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TREE SPECIES COMPOSITION AND STRUCTURE OF IGBO-ILE AND IGBO-OBA SACRED GROVES IN SOUTH-WESTERN NIGERIA

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ABSTRACT

Sacred grove forests are biodiversity-rich communities for a large number of endemic and rare plant taxa of the region compared to other conservation areas having records of illegal activities. The population structure of tree species in Igbo-Oba and Igbo-Ile sacred groves was determined. Each of the sacred groves regarded as cluster was divided into two with a line transect that ran North-South of the forest. At the midpoint along the transect line, a plot of 50m x 50m, laid at the right side with clockwise orientation. All living trees with diameter at breast height (dbh) $\geq$10cm on each plot were recorded by species. The Shannon-Weiner index and other tree diversity indices were used for the analysis. The total number of trees encountered in the two sacred groves was 184 stems that belong to indigenous tree species, distributed among 24 species, 13 families in Igbo-Ile and 18 species, 12 families in Igbo-Oba sacred groves. The groves are dominated by family Sterculiaceae with *Cola gigantea*, *Cola nitida*, *Hildegardia barteri*, *Sterculia rhinopetala*, *Sterculia triagacantha Sterculia tragacantha*, *Triplochiton scleroxylon* representing 20.83% and 22.23% of total density in Igbo-Ile and Igbo-Oba sacred groves respectively. Other significant families dominating the sacred groves are Ulmaceae, Moraceae, and Rubiaceae. The Shannon-Weiner index (2.644) and Evenness (0.78) were high in Igbo-Oba compared to Shannon-Weiner index (2.509) and Evenness (0.512) recorded in Igbo-Ile. The two sacred groves followed reverse J-shaped pattern where high frequency was recorded against the low dbh. Only 12.51% and 33.34% of the trees could be regarded as mature trees (dbh$\geq$ 40cm) in Igbo-Ile and Igbo-Oba respectively, while 87.47% and 66.66% represented the small diameter, while the average values of IVI are 2.94% and 2.77% for Igbo-Ile and Igbo-Oba respectively. To reduce pressure, sacred groves should be formally enlisted as part of conservation areas recognized by law in Nigeria, incorporate and recognize the conservation efforts of rural communities as it confirms the structure of the lowland rain forest and its potential for biodiversity conservation. This study provides a baseline for the management of protected areas in developing countries and it shows the potential of *in situ* conservation method in nature conservation.

Keywords: Population, structure, sacred grove, biodiversity, conservation, Important Value Index

Introduction

The rainforests of south-western Nigeria are of considerable biological importance. They are characteristically dense as a result of the rampant growth and are usually difficult to penetrate. They are stratified into layers sometimes exhibiting as many as five different stories. It occupies only 9.7% (95, 372 km^2) of country's land mass of 983, 213 km^2 (Adekunle, 2005). Despite the small extent of Nigeria's tropical rainforest ecosystem, forests perform a key role in providing vital services, notably global climate regulation and watershed protection (Onyekwelu *et al*., 2008). Throughout the world, there is increasing awareness and recognition that the forest is fundamental in maintaining ecological processes/services, are source of livelihood to rural populace and are important in enhancing economic growth (UNEP, 2007; FAO, 2009). With intensive and extensive deforestation of the natural ecosystems of the country, there is growing concern about the disappearance of many species and varieties of plants, which are of significance use. Removal of the forest cover may result in an unstable ecosystem or create an ecological imbalance. The South-western forests have come under intense pressure as the population and economy of Nigeria have increased, leading to more land for agricultural activities, urbanization and many others. In this vein, Salami (2001) stressed that agricultural colonization is one of the several factors that modified original forest reserve of Nigeria. For instance, Agroforestry and arable land penetrated Oluwa forest reserve, Nigeria and replaced the natural vegetation of the area.

The local tribes of the rainforest in Nigeria have an age-old tradition of conserving forests as a part of their culture and religious beliefs. These indigenous communities lived in harmony with the nature and conserved its valuable biodiversity (Oyelowo, 2014). These forests, popularly known as sacred groves, are biodiversity-rich communities, which provide refuge for a large number of endemic and rare plant taxa of the region. Direct and indirect benefits are being derived regularly in the conservation of these sacred groves. Local communities derive direct economic benefits like fuelwood from their sacred grooves (Oyelowo, 2014). In a cursory inspection of some fetish grove in southern Nigeria by Okafor and Fermandes (1987), 120 species of flowering plants covering 99 general and 49 families were identified (certain fruit trees like dawadawa" *Parkia biglobosa* and shea butter *Vitalaria paradoxa* have been protected throughout northern Ghana (Telly, 1997). Faith, tradition, taboo are good examples of informal institutions where norms, taboo and traditional ethics rather than governmental judicial laws and rules determining human behaviour. These taboos guides human conduct toward the natural environment especially forests (Carle, 2001).

One of the most conspicuous effects of deforestation ecosystem perturbation has been the depletion of biodiversity. Disappearance of species due to habitat alteration, overexploitation, pollution, global climate change and invasion of exotic species is so fast that many valuable taxa may vanish even before they are identified and their scientific value is discovered. Human activities in obtaining food, fiber, fuel and shelter have significantly degraded the rainforest ecosystem (Oyelowo *et al*., 2008). As a result, knowledge gathering on the floristic composition and the population structure of forests are essential for providing information on species richness and the forest changes (dynamic), especially for management purpose. As a first step to develop conservation policies (conservation and protection of those important forest grove areas) there is a need to assess the forest diversity and population dynamic of the sacred grove forest areas. Achieving the latter may contribute at large on to promote cultural values and indigenous knowledge of community living around the sacred grove forests. Thus, this study assessed the floristic composition and the population dynamic of forest resources in the Igbo-Ile and Igbo-Oba sacred groves as part of the lowland rainforest of the Southern west of Nigeria.

Materials and Method

Study Area

The study area is the tropical rainforest ecosystem in South West Nigeria (Table 1).There is a distinct dry and rainy seasons, having an average annual rainfall and temperature of 1489 mm and 26.5° C respectively. The lower layer vegetation is with abundance of herbs, shrubs and some grasses. The top layer accounts for valuable economic trees such as *Miliciaexcelsa* and *Cola nitida* among others. The zone has a high density of human population with agriculture as primary occupation of the people. The soils vary in physical and chemical properties but they exhibit some common characteristics, most of them are well – drained by several rivers, bright red or brown in colours and dominated by the kaoline type of clay. Their humus content tends to be low and is mostly confined to the uppermost horizons. Soils are predominantly ferruginous tropical, typical of the variety found in intensively weathered areas of basement complex formations in the rainforest zone of south-western Nigeria (Onyekwelu *et al*., 2008).

Vegetation:

The national report of FEPA (1992) recorded 5, 018 plant species in Nigeria lowland rainforest ecosystem of which 205 are endemic. The physiognomy of trees is usually uniform that is, with straight boles and almost cylindrical.

Table 1: Location of Study Sites.

Sacred Grove	Town	L.G.A.	State	Latitude	Longitude
Igbo-Ile	Ibere	OgoOluwa	Oyo	7.9333333°,	4.2°.
Igbo-Oba	Oba Ile	Olorunda	Osun	7.54^0	4.35^0

Field Survey

Vegetation studies

The sacred groves were purposively selected among others affected by anthropogenic pressure. Each of the sacred groves regarded as cluster was divided into two with a line transect that ran North-South of the forest. At the midpoint along the transect lines at 30cm interval, 3 plot of 50m x 50m each were laid at the right side with clockwise orientation. All living trees with diameter at breast height (dbh) ≥10cm on each field plot were recorded by species. All trees were assigned to families and relative density (number of species in a family) was obtained for tree family diversity classification. Trees that could not be identified in the field, part of such trees (Leaves, bark, fruits.) were collected for identification at Forestry Research Institute of Nigeria (FRIN) herbarium, Ibadan.

Data and structure analysis

Diversity index and tree species classification

All plant species encountered were classified into families. Their species occurrence were obtained to ascertain species abundance and species evenness. The following biodiversity indices were used to obtain the diversity, evenness within each sacred grove.

a. **Shannon-Wiener diversity index:**

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$$H^{i} = \sum_{i=1}^{s} \mathbf{Pi}\ln(\mathbf{pi})$$

where H^1 is the Shannon-Wiener diversity index; S is the total number of species in the community; pi is the proportion of S made up of the ith species; Ln is natural logarithm.

b. **Species relative density (RD):** Refers to the number of individual of a given species divided by total number of individual of all the species found.

$$RD = \left(\frac{ni}{N}\right) X\ 100$$

where, RD = species relative density; n_i= number of the individual of species I; N = total number of all tree species in the entire community.

c. Margale fs index of species richness (M)

$$M = 1\frac{(S-1)}{lnN}$$

d. **The species relative dominance (RDo %):** This was obtained following Brashear's *et al* (2004)

$$\mathbf{RDo} = \frac{(\Sigma Bai\ X\ 100)}{\Sigma \mathbf{Ban}}$$

where, RD_O = Relative Dominance; B_{ai} = basal area of individual tree belonging to ith species; B_{an} = stand basal area.

e. **Relative Frequency (RF)** =

$$\mathbf{RF} = \frac{No\ of\ occurrence\ of\ the\ species}{No\ of\ occurrence\ of\ all\ the\ species} X\ 100$$

f. **Important Value (IV)** is the relationship between Relative density and relative dominance. The sum of the RD and RD_O divided by 2 (RD x RD_O/2) gave the importance value index for each species (Brashears *et al.* 2004; Yang *et al.* 2008)

g. **Species diversity index:** Species diversity is a measure of heterogeneity of a site taking into consideration the number and the density of individual species. Each sacred grove was assessed using the Simpson (1949)

$$I = \frac{\Sigma\{ni(ni-1)\}}{N(N-1)}$$

where, I = Simpson's diversity index; n_i = Number of individuals of *ith* species enumerated;
N = Total number of species enumerated

h. **Species evenness (E)** in each plot will be calculated by adopting Shannon's equitability (E_H) as stated by Kent and Coker (1992):

$$EH = \frac{\Sigma\mathbf{Piln}\ (\mathbf{Pi})}{ln(s)P}$$

where, S = the total number of species in the habitat; P_1 = proportion S (species in the family) made up of the ith species; ln = natural logarithm.

i. **Sorensen's species similarity index** (SI) following Nath *et al.,* (2005) between any two sites will be calculated using:

$$SI = \left(\frac{2c}{a} + b\right) X\ 100$$

where, C = number of species in sites a and b; a, b = number of species at sites a and b

Results

Tree Diversity and Abundance

The total number of trees (≥10cm dbh) encountered in the two sacred groves was 184 stems (Table 2. Igbo-Ile had 162 stems while Igbo-Oba had 42 stems. These were distributed among 24 species, 13 families in Igbo-Ile and 18 species, 12 families in Igbo-Oba. In the two locations, Sterculiaceae had the highest number of species, followed by Ulmaceae. In Igbo-Ile, Sterculiaceae had the highest number of species (5) followed by

Ulmaceae (4) and Moraceae (3). In Igbo-Oba, Sterculiaceae had the highest number of species (4), followed by Ulmaceae (3) and Rubiaceae (2). Bignonaceae, Olacaceae, Myristicaceae and Combretaceae had 1 species each in Igbo-Ile while Sapotaceae, Palmae, Caesalpinioideae also had 1 species each among others in Igbo-Oba. Simpson Diversity Index was high in Igbo-Oba (0.91) compared to Igbo-Ile (0.88) and Equitability index was high in Igbo-Oba (0.91) compared with Igbo-Ile (0.79). The results of the other biodiversity indices were Margalef indicated 4.5 and 4.6 in Igbo-Ile and Igbo-Oba respectively. Berger-Perker showed the value of 0.28 in Igbo-Ile and 0.18 in Igbo-Oba.

Table 2: Summary of Tree Diversity Indices in the Sacred Groves

	Sacred groves	
	Igbo-Ile	**Igbo-Oba**
Taxa_S	24	18
Individuals	162	42
Dominance	0.1248	0.08844
Simpson_1-D	0.8752	0.9116
Shannon_H	2.509	2.644
Evenness_e^H/S	0.512	0.7815
Brillouin	2.299	2.163
Menhinick	1.886	2.777
Margalef	4.521	4.548
Equitability_J	0.7893	0.9147
Fisher_alpha	7.787	11.93
Berger-Parker	0.2778	0.1667
No of family	13	12
Mean dbh (cm)	27.8	32.9
Max. dbh (cm)	230	119

Similarity Indices (0.9721)

Forest Structure

Cola gigantean gigantea (Sterculiaceae) had the highest number of occurrence (45 stems) and a relative density of 26.37 in Igbo-Ile (Table 3). This is known to be the most abundant species in Igbo-Ile. This was closely followed by *Celtis zenkeri* (Ulmaceae) with 18 stems and a relative density of 11.11. The third abundant species are *Hildergardia barteri* and *Triplochyton sclerozylon* with 15 stems each and a Relative Density of 9.26 each. In Igbo-Oba, *Trilepisium madagascarlensis* (Moraceae) had the highest number of occurrence (7 stems) and relative density of 15.22. It is regarded as dominant species in the sacred grove. This was followed by *Trichilia prieureana* with 6 trees and relative density of 13.04.

Table 3: Tree Family Diversity within the Sacred Groves

Family	Igbo-Ile No of Spp. (%)	Igbo-Oba No of Spp. (%)
Bignonaceae	4.17	0
Bombacaceae	4.17	0
Caesalpinioideae	0	5.56
Combretaceae	4.17	0
Ebenaceae	4.17	0
Irvingiaceae	0	5.56
Melastomataceae	0	5.56
Meliaceae	8.33	5.56
Mimosoideae	4.17	5.56
Moraceae	12.5	5.56
Myristicaceae	4.17	0
Olacaceae	4.17	0
Palmae	0	5.56
Rubiaceae	4.17	11.12
Sapindacea	8.33	5.56
Sapotaceae	0	5.56
Steculiaceae	20.83	22.23
Ulmaceae	16.67	16.67

In Table 4, *Ceiba pentandra* had the highest mean dbh (129cm) in Igbo-Ile while *Hylodendron gabunense* had the highest mean dbh (67.5cm) in Igbo-Oba. The least mean dbh (10cm) was *Morusmeso zygia* was recorded in Igbo-Ile while the list recorded in Igbo-Oba was 13.5cm. The highest Important Value (IV) encountered in Igbo-Ile was *Cola gigantean* (26.38), followed by *Triplochiton scleroxylon* (14.58), *Ceiba pentandra* (12.96), *Milicia excelsa* (4.49) and *Khayagrandifoliola* (4.39) while the least recorded was *Celtis mildbreadii* (0.19). Within Igbo-Oba, *Triplochiton scleroxylon* had the highest Important Value (IV) of 26.30%, followed by *Irvingia wombolu* (9.91%), *Trilepisium madagascariense* (9.81%), *and Hylodendron gabunense* (8.73%) while the least encountered was *Celtis brownii* (1.30%). Steculiaceae had the highest total frequency of 20.83% and 22.23% in Igbo-Ile and Igbo-Oba respectively, followed by Ulmaceae with 16.67% in Igbo-Ile and 16.67% in Igbo-Oba. Among the families with least frequency (4.17%) in Igbo-Ile are Bignonaceae, Bombacaceae, Combreataceae and Ebanaceae, while Irvingiaceae, Melastomataceae, Meliaceae, Moraceae and Sapotaceae had the lowest frequency of 5.56% each in Igbo-Oba.

Table 4: Tree Species Diversity in the two Sacred Groves

Species	Frequency		Mean dbh (cm)		Max dbh (cm)		RDo (%)		RD%		IV (%)	
	I-I	I-O	I-I	I-O	I-I	I-O	I-I	I-O	I-I	I-O	I-I	I-O
Albizia ferruginea	3	1	16	28	17	28	0.354	1.14	1.852	2.174	1.103	1.657
Blighia sapida	0	1	0	62	0	62	0	5.92	0	2.174	0	4.048
Canthium vulgare	0	2	0	16.5	0	17	0	0.85	0	4.348	0	2.597
Ceiba pentadra	2	0	129	0	230	0	24.69	0	1.235	0	12.96	0
Celtis brownie	1	2	25	17	25	19	0.288	0.84	0.617	4.348	0.226	1.298
Celtis mildbreadii	1	0	18	0	18	0	0.149	0	0.617	0	0.192	0
Celtis whitii	3	1	23	53	32	53	0.792	4.04	1.852	2.174	1.322	3.107
Celtis zenkeri	18	3	23	14	109	15	8.149	0.85	11.11	6.522	9.63	3.685
Chrysophyllum albidum	0	1	0	17	0	17	0	0.42	0	2.174		1.295
Cola gigantea	45	1	26	22	120	22	24.98	0.7	27.78	2.174	26.38	1.435
Cola nitida	0	3	0	21	0	26	0	2.04	0	6.522	0	4.283
Diospyrosmon buttensis	1	0	12	0	12	0	0.066	0	0.617	0	0.342	0
Elaeis guineensis	0	1	0	48	0	48	0	3.31	0	2.174	0	2.744
Entandrophragma angolense	4	0	25	0	40	0	1.261	0	2.469	0	1.865	0
Ficus exasperata	2	0	30	0	45	0	4.086	0	1.235	0	2.6605	0
Hildegardia barteri	15	0	21	0	34	0	3.365	0	9.259	0	6.312	0
Hylodendron gabunense	0	2	0	67.5	0	68	0	13.1	0	4.348	0	8.726
Irvingia wombolu	0	2	0	65	0	99	0	15.5	0	4.348	0	9.912
Khaya grandifoliola	14	0	20	0	48	0	0.127	0	8.642	0	4.385	0
Lecaniodiscus cupanioides	1	0	12	0	12	0	0.066	0	0.617	0	0.342	0
Memecylon afzelii	0	1	0	23	0	23	0	0.76	0	2.174	0	1.467
Milicia excelsa	5	0	39	0	98	0	5.905	0	3.086	0	4.496	0
Morusmeso zygia	1	0	10	0	10	0	0.046	0	0.617	0	0.332	0
Newbouldia laevis	1	0	18	0	18	0	0.149	0	0.617	0	0.383	0
Olax subscorpioidea	3	0	13	0	14	0	0.247	0	1.852	0	1.049	0
Pycnanthus angolensis	1	0	23	0	23	0	0.243	0	0.617	0	0.43	0
Rothmanniahispida	0	1	0	24	0	24	0	0.9	0	2.174	0	1.538
Sterculia rhinopetala	7	0	15	0	18	0	0.737	0	4.321	0	2.529	0
Sterculia tragacantha	1	2	16	13.5	16	15	0.118	0.53	0.617	4.348	0.368	2.439
Terminalia ivorensis	1	0	70	0	70	0	2.254	0	0.617	0	1.436	0
Trichilia monadelpha	9	0	15	0	19	0	0.913	0	5.556	0	3.234	0
Trichilia prieureana	0	6	0	16.8	0	26	0	2.62	0	13.04	0	7.83
Trilepisium madagascarlensis	8	7	18	20.4	32	29	1.362	4.41	4.938	15.22	3.15	9.814
Triplochiton scleroxylon	15	5	49	63.2	109	119	19.9	41.7	9.259	10.87	14.58	26.3

***I-I means Igbo-Ile** **I-O means Igbo-Oba**

Table 5 shows that, *Albizia ferruginea*, *Celtis brownie*, *Celtis whitii*, *Celtis zenkeri*, *Cola gigantean gigantea*, *Sterculia tragacantha*, *Trilepisium madagascariense*, *Triplochiton scleroxylon* were found to be common to Igbo-Ile and Igbo-Oba. Among the species peculiar to Igbo-Ile are *Ceibapentadra*, *Celtis mildbreadii*, *Diospyros monbuttensis*, *Entandrophragma angolense*, *Ficus exasperata*, *Hildegardia barteri*, *Khaya grandifoliola*, *Lecaniodiscus cupanioides*, *Milicia excelsa*, *Morusmeso zygia*, *Newbouldia laevis* while *Blighia sapida*, *Canthium vulgare*, *Chrysophyllum albidum*, *Cola nitida*, *Elaeis guineensis*, *Hylodendron gabunense*, *Irvingia wombolu*, *Memecylon afzelii*, *Rothmannia hispida*, *Trichilia prieureana* were peculiar to Igbo-Oba.

Table 5: Species common to the sites

	Species encountered in each of the site	
Species common to the 2 sites	***Igbo- Ile***	***Igbo-Oba***
Albizia ferruginea	*Ceiba pentadra*	*Blighia sapida*
Celtis brownie	*Celtis mildbreadii*	*Canthium vulgare*
Celtis whitii	*Diospyros monbuttensis*	*Chrysophyllum albidum*
Celtis zenkeri	*Entandrophragma angolense*	*Cola nitida*
Cola gigantean	*Ficus exasperata*	*Elaeis guineensis*
Sterculia tragacantha	*Hildegardia barteri*	*Hylodendron gabunense*
Trilepisium madagascariense	*Khaya grandifoliola*	*Irvingia wombolu*
Triplochiton scleroxylon	*Lecaniodiscus cupanioides*	*Memecylon afzelii*
	Milicia excelsa	*Rothmannia hispida*
	Morusmeso zygia	*Trichilia prieureana*
	Newbouldia laevis	
	Olax subscorpioidea	
	Pycnanthus angolensis	
	Sterculia hinopetala	
	Terminalia ivorensis	
	Trichilia monadelpha	

The results of the diameter sizes class distribution are presented in Fig 1. The structure of the population in both sacred groves was nearly or typically reverse J-shaped curve. Igbo Ile SG followed the reverse curve where high frequency was recorded within the diameter of 10-19.99 cm, the same applied to Igbo-Oba. These follows a typical of mature natural forest, the number of stems was inversely proportional to diameter sizes.

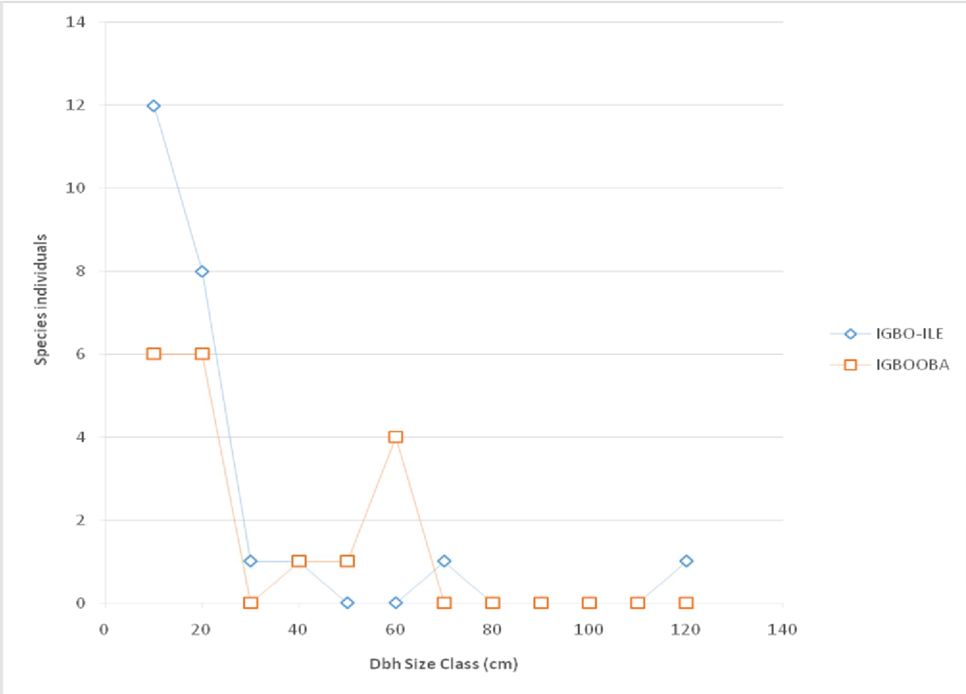

Fig. 1: Diameter Distribution graph of Igbo-Ile and Igbo-Oba sacred grove.

Discussion

It is widely acknowledged that the floristic composition and structure of forests are parameters that are essential for providing key information to resources managers on tree species richness and dynamic. Such information is critical for implementing strategies related to forest resources management and ecosystem sustainability at large (Pappoe *et al*., 2010). Sacred groves play important role in the conservation of biodiversity. The areas are protected by indigenous unwritten laws and taboos serving as policy to manage the existence of sacred groves. The results of the study indicated that sacred groves which are examples of *in-situ* conservation method is a home to many tropical tree species.

The dominated families in the sacred groves followed the work of Adekunle *et al*. (2013) that the Nigerian SNR is dominated by the family of Steculiaceae with 10 important species representing 32% of the total stand density. In a similar study Rubiaceae, Mimosaceae and Moraceae were reported as the families that dominated the five inland tropical dry evergreen forests of peninsular India (Mani and Parthasarathy, 2004).

Although the Shannon index is higher but similar to the study of Ramanujam and Kadamban (2000), where the data on diversity analysis Shannon index were 2.08 and 2.28. Rao *et al.* (2011) recorded the range of 2.94-3.96 for sacred groves in South eastern Ghats, India. The similarity index (0.97) between the two sacred groves revealed the overlap of tree species. This could be attributed to the presence of tree species covering wider range with related species composition. The higher the value of similarity indices between the sacred groves, the more related they are in species composition. According Soedjito, (2005), the locally specific species distribution within sacred sites revealed that there is overlapping of species between sacred sites in Insana, Indonesia. High similarity in species composition was found between Shegong and Hanuman camp while, it was less between Hanuman camp and Yarlung (Sanjeeb *et al.*, 2011).

The IVI commonly used in ecological studies reflects ecological importance of a species in a given ecosystem. The IVI is also used for prioritizing species conservation whereby species with low IVI value need high conservation priority compared to the ones with high IVI (Zegeye *et al.*, 2006 and Kacholi, 2013).A quantitative ecological studies use RIV/IVI, which combines density and frequency (dominance) into a single measure to analyze a plant community. Vegetation which can be described in terms of a number of parameters including frequency, density, and cover; the use of any of these qualitative parameters could lead to over simplification or under estimation of the status of the species (Kigomo *et al*., 1990; Oyun *et al*., 2009).Low ecological status of most of the species in a study, as evidenced by the RIV may be attributed to lack of dominance by any one of species, which suggests positive interactions among the tree species. The low RIVs may also imply that most of the species in this forest are rare (Pascal and Pellissier, 1996; Oyun *et al*., 2009).

Tree species similarities (0.9721) between the selected sacred groves could be attributed to the presence of tree species covering wider range. The higher the value of similarity indices between the sacred groves, the more related they are in species composition. Ojo *et al.* (1999) reported a similarity index of 60.9% between two tracks of rainforest far apart in Southwestern Nigeria. High similarity in species composition was found between Shegong and Hanuman camp while, it was less between Hanuman camp and Yarlung (Sanjeeb *et al.*, 2011). Murphy and Lugo (1986) suggested that the differences in the species composition and physiognomy of vegetation might be due to soil characteristics.

The average D_{max} distribution of the tree species followed an approximately normal distribution. The two sacred groves followed reverse J-shaped pattern where high frequency was recorded against the low dbh. Only 12.51% and 33.34% of the trees could be regarded as mature trees (dbh≥ 40cm) in Igbo-Ile and Igbo-Oba respectively, while 87.47% and 66.66% represented the small diameter. The distribution of plants in different age group suggests that the sacred grove is climax or stable forest. Similar results have been reported by Cao *et al.* (1996) for a rainforest in Southwest China, and Jamir (2000) in the sacred groves of Jaintia hills, Meghalaya, India. Adekunle *et al*. (2013), in the study carried out in SNR, only 12% of the trees encountered was regarded as mature or big trees (dbh≥ 40cm). The diameter distribution curve exhibited good regeneration potentials. In general, size class distribution of undisturbed forest or less disturbed forest should fit the reverse J-shaped pattern, with most of the trees in the smaller size classes and fewer in the larger ones (Whitmore, 1998). However, anthropogenic pressure like farming at the edge of the groves, medicinal plant and firewood collection on both forest locations and by species were noticed in the two locations. There is necessity for sustainable management of the sacred grove forests (in general) and by species.

Conclusion

The result of this study showed how important the scared grove is in biodiversity conservation. The results compared to other studies revealed the structure and floristic composition of sacred groves in the tropical region. Most of these forests are regarded as forbidden forests in the Southwestern part of Nigeria. Communities maintain these groves as part of the culture which strengthens the institution. The study however showed that the species composition in other conservation areas are well represented in the sacred groves. Conservation policies should therefore acknowledge and incorporate values and local practices to reduce loss of both cultural and biological diversity. Sacred groves should be formally enlisted as part of conservation areas recognized officially.

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