The Environmental Studies

A Comparative Analysis of Floral Species Diversity between the Mined and Unmined Quarry Areas in Ebonyi State

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Abstract
The objective of this study was to determine flora species diversity between the mined and unmined quarry sites in Ebonyi State. Essentially, eight quadrats were laid in all in the study areas. Four quadrats were in the Crushed Rock and another four in the Setracto Company. The size of the quadrats was 100m x 100m. These quadrats were laid along a transect in each of these quarry mining sites at a distance of 500m. Floral species (trees/shrubs) were enumerated in each of these quadrats. The Simpson's Index of diversity which has the form Si = 1 – D where $D = \sum(n_1/N)^2$, N_1 = some specified importance value for species and N = importance value for all species) was used to measure the diversity of floral species. The result of the study indicated that for the Crushed Rock mined site; plot one had diversity value of 0.764, plot 2 had 0.531 and 0.778 and 0.807 for plots 3 and 4 respectively. In the Crushed Rock unmined site the diversity values for the four sample plots were 0.899, 0.858, 0.876 and 0.867 respectively. For the Setraco mining company, the diversity values for the four sample plots were 0.74, 0.727, 0.511 and 0.612 respectively. In the unmined site in Setraco company, plot one had diversity value of 0.896, plot 2 (0.864), plot 3 (0.886) and finally plot four (0.932). The study generally revealed that the unmined sites in both the Crushed Rock and Setraco companies had diversity values higher than that in the mined site.
Keywords: *Flora, Species Diversity, Mining, Quarry, Sites, species abundance, etc*

Introduction

Species diversity is the variety of biological organisms found in an ecosystem (environment). It is the measure of heterogeneity of a site in terms of the number of each species (Ogunleye *et al*., 2004). In looking at the dynamics of ecosystem change on the flora diversity of plant assemblage, Ogunleye *et al*., (2004) asserted that anthropogenic activities including farming fragmentation and depleted plant species results in decrease in diversity. Their study in Olokemeji Forest Reserve recorded a diversity index of 43.5 percent, 2.1 percent and 11.8 percent for natural undisturbed forest, cultivated plantation and fallow or young weed growth area respectively.

What gives tropical ecosystem their unique distinction is their array of diversity. As the world's richest ecosystem, loss of species diversity in tropical ecosystem thus represents a big loss of biodiversity, not only to the tropics but to the world at large, and as Dubey and Dubey (2010) have asserted, mining is an economic activity that withdraws resources from nature. In the process, massive damage is done to the landscape and biological communities. Dubey and Dubey (2010) found that the Shankargarh Forest, Allahabad, India had lost some of its diversity due to silica mining there and created unfavourable habitat conditions for other biota. It has been observed that changes in diversity, as noted in all of these studies, points to the fact that mining, whether in Africa, Asia or Europe, or whether in free forests or protected areas carries the same consequence on flora diversity loss as well as fauna loss.

Tom-Dery, Dagben and Colobbina (2012) in their study at Nangodi in Telensi-Nabdam District of Upper East Region of Ghana, the researchers found that although flora diversity was generally low in the region owing to its Sudan Savannah status, the Simpson's reciprocal index of diversity showed that the mine has a value of 8.33 while the un-mined sites scored 10.80, indicative of the fact that the mine site had suffered loss. This is because mining result to serious land degradation and deforestation as a consequence of clearing of large tracks of forests for mine working which in-turn renders the land environmentally unsustainable and economically worthless. Munti, Milgo, Mutakyahwa and Ikingura (2006) reported similar cases of reduction in species diversity from a mine site around Lake Victoria in Tanzania. The 3 communities impacted by the mining activities had a diversity value of 1.08 to 1.70 for Mwakiltoyo, 2.29 to 2.57 for Geita and 2.34 to 2.70 for Nyamtukuza, despite the fact that they share the same vegetation type. The high diversity in Nyamtukuza was however traced to the fact that most of the diversity was confined to a water logged area which was not affected by human activities. Aside the variations in diversity scores between these mining sites, the researchers reported that results from the mining free sites were significantly different from the mining impacted sites.

The explanation offered by the authors was that mining was responsible for the clearing of vegetation for the operation and the cutting down of trees for building, construction poles and fuel woods in the mining camps. Livestock grazing and farming to a lesser extent were also accountable. Arising from the many impacts of human activities on vegetation, as noted by Okpiliya (2014; 2017) various studies such as Ruiz-Jaen and Aide (2005) and Dorren, Berger, Imerson, Maier and Rey (2004) as quoted by Surma, Kashawaha and Singh (2010) have recommended the assessment of vegetation structure and species diversity of an ecosystem as a means of unraveling a better understanding of the impact of mining on the vegetation characteristics as a prerequisite for their proper management.

Methodology

Scope

This study was undertaken with the view to assessing the status of the floral species diversity between the mined and the unmined quarry areas in Ishiagu Ebonyi State. The mining areas operated by Crushed Rock and Setraco were used for the study. Information regarding the diversity of floral species were derived from these two areas. The measurement of diversity was confined to trees and shrubs only. The objectives of this study were as follows:

(i) Enumerate the floral species (trees and shrubs) in the area

(ii) To determine the diversity indices of all the floral species between the mined and the unmined quarry sites.

Study Area is Ishiagu in Ebonyi State, Nigeria, the area lies between latitude $5^{0}5^{1}$ and $6^{0}00^{1}$N and longitude $7^{0}25^{1}$ to $7^{0}38^{1}$E. Ishiagu is bounded to the North by Awgu and Aninri (Enugu state) to the south by Ugwueke, Ishiukwato (Abia) to the West by Lokpa and Lekwesi (Abia state) and to the East by Akaeze (Ebonyi state) (Anyata, 2001). According to 2006 National Population Census Ishiagu has an estimated population of 61,669 persons and projected to about 100,000 persons in 2017. The area has a sub-humid tropical climate with annual mean temperature range ^{0}of 23^{0}C to 34^{0}C (Iwena, 2008). It is characterized by two distinct seasons: the dry season which start from March to October and wet season which starts from April to November. As the name implies, the dry season is basically dry because the wind that blows during the period is continental, which are characteristically dry, cold and hazy. The "mean annual precipitation is about 1,370millimetre.The average wind speed over the study area is about 1.50m/s, while the average ambient air temperature is about 30^{0}C" (Nigeria Meteological Agency, 2012).

The area is generally low-lying and swampy with gentle undulating shaley lands, about 70-95m above sea level. The low-lying hills are made up of both resistant highly indurated shales and Igneous intrusive rock outcrops where the quarries (Crushed Rocks Industries Limited and Setraco) are located (Chiadikobi & Chinghanam, 2011). So many rivers and streams criss-cross the entire landscape. The Ivo River, the largest, rises from the region of Uturu and Umuchieze and meanders it ways through to join the Ike River Eastwards. Numerous small lakes and springs can be found in some parts in the community. Prominent among the lakes include Ogwu and Iyiodu, they are noted for providing the inhabitant source of drinking water (Anyata, 2001). The study area is located within the transitional forest savanna mosaic (derived savanna) zone characterized by varying vegetation profiles. In the area, the predominant soil is tropical ferruginuous soils; coarse loamy soils, laterite soils as well as sandy soils (Iwena, 2008). Riparian forests of some fresh water trees are commonly found along the fringes of water courses and flood plains. Here the inhabitants are largely pre-occupied in traditional subsistence agriculture/land cultivation and wildlife hunting. Important cash crops that are cultivated in the study area include, rice, groundnut and citrus. Other cash crops include melon, African pear, hot pepper, cashew and oil palm. Food crops include yam, cassava, sweet potatoes, beans, maize, millet and guinea corn. Other economic activities in the area include blacksmithing, fishing, carving and pot making.

Eight quadrats of size 100m x 100m were established in the two locations of Crushed Rock and Setraco, two each on a mined site and two each on an unmined site. Each quadrat was divided into 10 grids cells of dimension 10m x 10m out of which eight was selected for sampling. This yielded a total of 40 grid cells in the mined sites, and 40 grid cells in the unmined sites within each of these grid cells, tree/shrubs species were identified and enumerated,

hence their diversity indices computed.

The Simpson's Index of diversity (Si), defined as the sum of squares of the proportion of abundance of each species (Oyegun, 1997) was employed to measure the diversity in plant communities. Its scale ranges from 0 to 1, with values close to 1 showing a community of many species but low abundance, while values close to 0 express fewer species with one of them obviously dominant or abundant. The D is an index or dominance or homogeneity. The index is stated as:

Si = 1 – D

Where D = $\sum(n_1/N)^2$

N_1 = some specified important value for a species (No. of bions of a species)

N = important-value for all the species (No. of bions of all the species

Results and Discussion

Table 1: Summary of Tree/shrub Species Diversity Indices between the Mined and Unmined Sites

	Mine sites		Unmined sites	
Cells	Cruch Rock	Setraco	Crush sites	Setraco
1	0.764	0.740	0.899	0.896
2	0.531	0.727	0.858	0.864
3	0.778	0.571	0.858	0.886
4	0.807	0.612	0.867	0.932
Total	2.880	2.651	3.500	3.579
Mean	0.720	0.663	0.875	0.895

Source: Authors Field Work, 2016

Trees/shrub species Diversity in the Crush Rock Mine Site

Table for plot 2, and 0.778 for plot 3, while plot 4 had a diversity value of 0.807 respectively. These four mined plot in Crush Rock thus recorded 76.4 percent, 53.1 percent, 77.8 percent and 80.7 percent respectively, with a mean value of 72 percent species diversity for the site. These results reveal that the site had suffered serious tree/shrub species loss through site conversion by the miners for quarry mining activities. These findings are in agreement with research findings of Panda *et al* (2013) and Tom-Dery *et al* (2012) which revealed that mining has negative impacts on flora species diversity through deforestation of forest ecosystems. IUCN (2014) report is in tandem with the research findings reported above1 contains plant species diversity in Crush Rock mined site. The Simpson's Index of diversity was used to analyze the field data from the four mined sample plots and gave values of 0.764 for Crush Rock mined plot 1, 0.531.

Tree/shrub Species Diversity in Crushed Rock Unmined Site

Diversity indices of 0.899, 0.858, 876 and 0.867 respectively were obtained from Crush Rock unmined sample plots, 1, 2, 3 and 4. The result shows that there was homogeneity or consociation in species diversity on this site as a higher number of plant species was found in the area. These values thus represent 89.9 percent, 85.8 percent, 87.6 percent and 86.7 percent of tree/shrub species diversity in Crush Rock unmined sample plots 1, 2, 3 and 4 respectively, with a mean value of 87.5 percent for the site. Comparing this result to Crush Rock mined sample plots 1,2,3 and 4 had values of 76.4 percent, 53.1 percent, 77.8 percent and 80.7 percent respectively, the Crush Rock unmined plots were richer in species abundance with value of 89.9 percent, 85.8 percent, 87.6 percent and 86.7 percent respectively. The relatively high difference between the low diversity scores in the mined site and the high diversity scores in the unmined site is a clear indication of the low number of tree/shrub species and their individuals encountered in the mined site as opposed to the significantly high number of tree/shrub species and their bions encountered in the Crush Rock unmined site. The low diversity recorded in the Crush Rock mined site was further affected by the fact that the site was freshly mined between 2012 and 2015 just as this study was taking place in the study area. As a result of this, the site had not enjoyed a sufficient post-mining fallow period to perhaps enable new tree/shrub species to re-colonize the site and by so doing restore its site diversity status.

Tree/shrub Species Diversity in the Setraco Mined Site

Table 1 equally displays results of tree/shrub species found in Setraco mined site values of Simpson's Index of diversity obtained from plots 1, 2, 3 and 4 were 0.74, 0.727, 0.571 and 0.612 respectively with a mean index of 0.663. This is represented as 74 percent, 72.7 percent, 57.1 percent and 61.2 percent tree/shrub species diversity in Setraco mined sample plots 1, 2, 3 and 4 respectively, with a mean value of 66.3 percent for the site. These reported result in Setraco mined site is in agreement with the observation as reported by Mtui *et al.* (2006).

Tree/shrub Species Diversity in the Setraco Unmined Site

Plot	Name of specie	Specie class	No. Of bions	n1/N	$\sum(n1/N)^2D$
	Ciba pentengra	T	2	0.17	0.03
	Tephrosia bracteolate	T	2	0.17	0.03
	Mucuna pruriens	S	3	0.25	0.06
1	*Anacardium occidentale*	T	1	0.08	0.01
	Nauclea latifola	T	4	0.33	0.11
	Total		**12**	**1.00**	**0.24**
	Simpson Index of Diversity			**0.76**	
2	*Cola nitida*	T	1	0.13	0.02
	Borassus aethropium	T	5	0.63	0.39
	Helichrysum pertiolare	S	2	0.25	0.06
	Total		8	1.00	0.47
	Simpson index of diversity			0.53	
	Alstomia booneil	T	5	0.24	0.06
	Pittosporum viricliflorunaciusm	S	3	0.14	0.02
	Pterocarpus erinacius	T	1	0.05	0.00
3	*Ricinodendron heudelatin*	T	3	0.14	0.02
	Hibiscus surattensis	S	5	0.24	0.06
	Spondia mombia	T	4	0.19	0.04
	Total		**21**	**1.00**	**0.19**
	Simpson Index of Diversity			**0.81**	
	Porkia bigbliobosa	T	3	0.25	0.06
4	*Magnifera indica*	T	3	0.25	0.06
	Iophira alota	T	1	0.08	0.01
	Daibergia meamoxylon	T	2	0.17	0.03
	Alchornea floribunda	S	3	0.25	0.06
	Total		**12**	**1.00**	**0.22**
	Simpson Index of Diversity			**0.78**	

In the unmined sample site in Setraco, as presented in table 5, the values of Simpson's Index of diversity obtained were 0.896, 0.864, 0.886 and 0.932 for plots 1, 2, 3 and 4 respectively. The tree/shrub species diversity recorded in the Setraco unmined sample plots 1,2,3 and 4 represents 89.6 percent, 86.4 percent, 88.6 percent. These values indicated that more flora species occurred in the unmined site than in the mined site which had values of 0.74, 0.727, 0.571 and 0.612. These species equally recorded more individuals of each species than those in mined site. The high diversity values from Setraco unmined site thus suggested a more stable, homogeneous community than that observed in the mined site. Comparing these values with those obtained from the Crush Rock unmined site, it was observed that human activities such as forestry, farming, settlement and mining resulted in reduction of flora species diversity.

Individual Floral Species Diversity

In the Crush Rock mined site, it was discovered in this study that in the four sample plots as table 2 indicated *Borassus aethropium* has the highest diversity value of 0.39 and hence more diverse than others.

The floral species with the least value of 0.01 were *Nauccea latifola,* pterocarpus *erinaceous* and *lophira alata.* In the unmined Crush Rock site as table 3 shows, *Burkea Africana* had the highest diversity value of 0.05, *steculia setigera* and *lophira alata* had diversity values of 0.04 each. Other species had diversity indices of 0-01 – 0.02. On the other hand, in the Setraco Quarry mined site, (Table 4) *Carapa procera* had the highest diversity indices of 0.03, followed by *Piliostigma thonnigii* and *pseudocedrala kotshiyi* (0.18). The species with the least diversity values were *pterocardrum osim* (0.02) and *Solanum nigrum* (0.02).

In the Setraco unmined quarry site (Table 5) two floral species, *pilostigma viricliforum* and *mucuna pruriens* had diversity indices of 0.014. Other floral species had diversity values of below 0.04.

Table 2: Tree/shrub Diversity in Crushed Rock Mined Site

Plot	Name of specie	Specie class	No. Of bions	n1/N	$\sum(n1/N)^2D$
	Ricndendrum hentonic	S	2	0.07	0.00
	Magnifera indica	T	4	0.14	0.02
	Harungana madagascarriensis	T	3	0.10	0.01
	Musa paradisuaca	S	2	0.07	0.00
1	*Musa sapietum*	S	2	0.07	0.00
	Gardenia aqualla	T	3	0.10	0.01
	Trema orientalis	T	3	0.10	0.01
	Terminalia glaucescens	T	1	0.03	0.00
	Bridelia ferruginea	T	4	0.14	0.02
	Daniela oliveri	T	2	0.07	0.00
	Crossopteryx febrifuga	T	3	0.10	0.01
	Total		**29**	**1.00**	**0.10**
	Simpson's Index of Diversity (I-D)		**0**	**0.90**	
	Uapaca togoensis	T	4	0.13	0.02
	Burkea Africana	T	7	0.23	0.05
	Combretum molle	S	3	0.10	0.01
2	*Alchornea floribunda*	S	3	0.10	0.01
	Albinia adeamlefoha	S	4	0.13	0.02
	Pittosporum viricliforum	S	2	0.07	0.00
	Prosopis Africana	T	3	0.10	0.01
	Afzelia Africana	T	4	0.13	0.02
	Total		**30**	**1.00**	**0.14**
	Simpson's Index of Diversity (I-D)			**0.86**	
	Tephrosia bracteolate	S	2	0.08	0.01
	Parinari exelsa	T	4	0.15	0.02
	Mucuna pruriens	S	3	0.12	0.01
	Hibiscus surattensis	S	1	0.04	0.00
	Afromozia laxiflora	T	2	0.08	0.01
3	*Vitteleria paradoxa*	T	4	0.15	0.02
	Solanum nigrum	S	1	0.04	0.00
	Sterculia setigera	T	5	0.19	0.04
	Ficus sycomorus	T	2	0.08	0.01
	Icacinia trichantha	S	2	0.08	0.01
	Total		**26**	**1.00**	**0.12**
	Simpson's Index of Diversity (I-D)			**0.88**	
	Diplazium esculentium	S	2	0.13	0.02
	Annona senegalensis	T	2	0.13	0.02
4	*Piliostigma thonningi*	T	2	0.13	0.02
	Annogessus leiocarpus	S	2	0.13	0.02
	Helichrysum pertiolare	S	2	0.13	0.02
	Sesbania leptocarpa	S	1	0.06	0.00
	Lophira alata	T	3	0.19	0.04
	Gmilila arborea	T	2	0.13	0.02
	Total		**16**	**1.00**	**0.13**
	Simpson's Index of Diversity (I-D)	**1**		**0.87**	

Table 3: Crushed Rock Unmined Sites

Plot	Name of specie	Specie class	No. Of bions	n1/N	$\sum(n1/N)^2D$
	Ricndendrum hentonic	S	2	0.07	0.00
	Magnifera indica	T	4	0.14	0.02
	Harungana madagascarriensis	T	3	0.10	0.01
	Musa paradisuaca	S	2	0.07	0.00
1	*Musa sapietum*	S	2	0.07	0.00
	Gardenia aqualla	T	3	0.10	0.01
	Trema orientalis	T	3	0.10	0.01
	Terminalia glaucescens	T	1	0.03	0.00
	Bridelia ferruginea	T	4	0.14	0.02
	Daniela oliveri	T	2	0.07	0.00
	Crossopteryx febrifuga	T	3	0.10	0.01
	Total		**29**	**1.00**	**0.10**
	Simpson's Index of Diversity (I-D)		**0**	**0.90**	
	Uapaca togoensis	T	4	0.13	0.02
	Burkea Africana	T	7	0.23	0.05
	Combretum molle	S	3	0.10	0.01
2	*Alchornea floribunda*	S	3	0.10	0.01
	Albinia adeamlefoha	S	4	0.13	0.02
	Pittosporum viricliforum	S	2	0.07	0.00
	Prosopis Africana	T	3	0.10	0.01
	Afzelia Africana	T	4	0.13	0.02
	Total		**30**	**1.00**	**0.14**
	Simpson's Index of Diversity (I-D)			**0.86**	
	Tephrosia bracteolate	S	2	0.08	0.01
	Parinari exelsa	T	4	0.15	0.02
	Mucuna pruriens	S	3	0.12	0.01
	Hibiscus surattensis	S	1	0.04	0.00
	Afromozia laxiflora	T	2	0.08	0.01
3	*Vitteleria paradoxa*	T	4	0.15	0.02
	Solanum nigrum	S	1	0.04	0.00
	Sterculia setigera	T	5	0.19	0.04
	Ficus sycomorus	T	2	0.08	0.01
	Icacinia trichantha	S	2	0.08	0.01
	Total		**26**	**1.00**	**0.12**
	Simpson's Index of Diversity (I-D)			**0.88**	
	Diplazium esculentium	S	2	0.13	0.02
	Annona senegalensis	T	2	0.13	0.02
4	*Piliostigma thonningi*	T	2	0.13	0.02
	Annogessus leiocarpus	S	2	0.13	0.02
	Helichrysum pertiolare	S	2	0.13	0.02
	Sesbania leptocarpa	S	1	0.06	0.00
	Lophira alata	T	3	0.19	0.04
	Gmilila arborea	T	2	0.13	0.02
	Total		**16**	**1.00**	**0.13**
	Simpson's Index of Diversity (I-D)	**1**		**0.87**	

Table 4: Setraco Quarry Mined Site

Plot	Name of specie	Specie class	No. Of bions	n1/N	$\sum(n1/N)^2D$
	Albinia adeamlefoh	S	3	0.3	0.09
	Ficus thonningii	T	2	0.2	0.04
1	*Alchornea cordifolia*	S	2	0.2	0.04
	Alchornea floribunda	S	3	0.3	0.09
	Total		**10**	**1**	**0.26**
	Simpson's Index of Diversity (I-D)			**0.74**	
	Solanum indicum	S	3	0.27	0.07
2	*Pittosporum viricliflorum*	S	2	0.18	0.03

	Ficus capensis	T	2	0.18	0.03
	Senna tora	S	4	0.36	0.13
	Total		**11**	**1.00**	**0.27**
	Simpson's Index of Diversity (I-D)			**0.73**	
	Phonix reclinata	T	2	0.29	0.08
3	*Pterocardrum osim*	S	1	0.14	0.02
	Carapa procera	T	4	0.57	0.33
	Total		**7**	**1.00**	**0.43**
	Simpson's Index of Diversity (I-D)			**0.57**	
	Piliostigma thonnigii	T	3	0.43	0.18
4	*Solanum nigrum*	S	1	0.14	0.02
	Pseudocedrala kotshiyi	T	3	0.43	0.18
	Total		**7**	**1.00**	**0.39**
	Simpson's Index of Diversity (I-D)			**0.61**	

Table 5: Setraco Unmined Site

Plot	**Name of specie**	**Specie class**	**No. Of bions**	**n1/N**	**$\sum(n1/N)^2$ D**
	Clausena anisata	T	2	0.09	0.01
	Ficus capensis	T	1	0.04	0.00
	bridelia feruginea	T	3	0.13	0.02
	Pittosporum viricliflorum	T	2	0.09	0.01
	Solanum indicum	S	3	0.13	0.02
1	*Furiunia elastic*	S	3	0.13	0.02
	Albinia adeamlefoh	S	3	0.13	0.02
	Anthocleista vogelli	T	1	0.04	0.00
	Ricenoderdrum heulelotti	T	1	0.04	0.00
	Senna tora	S	2	0.09	0.01
	Dembeya ledermanni	T	2	0.09	0.01
	Total		**23**	**1.00**	**0.10**
	Simpson's Index of Diversity (I-D)			**0.90**	
	Diplazium esculentium	S	1	0.05	0.00
	Phoenix reclinata	T	1	0.05	0.00
	Trema orientalis	T	3	0.16	0.02
2	*Securidaca longepedunculata*	T	3	0.16	0.02
	Alchornea floribunda	S	2	0.11	0.01
	Combretum molle	S	2	0.11	0.01
	Pihostigma thonnigii	T	4	0.21	0.04
	Pittosporum viricliflorum	T	2	0.11	0.01
	Psorospermum guineense	S	1	0.05	0.00
	Total		**19**	**1.00**	**0.14**
	Simpson's Index of Diversity (I-D)			**0.86**	
	Mallotus oppositiffolius	S	1	0.04	0.00
	Helichrysum pertiolare	S	1	0.04	0.00
	Mucuna pruriens	S	2	0.08	0.01
	Alchornea cordifolia	T	5	0.20	0.04
	Bambusa costatum	S	1	0.04	0.00
	Cola gigantean	T	1	0.04	0.00
	Elaeis guineensis	T	1	0.04	0.00
	Uapaca togoensis	T	3	0.12	0.01
	Nuxia congesta	S	1	0.04	0.00
	Tephrosia bracteolate	S	1	0.04	0.00
3	*Dacryodes edutis*	T	4	0.16	0.03
	Rauvolfia vomitoria	S	1	0.04	0.00
	Pentacielbera macrophylla	T	3	0.12	0.01
	Total		**25**	**1.00**	**0.11**
	Simpson's Index of			**0.89**	

	Diversity (I-D)				
	Solanum nigrum	S	2	0.05	0.00
4	*Sesbania leptocarpa*	S	1	0.03	0.00
	Carapa procera	T	4	0.11	0.01
	Grewia mollis	S	2	0.05	0.00
	Anthocleista vogellii	T	2	0.05	0.00
	Annona senegalensis	T	1	0.03	0.00
	Afromozia laxiflora	T	2	0.05	0.00
	Crossopteryx febrifuga	T	3	0.08	0.01
	Lophira alata	T	4	0.11	0.01
	Gardenia aqualla	T	2	0.05	0.00
	Parkia bigblobosa	T	3	0.08	0.01
	Pseudocedrala kotshyi	T	2	0.05	0.00
	Ciba pentengra	T	2	0.05	0.00
	Irvingia gabonensis	T	2	0.05	0.00
	Anacardium occidentale	T	1	0.03	0.00
	Ancistrophyllum secundiflorum	S	2	0.05	0.00
	Total		**38**	**1.00**	**0.07**
	Simpson's Index of Diversity (I-D)			**0.93**	
	Musa paradisiaea	S	3	0.08	0.01

Conclusions

The degree of diversity in the species of plants is one of the renowned features of the ecosystem within the study area. This is because the area lies at the fringe of the rainforest, thereby sharing both the characteristics of the Guinea Savanna and that of tropical rainforest. It is therefore sad to note that this rich diversity of the flora in this area has been under threat pioneered by anthropogenic activities such as quarry and mining. Mining activities has been so consistent in the area such that as the vegetation is being cleared for the operations, the rich flora is completely removed. This therefore calls for concern through the use of legislative forces to curb this wanton removal of the vegetative cover.

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