ASSESSMENT OF TREE BIODIVERSITY OF TWO TROPICAL RAINFOREST IN CROSS RIVER STATE, NIGERIA

Aigbe H.I, Adeyemo T. O and Oyebade B. A

Abstract— In this study, the status of biodiversity conservation was assessed. Multistage sampling technique was used for the study. The sampling entailed primary, secondary and tertiary sampling units. Tree identification and detailed growing stock were determined within the tertiary sampling plots (40m x 50m). Biodiversity status was assessed using Shannon-Wiener diversity (H'), species evenness (E) and Simpson dominance index. In addition, species similarity index of the two forest reserves was determined using Sorensen's indix (based on qualitative and quantitative data). The study revealed that dominant families in Afi River Forest Reserve are Caesalpinioideae, Mimosoideae, Euphorbiaceae and Meliaceae while for Oban Forest Reserve, Caesalpinioideae, Mimosoideae, Moraceae and Papilionoideae were the dominant families. The species similarity index of the two forest reserves was 84%, implying very high floristic similarity in their constituent tree species. The species richness index were 10.44 and 10.61 for Afi River and Oban Forest Reserves respectively while the values of Shannon-Wiener diversity index (HI) for Afi River Forest Reserve and Oban Forest Reserve were 3.827 and 3.795 respectively. The species diversity was higher in Afi River Forest Reserve than Oban Forest Reserve. More studies aimed at providing qualitative and quantitative assessments are required in order to further close the existing information gap in the study area.

Index Terms— Tropical rainforest, species diversity, species richness, tree species, Afi River Forest Reserve, Oban Forest Reserve

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INTRODUCTION

The tropical rainforests often are recognized internationally as biodiversity hotspot (Oates *et al.* 2004) and as the home of two-thirds of all plants and animals living on land, the tropical rainforest are the most biodiverse of all terrestrial ecosystems (FAO, 2010, and IUCN, 2010). Their immense biodiversity generates a variety of natural resources which help sustain the livelihood of local communities (Khan *et al*, 1997 and Kumar *et al*, 2002).

Biodiversity has drawn the attention of world biological scientists as a result of the danger posed on it by the high rate of natural resources exploitation. Changes in the diversity of a particular plant population will affect the changes in the diversity of all other organisms present within the ecosystem (Ihenyen *et al.,* 2010). Biodiversity has recently emerged as an issue of both scientific

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and political concern, primarily because of an increase in extinction rates caused by human activities (Ehrlich and Wilson 1991).

Loss of biodiversity has been recognized as one of the main threats to the world's forests, and there is a general growing concern for developing new global, regional and national programmes for conserving and managing forest biodiversity (Köhl *et al*, 1998). Biodiversity as an irreplaceable value in itself since the

diversity of the biosphere creates a genetic bank, crucial for functioning of ecosystems and the recovery of ecosystems after disturbance and temporal changes in ecosystem functions as well as in environmental factors (Köhl *et al*, 1998). Hence, apart from the immense economic, ethical and aesthetical benefits, biodiversity is essential for the ecosystem function and stability (Ehrlich and Wilson, 1991; Holdgate, 1996; Tilman, 2000).

Biodiversty measures (i.e. species diversity and species richness) have been widely used as indicators of ecosystem status, and play a critical role in studies dealing with the assessment of human impact on ecological sytems (Leitner and Turner, 2001). Forest managers rely on knowledge from forest assessments to make informed management decisions. Understanding species diversity and its status is important for helping managers evaluate the complexity and resources of these forests. Trees form the major structural and functional basis of tropical forest ecosystems and can serve as robust indicators of changes and stressors at the landscape scale. This paper focused on assessing the status of biodiversity conservation in two tropical rainforest reserves of

Cross River State, Nigeria. It is aimed at ensuring the conservation of its rich biodiversity to fashioning out realistic and effective conservation strategies.

Methodology

Study Area

This study was conducted in the Afi River and Oban Forest Reserves which are located in Cross River State (Fig. 1).
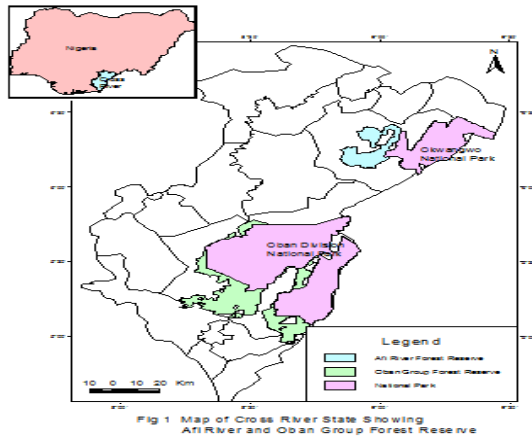

Fig 1 Map of Cross River State Showing Afi River and Oban Group Forest Reserve

Afi River Forest Reserve

Afi River Forest Reserve lies approximately between latitudes 6° 08' and 6° 26'N and longitudes 8° 50' and 9° 05'E and covers a total land area of 383.32 km² including the area known as Afi Mountain. The topography ranges between 200m - 1200m above sea level. The reserve is characterized by large tracts of rock outcrops especially on the North-East axis. The fast moving and high gradient streams drain the Afi River Forest Reserve, constituting an important watershed. The geological and soil components can be described as crustaceous sedimentary sandstone occupying a significant area of the study site. In a few places, there are volcanic eruptions through the sedimentary surface and this sometimes comprises columnar basalt (Nsor, 2004).

Generally the soils vary from clayey-loam to loamy-clay and normally red with high content of iron oxide. The soils are generally acidic and of low nutrient status, thus not suitable for arable crop production (Agbor, 2003). The entire area falls within a broad annual rain fall zone of 3,000 mm - 3,800 mm but, with a variation increasing from lowland to uphill (Agbor, 2003). The mean temperatures on Afi Mountain was 22.2^0C, and in the lowland 27.4^0 C. Daily minimum temperatures on Afi Mountain averaged 18.7^0C and in the lowland 22.1^0C while an average of 25.8^0c and 32.8^0c were recorded as daily maximum temperatures for Afi Mountain and its lowland respectively. The work of Balogun, (2003) indicates that the mean annual relative humidity is 78% at 7.00 Hr.

Oban Forest Reserve

Oban Forest Reserve lies within longitude 8°20' E and 8°55' E and latitudes 5°00' N and 6°00' N. Presently, it cover an area of 742.55km². Topographically, the terrain is rugged and its elevation rises from the river valleys to over 1,000 m in mountainous areas (Jimoh et al., 2012). Most of the area is characterized by hilly terrain ranging from 100 to over 1,000m. Oban Forest Reserve consists of dominant rock types that are ancient metamorphic rocks of the Basement Complex which cover 50% of Nigeria. Derived from sedimentary rocks and Precambrian in age these rocks are interspersed with smaller areas of intrusive igneous rocks. (Holland et al, 1989; Schmitt, 1996). Less sandy soils are found in areas with igneous rocks and deeper soils prevail in the plains of the southern part of the park whilst on steeper slopes they are increasingly stony, shallow and erodible (Holland et al, 1989). The annual rainfall is generally, between 2,500mm- 3,000mm. At times, it can be up to 4,000mm. Temperatures are generally high (average around 27°C) and vary little throughout the year with the annual range of the monthly average temperature varying only between 3° and 3.5° C. Mean monthly relative humidity varies between 78% and 91% with an average of 85%. (Holland et al, 1989; Schmitt, 1996).

Data Collection

Multistage sampling method (Aigbe et al, 2014; Aigbe and Omokhua, 2015) was adopted in this study. This sampling procedure was made up of primary, secondary and tertiary sampling units. 1000m by 1000m, were randomly chosen, which constitute the primary units. The primary units were divided into secondary 20 units of rectangular plots (otherwise known as strip plot) of 50 m by 1000 m (5 ha in size), out of which about 4 plots were randomly chosen. Each selected secondary units (strip plot) were then divided into 25 equal tertiary plots of 40 m by 50 m (0.20ha) in size, out of which 4 plots were randomly selected. Consequently, the total numbers of sampling plots (tertiary units) for this study were 24 sampling plots. Tree identification and detailed growing stock assessment of trees ≥ 10cm were undertaken within the tertiary sampling units.

Computation of Biodiversity indices

The Shannon-Wiener diversity (H') and Evenness (E) indices are calculated as a measure to incorporate both species richness and species evenness (Magurran 1988). Species richness index, the Shannon-Wiener diversity (H'), Evenness (E) and Simpson dominance indices were all calculated to analyse the biodiversity conservation status of each forest reserve.

Results and Discussion

Biodiversity Indices

1,419 individual trees were encountered in the 24 sample plots

from the two forest reserves. A total of 69 tree species distributed among 29 families and 62 genera were encountered in Afi River Forest Reserve while a total of 72 tree species distributed among 30 families and 67 genera were encountered in Oban Forest Reserve (Tables 1 and 2). The order of family dominance varied in each forest reserve. The first four dominant families in Afi River Forest Reserve are Caesalpinioideae (9), Mimosoideae (7), Euphorbiaceae (6) and Meliaceae (4) while for Oban Forest Reserve, Caesalpinioideae (10), Mimosoideae (7), Moraceae (6) and Papilionoideae were the dominant families. Dominant families in the two reserves were slightly different than those reported for tropical rainforest ecosystems in southwestern Nigeria (Adekunle, 2006; Onyekwelu *et al.,* 2008). For example, Onyekwelu *et al.* (2008) reported members of the Euphorbiaceae, Sterculiaceae, Meliaceae, Mimosoideae and Apocynaceae families to be dominant in three rainforest ecosystems in southwestern Nigeria, which are different from the dominating families in Afi River and Oban forest reserves. Adekunle *et al.,* (2013b) also reported Caesalpinioideae, Sterculiaceae, Meliaceae and Moraceae as dominant families. However, in a similar study, Meliaceae, Euphorbiaceae and Moraceae were reported as the families that dominated the tropical rainforest of Doi Inthanon, Thailand (Kanzaki *et al.* 2004), some sites in southeast Asia (Kessler *et al.* 2005), Andaman Giant evergreen forest in India (Rajkumar and Parthasarathy 2008) and the Xishuangbanna forest in southwest China (Lu *et al.* (2010).

Of the 68 species documented in Afi River Forest Reserve, *Pycnathus angolensis, Staudtia stipitata,* and *Brachystegia eurycoma* had the highest density with 29, 16, and 15 trees per hectare, respectively, which accounted for 9.5%, 5.7% and 4.9% of the total tree density per hectare, respectively. Some few species have one tree per hectare, indicating that these species might be under threat of extinction due probably to anthropogenic factor. FORMECU (1999) reported that tropical tree species (less than 10 individual per hectare) that are vulnerable and threatened with extinction are endangered species. Ihenyen *et al.,* (2010) and Alamu and Agbeja (2011) also reported that one tree species per hectare is endangered. In Oban Forest Reserve, out of 72 tree species, *Staudtia stipitata, Uapaca heudelotii, Carapa procera,* and *Diospyros crassiflora* had the highest density with 22 trees, 19 trees, 15 trees and 15 trees per hectare respectively, accounting for 7.6%, 6.5%, 5.2% and 5.2% of the total tree density per hectare, respectively. Dominant species in the two reserves were different from those reported for some tropical rainforest ecosystems in other part of Nigeria. For example, Adekunle *et al.,* (2013b), reported *Mansonia altissima* and *Triplochiton scleroxylon* as the dominant species in Akure Forest Reserve and Ihenyen *et al.,* (2009), reported *Brachystegia nigerica, Pentaclethra macrophylla, Baphia nitida, Ricinodendron heudelotti* and

Uvariopsis dioica as the dominant species in Ehor Forest Reserve, Nigeria, which are different from the dominating species in Afi River and Oban Forest Reserves.

Table 1: Family and Tree Species in Afi River Forest Reserve and their relative densities/Ha

Family	Species name	Average tree/Hectare	Relative density/Hectare
Anisophylleaceae	*Poga oleosa*	5	0.01471
Annonaceae	*Monodora myristica*	4	0.01307
Annonaceae	*Xylopia aethiopica*	2	0.00654
Apocynaceae	*Alstonia boonei*	3	0.00817
Apocynaceae	*Alstonia congensis*	3	0.0098
Apocynaceae	*Futumia elastic*	6	0.01961
Bombacaceae	*Bombax buonopozense*	4	0.01307
Bombacaceae	*Ceiba pentandra*	2	0.00654
Burseraceae	*Canarium schweinfurthii*	1	0.00327
Caesalpinioideae	*Afzelia Africana*	5	0.01634
Caesalpinioideae	*Berlinia grandiflora*	10	0.03268
Caesalpinioideae	*Brachystegia eurycoma*	15	0.04902
Caesalpinioideae	*Daniellia ogea*	3	0.00817
Caesalpinioideae	*Detarium macrocarpum*	1	0.00163
Caesalpinioideae	*Distemonathus benthamianus*	4	0.01144
Caesalpinioideae	*Erythrophleum suaveolens*	2	0.0049
Caesalpinioideae	*Gossweilerodendron balsamiferum*	2	0.0049
Caesalpinioideae	*Oxystigma manni*	5	0.01634
Combretaceae	*Terminalia ivorensis*	5	0.01471
Combretaceae	*Terminalia superba*	6	0.01961
Ebenaceae	*Diospyros crassiflora*	6	0.01961
Euphorbiaceae	*Claoxylon hexandrum*	1	0.00163
Euphorbiaceae	*Drypetes gossweileri*	1	0.00163
Euphorbiaceae	*Drypetes preussii*	1	0.00163
Euphorbiaceae	*Klainedoxa gabonensis*	4	0.01307
Euphorbiaceae	*Ricinodendron africanum*	3	0.0098
Euphorbiaceae	*Uapaca heudelotii*	8	0.02451
Flacourtiaceae	*Homalium spp.*	3	0.00817
Guttiferae	*Allanblackia floribunda*	5	0.01634
Guttiferae	*Mamea Africana*	9	0.02778
Irvingiaceae	*Irvingia gabonensis*	11	0.03595

Family	Species name	Average tree/Hectare	Relative density/Hectare
Lecythidaceae	*Petersianthus macrocarpus*	1	0.00327
Loganiaceae	*Anthocleista djalonensis*	4	0.01144
Meliaceae	*Carapa procera*	7	0.02288
Meliaceae	*Entandrophragma cylindricum*	3	0.0098
Meliaceae	*Khaya ivorensis*	5	0.01471
Meliaceae	*Lovoa trichilioides*	2	0.0049
Mimosoideae	*Albizia ferruginea*	4	0.01307
Mimosoideae	*Albizia gumifera*	2	0.0049
Mimosoideae	*Albizia zygia*	13	0.04085
Mimosoideae	*Cylicodiscus gabunensis*	4	0.01144
Mimosoideae	*Parkia bicolor*	6	0.01961
Mimosoideae	*Piptadeniastrum africanum*	10	0.03105
Mimosoideae	*Tetrapleura tetraptera*	2	0.00654
Moraceae	*Antiaris welwitschii*	3	0.00817
Moraceae	*Ficus mucuso*	4	0.01144
Moraceae	*Milicia excelsa*	4	0.01144
Moraceae	*Treculia obovoidea*	3	0.00817
Myristicaceae	*Coelocaryon preussii*	3	0.00817
Myristicaceae	*pycnathus angolensis*	29	0.09477
Myristicaceae	*Staudtia stipitata*	18	0.05882
Ochnaceae	*Lophira alata*	1	0.00327
Olacaceae	*Strombosia pustulata*	1	0.00163
Papilionoideae	*Amphimas pterocarpoides*	5	0.01634
Papilionoideae	*Pterocarpus osun*	9	0.02941
Papilionoideae	*Pterocarpus soyauxii*	2	0.00654
Rhizophoraceae	*Anopyxis Klaineana*	1	0.00327
Rubiaceae	*Mitragyna stipulosa*	4	0.01144
Rubiaceae	*Nauclea diderrichii*	4	0.01307
Rubiaceae	*Pausinystalia macrocera*	1	0.00163
Rutaceae	*Zanthoxylum zanthoxyloides*	3	0.00817
Sapotaceae	*Baillonella toxisperma*	1	0.00163
Sterculiaceae	*Pterygota macrocarpa*	8	0.02451
Sterculiaceae	*Sterculia oblonga*	1	0.00163
Sterculiaceae	*Triplochiton scleroxylon*	5	0.01634
Ulmaceae	*Celtis zenkeri*	8	0.02451
Verbenaceae	*Vitex gradifolia*	1	0.00163
Bignoniaceae	*Spathodea campanulata*	1	0.00163

Source: Field work, Aigbe *et al*, 2014

Table 1: Family and Tree Species in Oban Forest Reserve and their relative densities/Ha

Family	Species name	Average tree/Hectare	Relative density/Hectare
Anacardiaceae	*Lannea welwitschii*	6	0.01854
Anisophylleaceae	*Poga oleosa*	7	0.02224
Annonaceae	*Pachypodathium staudtii*	2	0.00494
Annonaceae	*Xylopia aethiopica*	2	0.00741
Apocynaceae	*Alstonia boonei*	1	0.00371
Apocynaceae	*Futumia elastica*	9	0.02842
Apocynaceae	*Voacanga africana*	2	0.00618
Bombacaceae	*Bombax buonopozense*	3	0.00865
Bombacaceae	*Ceiba pentandra*	1	0.00371
Burseraceae	*Canarium schweinfurthii*	5	0.0173
Caesalpinioideae	*Afzelia Africana*	7	0.02224
Caesalpinioideae	*Berlinia grandiflora*	2	0.00618
Caesalpinioideae	*Brachystegia eurycoma*	4	0.01483
Caesalpinioideae	*Daniellia ogea*	8	0.02719
Caesalpinioideae	*Detarium macrocarpum*	1	0.00247
Caesalpinioideae	*Distemonathus benthamianus*	1	0.00124
Caesalpinioideae	*Erythrophleum suaveolens*	3	0.00989
Caesalpinioideae	*Gossweilerodendron balsamiferum*	7	0.02472
Caesalpinioideae	*Hylodendron gabunense*	2	0.00618
Caesalpinioideae	*Oxystigma manni*	2	0.00618
Combretaceae	*Terminalia ivorensis*	8	0.02842
Combretaceae	*Terminalia superba*	6	0.01977
Ebenaceae	*Diospyros crassiflora*	15	0.05067
Ericaceae	*Agauria salicifolia*	1	0.00124
Euphorbiaceae	*Klainedoxa gabonensis*	3	0.01112
Euphorbiaceae	*Ricinodendron africanum*	2	0.00741
Euphorbiaceae	*Uapaca heudelotii*	20	0.0655
Flacourtiaceae	*Homalium spp.*	7	0.02224
Guttiferae	*Allanblackia floribunda*	1	0.00124
Guttiferae	*Mamea Africana*	3	0.00865
Irvingiaceae	*Irvingia gabonensis*	7	0.02472
Lauraceae	*Hypodaphnis zenkeri*	1	0.00371
Lecythidaceae	*Petersianthus macrocarpus*	1	0.00124
Loganiaceae	*Anthocleista djalonensis*	2	0.00494
Meliaceae	*Carapa procera*	15	0.05067
Meliaceae	*Entandrophragma cylindricum*	2	0.00494
Meliaceae	*Guarea thompsonii*	2	0.00741
Meliaceae	*Khaya ivorensis*	1	0.00247
Meliaceae	*Lovoa trichilioides*	1	0.00247
Mimosoideae	*Albizia ferruginea*	3	0.00989
Mimosoideae	*Albizia gumifera*	2	0.00741
Mimosoideae	*Albizia zygia*	3	0.01112
Mimosoideae	*Cylicodiscus gabunensis*	1	0.00124
Mimosoideae	*Parkia bicolor*	2	0.00618

Mimosoideae	*Piptadeniastrum africanum*	3	0.00989
Mimosoideae	*Tetrapleura tetraptera*	1	0.00371
Moraceae	*Antiaris welwitschii*	2	0.00494
Moraceae	*Ficus lutea*	2	0.00741
Moraceae	*Ficus mucuso*	3	0.00989
Moraceae	*Milicia excelsa*	4	0.01359
Moraceae	*Treculia africana*	2	0.00618
Moraceae	*Treculia obovoidea*	1	0.00124
Myristicaceae	*Coelocaryon preussii*	1	0.00247
Myristicaceae	*pycnathus angolensis*	12	0.04202
Myristicaceae	*Staudtia stipitata*	22	0.07662
Ochnaceae	*Lophira alata*	7	0.02348
Olacaceae	*Strombosia pustulata*	4	0.01236
Papilionoideae	*Amphimas pterocarpoides*	3	0.00865
Papilionoideae	*Baphia nitida*	2	0.00494
Papilionoideae	*Pentaclethra mycophylla*	1	0.00124
Papilionoideae	*Pterocarpus osun*	5	0.01607
Papilionoideae	*Pterocarpus soyauxii*	1	0.00124
Rhizophoraceae	*Anopyxis Klaineana*	1	0.00247
Rubiaceae	*Mitragyna stipulosa*	2	0.00741
Rubiaceae	*Nauclea diderrichii*	1	0.00124
Rubiaceae	*Pausinystalia macrocera*	2	0.00494
Simaroubaceae	*Hannoa klaineana*	2	0.00741
Sterculiaceae	*Cola spp*	1	0.00371
Sterculiaceae	*Sterculia oblonga*	12	0.04078
Sterculiaceae	*Triplochiton scleroxylon*	4	0.01483
Ulmaceae	*Celtis zenkeri*	13	0.04572
Verbenaceae	*Vitex gradifolia*	8	0.02719

Source: Field work, Aigbe and Omokhua, 2015

Biodiversity Indices

Summary of the results of various diversity indices for Afi River and Oban Forest Reserve are presented in Table 3. The species richness index were 10.44 and 10.61 for Afi River and Oban Forest Reserves, respectively. The results indicated that Oban Forest Reserve has higher tree species richness than Afi River Forest Reserve. This was collaborated by the result of t – test, which showed that species richness of Oban Forest Reserves was significantly higher than that of Afi River Forest Reserves. The values of the species richness is quite high when compared with the values (7.19-10.64) for Bwindi forest, (4.71-10.51) for Budonga forest, (6.36-8.08) for Kibale forest and (7.54-8.20) for Kasyoha-Kitomi forest, all located in Albertine rift, Uganda (Eilu *et al.,* 2004). Several factors could influence why the present studies has high species richness when compared with other studies from tropical forests. Factors like anthropogenic activities and soil quality. The implication for high species richness for the two forest reserves is that the forest environments are stable, thus there is high likeli-

hood of sustainability if the forests are well managed. The values of Shannon-Wiener diversity index (H^l) for Afi River Forest Reserve and Oban Forest Reserve were 3.827 and 3.795 respectively. The results of t-test revealed a significant difference ($p < 0.05$) in species diversity indices of the two forest reserves, and indicating that Afi River Forest Reserve is significantly ($p < 0.05$) more species diverse than Oban Forest Reserve. Afi River Forest Reserve had a higher diversity index value probably because it is more densely populated. The results of Shannon- Wiener diversity Index in the study area are higher compared to the 2.20–2.65 for the tropical forests of Kodayar in the Western Ghats of southern India (Sundarapandian *et al,* 2000), 2.74 and 1.63 for South Nandi and North Nandi Forest, Kenyan respectively (Gebresellasse, 2011). In Strict Nature Reserve in south western state of Nigeria and Akure Forest Reserve, the values were 3.74 (Adekunle *et al.,* 2013a) and 3.037/3.16 (Adekunle *et al.,* 2013b) respectively. While in some other tropical rainforest sites in southern Nigeria the values range between 3.34-3.66 as reported for by Adekunle (2006) and Adekunle and Olagoke (2008). The difference in species diversity in other tropical forest communities from this present study area could be attributed to anthropogenic activities, soil factor, sample plot sizes and ecological sub region.

The evenness of species in Afi River forest reserve is 0.907 while that of Oban forest reserve is 0.887. The t – test calculated shows that there is no significant difference ($p > 0.05$) between evenness indices in Afi River and Oban Forest Reserves (Table 3). The Simpson's Indices (D) obtained was 0.029 ($D^{-1} = 34.48$) for Afi River Forest Reserve and 0.030 ($D^{-1} = 33.33$) for Oban Forest Reserve. The values obtained for both forest reserves indicate high species diversity. And this is quite high when compare with the values of Simpson's Indices (17.43-18.41) in Abeku sector of Omo Forest Reserve, Nigeria and much more higher than the value of 0.1, as reported in lowland rainforest of Los Tuxtlas, Mexico by Bongers *et al.,* (1988).

Table 3: Summary of the Various Diversity indices computed for Afi River and Oban   Forest Reserves

Characteristic	Afi River Forest Reserve	Oban Forest Reserve
Species Richness (d)	10.444[b]	10.605[a]
Shannon Wiener Index (H^l)	3.827[a]	3.795[b]
Evenness Index (E)	0.907[a]	0.887[a]
Simpson's Index (D)	0.029[a]	0.030[a]

Means followed by different superscripts are significantly different at 0.05 level of significance. Source: Field Work, (Aigbe *et al*,

2014; Aigbe and Omokhua, 2015)

Species Similarity Index

As shown in Table 4, the Sorenson's similarity index of the floristic comparison between Afi River and Oban Forest Reserve is 84%. This value indicates that there is little variation in the species composition of the two forest reserves. This implies that about 84% of the species in the two reserves are similar, which means that Afi River Forest Reserve and Oban Forest Reserve have very high floristic similarity. It has been shown that the higher the species similarity index values, the lower the variation in the species composition of two forest communities. The similarity of species in Afi River and Oban Forest Reserves is higher than what was reported for some tropical rainforest ecosystems in Nigeria. For example, Onyekwelu *et al.* (2008) reported lower species similarity indices of 63.4%, 58.3% and 47.4% between Queen's and Elephant forests, Queen's and Oluwa forests, Oluwa and Elephant forests, respectively in tropical rainforest ecosystems of southwestern Nigeria. Also, Gebreselasse (2011) reported similarity indices range of 25% to 39% for some tropical forest ecosystems in Kenya, which are lower than the results of present study.

Table 4: Sorenson's Index of Afi River and Oban Group forest reserves

Site	Afi Forest	Oban Forest
Afi Forest	-	0.84
Oban Forest	0.84	-

Conclusion

Afi River and Oban Forest Reserves are not only important in terms of plant biodiversity but they are also important destination point for rich timber resources. The commonest timber species in Afi River Forest Reserve are *Pycnathus angolensis, Staudtia stipitata, Brachystegia eurycoma, Albizia zygia* while in Oban Forest Reserve, the commonest tree species are *Staudtia stipitata, Uapaca heudelotii, Carapa procera,* and *Diospyros crassiflora.* Coincidentally, the presence of *Thaumatococcus danielli, Musanga cecropioides* and *Aframomum latifolium* in the study area, especially Oban Forest Reserve, is an indication that the vegetation has been disturbed in the recent past. However, there are strong signs of recovery in both reserves. Some tree species unique to Afi River Forest Reserve are *Monodora myristica, Alstonia congensis, Baillonella toxisperma.* While in Oban Forest Reserve, the unique species are *Pachypodathium staudtii, Lannea welwitschii, Canarium schweinfurthii, Aguaria Salicifolia, Petersianthus macrocarpus, Anthocleista djalonensis, Guarea thompsonii.*The floristic similarity between the two forest reserves was high judging from the high (84%) Sorenson's similarity indices. The species diversity of the two for-

est reserves was quite high, the implication is that, the biodiversity status is of high conservation value. The species richness shows high number of individual species.

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