

Flora Diversity of Urhonigbe Forest Reserve, Edo State, Nigeria

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Abstract Urhonigbe Forest Reserve is located in Edo State, Nigeria. The study area was conveniently divided into three sample areas (X, Y and Z). Each sample area had four sampling plots, each measuring 50 m x 50 m. nine quadrants were laid in a plot to sample for plant species. One hundred and sixty (160) plant species, belonging fifty six families and one hundred and thirty eight genera were identified. Their habits vary from trees, shrubs, herbs, sedges, grasses to climbers. Tree species contributed to 53.75% of the total plant species obtained in Urhonigbe Forest Reserve. This was followed by shrubs (25.63%), herbs (10.63%), climbers (7.50%), grasses (1.88%) and sedge (0.63%). The trees were the most represented whereas, the sedge was the least. Fabaceae was the most dominant plant family having fourteen species which accounted for 8.75% of the total plant species sampled in the fields. Also, Rubiaceae and Euphorbiaceae had by twelve species each and contributed 15% of the total plant species enumerated in the fields. Others include Apocynaceae and Meliaceae with nine species each contributed 11.25%; Annonaceae, Ebenaceae, Sapindaceae and Tiliaceae with five species each accounted 12.50%. Icacinaceae, Sterculiaceae, Ulmaceae with four species each contributed 7.5%, while Piperaceae, Poaceae, Araceae, Menispermaceae, Commelinaceae, Palmaceae, Moraceae and Myristicaceae with three species each accounted for 15%. Rutaceae, Veberaceae, Convolvulaceae, Clausiaceae, Irvingiaceae, Connaraceae, Burseraceae, Capparaceae, Combretaceae and Maranthaceae with two species each contributed 12.50%, while Anacardiaceae and the other families with one species each accounted for 17.50%.

Keywords Flora, Diversity, Forest reserve

1. Introduction

Biological diversity has taken the centre stage in the field of science as a result of the rate of exploitation of our natural resources. Biodiversity is the relationship between species and their pattern of richness (Young and Swiacki, 2006). Diversity is also a measure of heterogeneity of a site taking into consideration the number and density of individual species (Ogunleye et al., 2004). Forest diversity is increasingly threatened as a result of deforestation, fragmentation, climate change and other stressors. The rich flora diversity of plant species is a major source of raw plant materials that enable sustainability in the human communities now and in the future (Ogie-Odia et al., 2010).

Plant diversity could affect food web connectivity in a variety of ways (Gross et al. 2009; O'Gorman & Emmerson 2009). Higher plant diversity increases plant productivity and predator abundance (Haddad et al., 2009), which increases the amount of energy transfer among interacting

species and thus increases food web connectivity. Few forest reserves have positive flora and fauna diversity where as many forest reserves diversity have been affected through anthropogenic and natural factors (Stock, 2007).

2. Materials and Methods

Sampling Technique

The study area was conveniently divided into three sample areas (X, Y and Z) based on the varying degrees of human interference. Each sample area had four fields, each measuring 50m x 50m. In a field, nine quadrats each measuring 10m x 10m giving total of one hundred and eight (108) sample units for the three sample areas were used. Sample area X represented Forest Re-Growth Area (FRA), while Y was Restricted Forest Area (RFA) and Z, Strictly Restricted Forest Area (SRFA).

In a field, line transects were cut diagonally and five (5) quadrats were laid along each diagonal leaving 2m at each edge to minimize edge effect. The distance between one quadrat (sample unit) and the other was 4m. The third quadrat at the centre was common to both diagonals. Sampling along the diagonals at close spacing ensured adequate coverage of the fields. A total area of 30,000m² was

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sampled in the three sample areas. Plants encountered during surveys were collected. Some plant species were identified in the field while useful parts such as plant exudes (gums, resins) and leaves, preserved and taken to the laboratory to ease identification; besides the plants, their seeds, flowers, and barks were collected.

3. Results

One hundred and sixty plant species, belonging fifty six families and one hundred and thirty eight genera were identified. The family Fabaceae had fourteen species and contributed 8.75% of the total plant species encountered. Also, Rubiaceae and Euphorbiaceae were represented by twelve

species and contributed 15% of the total plant species enumerated in the fields. Others include Apocynaceae and Meliaceae with nine species each contributing 11.25%; Annonaceae, Ebenaceae, Sapindaceae and Tiliaceae with five species each contributed 12.50%. Icacinaceae, Sterculiaceae, Ulmaceae with four species each contributed 7.50%, while Piperaceae, Poaceae, Araceae, Menispermaceae, Commelinaceae, Palmaceae, Moraceae and Myristicaceae with three species each accounted for 15%. Rutaceae, Vebenaceae, Convolvulaceae, Clausiaceae, Connaraceae, Irvingiaceae, Burseraceae, Capparaceae, Combretaceae and Maranthaceae with two species each contributed 12.50%, while Anacardiaceae and the other families with one species each accounted.

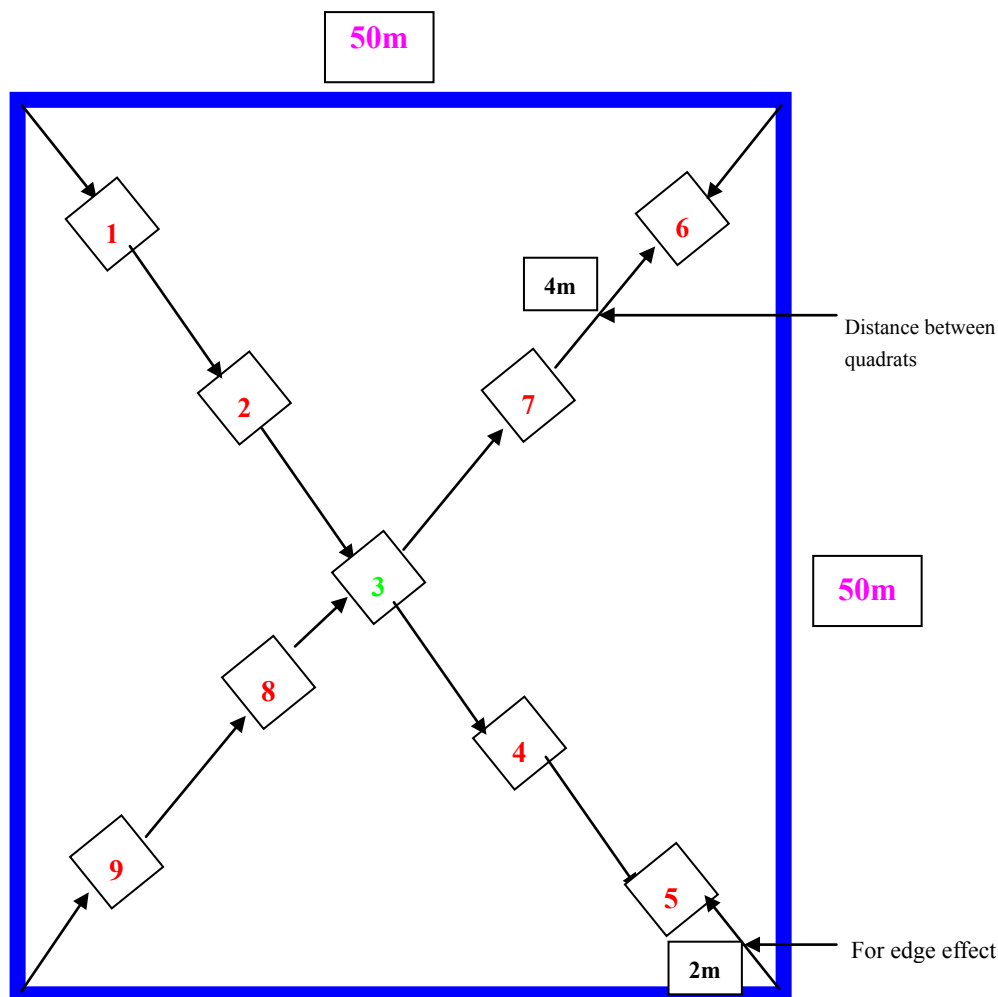


Figure 1. Schematic diagram of plant survey technique

Table 1. Plant families, scientific names and habits of plant species encountered in Urhonigbe Forest Reserve

Families	Scientific name	Number of species	Habit
Agavaceae	<i>Dracaena desistelina</i> Vand ex L.	2	Shrub
Agavaceae	<i>Dracaena mannii</i> Bax		Shrub
Amaranthaceae	<i>Cyatula protrata</i> (L.) Blume	1	Herb
Anacardiaceae	<i>Anacardium occidentale</i> L.	1	Tree
Annonaceae	<i>Anonidium mannii</i> (Oliv.) Engl. & Diels	5	Tree
Annonaceae	<i>Cleistopholis patens</i> (Benth.) Engl. & Diels.		Tree
Annonaceae	<i>Enantia chlorantha</i> Oliv.		Tree
Annonaceae	<i>Monodora tenuifolia</i> Benth.		Tree
Annonaceae	<i>Polyalthia suaveolens</i> Engl. & Diels		Tree
Apocynaceae	<i>Picralima nitida</i> (Staphf.)	9	Tree
Apocynaceae	<i>Funtumia elastica</i> (Preuss) Stapf.		Tree
Apocynaceae	<i>Voacanga africana</i> Stapf.		Tree
Apocynaceae	<i>Tabernaemontana pachysiphon</i> Stapf		Tree
Apocynaceae	<i>Hunteria umbellata</i> (K.Schum) Hallier.F.		Tree
Apocynaceae	<i>Alstonia boonei</i> De Wild.		Tree
Apocynaceae	<i>Mezoneuron benthamiana</i> Baill.		Tree
Apocynaceae	<i>Camerunia penduliflora</i> (K. Schum.) Boiteau		Shrub
Apocynaceae	<i>Rauwolfia vomitoria</i> Afzel		Shrub
Araceae	<i>Culcacia saxatilis</i> A.Chev. s A.Chev. A.Chev.	3	Herb
Araceae	<i>Nephtytis poisonii</i> (Engl.). N.E.Br		Herb
Araceae	<i>Cercetis camerunensis</i> (Ntepe-Nyame) Bogner		Climber
Arecaceae	<i>Colocasia esculenta</i> L.	1	Herb
Asteraceae	<i>Aspilia Africana</i> (Pers.) C.D. Adams.	1	Herb
Asteraceae	<i>Chromolaena odorata</i> (L.) King & Robinson	1	Shrub
Bigoniaceae	<i>Newbouldia leavis</i> (P.Beauv.) (P.Beauv.)	1	Tree
Bolanophoraceae	<i>Thonningia sanguinea</i> Vahl.	1	Shrub
Bombacaceae	<i>Bombax buonopozense</i> P.Beauv.	1	Tree
Burseraceae	<i>Santeria trimera</i> (Oliv.) Aubrev.	2	Tree
Burseraceae	<i>Dacryodes edulis</i> (G.Don) H.J.Lam		Tree
Capparaceae	<i>Euademia trifoliata</i> L.	2	Shrub
Capparaceae	<i>Buchholzia coriacea</i> Engl.		Tree
Chrysobalanaceae	<i>Parinari excelsa</i> Sabinea Sabine Sabine	1	Tree
Clausiaceae	<i>Garcinia kola</i> Heckel	2	Tree
Clausiaceae	<i>Garcinia afzelii</i> Engl.		Tree
Combretaceae	<i>Combretum hispidum</i> M.A. Lawson	2	Tree
Combretaceae	<i>Terminalia superba</i> Engl. & Diels.		Tree
Commelinaceae	<i>Palisota hirsuta</i> (Thunb.) K.Schum	3	Herb
Commelinaceae	<i>Palisota barteri</i> Hook		Herb
Commelinaceae	<i>Commelina benghalensis</i> L.		Herb
Connaraceae	<i>Cnestis ferruginea</i> Vahl ex DC		Shrub
Connaraceae	<i>Agelaea obligua</i> (P.Beau.) Baill	2	Herb
Convolvulaceae	<i>Ipomoea involucrata</i> P.Beauv	2	Climber
Convolvulaceae	<i>Ipomoea triloba</i> L. L.		Climber
Costaceae	<i>Costus afer</i> Ker Gawl.	1	Herb
Cucurbitaceae	<i>Momordica charantia</i> L.	1	Climber
Cyperaceae	<i>Mariscus alternifolius</i> Vahl. Vahl. Vahl.	1	Sedge
Dischapelitaceae	<i>Dichapetalum guineense</i> (DC) Keay.	1	Tree
Ebenaceae	<i>Diospyros dendo</i> Welw.	5	Tree
Ebenaceae	<i>Diospyros piscatorial</i> (Gurke)		Tree
Ebenaceae	<i>Diospyros crassiflora</i> H. Perrier		Tree
Ebenaceae	<i>Diospyros chavalieri</i> (Levl.) Rehd.		Tree
Ebenaceae	<i>Diospyros zenkeri</i> (Gurke) f. White		Tree
Euphorbiaceae	<i>Manihot esculenta</i> Crantz	11	Shrub

Euphorbiaceae	<i>Hevea brasiliensis</i> (Wild. Ex A.Juss.)		Tree
Euphorbiaceae	<i>Ricinodendron heudelotii</i> (Baill.) Pierre ex Pax		Tree
Euphorbiaceae	<i>Discoglypemma coloneura</i> (Pax)		Tree
Euphorbiaceae	<i>Drypetes gilgiana</i> (Pax) Pax & K.Hoffm.		Tree
Euphorbiaceae	<i>Drypetes gessiveileri</i> L.		Tree
Euphorbiaceae	<i>Drypetes dendo</i> Welw. ex Hiern		Tree
Euphorbiaceae	<i>Drypetes chevalieri</i> Beille Beille		Tree
Euphorbiaceae	<i>Alchornea cordifolia</i> (Schum and Thonn) Muell.Arg.		Shrub
Euphorbiaceae	<i>Alchornea laxiflora</i> (Benth.) Pax & Hoffman		Shrub
Euphorbiaceae	<i>Manniophyton fulvum</i> Mull-Arg.		Shrub
Fabaceae	<i>Belinia confusa</i> Hoyle.		Tree
Fabaceae	<i>Berlinia macrophylla</i> Pierre ex Pellegr.		Tree
Fabaceae	<i>Afzelia bipindensis</i> Harms.		Tree
Fabaceae	<i>Albizia zygia</i> (D.C)		Tree
Fabaceae	<i>Piptadeniastrum africanum</i> (Hook.F.) Brenan		Tree
Fabaceae	<i>Cyclicodiscus gabunensis</i> (Taub.) Harms		Tree
Fabaceae	<i>Albizia ferruginea</i> (Guill. & Perr.) Benth.	14	Tree
Fabaceae	<i>Pentaclethra macrophylla</i> Benth.		Tree
Fabaceae	<i>Acacia pentagona</i> (Schumach) Hook.F.		Climber
Fabaceae	<i>Acacia ataxacantha</i> DC		Climber
Fabaceae	<i>Baphia nitida</i> Lodd		Shrub
Fabaceae	<i>Angylocalyx oligophyllus</i> (Baker) Baker f.		Shrub
Fabaceae	<i>Pterocarpus santalinoides</i> DC		Shrub
Fabaceae	<i>Erythrina excelsa</i> Bak.		Tree
Flacourtiaceae	<i>Scottelia coriacea</i> A.Chev. A.Chev.	1	Tree
Icacinaeae	<i>Icacina trichanta</i> Oliv.	4	Shrub
Icacinaeae	<i>Chlamydocarya thomsoniana</i> Baill.		Shrub
Icacinaeae	<i>Neostachanthus occidentalis</i>		Shrub
Icacinaeae	<i>Icacina manii</i> Oliv.		Shrub
Irvingiaceae	<i>Irvingia gabonensis</i> (Aubry-lecomte ex O' Rorke) Baill.	2	Tree
Irvingiaceae	<i>Klainedoxa gabonensis</i> Pierre ex Engl .		Tree
Ixonanthaceae	<i>Ochthocosmus africanus</i> Hook.F.	1	Tree
Liliaceae	<i>Gloriosa superba</i> L.	1	Herb
Lomariopsidace	<i>Lomariospsis guineensis</i> (Underw.) Alston	1	Herb
Malvaceae	<i>Abutilon mauritianum</i> (Jacq.) Medik	1	Tree
Marantaceae	<i>Thaumatococcus daniellii</i> (Benn.) Benth.		Herb
Marantaceae	<i>Thalia welwitschii</i> Ridl.	2	Herb
Melastomataceae	<i>Memecylon afzelii</i> G.Don G.Don G.Don	1	Shrub
Meliaceae	<i>Entandrophragma cylindricum</i> (Sprague)	9	Tree
Meliaceae	<i>Khaya ivorensis</i> A.Chev.		Tree
Meliaceae	<i>Trichilia monadelpha</i> (Thonn.) JJ de Wilde		Tree
Meliaceae	<i>Guarea thompsonii</i> Sprague & Hutch.		Tree
Meliaceae	<i>Guarea cedrata</i> (A.Chev.) Pellegr.		Tree
Meliaceae	<i>Carapa procera</i> DC DC DC		Tree
Meliaceae	<i>Trichilia peruviana</i> C. DC.		Tree
Meliaceae	<i>Entandrophragma angolense</i> (Welw.) DC.		Tree
Meliaceae	<i>Lovoa trichiloides</i> Harms.		Tree
Menispermaceae	<i>Sphenocentrum jollyanum</i> (SJ) Pierre. (SJ) Pierre.	3	Shrub
Menispermaceae	<i>Trichilia subcordata</i> Oliv.		Climber
Menispermaceae	<i>Synclisia angoustatus</i>		Climber
Moraceae	<i>Antiaris africana</i> Engl.	3	Tree
Moraceae	<i>Musanga cecropioides</i> R.Br. ex Tedlie		Tree
Moraceae	<i>Myrianthus arborea</i> P.Beauv.		Tree
Myristicaceae	<i>Pycnanthus angolensis</i> (Welw.) Warb.	3	Tree
Myristicaceae	<i>Staudtia stipitata</i> Warb		Tree

Myristicaceae	<i>Strombosia pustulata</i> Oliv.		Tree
Ochnaceae	<i>Lophira alata</i> Banks ex Gaertn.	1	Tree
Palmaceae	<i>Calamus</i> sp	3	Climber
Palmaceae	<i>Elaeis guineensis</i> Jacq.		Tree
Palmaceae	<i>Raphia hookeri</i> G.Mann & H.A.		Tree
Euphorbiaceae	<i>Microdesmis puberula</i> Hook .F. ex Planch	1	Shrub
Passifloraceae	<i>Barteria fistulosa</i> Mast.	1	Shrub
Piperaceae	<i>Piper guineense</i> Thonn & Schum Thonn & Schum	3	Herb
Polygalaceae	<i>Carpolobia lutea</i> G.Don		Shrub
Piperaceae	<i>Maesopsis eminii</i> Engl.		Tree
Poaceae	<i>Panicum laxum</i> Sw	3	Grass
Poaceae	<i>Bambusa vulgaris</i> Schrad.ex J.C.Wendl.		Grass
Poaceae	<i>Panicum maximum</i> Jacq.		Grass
Rubiaceae	<i>Mitracarpus villosus</i> (Sw.) DC	12	Herb
Rubiaceae	<i>Oxyanthus subpunctatus</i> (Hiern) Keay		Shrub
Rubiaceae	<i>Psychotria fimbriatifolia</i> R.D.Good		Shrub
Rubiaceae	<i>Pavetta corymbosa</i> (DC) F.N. Williams (DC) F.N. Williams (DC) F.N. Williams		Shrub
Rubiaceae	<i>Massularia acuminata</i> (G.Don) Bullock ex Hoysl.		Shrub
Rubiaceae	<i>Keetia venosa</i> (Oliv.)		Tree
Rubiaceae	<i>Perferandia cladantha</i>		Tree
Rubiaceae	<i>Corynanthe pachyceras</i> K.Schum.		Tree
Rubiaceae	<i>Coffea ebracteolata</i> (Hiern) Brenan		Shrub
Rubiaceae	<i>Rothmannia hispida</i> (K.Schum.) Fageri		Shrub
Rubiaceae	<i>Euclinia longiflora</i> Salisb		Shrub
Rubiaceae	<i>Rytiginia umbellata</i> (Hiern) Robyns.		Shrub
Rutaceae	<i>Zanthoxylum gilleti</i> (De Wild.) Waterm.	2	Tree
Rutaceae	<i>Nauclea diderrichii</i> (De Wild. & T.Durand) Merrill.		Tree
Samydaceae	<i>Homalium africanum</i> (Hook.f.) Benth.	1	Tree
Sapindaceae	<i>Paullinia pinnata</i> L. L.	5	Climber
Sapindaceae	<i>Pancovia turbinata</i> Radlk.		Shrub
Sapindaceae	<i>Blighia sapida</i> K.Konig.		Shrub
Sapindaceae	<i>Lecaniodiscus cupanioides</i> Planch.		Shrub
Sapindaceae	<i>Chyranthus talbotii</i> L.	1	Tree
Sapotaceae	<i>Chrysophyllum albidum</i> G.Don	1	Tree
Smilacaceae	<i>Smilax kraussiana</i> Meisn.	1	Climber
Sterculiaceae	<i>Sterculia tragacantha</i> Lindl.	4	Tree
Sterculiaceae	<i>Triplochiton scleroxylon</i> K.SchumK.Schum		Tree
Sterculiaceae	<i>Eribroma oblonga</i> (Mast.) Pierre ex A.Chev.		Tree
Sterculiaceae	<i>Cola millenii</i> K.Schum		Shrub
Tiliaceae	<i>Grewia mollis</i> Juss.	5	Shrub
Tiliaceae	<i>Grewia pubescens</i> P.Beauv. P.Beauv.		Shrub
Tiliaceae	<i>Glyphaea brevis</i> (Spreng.) Monach		Shrub
Tiliaceae	<i>Desplatsia dewevrei</i> L.		Tree
Tiliaceae	<i>Grewia coriacea</i> Mast.		Shrub
Ulmaceae	<i>Celtis zenkeri</i> Engl.	4	Tree
Ulmaceae	<i>Celtis brownie</i> Engl.		Tree
Ulmaceae	<i>Celtis mildbraedii</i> Engli Engl.		Tree
Ulmaceae	<i>Holoptelea grandis</i> (Hutch) Mildbr.		Tree
Verbenaceae	<i>Vitex rivularis</i> Gurke		Tree
Vebenaceae	<i>Clerodendrum capitalum</i> (Wild.) Schumach.	2	Climber
Violaceae	<i>Rinorea dentata</i> (P. Beauv.) O Ktze.	1	Shrub
Zingiberaceae	<i>Afromanum melegueta</i> K.Schum	1	Herb

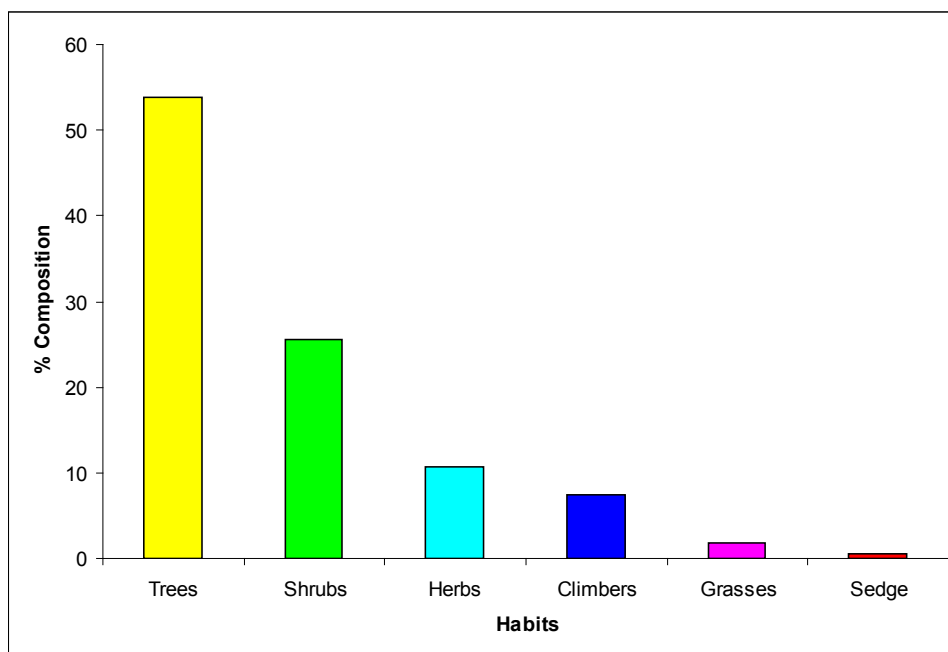


Figure 2. Percentage composition of the plants based on habits in Urhonigbe Forest Reserve

The habits of the plant species showed eighty six trees, forty one shrubs, seventeen herbs, twelve climbers, three grasses and a sedge. Tree species contributed 53.75% of the total plant species obtained in Urhonigbe Forest Reserve. This was closely followed by shrubs (25.63%), herbs (10.61%), climbers (7.50%), grasses (1.88%) and sedge (0.63%). The trees were the most represented whereas, the sedge was the least represented (Fig 2).

4. Discussion and Conclusions

The different plant species collected from Urhonigbe forest reserve were one hundred and sixty species. The plant species vary in different plant habits which range from tree, shrubs, herbs, climbers, grasses and sedge. The flora diversity was highest in designated Strictly Restricted Forest Area (SRFA) due to the least anthropogenic activities (such as lumbering, grazing and farming) taking place there as compared to Forest Re-Growth Area (FRA) which has the most anthropogenic activities of these three designated areas. Similar but lower number of woody species was reported by Aremu *et al.*, (2009) who enumerated seventy four (74) woody plant species belonging to thirty three (33) families in Gele-gele Forest Reserve. The difference in the number of woody species in both forest reserves was due to greater human interference at Gele-gele Forest Reserve.

Ihenyen *et al.*, (2009) reported ninety-nine species of trees distributed into 36 families and 87 genera in Ehor forest reserve, Edo state, Nigeria. This report was quite similar to the results obtained in the present study due to closeness in latitudinal location of the two reserves studied. Also, Ogunleye *et al.*, (2004) sampled Olokemeji Forest Reserve, located in Olokemeji, Ibadan, and identified 107 plants made

up of sixty-nine trees and thirty six (36) shrubs. The more southern location of Urhonigbe Forest Reserve probably the higher number of tree species obtained may be due to the southern location of Urhonigbe Forest Reserve where there is sufficient rainfall annually, less farming activities and abundant coastal riparian vegetation as compared to Olokemeji Reserve located in the Western part of Nigeria where more farming activities take place as well as has lower annual rainfall.

Oduwaiye and Ajibode (2005) identified thirty five (35) trees, fifteen (15) shrubs and eight (8) climbers in thirty-three (33) families from Onigambari Forest Reserve, Ibadan in Oyo state. The low number of tree species encountered by the authors was expected as Ibadan is located in the forest/savannah transition zone. Asyraf *et al.*, (2012) recorded 325 plant species belonging to 68 families and 211 genera in Sabang Island, Aceh, Indonesia. The Sundaland countries are known for high species diversity due to their peculiar geographical location, high rainfall throughout most parts of the year, fertile soil and easy transfer of plant species from one area to another because of large land area.

Anthropogenic activities (cattle grazing, poor farming techniques, illegal encroachment as well as over dependence on the forest reserve resources) pose serious threats to the biodiversity as well as the plant community of the forest reserve.

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