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MORPHOLOGICAL STRUCTURE, DIVERSITY AND ABUNDANCE OF TREE SPECIES IN OWO FOREST RESERVE, NIGERIA

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ABSTRACT

Diversity, structure and abundance of tree species at Owo Forest Reserve were established in this study. A hectare was demarcated at well stocked portion of the forest. All living plants within the demarcated area were identified and enumerated. Tree species > 10cm Dbh were also measured. Total of 864 trees belonging to 79 species and 31 families were recorded. The forest is dominated by Caesalpiniaceae, Sapindaceae, Ebenaceae, Sterculiaceae, Papilionaceae, Lecythidaceae and Anacardiaceae. Total basal area and tree volume obtained were 104.35m^2ha^{-1} and 162.47m^3ha^{-1} respectively. The diversity indices are an indication of lesser diverse ecosystem. Shannon-weiner index, evenness, Simpson index, Margalef, Hill 1 and Hill 2 indicies were found to be 3.08, 1.38, 1.05, 8.36, 30.89 and 74.41 respectively. This study provided a baseline for the management of tropical rainforest in Southwestern Nigeria.

Keywords: Species richness; diversity; evenness; high rainforest

INTRODUCTION

Deforestation in Nigeria is mainly caused by agricultural expansion, forest encroachment, over-exploitation, bush burning, illegal harvesting, heavy demand of wood for construction and other purposes by the wood-based industries encouraged logging which led to large scale deforestation of our forest (Onyekwelu and Fuwape, 2008; Popoola, 2008). Other factors include the non-forest policies particularly, energy policies, which have continually, posed a grievous threat to the forestry subsector (Popoola, 2004). By the turn of the 21st Century, the Federal Department of Forestry (FDF) in 2001 estimated the annual rate of forest depletion to be as high as 3.5%. Over 70% of the reserves in Nigeria are open tree savanna while the remaining 30% are closed forests. The lowland tropical rainforest ecosystem is small, occupying only 9.7% (95,372 km^2) of the country's land mass. Only about 2.0% of the lowland tropical rainforest ecosystem has been constituted as forest reserves. The rainforest ecological zone is the most densely populated area of Nigeria and the main source of timber for both local consumption and export, probably because of the large concentration of important timber species found in them. The dominant tree species include members of such families as Sterculiaceae (*Cola* spp, and *Sterculia* spp), Moraceae (*Antiaris africana* and *Ficus* spp), Ulmaceae (*Celtis* spp, and *Holoptelea grandis*), Meliaceae (*Entandrophragma* spp and *Khaya ivorensis*), Euphorbiaceae (*Bridelia* spp, *Drypetes* spp and *Ricinodendron* spp) and species like *Nauclea diderrichi, Erythrophleum ivorense,*

Brachystegia eurycoma, Terminalia ivorensis, Diospyros ssuaveolens, Napoleona vogalii and *Stombosia pustulata* (Richards, 1939; Isichie, 1995; Adekunle and Olagoke, 2007; Onyekwelu and Fuwape, 2008; Salami, 2017; Salami and Akinyele, 2018b). The knowledge of the floristic composition and structure will enhance future conservation and other land use planning efforts. It will further enhance the sustainable utilization of the resources therein (Ojo, 1998; Akinyemi *et al*., 2002). Oduwaye *et al*., (2002) reported that most of the preserved forest areas are being vandalized at alarming rate which resulted to the removal of valuable tree species through illegal means. This study was, therefore designed to explain composition and diversity components of tree species in a 1-ha plot at Owo Forest Reserve, in Ondo State.

MATERIALS AND METHODS

The Study Area

Owo Forest reserve is located between latitudes 6˚ 57' and 6° 59' N and longitudes 5° 34' and 5° 38' E in the northern part of Ondo State. Study area is located in Southwest Nigeria, lowland rainforest zone. The state is an agrarian state this encourage encroachment of farmers into the reserve. The climate is humid sub-tropical indicating that it is basically within the tropical rainforest zone which is dominated by broadleaved hardwood trees that form dense layered stands. Characteristic of the study site is two distinct seasons (rainy and dry seasons), with frequent rainfall that normally starts in March and ends in November. The annual rainfall ranges from 1,700 to 2,200 mm. The dry season is experienced from December to February. Mean annual temperature falls between 26^0C and 28^0C while the average daily humidity is 80%. The soils are predominantly ferruginous tropical soils and are typical of the variety found in the intensively weathered areas of basement complex formations in the rainforest zone of Southwest in Nigeria (Onyekwelu *et al*., 2005).

Sampling and Data Collection

Data were collected in the year 2009 using systematic sampling design (Systematic line transect) for the laying of plots at the centre of the forest. One transect was laid at the well-stocked portion located at the centre of the forest, this was done to avoid age differences. Sample plots of equal size (50 × 50m) were laid in alternate direction along transect at 250m interval and thus summing up to 4 sample plots. Using this method ensured that the forest is relatively covered. Measurement and identification of all woody plants with dbh of 10cm and above was carried out. The botanical name of every living tree that encountered in each sample plot was recorded for the study site. Where a tree's botanical name is not known immediately, such a tree was identified by its commercial or local name and later translated to correct botanical names using Gbile (1984) and Keay (1989). Trees that could not be identified were tagged 'unknown'. Specimens of such unknown trees were collected and preserved and taken to Forestry Herbarium, Ibadan (FHI) of the Forestry Research Institute of Nigeria for their identification. Each tree species recorded individually in the field forms and possible effort was made not to omit any eligible stem in a sample plot. This is because any species omitted was indicated the absence of such species in the ecosystem.

Data Analysis

The data obtained were analyzed with the aid of statistical package for social sciences (SPSS) version 18.

Basal area calculation

The basal area of all trees in the sample plots was calculated using the formula

$$BA = \frac{\pi D^2}{4} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

Where BA = Basal area (m^2), D = Diameter at breast height (cm) and $\pi = 3.142$.
The total basal area for each of the sample plots were obtained by adding the BA of all trees in the plot while mean BA for the plot (*BAp*) was obtained by dividing the total BA by the number of sample plots. Basal area per hectare was obtained by multiplying mean basal per plot with the number of 50 × 50m plots in a hectare.

$$BAha^{-1} = BAp\, X\, 4 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2)$$

Where $BAha^{-1}$ = Basal area per hectare

Volume Computation

The volume of individual trees was estimated using the equation developed for tree volume estimation in lowland rainforest ecosystem of South-west Nigeria by FORMECU (1999). This equation is expressed as follows:

$$V = e^{-8.433+2.331Ln(D)} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3)$$

Where V = Volume of tree (m^3) and D = dbh (m).

Total plot volume was obtained by adding the volume of individual trees encountered in the plots. Mean volume for sample plots was calculated by dividing the total plot by the number of sample plots. Volume per hectare was obtained by multiplying mean volume per plot *V P* with the number of 50×50 m plots in a hectare.

Tree Species Classification and Diversity Indices

All the trees encountered were assigned to families and number of species in each family was obtained for tree species diversity classification. Frequency of occurrence was obtained for species abundance/ richness. This was repeated for all plants encountered in the sample plots for the site. The following biodiversity indices were used to obtain tree species richness and evenness within the forest. They were used as indices for comparing biodiversity as indication of biodiversity loss. Species relative density (RD) number of individuals per hectare was obtained using the formula given by Oduwaiye *et al.*, (2002):

$$RD = \left[\frac{n_i}{N}\right] \times 100 \quad \ldots\ldots (4)$$

Where RD = relative density, n_i = number of individuals of species i and N = total number of individuals in the entire population.

Species diversity is the number of different species in a particular area. This was obtained using a mathematical formula that takes into account the species richness and abundance of each species in the ecological community. The equation for the Shannon-Wiener diversity index given by Price (1997) was used:

$$H^1 = \sum_{i=1}^{S} p_i \, Lnp_i \quad \ldots\ldots (5)$$

H^1 is the Shannon diversity index, S is the total number of species in the community, p_i is the proportion of a species to the total number of plants in the community and Ln is the natural logarithm

Species evenness (E) measures the distribution of the number of individual in each species. It was determined using Shannon's equitability (E_H) as stated by Kent and Coker (1992):

$$E = \frac{H^1}{Ln(S)} \quad \ldots\ldots (6)$$

S is the total number of species in each community.

Margale f's index of species richness (M)

$$M = \frac{(S-1)}{Ln(N)} \quad \ldots\ldots (7)$$

Simpson concentration (λ) index

$$\lambda = \sum \quad (\frac{ni}{Ni})\text{^}2 \quad \ldots\ldots (8)$$

Number 1 of Hill diversity index (N1) = e^H ……..(9)

Number 2 of Hill diversity index (N2) = $1/\lambda$ …… (10)

RESULTS

Table 1: Tree growth variables obtained at the study area

Variables	Value
Total basal area (m^2)/ha	104.35
Total volume (m^3)/ha	162.47
Mean Dbh (m)	0.39
Mean basal area (m^2)	0.12
Mean volume (m^3)	2.05
No of stems per hectare	864
No of species per hectare	79
No of family per hectare	31

Table 2: Diameter distribution of trees into diameter class

Diameter class (cm)	Frequency/ha	%/ha
10-20	142	16.43
21-30	136	15.74
31-40	79	9.14
41-50	51	5.92
51-60	93	10.76
61-70	99	11.45
71-80	80	9.25
81-90	64	7.43
91-100	42	4.86
>100	78	9.02
Total	864	100

Table 3: Diversity indexes obtained at the study area

Indices	Value
Shannon-weiner diversity index	3.08
Evenness	1.38
Simpson diversity index	1.05
Margelef's index	8.36
Hill 1 diversity index	30.89
Hill 2 diversity index	74.41

Table 4: Tree species diversity obtained at Owo Forest Reserve Southwest Nigeria

SPECIES	Family	Freq	RD	H-index	Evenness	S index	M Index	Hill 1	Hill 2
Alchornea laxiflora	*Euphorbiaceae*	15	1.7361111	0.05475	0.0202009	0.01336	0.13349	0.40739	0.82501
Anthonotha macrophylla	*Caesalpiniaceae*	2	0.2314818	0.01067	0.0153598	0.01336	0.05251	0.36096	1.14082
Antiaris Africana	*Moraceae*	12	1.3888889	0.04592	0.0185084	0.01336	0.118382	0.397974	0.882729
Baphia nitida	*Papilionaceae*	31	3.587963	0.094335	0.0274709	0.013396	0.202567	0.450883	0.587869
Beilschmiedia mannii	*Lauraceae*	11	1.2731482	0.042955	0.0179138	0.013396	0.113108	0.394737	0.903334
Bombax spp	*Bombacaceae*	8	0.9259259	0.03336	0.0160426	0.013396	0.096249	0.384573	0.970289
Brachystegia eurycoma	*Caesalpiniaceae*	84	9.7222222	0.185955	0.0419685	0.013396	0.383493	0.558596	0.160202
Brachystegia nigerica	*Caesalpiniaceae*	15	1.7361111	0.054705	0.0202009	0.013396	0.133439	0.407319	0.825081
Caesaria spp	*Samydaceae*	3	0.3472222	0.014958	0.0136153	0.013396	0.061711	0.365357	1.107052
Ceiba pentandra	*Bombacaceae*	4	0.462963	0.018987	0.0136959	0.013396	0.069735	0.369533	1.076121
Ceiltis Zenkeri	*Ulmaceae*	2	0.2314815	0.010647	0.0153598	0.013396	0.052521	0.360906	1.140802
Celtis mildbraedii	*Ulmaceae*	5	0.5787037	0.022805	0.0141695	0.013396	0.077024	0.373507	1.047328
Chassalia kully	*Rubiaceae*	4	0.462963	0.018987	0.0136959	0.013396	0.069735	0.369533	1.076121
Cleistopholis patens	*Annonaceae*	2	0.2314815	0.010647	0.0153598	0.013396	0.052521	0.360906	1.140802
Cnestis ferrugenia	*Connaraceae*	6	0.6944444	0.026456	0.0147653	0.013396	0.083796	0.377321	1.020263
Cola gigantean	*Sterculiaceae*	5	0.5787037	0.022805	0.0141695	0.013396	0.077024	0.373507	1.047328
Cola hispida	*Sterculiaceae*	30	3.4722222	0.09211	0.0270817	0.013396	0.198605	0.448391	0.600198
Cola milenii	*Sterculiaceae*	5	0.5787037	0.022805	0.0141695	0.013396	0.077024	0.373507	1.047328
Cola spp	*Sterculiaceae*	6	0.6944444	0.026456	0.0147653	0.013396	0.083796	0.377321	1.020263
Cordia milenii	*Boraginaceae*	5	0.5787037	0.022805	0.0141695	0.013396	0.077024	0.373507	1.047328
Culcasia spp	*Araceae*	5	0.5787037	0.022805	0.0141695	0.013396	0.077024	0.373507	1.047328
Cuviera acutiflora	*Rubiaceae*	10	1.1574074	0.039843	0.0173037	0.013396	0.107679	0.391429	0.924739
Dalbergia spp	*Papilionaceae*	5	0.5787037	0.022805	0.0141695	0.013396	0.077024	0.373507	1.047328
Dialium guineense	*Caesalpiniaceae*	14	1.6203704	0.051862	0.0196515	0.013396	0.128533	0.40426	0.843656
Dichapetalum barteri	*Dichaptaliaceae*	11	1.2731482	0.042955	0.0179138	0.013396	0.113108	0.394737	0.903334
Dichapetalum spp	*Dichapetaliaceae*	5	0.5787037	0.022805	0.0141695	0.013396	0.077024	0.373507	1.047328
Diospyros barteri	*Ebenaceae*	40	4.6296296	0.11324	0.0306977	0.013396	0.236847	0.472293	0.487328
Diospyros dendo	*Ebenaceae*	4	0.462963	0.018987	0.0136959	0.013396	0.069735	0.369533	1.076121
Diospyros mobutensis	*Ebenaceae*	34	3.9351852	0.100851	0.0285992	0.013396	0.214254	0.458216	0.552375
Diospyros nigerica	*Ebenaceae*	15	1.7361111	0.054705	0.0202009	0.013396	0.133439	0.407319	0.825081
Diospyros spp	*Ebenaceae*	16	1.8518519	0.057493	0.0207362	0.013396	0.138246	0.410326	0.807086
Drypetes spp	*Euphorbiaceae*	16	1.8518519	0.057493	0.0207362	0.013396	0.138246	0.410326	0.807086

Drypetes spp	*Euphorbiaceae*	16	1.8518519	0.057493	0.0207362	0.013396	0.138246	0.410326	0.807086
Hexalobus spp	*Annonaceae*	5	0.5787037	0.022805	0.0141695	0.013396	0.077024	0.373507	1.047328
Hildagedia barteri	*Sterculiaceae*	20	2.3148148	0.068153	0.0227501	0.013396	0.156651	0.421905	0.740200
Holoptelia grandis	*Ulmaceae*	10	1.1574074	0.039843	0.0173037	0.013396	0.107679	0.391429	0.924739
Hylodendron gabonensis	*Caesalpiniaceae*	5	0.5787037	0.022805	0.0141695	0.013396	0.077024	0.373507	1.047328
Keetia venosum	*Rubiaceae*	6	0.6944444	0.026456	0.0147653	0.013396	0.083796	0.377321	1.020263
Lagastromia speciota	*Letheraceae*	8	0.9259259	0.03336	0.0160426	0.013396	0.096249	0.384573	0.970289
Lannea welwitschii	*Anacardiaceae*	18	2.0833333	0.062916	0.0217673	0.013396	0.147599	0.416201	0.772688
Lecaniodiscus cupanioides	*Sapindaceae*	57	6.5972222	0.144572	0.0357581	0.013396	0.296675	0.508698	0.335804
Lonchocarpus spp	*Fabaceae*	5	0.5787037	0.022805	0.0141695	0.013396	0.077024	0.373507	1.047328
Makhamia tomentosa	*Bignonaceae*	6	0.6944444	0.026456	0.0147653	0.013396	0.083796	0.377321	1.020263
Malacantha alnifolia	*Sapotaceae*	4	0.462963	0.018987	0.0136959	0.013396	0.069735	0.369533	1.076121
Mallotus oppositifolis	*Euphorbiaceae*	9	1.0416667	0.036648	0.0166791	0.013396	0.102069	0.388044	0.947025
Mallotus sobulathus	*Euphorbiaceae*	9	1.0416667	0.036648	0.0166791	0.013396	0.102069	0.388044	0.947025
Manikara alnifolia	*Sapotaceae*	16	1.8518519	0.057493	0.0207362	0.013396	0.138246	0.410326	0.807086
Markhama tomentosa	*Bignonaceae*	5	0.5787037	0.022805	0.0141695	0.013396	0.077024	0.373507	1.047328
Memocylon Blakeioides	*Melastomataceae*	15	1.7361111	0.054705	0.0202009	0.013396	0.133439	0.407319	0.825081
Microdesmis puberula	*Euphorbiaceae*	16	1.8518519	0.057493	0.0207362	0.013396	0.138246	0.410326	0.807086
Monodora spp	*Annonaceae*	12	1.3888889	0.045992	0.0185084	0.013396	0.118382	0.397974	0.882729
Monodora tenuifolia	*Annonaceae*	16	1.8518519	0.057493	0.0207362	0.013396	0.138246	0.410326	0.807086
Napoleona imperialis	*Lecythidaceae*	22	2.5462963	0.073224	0.0236891	0.013396	0.165443	0.427458	0.709413
Napoleona vogelii	*Lecythidaceae*	4	0.462963	0.018987	0.0136959	0.013396	0.069735	0.369533	1.076121
Newbouldia leavis	*Bignonaceae*	4	0.462963	0.018987	0.0136959	0.013396	0.069735	0.369533	1.076121
Octolobus angusifolia	*Sterculiaceae*	4	0.462963	0.018987	0.0136959	0.013396	0.069735	0.369533	1.076121
Oxyanthus spp	*Rubiaceae*	6	0.6944444	0.026456	0.0147653	0.013396	0.083796	0.377321	1.020263
Pauridiantha hirtelia	*Rubiaceae*	16	1.8518519	0.057493	0.0207362	0.013396	0.138246	0.410326	0.807086
Pavetta corymbosa	*Rubiaceae*	3	0.3472222	0.014958	0.0136153	0.013396	0.061711	0.365357	1.107052
Pavette spp	*Rubiaceae*	2	0.2314815	0.010647	0.0153598	0.013396	0.052521	0.360906	1.140802
Picralima nitida	*Apocynaceae*	7	0.8101852	0.029967	0.0154002	0.013396	0.090177	0.381003	0.994651
Polyalthia suaveolens	*Annonaceae*	5	0.5787037	0.022805	0.0141695	0.013396	0.077024	0.373507	1.047328
Pterigota macrocarpa	*Sterculiaceae*	16	1.8518519	0.057493	0.0207362	0.013396	0.138246	0.410326	0.807086
Ricinodendron heudelotii	*Euphorbiaceae*	4	0.462963	0.018987	0.0136959	0.013396	0.069735	0.369533	1.076121
Rinorea spp	*Violaceae*	7	0.8101852	0.029967	0.0154002	0.013396	0.090177	0.381003	0.994651
Rothmannia hispida	*Rubiaceae*	6	0.6944444	0.026456	0.0147653	0.013396	0.083796	0.377321	1.020263
Rothmannia spp	*Rubiaceae*	7	0.8101852	0.029967	0.0154002	0.013396	0.090177	0.381003	0.994651

Rothmannia whitfieldii	*Rubiaceae*	8	0.9259259	0.03336	0.0160426	0.013396	0.096249	0.384573	0.970289
Rythigynia spp	*Rubiaceae*	4	0.462963	0.018987	0.0136959	0.013396	0.069735	0.369533	1.076121
Salacia pallescens	*Celastraceae*	5	0.5787037	0.022805	0.0141695	0.013396	0.077024	0.373507	1.047328
Spathodea companulata	*Bignonaceae*	6	0.6944444	0.026456	0.0147653	0.013396	0.083796	0.377321	1.020263
Sphenocentrum jollyanum	*Menispermaceae*	11	1.2731482	0.042955	0.0179138	0.013396	0.113108	0.394737	0.903334
Stanchia spitilatha	*Myristicaceae*	7	0.8101852	0.029967	0.0154002	0.013396	0.090177	0.381003	0.994651
Sterculia tragacantha	*Sterculiaceae*	7	0.8101852	0.029967	0.0154002	0.013396	0.090177	0.381003	0.994651
Trichilia heudelothi	*Meliaceae*	2	0.2314815	0.010647	0.0153598	0.013396	0.052521	0.360906	1.140802
Trichilia prieureana	*Meliaceae*	3	0.3472222	0.014958	0.0136153	0.013396	0.061711	0.365357	1.107052
Uvaria spp	*Annonaceae*	3	0.3472222	0.014958	0.0136153	0.013396	0.061711	0.365357	1.107052
Vitex grandifolia	*Verbalaceae*	5	0.5787037	0.022805	0.0141695	0.013396	0.077024	0.373507	1.047328
Xylopia spp	*Annonaceae*	2	0.2314815	0.010647	0.0153598	0.013396	0.052521	0.360906	1.140802
TOTAL		864	100	3.088777	1.381592	1.058278	8.360104	30.89962	74.41239

DISCUSSION

Tropical forests are often referred to as one the most species diverse terrestrial ecosystems and generate a variety of natural resources to help sustain the livelihood of local communities (Kumar *et al.,* 2006). The results of this study revealed that Owo Forest Reserve is a repository of many indigenous tropical hardwood tree species in different families. The total basal (m^2/ha) area volume (m^3/ha) of the species was reported to be 104.35m^2/ha and 162.47m^3/ha, respectively. The mean Dbh and volume were 0.39 (m) and 2.05m^3 with total of 864 stems/ha belonging to 79 species and 31 families respectively. The floristic distribution of this forest was found to be relatively high. This is a pointer to the fact that this forest can still recover its primary genetic resources if properly monitored. However, the genetic resources were relatively high compared with values obtained in a degraded Gambari Forest Reserve in South western Nigeria (Nurudeen *et al.,* 2017; Salami and Akinyele, 2018a). Aigbe *et al.,* reported 387 stems ha^{-1} in Strict Nature Reserve (SNR) of Akure forest, Nigeria. Lu *et al.,* (2010) obtained a total of 105 species that belong to 32 families in the evergreen forest of Andaman Giant, India. An average stands density of 422 stems/ha was reported for Borneo rainforest by small *et al.,* (2005). In a Mexican tropical deciduous forest, 347 stem/ha in 148 species distributed among 42 families were reported (Duran *et al.,* 2006). The diameter classes show a forest whose population structure is tending towards stability as trees were found across all the diameter classes. A total of 864 trees representing 79 species and 311 families were identified from the study area. Caesalpiniaceae was the dominant family in the forest with *Brachystegia eurycoma* as its highest species, followed by Sapindaceae, Ebenaceae, Sterculiaceae, Papilionaceae, Lecythidacaceae and Anarcardiaceae. The family of Euphorbiaceae, Moraceae, Dichaptaliaceae, Rubiaceae, Lauraceae Bombacaceae, Menispermaceae, Bignonaceae Melastomataceae were equally noteworthy. Ebanaceae and Rubiaceae were among the families that Ojo (2004) to forming 86% of the Abeku sector of Omo Forest Reserve. The preponderance of species in family with high diversity in Owo Forest Reserve may be due to their methods of seed dispersal. Soladoye *et al.,* (2005) also observed that dispersal mechanisms play a strong role in addition to climatic conditions and soil types in the preponderance of species of Rubiaceae on the Olabisi Onabanjo University permanent site. This finding is in accordance with the findings of Adekunle *et al.* (2010), Onyekwelu *et al.,* (2008) that tropical rainforest ecosystem of southwest Nigeria is dominated by these set of tree species and families. 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). Biodiversity indices are generated to bring the diversity and abundance of species in different habitats to similar scale for comparison and the higher the value, the greater the species richness (IIRS, 2002 a and b). The very high values of the diversity indices revealed a forest with very high tree species diversity and abundance. The Shannon-weiner, evenness, Simpson concentration, Margelef's index and number 1 and 2 of Hill diversity indices recorded for Owo Forest Reserve compared favorably within the range reported by Rao *et al*., (2011) in their findings they observed Shannon diversity index ranged between 2.94 – 3.96 for sacred grooves in southeastern ghats, India. Duran *et al.,* (2006) recorded Shannon index that ranged from 2.69 to 3.33 which indicated a less diverse ecosystem. The Shannon index recorded for this study (3.08) is an indication of a lesser diverse ecosystem. The reason

for this is not farfetched; Owo Forest Reserve is a disturbed forest that is affected by anthropogenic activities of human interference as a result of illegal felling of trees, deforestation and conversion of forest to arable crop land. The evenness index, Simpson index and Margalef's index were found to be 1.38, 1.05 and 8.36 respectively. The Margalef's index which is an indication of species richness obtained in this study was lower compare with the value obtained by Aigbe *et al.*, (2014) in Afi river Forest Reserve in Cross River, Nigeria. In their study, they reported Margalef's index of 10.44 as an indication of high species richness. The value also competes favourably with the range obtained by Eilu *et al.* (2004) which ranged between 7.19-10.64 for Bwindi Forest and 7.54-8.20 for Kasyoha-kitomi Forest all located in Albertine rift Uganda. Though, the Simpson index recorded for this study (1.05) is an indication of high diverse ecosystem. The Hill 1 and 2 index values were 30.89 and 74.41 respectively. These values were reported to be higher than the one recorded by Adekunle *et al*. (2013) for Strict Nature Reserve in Akure Southwestern Nigeria.

CONCLUSION

Tree species diversity and abundance of tropical rainforest ecosystem in South west Nigeria was investigated. Total of 864 stems belonging to 79 species and 31 families were recorded at Owo Forest Reserve. The diversity indices obtained in this study showed a lesser diverse ecosystem. The diameter distribution as revealed by diameter class show a forest whose population structure is tending towards stability as trees were found across all diameter classes. The present status of Owo vegetation and the continuous pressure on it as a result of population growth call for urgent conservation efforts that will prevent the total collapse of the ecosystem. Nigeria must move toward attaining the 20% forest cover for the country as specified in the forest policy. To achieve this, all the existing forest reserves in the country should be re-surveyed and the boundaries properly demarcated. Exploitation of trees below the merchantable size (≥48 cm) specified by forest policy should be prevented in totality. Even when trees are removed, it should be done in a way to preserve the residual trees and the forest ecosystem.

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