38 plant species from 17 families were recorded. The Dbh classes in the study area ranged between less than 20cm to below 80cm. The tree species in the community were used for food, medicines, crafts, local construction materials, fuelwood and charcoal making. Plants with multiple uses such as Prosopis africana with a CI of 5.5, Vitellaria paradoxa (4.2) and Burkea africana (3.9) were rated high by respondents. Tree species in the area were less diverse but useful to the people. It is recommended that planting of these species be prioritized to ensure their sustainability in the community.*
Keywords: *Wild trees, relative abundance, local knowledge, importance value index, Ukohol community*

I. Introduction

Traditional ecological knowledge refers to people's knowledge, practices and beliefs about the relationships between organisms and their biophysical environment (Berkes, 2008). Traditional knowledge is a cumulative body of knowledge, know-how, practices and representations maintained and developed by people with extended histories of interaction with the natural environment (Lepage *et al.*, 2007). The association between knowledge of plants and the uses of these plants depends on the ecosystem from which the plants were derived; people used plants they knew about from the forest (Ladio and Lozada, 2004). Accumulated knowledge and traditional practices of indigenous communities are a powerful resource that can greatly facilitate the task of identifying useful new varieties of domestic plants or animals, isolating novel biological components, or developing innovative technologies and techniques (Munn, 2002). The existence of plants species in any habitat is crucial to man and other components of the ecosystem as all plants are valuable for one purpose or the other (Olapade and Bakare, 1992) but anthropogenic activities can influence plants by modifying their environment, especially their resource base –the soil (Buba, 2015). In addition, the distribution, abundance and structure of plant species are shaped by biotic and abiotic factors such as rainfall, temperature, topography, soil, luminosity and human activities (Wala *et al*., 2012, Mendoza-González *et al.*, 2012). Fraterrigo *et al.*, (2006) and Latzal, (2008) affirmed that the performance and success of plants depends partly on the soil composition and characteristics, with frequent anthropogenic disturbances playing a major role in shaping and determining plant community composition and distribution. According to Buba (2015), human disturbances arising from different types of land use can directly affect plants by damaging the plant's conducting tissues and leaves, which may result in growth retardation or death of the plant. Tillage also affects plant community composition and diversity and this reflects in the relaxation of competition due to the elimination of dominant species, which takes time to reestablish (Daniellie *et al*., 2008, Dinnage, 2009). Another attribute of human disturbances is heavy grazing which alters species abundance and their functional composition in an area (Kukshal *et al*., 2009, Hanke *et al.*, 2014). Tree harvesting arising mainly from unsustainable farming practices, timber, craft making, charcoal production, fuelwood and grazing/trampling have deepened in Ukohol community. Preferred tree species are frequently sought for these purposes even beyond the community but baseline information on their uses and relative abundance in the area is lacking. This study therefore sought to estimate the relative abundance and document the uses categories of tree species harvested in the area in order to provide information on the status and uses of wild tree plants in the area.

II. Materials And Methods

2.1 Study area

The Ukohol community is located in Guma Local Government Area (LGA), Benue North in North-Central Nigeria. The area is characterized by two distinct seasons, the wet and dry season respectively. The wet season commences from April –November while the dry season begins from November to March. The major tribe in the area is the Tiv people, who are predominantly farmers. The vegetation is the open savanna woodland characterized by scattered trees within vast grasslands.

2.2 Data Collection

Tree species composition, distribution and diameter at breast height was estimated through a field survey to obtain the status of each tree species utilized in the community while semi-structured interviews with heads of selected households in the community provided information on the use categories of tree species in the study area

2.2.1 Tree composition, distribution and estimation of diameter at breast height

Six (6) transects were laid at a range of 500m within a 5km base line through the fallowlands in the community between February and March, 2016. On each transect, 4 plots of 50m x 50m each were marked and the total number of each tree species in each of the plots was counted and recorded (Brerly *et al*., 2004). The Dbh of each species was measured and Dbh classes assigned to each of the trees encountered according to Turyahabwe and Tweheyo (2010). Trees recorded were identified through their local names with the aid of Agishi (2010) and botanical information obtained from Arbonnier (2004), Keay (1989) and support from virtual plant identification platforms especially Angiosperm Phylogeny Group (APG III).

2.2.1.1 Species Diversity

Species diversity refers to the number of species and their relative abundance in a defined area (Sanderson *et al.*, 2004). This was determined using relative frequency; relative density and Importance Value Index, estimated according to Maingi and Marsh, 2006 and Adams *et al.,* 2007).

Relative Frequency (RF)

This gave an indication of the degree of dispersion of individual tree species in relation to all other tree species present in the area, calculated as follows;

$$\text{Relative Density (RF)} = \frac{\text{Frequency of individual species x 100}}{\text{Total frequency of all species}}$$

Relative Density (RD)

The relative density provided information on the distribution of tree plants in the area and is expressed as;

$$\text{Relative Density (RD)} = \frac{\text{Number of individual species x 100}}{\text{Total number of species}}$$

2.2.1.2 The Importance Value Index (IVI)

The Importance Value Index (IVI) of each tree species was estimated by obtaining the sum of relative frequency and relative density of the tree species. It gave an indication of which tree species was dominant over the other.
The Importance Value Index (IVI) = RF + RD.

2.2.2 Semi-Structured Interviews

A semi-structured questionnaire was administered to 40 respondents in four out of six villages in Ukohol community to obtain information on use categories of tree species in the area. The list of plants and their uses was compiled and documented. The number of citations (CI) for each plant was estimated as provided below;

$$\text{The number of citations (CI)} = \frac{\text{Total number of citations of an individual plant}}{\text{Total number of respondents}}$$

III. Results and Discussion

3.1 Floristic Composition and Distribution of tree species in Ukohol community.

A total of 38 plant species from 17 families were recorded (Table 1) with combretaceae having the highest number of species (6), followed by Rubiaceae and Caesalpinioidaeae with 5 species each (Fig.1). Nine (9) families had 1 species each, mainly from species with multiple uses or high rating for craft making, timber and charcoal production. Species such as *Daniellia oliveri*, *Parkia biglobosa*, *Ficus sur* and *Mitrygyna inermis* were more diverse with relative frequency of 5.95 each and among the most abundant species with a relative density of 8.24, 8.79, 8.24 and 6.59 respectfully. *Parkia biglobosa* had the highest IVI of 14.74 due to its multiple uses such as fish poisoning, condiment/food additive, local construction, medicine and shelter (Shomkegh *et al.*, 2016). This was followed by *Sarcpocephalus latifolia* with an IVI of 13.55, *Khaya senegalensis* (10.26), *Combretum nigricans* (9.16) and *Bridelia ferruginea* (7.97). Twelve species had the least IVI of 1.74 among preferred species in the community due mainly to their lower numerical strength as all the species had very low relative densities (0.55) compared with the other tree species in the community.

Table 1: Tree species encountered and the Importance Value Index in Ukohol community

S/No	Botanical name	Family	Local name (Tiv)	Relative frequency (RF)	Relative Density (RD)	Importance Value Index (IVI)
1	*Acacia nilotica*	Mimosoideae	Saa anula	1.190476	0.549451	1.739927
2	*Afzelia africana*	Caesalpinoideae	Yiase	1.190476	0.549451	1.739927
3	*Ancardium occidentale*	Anacardiaceae	Ishase	2.380952	2.197802	4.578755
4	*Anogeissus leiocarpa*	Combretaceae	Maaki	1.190476	0.549451	1.739927
5	*Anthocleista djelonensis*	Loganiaceae	Kookoso	1.190476	0.549451	1.739927
6	*Borassus aethiopum*	Boraginaceae	Akuugh	1.190476	1.098901	2.289377
7	*Bombax costatum*	Bombacaceae	Genger	1.190476	0.549451	1.739927
8	*Bridelia ferrugiena*	Euphorbiaceae	Ikpine	3.571429	4.395604	7.967033
9	*Combretum molle*	Combretaceae	Azulugh	2.380952	1.648352	4.029304
10	*Combretum nigricans*	Combretaceae	Alo	4.761905	4.395604	9.157509
11	*Crossopteryx febrifuga*	Rubiaceae	Iikwar	2.380952	2.747253	5.128205
12	*Daniella oliveri*	Caesalpinoideae	Chiha	5.952381	8.241758	14.19414
13	*Detarium microcarpum*	Caesalpinoideae	Lienegh	2.380952	3.296703	5.677656
14	*Entada africana*	Mimosoideae	Liemen	2.380952	1.648352	4.029304
15	*Ficus sur*	Moraceae	Tur	5.952381	8.241758	14.19414
16	*Ficus sycomorus*	Moraceae	Hirkar	3.571429	2.747253	6.318681
17	*Gardenia aqualla*	Rubiaceae	Ishondugh	1.190476	0.549451	1.739927
18	*Gardenia erubescens*	Rubiaceae	Ibohogh	1.190476	0.549451	1.739927
19	*Gmelina arborea*	Verbenaceae	Malina	2.380952	2.197802	4.578755
20	*Hymenocardia acida*	Hymenocardiaceae	Iikwar tor	1.190476	0.549451	1.739927
21	*Khaya senegalensis*	Meliaceae	Haa	4.761905	5.494505	10.25641
22	*Lannea schimperiana*	Anacardiaceae	Ipungwa	3.571429	2.747253	6.318681
23	*Mitrygyna inermis*	Rubiaceae	Sohonor	5.952381	6.593407	12.54579
24	*Morinda lucida*	Moraceae	Ikpine-puupuu	3.571429	2.197802	5.769231
25	*Parkia biglobosa*	Mimosoideae	Nune	5.952381	8.791209	14.74359
26	*Parinari curatellifolia*	Chrysobalanaceae	Ibua-kyuna	1.190476	1.098901	2.289377
27	*Pericopsis laxiflora*	Caesalpinoideae	Giragba	1.190476	0.549451	1.739927
28	*Piliostigma thonningii*	Caesalpinoideae	Nyihar	1.190476	1.098901	2.289377
29	*Prosopis africana*	Mimosoideae	Gbaaye	3.571429	2.197802	5.769231
30	*Pterocarpus erinaceus*	Papilionoideae	Ngaji	1.190476	1.098901	2.289377
31	*Sarcocephalus latifolia*	Rubiaceae	Ikura-ukase	4.761905	8.791209	13.55311
32	*Strychnos spinosa*	Loganiaceae	Maku	2.380952	2.197802	4.578755
33	*Syzygium guinenses*	Myrtaceae	Daanyam	1.190476	0.549451	1.739927
34	*Terminalia avicenniodes*	Combretaceae	Kwegh	3.571429	3.296703	6.868132
35	*Terminalia schimperiana*	Combretaceae	Ukwegh	1.190476	0.549451	1.739927
36	*Terminalia catarpa*	Combretaceae	Hii-pine	1.190476	0.549451	1.739927
37	*Vitallaria paradoxa*	Sapotaceae	Chamegh	2.380952	2.747253	5.128205
38	*Vitex donniana*	Verbenaceae	Hulugh	2.380952	2.197802	4.578755

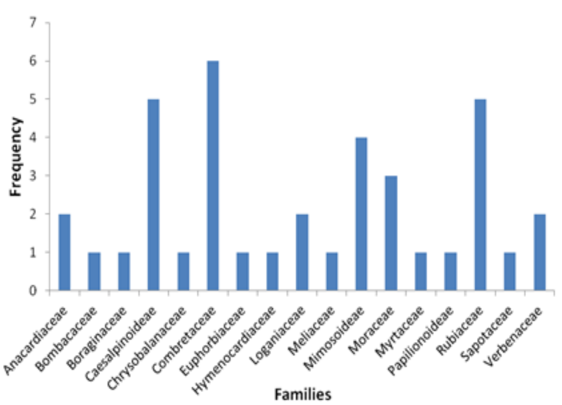

Fig.1 Family representation in the study area

3.2 Diameter at Breast Height (Dbh) classes of tree species in the study area

The Dbh classes in the study area ranged between less than 20cm to below 80cm. This gives an indication of absence of large trees species in the area. Dbh class 41-60cm had the highest number of tree species (25) but with only 40 individual plants, lower than Dbh range 41-60cm which had the highest number of individual plants (76) from 25 species as shown in Fig.2. Dbh of less than 20cm had 15 species with 26 individual plants. The oldest classes of trees were fewer, having 11 species with a total of 18 individuals compared with all other classes. This could be linked to the high rate of deforestation arising from destructive harvesting of merchantable trees for craft making, timber, charcoal production and fuelwood. Using Turkey's pairwise comparison, DBH class 21-40cm was found to be significantly different with Dbh class less than 20cm; similarly, Dbh class 61-80cm and 81cm beyond were significantly different from other classes(Table 2). This implies that the observed differences in most of the Dbh classes were not significantly different as only the few highlighted above were different. Seventy-five percent (75%) of trees species in the area were moderately harvested while 25% believed to be most preferred species were heavily harvested (Table 3). All the respondents agreed that there has been a decline in tree population in the area in the last 10 years. The major reasons for the decline were unsustainable farming practices (62.5%) and craft making (20%) which was observed to be a lucrative business for energetic young men who were seen operating the venture in several mini camps along the Makurdi-Lafia expressway. Timber harvesting accounted for 10% due lack of merchantable timber species in the area. Charcoal production was said to be practiced in the past but was no longer operational due to scarcity of *Prosopis africana*, the most preferred species because of its high heating value. Mortar carvers who noted that they go outside the Local Government Area to purchase the tree and transport it back for their business. Majority of respondents (87.5%) in the area admitted that they do not plant these trees species, which poses a bleak future for tree utilization in the area.

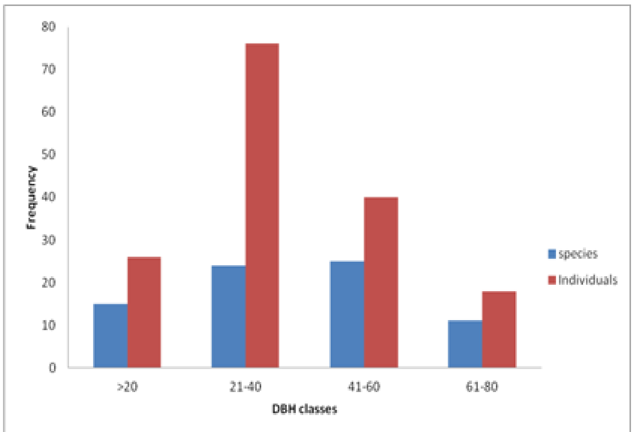

Fig. 2 DBH classes distribution in the study area

Table 2: Tukey's pairwise comparison of species distribution in the study area

DBH classes(cm)	<20	21- 40	41 – 60	61 – 80	81 & above
<20		0.002172**	0.841 ns	0.9767 ns	0.9276ns
21- 40			0.06141 ns	0.2009**	8.333E-05**
41-60				0.4842 ns	0.3496 ns
61-80					0.9995 ns
80 & above					

Note ** significant at 5% ns= not significant at 5%

Table 3: Reasons for tree species decline in the study area

Variable	Parameters	Frequency	Percentage frequency (%)
Harvesting intensity of trees	Heavily	10	25
	Moderate	30	75
	Light	0	0
	Do not know	0	0
Are there tree species which were available in last 10 years rare or absent now?	Yes	40	100
	No	0	0
Reasons for tree species decline	Farming	25	62.5
	Charcoal production	0	0
	Fire	0	0
	Fuelwood collection	3	7.5

	Timber	4	10
	Craft making	8	20
Do you plant some of the tree species in your area?	Yes	5	12.5
	No	35	87.5

3.3 Local uses of tree species in the study area

3.3.1 Demographic information of study respondents

Forty (40) heads of households in the four villages made up of 65% men and 35% women mainly within the ages of 21-40 years were interviewed in the study area (Table 4). Elderly people were between the ages of 41-60 years constituting 10% of the surveyed population. The respondents were all married with their primary vocation as farming. On their educational status, most of them had primary school education (47.5%), while secondary and tertiary education had 5% each. Tree species in the area were used as food, medicines, crafts, local construction materials, fuelwood and charcoal making (Table 5). Tree plants with multiple uses such as *Prosopis africana, Vitellaria paradoxa* and *Burkea africana* had a CI of 5.5, 4.2 and 3.9 respectively and were rated high by respondents. Fourteen (14) tree species were the least cited with a CI of less than 2. Plants parts such as leaves, seeds, fruits, root and trunk were used for each of the use categories (Fig. 3). Plant parts utilized for food were the leaves, seed and fruits depending on the tree species. Plants with medicinal values utilized roots, seeds, leaves and trunk (bark) of different tree species depending on the ailment treated. Craft making, local construction, fuelwood and charcoal production used mainly the trunk of tree species in the area.

Table 4: Demographic data of study respondents

Variable		Frequency	Percentage frequency (%)
Sex	Male	26	65
	Female	14	35
Age	< 20	0	0
	21-40	36	90
	41-60	4	10
	61-80	0	0
	81 above	0	0
Occupation	Farming	40	100
Marital status	Married	40	100
Educational status	Non formal	17	42
	Primary	19	47.5
	Secondary	2	5
	Tertiary	2	5
	Total	**40**	**100**

Table 5: Uses of tree species in Ukohol community

S/n	*Scientific name*	Family	Local name	Food	Medicine	Crafts	Local Construction	fuel wood	charcoal	CI
1	*Prosopis africana*	Mimosoideae	Gbaaye	40	21	40	40	40	40	5.525
2	*Parkia biglobosa*	Mimosoideae	Nune	40	21	0	0	32	0	2.325
3	*Ficus sur*	Moraceae	Tur	40	31	0	0	20	0	2.275
4	*Vitex doniana*	Verbenaceae	Hulugh	40	35	0	0	0	0	1.875
5	*Saba florida*	Apocynaceae	Ipungwa	40	11	0	25	0	0	1.900
6	*Mangifera indica*	Anacardiaceae	Mango	40	4	0	0	21	0	1.625
7	*Burkia africana*	Caesalpinoideae	Gbagbongom	0	40	21	31	38	27	3.925
8	*Annona sengalensis*	Annonaceae	Ahur	13	40	0	0	1	0	1.350
9	*Piliostigma thonningii*	Caesalpinoideae	Nyihar	0	40	0	0	31	0	1.775
10	*Maytenus sengalensis*	Celatraceae	Alom	0	40	0	0	20	0	1.500
11	*Grewia mollis*	Tiliaceae	Hwerbar	0	40	0	0	0	0	1.000
12	*Gardenia aqualla*	Rubiacea	Shondugh	0	40	0	0	0	0	1.000
13	*Daniellia oliveri*	Caesalpinoideae	Chiha	0	40	0	40	14	0	2.350
14	*Pterocarpus erinaceus*	Papilionoideae	Ngaji	0	40	40	40	23	12	3.875
15	*Detarium macrocarpum*	Caesalpinoideae	Agashi	2	40	40	0	28	17	3.175
16	*Afzelia africana*	Caesalpinoideae	Yiase	0	40	40	40	32	0	3.800
17	*Vitellaria paradoxa*	Sapotacaea	Chamegh	35	40	40	16	26	11	4.200
18	*Pseudocedra kotschyi*	Euporbiaceae	Kpamegh	0	0	40	0	0	0	1.000
19	*Khaya sengalensis*	Meliaceae	Haa	0	31	21	40	30	0	3.050
20	*Anogeisus leiocarpa*	Combretaceae	Maaki	0	21	7	40	29	26	3.075
21	*Mitragyna inermis*	Rubiacea	Sohonor	0	40	0	0	0	0	1.000
22	*Crossopteryx febrifuga*	Rubiaceae	Irkwar	0	40	0	0	31	0	1.775
23	*Sarcocephalus latifolia*	Rubiaceae	Ikyura	0	40	0	0	13	0	1.325
24	*Allophyllus africanus*	Sapindaceae	Apaapa	0	31	0	0	21	0	1.300
25	*Azadirachta indica*	Meliacea	Dogonyaro	0	40	0	21	0	0	1.525

26	*Strychnos spinosa*	Loganiaceae	Amaku	37	40	0	0	18	0	2.375

CI = Number of citations of a particular plant

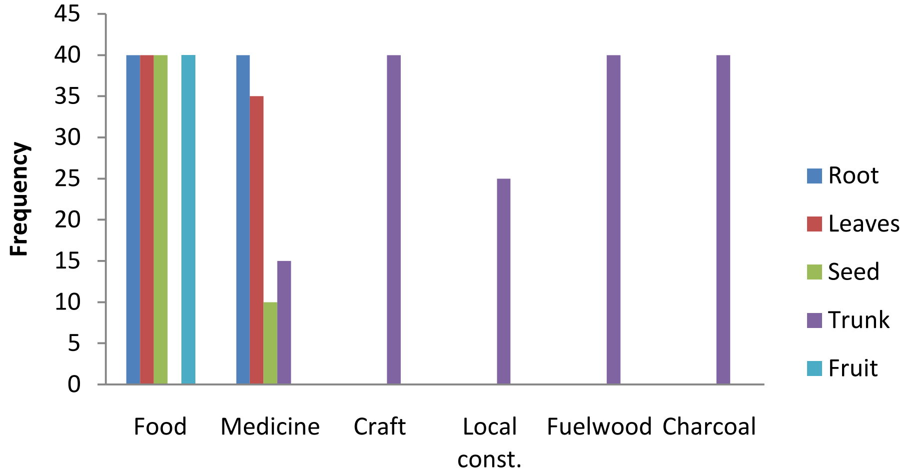

Fig. 3: Plant parts of tree species utilized in the study area

IV. Conclusion

A total of 38 plant species from 17 families were recorded with combretaceae having the highest number of species. Plants with multiple uses had high importance value index with the highest number of citations. *Daniellia oliveri*, *Parkia biglobosa*, *Ficus sur* and *Mitrygyna inermis* were more diverse with relative frequencies of 5.95 each and among the most abundant species with relative densities of 8.24, 8.79, 8.24 and 6.59 respectfully. Plants in the area were utilized for food, medicinal purposes, crafts making, local construction and fuelwood with most uses leading to the cutting of the trees. Majority of respondents agreed that they do not plant these tree species, a situation which presents a bleak future for utilization of the tree species for different purposes in the study area. It is therefore recommended that planting of tree species especially those preferred by community members be encouraged among members of the community and other stakeholders to reduce the current rate of loss of the species and provide for future demand. Creation of awareness on the impacts of deforestation and the need to conserve wild tree resources may reduce the current rate of exploitation of preferred tree species in the community.

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