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ECOLOGY OF UNDERGROWTH PLANT SPECIES IN FOUR SELECTED NATURAL FORESTS IN AKWA IBOM STATE, NIGERIA

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ABSTRACT: *The study was conducted to assess the population of undergrowth species of plants in four selected natural forests in Akwa Ibom State, Nigeria. Four local government areas were randomly selected with systematic sampling method used for enumeration of the species which were, Ibesikpo Asutan, Uruan, Mkpat Enin and Ikono LGAs. Descriptive statistics, Simpson's diversity and Sorenson's similarity indices were used to analyze the data collected from the study areas. The undergrowth plant species were identified and classified into scientific, family, common and ethnic names, uses as well as eco-forms and number found. The result showed that the total number of undergrowth species in four randomly selected areas was 5599 stands, 1740 stands of undergrowth species were found in Ibesikpo Asutan, 1292stands were obtained from Uruan, 1659 stands were found in Mkpat Enin and 908 stands of undergrowth plant species were obtained from Ikono LGAs. The result showed that Ibesikpo Asutan and Uruan LGAs have the diversity index (DI) of 0.024 each, while Mkpat Enin and Ikono LGAs have the DIs of 0.041 and 0.032 respectively. The total similarity index value in the study areas was 2.308. The similarity matrix index was also determined to give more knowledge on ecology of undergrowth species in the study areas. The research also showed variations in population distribution across the study areas in which some areas had abundance of a particular species while some had scanty population of the species. The study revealed that some undergrowth species were common and were evenly distributed among all the study areas such as Elaeis guineensis, Caladium bicolor, Costus afer, Chromolaena odorata and Cnestis ferrugenea. The undergrowth plant species that were scanty in the study areas were Hibiscus surathensis, Gongronema latifolium, Gnetum africanum and Penisetum purpurium.*

KEYWORDS: Ecology, Undergrowth, Functions, Natural Forest, Nigeria

INTRODUCTION

The tropical rainforest has been identified to be very rich in biodiversity. It is made up of a complex system which includes both flora and fauna interacting together with one another and to the physical environment (Etuk and John, 2020). The distribution and abundance of flora composition in the rainforest ecosystem is a function of favourable climate as well as edaphic factors including temperature, rainfall, relative humility, light, and day length (Micheal, 2008). Akwa Ibom State belongs to the tropical rainforest and it is made up of forests that are rich in floristic composition ranging from trees, shrubs, climbers and herbs (Etuk, 2013). This gives rise to stratification of the forest where by plant life forms are usually arrange in layers. Forest stratification in ecological point of view includes the upper layer (emergent zone/light demanders), the middle layer (intolerant species) and the under storey which is made up of forest undergrowth called tolerant species (Turner, 2001).

Forest undergrowth are normally found in the floor of the forest and it is composed of diverse species of plants. They are called tolerant species because they do not require maximum supply of sunlight for their photosynthetic process, rather they depend on the amount of light penetrating through the canopy to the forest floor (Nwoboshi, 2000). The upper stratum of the forest ecosystem composes of very tall trees which have in most cases reach their ecological climax, which they usually grow to the heights so as to obtain maximum supply of sunlight for photosynthesis (Etuk *et al.*, 2013). There are other flora compositions that are also found within these zones such as climbers. The climber life forms can also be classified to be intolerant species because they always climb to the top to acquire high amount of sunlight. It is also made of epiphytes in association with the trees in the forest (Buschbacher, 1990).

The middle layer which is the second layer in the rainforest is made up of tall trees of about 16-40m. The crown touches each other, thereby forming a continuous canopy below the emergent zone (Etukudo, 2000). The third layer which is described as the lower layer comprises of small tree species less than 16m in height and forms a continuous canopy below the middle storey. The middle storey lies a layer known as the shrub layer. This layer composes of small trees of 1-5m in height usually referred to as shrubs (Micheal, 2008). The last layer which are commonly identified in the tropical rainforest ecosystem is the ground layer or forest floor. This layer of forest contains both wet or shade loving flora which survive on the floor of the forest. In natural forest, these species of plants hardly receive sunlight because of inter logging effect of canopies of tall trees. Other plant species found in the zone are bryophytes, mosses, liverworts, lichens and thin leaved ferns. In these regards, undergrowth may be referred to as all the plant species occupying the ground layer or forest floor including the germinating seedlings (Beatley, 1994).

In view of this, habitat destruction, fragmentation and degradation have been identified to foster obvious harmful effects on biological diversity especially the undergrowth flora compositions of the ecosystem. Even when biological communities are intact, significant losses can occur due to changes cause by anthropogenic activities (Okebukola and Akpan, 1999). Three such changes are the introduction of exotic species, increase levels of diseases and excessive exploitation of a particular species by deforestation. However, some of the species are unable to establish in new areas and such successful exotic species may kill native species to the point of extinction. It may also altar the habitant such that many indigenous species of economic importance are no longer able to persist (Gilliespie *et al.*, 2004).

In recent times, the abundance of these species has been interfered with by human activities which had erroneously resulted at a drastic decline in the population and diversity of undergrowth flora species (Mongabag, 2010). It is imperative to note that undergrowth flora species are of fundamental importance to man and other ecosystem components. Therefore, its economic benefits cannot be over emphasized (Etuk *et al.*, 2013; Cunningham and Cunningham, 2004).

Forest undergrowth maintains and protects the environment against destruction and provides genetic materials for improvement of cultivated crops. They provide non-wood products such as leaves, fruits, nuts, oils, barks, roots, gums and industrial raw materials for man's use (Etukudo, 2000; Etukudo, 2007). However, in spite of the above-mentioned importance, a sound knowledge of the undergrowth flora is still far from complete in terms of diversity, richness and its population density in Akwa Ibom State (Usoro and Akpan, 2010; Ekpenyong *et al.*, 2018). Therefore the floristic and ethnobotanical information on any ecosystem

especially the vegetation that has been subjected to human interference is importance, it will enhance future conservation and other land–use planning especially this time where natural forests have been compromised with, in favour of other ecological and ethnobotanical importance (Turner and Corlett,1996; Etuk and Attah, 2016). This emphasized the intensive studies on distribution, composition, structure and dynamics of different flora life forms which provides baseline information on sustainable management and utilization of the species especially this time of climate change (Olajide and Akinyemi, 2007).

MATERIALS AND METHODS

The Study Area

The study was carried out in the community forests, in Akwa Ibom State, Nigeria. Akwa Ibom lies within the tropical rainforest zone of Nigeria and is located between latitudes 4° 30'N and 5°30'N and Longitudes 7° 31'E and 8° 20'E and landmass of 8,412km^2 (AKS, 1989). Akwa Ibom State has a population of about 3.92 million people (FRN, 2000). The State is characterized by two seasons, namely: The rainy season and dry season. The rainy season starts in April and ends in October while dry season usually starts in November and ends in March. The mean annual rainfall ranges from 2000mm to 3000mm, mean temperatures vary between 26°C and 28°C, while the relative humidity of about 75%-96% is common across the length and breadth of the state (AKS, 1989). The vegetation types of Akwa Ibom State are influenced by its location which is on the shore of Atlantic Ocean. The presence of high temperature and heavy rainfall support luxuriant tropical rainforest vegetation (Anon, 1999; FAO, 2006). The prevailing wind blows from southwest to north east. However, both the vegetation and the fauna of the state are largely depopulated because of strong human population pressure. The native vegetation has been almost completely replaced by secondary forests of predominantly wild oil palms, woody shrubs, and various grass undergrowths. (Usoro and Akpan, 2010; Udofia and Okeke, 2015). The soil type is well drained sandy loam with a pH of 6.7 (Daniel and Akpan, 2006).

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Fig. 1. Map of Akwa Ibom State, Nigeria Showing the Study Areas.

Method of Data Collection

The study areas were enumerated using a systematic sampling method where everything was randomized after reconnaissance survey has been carried out. Four community forests were randomly selected for the study; one community forest each at Ibesikpo Asutan, Uruan, Mkpat Enin, and Ikono Local Government Areas of Akwa Ibom State, Nigeria. In each of the four sites, four (4) 100m linear transect were cut. Along the cut transects, four (4) 5m x

5m quadrant were demarcated for enumeration of the undergrowth plant species making a total of 16 sample plots. The identification of the undergrowth plant species was carried out with the help of a certified taxonomist. The undergrowth plant species that were not identified immediately in the field were collected and taken to the herbarium laboratory for identification. The identified plant species were classified into trees, shrubs, herbs, climbers and grasses life forms respectively. All plant species measuring up to 1.5m were enumerated.

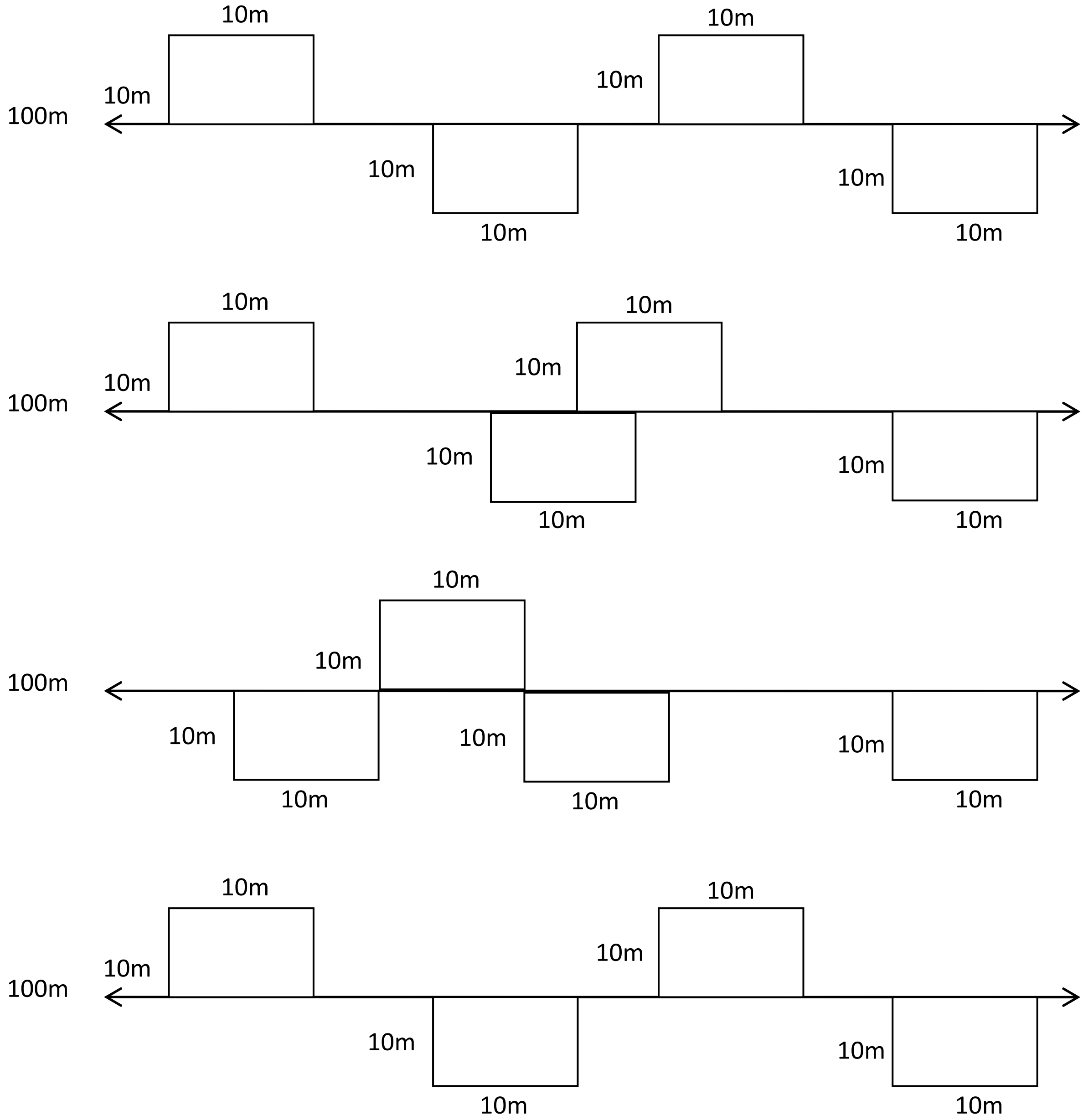

Fig 2: Layout of the Experiment:

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Data Analysis

The data collected from the research were analyzed using (a) Descriptive statistics which includes simple percentage, mean, mode, median and standard deviation.

(b). Ecological statistical models were also used to analyze the data such as:

i. Simpson's Diversity Index Function as applied by Ojo *et al* (1999), expressed as:

$$I = \sum \frac{[n(n-1)]}{N(N-1)} \quad \text{.......(1)}$$

Where;

I = Simpson's Diversity Index

N = Total number of all undergrowth plant species enumerated in the study area.

n_i = Number of individual undergrowth plant species enumerated in the study area.

q= Number of different species enumerated (Simpson, 1949; Bhandari, 2003).

ii. Measurement of Similarity Index of the undergrowth species between the study areas, also applied by Ojo *et al*. (1999):

$$SI = \frac{c}{a+b+c} \quad \text{....... (2)}$$

Where;

SI = Sorenson's Similarity Index

a = Number of species of plants that are in location one, which are not in two

b = Number of species of plants that are in location two, but are not in one

c = Number of species of plants that are in all locations (Sorenson, 1948).

RESULTS AND DISCUSSION

Identification and Classification of Undergrowth Flora Species in the Study Area

Table 1 result showed that the total number of undergrowth plant species in the study area was 1740 stands. The result also showed that some undergrowth species are more abundant in number while others are scanty in the study area. For example, the undergrowth plant species showing the highest number of stands in the study area after enumeration were, *Bambusa vulgaris*, with 137 stands, followed by *Justicia schimperi* with 120 stands as well as *Elaies guineensis* with 90 stands. Others were 75 stands of *Alchornea cordifolia*, 74 stands of *Caladium bicolo*r, 70 stands of *Palisota hirsota* and *Manniophyton fulfum* with 63 stands in

the study area. Table 1 result also revealed the least number of stands of undergrowth plant species in the study area such as *Pentaclethra macrophylla* and *Helia ciliata* with only 2 stands. Other undergrowth plant species with less number of stands were, *Lacosperma secondiflorum, Calopogonium mucunoides* and *Cola argantia* with 3 stands each in the study area (Grove, 2002). The least number of stands of undergrowth plant species were also obtained from *Clerodendron splendens, Ficus exasperata* and *Gongronema latifolium* with 4 stands each of the species.

Table 1: The Undergrowth Plant Species Identified and Classified into Scientific, Family Ethnic and Common Names, Population, Eco-forms and Uses at Ikot Ide Akpakpan in Ibesikpo Asutan L.G.A.

Scientific Name	**Population**	**Family**	**Eco-Form**	**Efik name**	**Common name**	**Uses**	$\frac{n(n-1)}{N(N-1)}$
Smilax ancepts	27	Smilaceae	Climber	Odufat	West African saparilla	Medicinal	0.0001767
Acanthus montanus	43	Acanthaceae	Herb	Mbara ekpe	False thistle	Medicinal	0.0004629
Baphia nitida	29	Papilionaceae	Shrub	Ofio	Com wood	Medicinal, staking, chewing stick, forage	0.00002525
Alchornea laxiflora	75	Euphorbiaceae	Shrub	Nwariwa	Kamala	Medicinal, forage	0.0001767
Spondius mombin	33	Anacardiaceae	Tree	Nsukakara	Hug plum	Timber, forage, medicinal	0.00005049
Palisota hirsota	70	Commelinaceae	Herb	Mbriyom Edongobot	Goat's knee	Forage, medicinal	0.0002356
Icacina trichantha	5	Icacina	Herb	Efik isong	Earth ball	Food, medicinal	0.001288
Cnestis ferrugenea	6	Connaraceae	Shrub	Utinewa	Velvet sun fruit	Firewood, staking, medicinal	0.000555
Glyphaea brevis	11	Tilliaceae	Shrub	Ndorido		Medicinal, timber	0.0006564
Elaeis guineensis	90	Arecaceae	Tree	Eyop	Oil palm tree	Food, fibre, medicinal	0.0003029
Macaranga barteri	49	Euphoribiaceae	Tree	Akpap	African thorn tree	Medicinal, timber	0.00002525
Strombosia postulata	5	Olacaceae	Tree	Ekom ubak		Timber, medicinal, forage	0.002129
Panicum maximum	*24*	*Poaceae*	*Grass*	*Nyayaha/Ebana*	*Guinea grass*	Forage	0.000555
Mimosa pudica	*41*	*Mimosaceae*	*Herbs*	*Mbamak iko*	*Shame weed or sensitive plant*	Medicinal	0.00

Mangifera indica	*1*	*Anacardiaceae*	*Tree*	*Manko*	*Mango*	Food, medicinal	0.0001262
Microdesmis puberula	*26*	*Euphorbiaceae*	*Shrubs*	*Ntanebit*		Food, forage	0.0003787
Lonchocarpus griffoneanus	*4*	*Papilionaceae*	*Shrub*	*Odudu*		Medicinal, live fence, staking	0.00
Lonchocarpus cyanescens	*5*	*Papilionaceae*	*Shrub*	*Awa*		Medicinal, live fence, staking	0.0001767
Costus afer	*39*	*Costaceae*	*Herbs*	*Mbritem*	*Bush cane or spiral ginger*	Medicinal, forage	0.0001262
Garcinia manii	*6*	*Sterculiaceae*	*Tree*	*Okok edi*	*Chewing stick*	Cleaning of teeth, forage	0.00
Bambusa vulgaris	*42*	*Poaceae*	*Grass*	*Nyanyaha*	*Ornamental bamboo*	Staking, pulp, construct ion, medicinal	0.000555
Chromolaena odorata	*35*	*Asteraceae*	*Herbs*	*Mbiet Awolowo*	*Siam weed*	Medicinal	0.0003029
Carpolobia lutea	*25*	*Polygalaceae*	*Shrub*	*Ikpafum*	*Cattle stick*	Medicinal, drum stick, food	0.0004629
Anthocaryon klanineanum	*1*	*Rhizophoraceac*	*Shrub*	*Ukan*	*Monkey fruit*	Medicinal	0.0003029
Voacanga africana	*2*	*Euphorbiaceae*	*Shrub*	*Mmonesa ebot*	*Milk bush*	Medicinal	0.0001262
Physalis angulata	*8*	*Solanaceae*	*Herb*	*Ntuen okpo ikot or Atautuak*	*Wild cape gooseberry Chinese lantern*	Medicinal	0.000008416
Phyllanthus amarus	*11*	*Euphorbiaceae*	*Herb*	*Oyomo ke iso aman ke edem*	*Carry me seed*	Medicinal	0.00
Bambusa vulgaris	*137*	*Poaceae*	*Shrub*	*Nyanyaha*	*Bamboo*		0.000008416
Cola argentia	*3*	*Sterculinceae*	*Tree*	*Ndiya*		Food	0.00002525
Impereta cylindrical	*42*	*Poaceae*	*Grass*		*Spear grass*	Medicinal	0.00008416
Aframomum sceptrum	*3*	*Zingiberaceae*	*Herb*	*Ikpod*		Medicinal	0.004721
Musanga cecropioides	*6*	*Cecropiaceae*	*Tree*	*Uno*	*Cork wood*	Medicinal	0.00
Canarium schweinfurthii	*12*	*Burseraceae*	*Tree*	*Eben etidong*	*Canarium*	Timber, medicinal	0.0001767
Laportea estuans	*24*	*Urticaceae*	*Herb*	*Ntan*		Medicinal, food	0.00002525
Macaranga barteri	*16*	*Euphorbiaceae*	*Herbs*	*Akpab*	*Thorn tree*	Timber, medicinal	0.0001262

Lasienthera africana	*30*	*Icacinaceae*	*Herbs*	*Editan*		Food, medicinal	0.0003787
Solenostemon monostachyus	*28*	*Lamiaceae*	*Herbs*	*Ntorikwot*	*African dead nettle*	Medicinal	0.0001767
Calopogoniu m mucunoides	3	Leguminoceae	Climber	Okoti ekpo	Calopo	Food, medicinal	0.00
Dioscorea bulbifera	16	Discoreaceae	Climber	Idomo	Aerial yam	Food, medicinal	0.00005049
Ficus exasperata	4	Moraceae	Tree	Ukwok	Sand paper tree	Timber, medicinal	0.00002525
Gongronema latifolium	4	Euphorboceae	Shrub	Utasi		Food, medicinal	0.00
Caladium bicolor	74	Araceae	Herbs	Ikpon ekpo	Ornamental cocoyam	Food, medicinal	0.001022
Crotalaria retusa	11	Papilionaceae	Herb	Nsak ntoeyen	Rattle box	ornamental , medicinal	0.00002525
Ageratum conyzoides	40	Asteraceae	Grass		Goat weed	Medicinal, forage	0.0003787
Sachytarpheta cayennesis	16	Verbenaceae	Herbs	Adan umo	Brazilian tea	Medicinal	0.00005049
Diodia scadens	5	Rubiaceae		Edem ikid	Turtle shell	Medicinal	0.00
Culcasia scandens	25	Araceae	Herbs	Atuatippe		Medicinal	0.0001262
Urena lobata	9	Malvaceae	Herbs	Ndidi		Fibre, medicinal	0.000008416
Anchomanis differmis	18	Araceae		Nkokot		Medicinal	0.00005049
Justicia schimperi	120	Acanthaceae	Herbs	Meme	Hunters weed	Food, medicinal	0.003661
Alchornea cordifolia	23	Euphorbiaceae		Mbon	Charismas bush	Medicinal, forage	0.0004625
Mallotus oppsitifolium	5	Euphorbiaceae	Shrub	Nwaniwa	Kamala	Medicinal	0.00
Laccosperma secondflorum	3	Arecaceae	Shrub	Nkara	Rattan palm	Furniture, medicinal	0.00
Araliopsis soyausii	6	Rutaceae	Shrub	Editan eto		Medicinal, staking	0.000008416
Maesobotrya barteri	8	Euphorbiaceae	Tree	Nyanyated	Squirrel cherry	Food, medicinal	0.000008416
Monniophyto n fulfum	63	Euphorbiaceae	Shrub	Ekomikon	Rasp plant	Forage, medicinal	0.001009
Psidium quajava	1	Myrtaceae		Wopa	Guava	Food, medicinal	0.00
Rothmania hispida	14	Rubiaceae	Shrub	Okukin		Medicinal, decoration	0.00005049
Uvaria chamae	19	Annonaceae	Tree	Nkarika ikot	Finger root	Medicinal, forage	0.00008416
Mammea africana	16	Clusiaceae	Tree	Edeng	African mammy apple	Forage, timber	0.00005049

Hellia ciliate	2	Rubiaceae		Uwen		Timber, medicinal	0.00
Newbouldia laevis	18	Bignoniaceae		Itumo	Boundary tree	Medicinal	0.00008416
Vigna ungoiculata	18	Papilionaceae	Shrub	Nkoti ekpo	Mecuna beans	Food, forage	0.00008416
Cissus quadrangularis	6	Vitaceae	Climber	Oboro uduk	Square-stemmed climber	Medicinal	0.000008416
Glyphaea brevis	9	Tiliaceae		Ndorido			0.0001767
Anthonotha macrophylla	28	Caesalpiniaceae		Nya		Medicinal, staking	0.001145
Milletia thonongii	33	Papilionaceae		Isara		Medicinal	0.0001765
Baphia maxima	29	Papilionaceae		Itaeto okondu		Chewing stick, medicinal	0.00
Pentaclethra macrophylla	2	Mimosaceae	Tree	Ukana	African oil beans	Food, timber	0.0002356
Anthocleista djalonensis	30	Loganiaceae		Ibu	Cabbage tree	Timber, medicinal	0.000008416
Terminalia superb	8	Combretaceae	Tree	Afia eto	White yam	Tiber, medicinal	0.00002525
Selaginella nyosurus	13	Selaginellaceae	Climber	Mkpatata	Spike mosses	Medicinal	0.00005049
Ipomea involucrata	17	Convolvulaceae	Climber	Mkpafiafian	Morning glory	Medicinal	0.000008416
Psilocybin spp.	6	Basidlomycetecea e		Udip	Mushroom	Food, medicinal	0.00
Clerodendrun splendens	4	Verbenaceae	Climber	Mmon oyot adiaha ekiko	African red ink plant	Medicinal	0.00
Total	**1740**						**0.024002548**

The Undergrowth Plant Species Identified at Uruan

Table 2 result showed that the total number of undergrowth plant species found in the study area was 1292 stands. The result from Table 2 also showed that the highest number of undergrowth plant species obtained from the study area were *Imperata cylindrica* with 103 stands, followed by *Justicia schimperi* with 81 stands, 76 stands from *Palisota hirsota*, 61 stands from *Panicum maximum*, 59 stands from *Banbusa vulgaris* and 42 stands were obtained from *Laportea estuans* with 42 stands respectively. The least number of stands of undergrowth species of plants were obtained from *Gongronema latifolium* with only 1 stand while others were *Canarium scheinfurthii, Longocarpus cyanescens, Xylopia aethiopica* and *Gnetum africanum* each with 2 stands in the study area. The result also whowed that *Macaranga barteri, Boerhavia diffusa, Culcasia scandens,* and *Cissus quadrangularis* had the least number with 3 stands each in the study area. *Strombosia postulata, Mallutus oppositifolium* and *Gloriosa superba* also had least number of stands of 4 each from the study area.

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Table 2: Undergrowth Plant Species Identified and Classified into Scientific, Family Ethnic and Common Names, Population, Eco-forms and Uses at Uruan LGA.

Scientific Name	Population	Family	Form	Efik name	Common name	Uses	$\frac{n(n-1)}{N(N-1)}$
Carpolobia lutea	13	Polygalaceae	Tree	Ikpafum	Cattle stick	Food, medicinal	0.0008746
Barteria nigritiania	34	Papilionaceae	Tree	Ekpakpan ekpaekpan	Ant tree	Staking, medicinal	0.0004770
Alchornea laxiflora	7	Euphorbiaceae	Shrub	Nwariwa	Kamala	Medicinal	0.00003975
Voacanga africana	16	Euphorbiaceae	Tree	Mmoneba ebot	Bush milk	Timber, medicinal	0.0003710
Smilax ancepts	64	Smilaieae	Climber	Odufat	West African saparilla	Medicinal	0.001590
Strombosia postulata	4	Olacaceae		Ekom ubak		Timber, medicinal	0.00
Canarium schweinfurthii	2	Burseraceae	Tree	Eben etidong	Hog plum	Timber, food, medicinal	0.00003975
Macaranga barteri	3	Euphorbiaceae	Tree	Akpab	African thorn tree	Timber, medicinal	0.00
Rothmania longiflora	38	Rubiaceae		Okukim		Medicinal, decoration	0.001034
Baphia nitida	11	Papilionaceae	Shrub	Ofuo, Afuo	Cam wood	Medicinal, staking	0.0002783
Bambusa vulgaris	59	Poaceae	Tree	Nyanyaha	Forest bamboo	Staking, construction, pulp	0.001391
Boerhavia cocanza	3	Euphorbiaceae	Shrub	Okponkoron	Red spiderling	Food, medicinal	0.00
Maesobotrya barteri	6	Euphoribiaceae	Tree	Nnyatet	Squirrel cherry	Food, medicinal	0.00003975
Thevetia peruviana	16	Euphorbiaceae	Shrub	Mmon-eba	Yellow oleander	Timber medicinal	0.00007951
Spondias mombin	8	Anacardiaceae	Shrub	Nsukakara	Hog plum	Timber, medicinal	0.00001325
Mimosa pudica	6	Mimosaceae	Herb	Mbamak iko	Sensitive tree	Medicinal	0.00001325
Imperata cylindricum	103	Poaceae	Grass	Nsai	Razor grass	Medicinal	0.004307
Randia accuminata	13	Rutaceae	Shrub	Okok edi	Chewing stick	Chewing stick, medicinal	0.00003975
Lasianthera africana	14	Icacinaceace	Shrub	Editan		Food, medicinal	0.00007951
Palisola hirsota	76	Commelinaceae	Herbs	Edong-ebot	Goat knee	Forage, medicinal	0.002266
Manmiophyton fulfum	8	Euphorbiaceae	Shrub	Ekonikon	Grass nut	Forage, medicinal	0.0001988

Lannea acida	7	Anacardiaceae		Ayara nsukakara	Hog plum	Forage, medicinal	0.00001325
Lonchocarpus cyanescens	2	Papilionaceae	Shrub	Awa	African indigo	Medicinal, forage	0.00003975
Lonalocarpus griffoneanus	16	Papilionaceae	Shrub	Ududu		Staking, medicinal	0.0002783
Hippocratea africana	18	Burseraceae	Tree	Ebenmi-ewan		Timber, medicinal	0.0001325
Icacina trichentha	13	Icinaceae	Herbs	Efik Isong	Earth ball	Food, medicinal	0.00003975
Albizia ferruginea	13	Memosaceae	Tree	Ubam	Albizia	Timber, medicinal	0.00003975
Hannoa klaneena	16	Papilionaceae	Shrub	Eto ibit		Staking, drum stick	0.00007951
Euphorbia prostrata	32	Euphorbiaceae	Tree	Etinkene ekpo	Spurge	Timber, medicinal	0.0003710
Ficus exasperata	12	Moraceae	Shrub	Ukwok	Sand paper tree	Timber, medicinal	0.00007951
Laportea aestuans	42	Urticaceae	Herbs	Ntan	Stinging herbs	Food, medicinal	0.0007288
Elaeis guineensis	18	Aracaceae	Tree	Eyop	Oil palm	Food, medicinal	0.0003710
Costus afer	8	Costaceae	Herb	Mberitem	Bush cane	Forage, medicinal	0.00001325
Crotalaria retusa	6	Palilionaceae	Herb	Nsa ntokeyin	Rattle box	Medicinal	0.00007951
Culcasia scandens	3	Araceae	Herbs	Ata-utippe	Common arum	Medicinal	0.0001325
Cola millenii	8	Sterculiaceae		Ekpa mfet ekpo		Food, medicinal	0.00001325
Combretum racemosa	28	Combretaceae		Ekpaekpa ikpaha	Wandering	Medicinal	0.0002783
Coelocaryon botryoides	4	Myristicaceae		Uyot ekong		Timber, medicinal	0.00
Celosia argentea	4	Euphorbiaceae		Efa ekiko	Cock comb	Medicinal	0.00
Chromolaena odorata	18	Asteraceae		Awolowo	Independence weed	Medicinal	0.0004770
Brachystegia eurycoma	5	Papilionaceae		Odukpa	Okwen	Timber, medicinal	0.00
Caladium bicolor	21	Araceae	Herb	Ikpon ekpo	Ornamental cocoyam	Food, medicinal	0.0008746
Canarium schweinfurthii	7	Burseraceae	Tree	Ebenetidong	False walnut	Timber, food, medicinal	0.0002783
Argemone Mexicana	28		Herbs	Mbara ekpa	Mexican poppy	Medicinal	0.00
Uvaria chamae	2	Annonaceae	Shrub	Nkarika ikot	Finger root	Medicinal	0.0001325
Sida acuta	11	Amaranthaceae	Herb	Urut nwanidip	Stubborn weed	Medicinal	0.0002783

Auhyranthes aspera	29	Amaranthaceae	Herbs	Udok mbiod	Devil's ship	Medicinal	0.0003710
Urena lobata	25	Malvaceae	Herbs	Ndidi	African jut fibre	Fibre, medicinal	0.00001325
Aspilia africana	8	Asteraceae	Herbs	Ndinuene	Compost weed	Forage, medicinal	0.00001325
Cnestis ferrugenea	9	Connaraceae	Shrub	Utinewa	Velvet sun fruit	Medicinal, staking	0.00007951
Alchornea cordifolia	11	Euphorbiaceae	Shrup	Mbom	Christmas bush	Forage, medicinal	0.00
Mallotus oppositifolium	4	Euphorbiaceae		Nwariwa	Kamala	Medicinal	0.00007951
Araliopsis soyauxii	14	Rutaceae	Shrub	Editan eto		Medicinal	0.00
Cissus quadroangularis	3	Vitaceae	Climber	Oboro uduk	Square stemed climber	Medicinal	0.0001325
Glyphaea brevis	11	Tiliaceae		Ndorido		Timber, medicinal	0.0001988
Milletia thonongii	23	Papilionaceae	Shrub	Isara		Medicinal	0.00007951
Cola argantia	15	Sterculiaceae	Tree	Ndiya		Food, medicinal	0.00
Xylopia aethiopica	2	Annonaceae	Tree	Ata	African pepper	Food, timber, medicinal	0.0001325
Laportea estuans	21	Urticaceae	Herb	Ntan		Medicinal, food	0.00003975
Banderaea simpicifolia	28	Euphorbiaaceae	Shrub	Ekonikon	Rasp plant	Medicinal, forage	0.0002783
Asystasia gangetica	13	Acanthaceae	Herbs	Mkpahautong Ntok eyen		Medicinal	0.00003975
Malastomastrum capitatum	22	Melastomataceae	Herbs	Eyop inuen		Food, medicinal	0.0001325
Josticia schimperi	81	Acathaceae	Herbs	Meme	Hunters weed	Food	0.002518
Congronema latifoium	1	Euphorbiaceae	Climber	Utasi		Food, medicinal	0.00
Gloriosa superba	4	Liliaceae	Climber	Okot okon	Glory lily	Medicinal, ornamental	0.00
Gnetum africana	2	Gnetaceae	Climber	Afang	African salad	Food, medicinal	0.00
Panicum maximum	61	Poaceae	Grass	Ebana	Guinea grass	Medicinal, forage	0.001391
Penizetum purpurium	5	Poaceae	Grass	Mboko Ekpo	Elephant grass	Food, forage, medicinal	0.00
Diodia scandens	6	Rubiaceae	Herb	Edem ikid	Turtle shell	Medicinal	0.00001325

Anthonotha macrophylla	11	Caesalpiniaceae	Shrub	Nya		Staking, medicinal	0.00003975
Baphia maxima	19	Papilionaceae	Shrub	Ita eto		Medicinal	0.0001325
Total	**1292**						**0.02354748**

The Undergrowth Plant Species Identified at Ikot Ntot, Mkpat Enin L.G.A

The result of Table 3 revealed that the total number of undergrowth plant species of economic values in the study area was 1659 stands. The result also revealed that *Palistota hirsota, Chromolaena odorata* and *Costus afer* had the highest number of stands of 201, 143 and 130 respectively. Other species with high number of stands were, *Moesobotrya barteri* and *Asystecia gangetica* with 60 and 52 stands respectively. The least number of stands were obtained from *Pycnanthus angolense* (1 stand), *Heinsia crinata* (1 stand), and *Hibiscus surathensis, Lovoa trichilioides, Drasaena arborea* and *Harungana madacascariensis* with 2 stands each in the study area. Other undergrowth plant species with least numbers of stands in the study area were, *Dactyladenia barteri* and *Irvingia gabonensis* with 3 and 4 stands.

Table 3: Undergrowth plants species identified and classified into scientific, family ethnic and common names, population, eco-forms and uses at Ikot Ntot, Mkpat Enin L.G.A.

Scientific Name	**Population**	**Family**	**Eco-Form**	**Efik name**	**Common name**	**Uses**	$\frac{n(n-1)}{N(N-1)}$
Xyplopia aethiopica	5	Annonaceae	Tree	Ata	African pepper	Timber, food, medicinal	0.00
Elaeis guineensis	26	Arecaceae	Tree	Eyop	Oil palm tree	Food, medicinal, fibre	0.00003393
Palisota hirsota	201	Commelinaceae	Herb	Edong ebot	Goat knee	Medicinal	0.01386
Anthonotha macrophylla	49	Caesalpiniaceae	Shrub	Nya		Staking, medicinal, firewood	0.0007465
Macaranga barteri	47	Euphoribiaceae	Tree	Akpab	Thorn tree	Timber, medicinal	0.0007465
Chromolaena odorata	143	Asteraceae	Herbs	Mbiet Awolowo	Independent weed	Medicinal	0.007126
Randia acuminata	22	Rutaceae	Shrub	Okok edi	Chewing stick	Brushing teeth, medicinal	0.0001697
Strombosia postulata	37	Olacaceae		Ekomubak		Timber, medicinal	0.0004072
Cnestis furrugenea	16	Connaraceae	Shrub	Utinewa	Velvet sun fruit	Medicinal	0.00006787
Baphia nitida	35	Papilionaceae	Shrub	Ofuo	Cam wood	Timber, brushing teeth, medicinal	0.0004072

Millettia thoningii	34	Pailionaceae	Shrub	Isara		Staking, medicinal, firewood	0.0004072
Glyphaea brevis	18	Tiliacease	Shrub	Ndorido		Timber, medicinal	0.0001131
Costus afer	130	Costaceae	Herb	Mberitem	Bush cane	Medicinal, forage	0.005972
Pentaclethra macrophylla	18	Mimosaceae	Tree	Ukana	African oil bean	Timber, food, medicinal	0.0001131
Alchornea cordifolia	75	Euphorbiaceae	Shrub	Mbom	Christmas bush	Medicinal, forage	0.007934
Longocarpus griffonianus	7	Papilionaceae	Shrub	Ududu		Staking, medicinal	0.0001131
Urena lobata	46	Malvaceae	Herb	Ndidi	African jut fibre	Fibre, medicinal	0.0007465
Phyllathus amarus	16	Euphoribiaceae	Herb	Oyomokiso amankedem	Seed under leaf	Medicinal	0.00006787
Synedrell flora	6	Asteraceae	Herb	Mbiodudo inyang	Node weed	Medicinal	0.00001131
Aframomum sceptrum	20	Zingiberaceae	Herb	Ikpod		Medicinal	0.0001131
Solenostermon monostachyus	23	Lamiaceae	Herb	Ntorikwot	African dead nettle	Medicinal	0.0001697
Asystasia gangetica	52	Acanthaceae	Herb	Mmeme	Hunter's weed	Food, medicinal	0.001029
Achyranthes aspera	13	Amaranthaceae	Herb	Udok mbiet	Devil's horsewhip	Medicinal	0.00003393
Imperata cylindricum	41	Poaceae	Grass	Nsai	Sedge razor grass	Erosion control	0.0005089
Dracaena arborea	2	Draceanaceae	Tree	Okono	Dragon tree	Boundary tree	0.00
Ficus exasperata	5	Moraceae	Tree	Ukwok	Sand paper tree	Timber, medicinal	0.00
Hannwa klaneana	18	Papilionaceae	Shrub	Eto ibit		Drum stick, medicinal	0.0001131
Harungana madagascariensis	2	Hypericaceae	Tree	Oton	Blood tree	Staking, forage, medicinal	0.00
Bambusa vulgaris	39	Poaceae	Grass	Nyanyaha (small stemmed)	Ornamental bamboo	Fodder, staking, construction, pulp	0.0005089
Icacina tricantha	54	Icacinaceae	Herb	Efik isong	Earth ball	Chewing stick, medicinal, food	0.0001131
Ipomoea involucrate	28	Convolvulaceae	Climber	Mkpa efiang	Morning glory	Medicinal	0.0002375

Gloriosa superb	6	Liliaceae	Climber	Okot Okon okot uweme	Glory lily	Beautification, medicinal	0.00001131
Physalis angulata	14	Annonaceae		Atuaktuak	Wild cape gooseberry Chinese lantern	Medicinal	0.00006787
Tetracarpidium conophorum	4		Climber	Ekporo	African walnut	Food, medicinal	0.00
Hibicus surathensis	2	Malvaceae	Herb	Ifot ebot	Prickly hibiscus	Medicinal	0.00
Mimosa pudica	17	Mimosaceae	Herb	Mfehehe iko	Sensitive weed	Medicinal	0.00006787
Sorindeia mildbrieadii	39	Anacardiaceae	Shrub	Nyin adiaha idang		Food, medicinal	0.0005089
Microdemis puberula	36	Euphorbiaceae	Shrub	Ntanebide		Food, medicinal	0.0004072
Araliopsis soyaaxii	9	Rutaceae	Shrub	Editan eto		Medicinal	0.00001131
Maesobotrya barteri	60	Euphorbiaceae	Shrub	Nyanyeted	Squirrel cherry	Food, medicinal	0.0008823
Heinsia crinata	1	Rubiaceae	Shrub	Atama		Food, medicinal	0.00
Lovoa trichilioides	2		Tree	Sida	African walnut	Wood, food, medicinal	0.00
Enantia chloreatha	4		Tree	Onio eto		Medicinal, timber	0.00
Thaumatococcus danielii	33			Nnin-nkon	Miraculous plant	Wrapping, medicinal	0.0003167
Vigna unguiculata	6	Papiliaeceae	Climber	Nkoti	Rice bean	Fodder, food, medicinal	0.00001131
Pycnanthus anglolensis	1	Myristocaceae	Tree	Abakang	False walnut	Wood, medicinal	0.00
Elaeis guineensis	14	Arecaceae	Tree	Eyop	Oil palm tree	Food, fibre, medicinal	0.00006787
Voacanya africana	22	Euphoriaceae	Shrub	Mongeba	Milk tree	Timber, medicinal	0.0008823
Smilax ancepts	58	Smilacaceae	Climber	Odufat	West African sawparika	Medicinal	0.001188
Mallotus oppostifolius	22	Euphoribiaceae	Shrub	Nwariwa	Kalama	Medicinal, fodder	0.0001697
Baphia maxima	34	Papilionaceae	Shrub	Ita eto		Medicinal	0.0004072
Anchomanis difformis	27	Araceae	Herbs	Nkokot	Spiny arum	Medicinal	0.0002375
Irvingia gabonensis	4	Irvinggiaceae	Tree	Uyo	Bush mango	Food, medicinal, timber	0.00

Melastomastrum capitatum	13	Melastomataceae	Herb	Eyop inuen		Food, medicinal, fodder	0.00003393
Dactyladenia barteri	3	Roseaceae	Shrub	Ukan	Monkey fruit	Charcoal, firewood, staking	0.00
Total	**1659**						**0.04114158**

Undergrowth Plant Species Identified at Ikono L.G.A.

Table 4 result showed that the total number of undergrowth plant species obtained from Ikono LGA was 908 stands. It also revealed that the undergrowth plant specie found in the study area with highest number of stands were *Uvaria chamae* (60 stands), *Imperata cylindrica* (59 stands), *Millettia thoningii* (46 stands), *Aspilia africana* (45 stands) and *Justicia schimperi* (45 stands). Other species with high number of stands was *Costus afer* with 41 stands respectively. The species with least number of stands in the study area were *Xylopia aethiopica* (1 stand) and *Crotolaria retusa* (2 stands) while others were, *Dactyladenia barteri* and *Icacinia tricantha* with 3 stands each (Udofia and Okeke, 2015). *Cnestis ferrugenea* and *Bafia nitida* with 4 stands each also showed the least number of stands in the study area respectively.

Table 4: Undergrowth Plants Species Identified and Classified into Scientific, Family Ethnic and Common Names, Population, Eco-forms and Uses at Ikono L.G.A.

Scientific Name	**Population**	**Family**	**Eco-Form**	**Efik name**	**Common name**	**Uses**	$\frac{n(n-1)}{N(N-1)}$
Ruthmannia hispida	34	Rubiaceae	Shrub	Okukin		Decoration, medicinal	0.001077
Strombosia postulata	5	Olacaceae	Tree	Ekom ubak		Timber, medicinal	0.00
Palisota hirsota	27	Commelinaceae	Herb	Edong ebot	Goat knee	Forage, medicinal	0.0006285
Pentaclethra macrophylla	5	Mimosaceae	Tree	Ukana	African oil bean	Timber, food, medicinal	0.00
Cnestis ferrogenea	4	Connavaceae	Shrub	Utinewa	Velvet sun fruit	Medicinal	0.00
Baphia nitida	4	Papilionaceae	Shrub	Ofuo	Cam wood	Staking, chewing stick, medicinal	0.0004489
Selagenalla myosurus	9	Selaginellace	Climber	Mkpatatat	Spike mosses	Medicinal	0.00008979
Culcasia scadens	55	Araceae	Herb	Atuatip		Medicinal	0.002724
Icacina trichantha	3	Icacinaceae	Herb	Efik isong	Earth ball	Food, medicinal	0.00
Glyphaea brevis	13	Tiliaceae	Shrub	Ndorido		Timber, medicinal	0.00008979

Longocarpus griffonianus	32	Papilionaceae	Shrub	Ududu		Staking, medicinal	0.0008380
Bambusa vulgaris	78	Poaceae	Shrub	Nyanyaha inyang	Bamboo	Staking, construction, pulp, medicinal	0.005687
Lasianthera africana	9	Icacimaceae	Shrub	Editan		Food, medicinal	0.00002993
Baphia maxima	36	Papilionaceae	Shrub	Ita eto		Medicinal	0.001077
Uvaria chamae	60	Amonaceae	Shrub	Nkarika Ikot	Finger root	Medicinal, forage	0.001077
Microdesms puberula	19	Euphoribiaceae	Shrub	Ntan abide		Medicinal, forage	0.0008380
Mallotus oppositifolius	4	Euphorbiaceae	Shrub	Nwariwa	Kamala	Medicinal	0.00
Elaeis guieneesis	27	Avecaceae	Three	Eyop	Oil palm tree	Food, fibre, medicinal	0.0006285
Spondias mombin	8	Anacardiaceae	Tree	Nsukakara	Hog plum	Timber, medicinal	0.00002993
Canarium schweinfurthii	8	Burseraceae	Tree	Eben etidong	African canari	Food, timber, medicinal	0.00002993
Xyplopia aethiopica	1	Annonaceae	Tree	Ata	African pepper	Food, timber, medicinal	0.00
Dactyladenia barteri	3	Rosaceae	Shrub	Ukan	Monkey fruit	Charcoal, firewood	0.00002993
Maesobotrya barteri	6	Euphobiaceae	Shrub	Nyanyated	Squirrel cherry	Food, medicinal	0.00002993
Millettia thoningi	46	Papilionaceae	Shrub	Isara		Medicinal, staking	0.001975
Carpolobia lutea	5	Polygalaceae	Shrub	Ikpafum	Cattle stick	Medicinal, food	0.00
Laccosperma secondiflorum	6	Euphorbiaceae	Shrub	Nkara	Kamala	Furniture, medicinal	0.00002993
Urena lobata	12	Malvaceae	Herb	Ndidi	African jut fibre	Fibre, medicinal	0.001347
Emilia sonchifolia	9	Asteraceae	Herb	Awak mong	Sharing bushy	Medicinal	0.00002993
Crotalaria retusa	2	Papilionaceae	Herb	Nsak mokeyen	Rattle box	Medicinal	0.00
Phyllanthus amarus	8	Euphoriabceae	Herb	Oyomokiso amanedem	Seed underleaf	Medicinal	0.001347
Mimosa pudica	8	Mimosaceae	Herb	Mefefehe iko	Sensitive weed	Medicinal	0.00002993
Imperata cylindricum	59	Poaceae	Grass	Nsai	Spear grass	Medicinal	0.003143
Vigna unguiculata	5	Papilionaceae	Climber	Okoti ekpo	Mecuna beans	Forage, medicinal	0.00

Clerodendron splendens	19	Verbenaceae	Climber	Mongeyet adiaha ekiko	Glory bower	Medicinal	0.0002993
Harungana madagascariensis	27	Hypericaceae	Shrub	Oton		Medicinal, staking	0.0006285
Voacanga africana	11	Euphorbiaceae	Shrub	Mongeba		Timber, medicinal	0.00008979
Caladium bicolor	24	Araveae	Herb	Ekpon ekpo	Ornamental cocoyam	Food, medicinal	0.0004489
Solenostemon monostachyus	18	Lamiaceae	Herb	Ntod ikwod	African dead mettle	Medicinal	0.0002993
Laportea aestuans	8	Urticaceae	Herb	Ntan	African stinging mettle	Food, medicinal	0.00002993
Anchomanis difformis	7	Araceae	Herb	Nkokot	Spiny arum	Medicinal	0.00002993
Costus afer	41	Costaceae	Mbritem	Herb	Mbritem	Food, medicinal	0.001347
Aspilia africana	45	Asteraceae	Ndinvene	Herb	Compose weed	Medicinal	0.001646
Josticia schimperi	45	Acanthaceae	Meme	Herb	Hunters weed	Food, medicinal	0.001347
Ageratum conyziodes	11	Asteraceae	Nnyano	Herb	Goat weed	Medicinal	0.00008979
Anthonotha macrophylla	12	Caesalpiniaceae	Nya	Shrub		Staking, firewood, medicinal	0.00008979
Alchornea cordifolia	7	Euphorbiaceae	Mbom	Shrub	Christmas bush	Forage, medicinal	0.001975
Chromolaena odonata	16	Asteraceae	Okwokpa akpa	Shrub	Siam weed	Medicinal, compost	0.0001796
Macarnga barteri	5	Euphorbiaceae	Akpab	Tree	Thorn tree	Medicinal	0.00
Cola argentea	2	Steculiaceae	Ndiya	Tree		Food, medicinal	0.00
Total	**908**						**0.03175475**

Determination of Diversity Index of Undergrowth Plant Life forms in the Study Areas

The result in Table 5 showed that the total value of diversity index from the four randomly selected areas was 0.120. Simpson's diversity index (DI) analyzed the degree of abundance and evenness of the species in a given ecosystem. It is probabilistic and its value lies between 0 and 1, signifying that as the value approaches 0, the more diverse the species are and vice versa (Simpson, 1949). In this regard, Table 5 result showed that Ibisikpo Asutan and Uruan LGAs with 0.024 each, has the highest diversity of undergrowth plant species on equal proportion. Next to Ibesikpo Asutan and Uruan LGAs in terms of abundance of undergrowth plant species is Ikono LGA with 0.032 diversity index, while the least 0.041 was obtained from Mkpat Enin LGA. It therefore, means that Mkpat Enin LGA has the lowest diversity index in terms of population of different undergrowth plant species among all the study areas.

Table 5: Diversity index in all the study areas

Local Government Area	Diversity Index (DI)	D^{-1}
Ibesikpo Asutan	0.0240	41.67
Uruan	0.0235	42.55
Mkpat Enin	0.0411	24.33
Ikono	0.0318	31.45
Total	**0.1204**	**140.00**

Similarity Index for all the Study Area

The result from Table 6 revealed that the natural forest pair comparison between Ibesikpo Asutan and Uruan LGAs (0.369) is similar to that of natural forest pair comparison between Ibesikpo Asutan and Mkpat Enin LGAs with 0.362. The result also showed that the diversity of plant species between Mkpat Enin and Ikono LGAs. The result also showed that the undergrowth plant species pair comparison between Ibesikpo Asutan and Ikono LGAs were dissimilar to all other study areas with similarity index of 0.512. This expressed how similar or dissimilar the different study areas are in terms of abundance or scarcity of undergrowth plant species.

Table 6: Similarity Index for all the Study Areas

	Study Area	Similarity index
1.	Ibesikpo Asutan VS Uruan	0.3689
2.	Ibesikpo Asutan VS Mkpat Enin	0.3617
3.	Ibesikpo Astan VS Ikono	0.5122
4.	Uruan VS Mkpat Enin	0.3053
5.	Uruan VS Ikono	0.3750
6.	Mkpat Enin VS Ikono	0.3846
	Total	**2.3077**

Similarity Matrix Index Determination

Similarity matrix index from Table 7 was also computed to give more information on the diversity index which expresses the abundance, evenness or scarcity of undergrowth plant species in the four randomly selected study areas.

Table 7: Similarity Matrix Index Determination in all the study Areas

	Ibesikpo Asutan	Uruan	Mkpat Enin	Ikono
Ibesikpo Asutan	-	0.3689	0.3617	0.5122
Uruan	0.3689	-	0.3053	0.3750
Mkpat Enin	0.3617	0.3053	-	0.3846
Ikono	0.5122	0.3750	0.3846	-

The result of the research generally showed that the total number of undergrowth plant species enumerated in the study areas was 5599 stands. It also showed there are variations in the distribution and abundance of the species of undergrowth across the four randomly selected study areas. This may be attributed to some factors such as geologic, edaphic, climatic, socio-economic and socio-cultural factors in the study areas. It also suggests that the abundance or scarcity of the undergrowth species is determined by the level of exploitation and utilization o the species in the study areas. Some species which are highly demanded by the people due to its economic values are usually scarce while the ones with less economic demands will be abundant in the study areas. For instance, *Gnetum africanum* which is one of the staple forest vegetables has high economic utilization showed a drastic decline in its population found in the study areas. Some undergrowth plant species with high economic demands which are scarce due to over utilization, appropriate conservation strategies must be intensified such as in-situ and ex-situ conservation to ensure sustainable management and utilization of the valuable species in perpetuity to avoid extinction, especially this era of climate change.

CONCLUSION

Undergrowth plant species is one of the critical components of the tropical rainforest which occupies the lowest layer of the forest. Tropical rainforest is made up eco-forms such as trees, shrubs, herbs, climbers, epiphytes, mosses, lichen and other forms of micro-flora which are sometimes arranged in a definite order known as strata, profile or storey. Each storey is composed of different species of plants and animals. The functions of undergrowth species of plant still remain paramount because many people especially in the rural communities totally or partly dependent on some of the species for food, medicine, forage, ornamental and environmental protection apart from other ecosystem services. There are variations on the distribution of the species in the study areas. Some areas have abundance while some have scarcity of the species. This may be as a result of socio-economic, cultural, geologic, edaphic, climatic and anthropogenic factors. Since economic and ecological importance of the species cannot be over-emphasized, appropriate conservation strategies must adopt for the management and utilization of the species on sustainable basis to avoid extinction especially this era of climate change.

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