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A CHECKLIST OF TREE SPECIES GROWING ON AKOKA CAMPUS OF UNIVERSITY OF LAGOS, NIGERIA

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Abstract: The following checklist is provided as the most complete compilation of the tree species growing on Akoka Campus of University of Lagos, southwestern Nigeria. This checklist was derived from extensive field survey, with the view of investigating the concurrent depletion on the remnant flora and inventory of all the tree species. Data collection was done by dividing the study area into several plots, and samples were randomly collected from each plot, and identification of the samples was done using local floras. A total of 67 woody tree species belonging to 57 genera within 27 families is represented in the study area. Of the 67 species, 43 species (64.17%) are native to Nigeria and West Africa and 24 species (35.83%) are considered exotic or non- native and are naturalized. The result showed that fourteen families consist of only 1 species each, four families have 2 species each and 3 species each respectively, two families have 4 species each while the other families consists of 5 species, 7 species and 13 species respectively. Of these, the family Fabaceae has the highest frequency (13 species) representing 19.409% of total species encountered) occurring in all the plots followed by Moraceae which consists of 7 species (10.45%). This result reveals high rate of degradation on the remnant flora species, as a result of habitat conversion into residential area (urbanization), indiscriminate degradation and reclamation of mangrove for development of several infrastructural facilities in order to satisfy the insatiable humans' wants and subsistence farming. However, these species now need high conservation priorities for sustainability.
Keywords: Tree, Conservation, Population, Urbanization.

INTRODUCTION

Nigeria vegetation is one of the most endowed in Africa, as almost all the vegetation types that exists in other African countries are found widely distributed in different geopolitical zones of the country, this is favored by the variations in climate and geographic features, which harbors about 7895 species of plant; this makes it as one of the richest countries in the continent in terms of biodiversity (Adeyemi and Ogundipe, 2012; Ayodele *et al.,* 2012 and Pelemo *et al.,* 2011). However, these habitats are under threat from advancing civilization and other unsustainable human activities, the attitude of the populace towards conservation is relatively poor; thereby resulting to inevitable loss of genetic resources at all levels. Ideally, conservation of biodiversity is supposed to be an intrinsic responsibility for all

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mankind (IUCN, 2010), but this is far from the case, as the rate of destructive anthropogenic activities on the floras and biodiversity at large escalates daily with nearly 90% of forest in Nigeria cleared (Kabiru, 2008). In 2010 Nigeria had 9 million hectares of forest, 336,000 hectares of which were primary forest (FAO 2010). However, the continual existence of this forest is in doubt, as several authors such as (Batta *et al.,* 2013; Momoh, 2011; Pelemo *et al.,* 2011 and Ladipo 2010), have lamented the rate of deforestation in the country which is estimated at 3.5% per year, translating to a loss of 350,000–400,000 ha of forest land per year and the entire Nigeria's forest land area now is about 10%, which is well below FAO's recommended national minimum of 25%. Perhaps this is threatening about 484 plant species in 112 families of 7895 plant species estimated in the country with extinction Pelemo *et al.* (2011). Unarguably, one of the persistent problems associated with deforestation is the selective exploitation of some targeted species for economic, social and spiritual paraphernalia, and trees are mostly targeted (Alamu and Agbeja, 2011). A tree has been defined in several ways, e.g. Seth (2002) defined a tree as a large, long-lived (i.e. perennial) woody plant that attains a height of at least 6 m (20 ft) at maturity in a given locality, and usually, but not always it has a single main self-supporting stem called a trunk or a bole, which gives off spreading branches, twigs and foliage to make a crown. Also Redhead (1971) defined a tree as a plant species capable of attaining at least a height of about 6m. In Nigeria, there are about 560 species of trees (Ihenyen, 2009; Keay, 1989 and Redhead, 1971). However continued existence of these trees species is in jeopardy; because deforestation, logging and other various forms of unsustainable activities have drastically increased in recent times, thereby posing appreciable risk of local extinction to some species. Indeed, the tree species growing in the study area, situated in the most commercial city of Nigeria, and also the most urbanized state in Nigeria, and accommodates about 10% of the entire population of the country (Pelemo *et al.,* 2011), are however not spared from the above aforementioned threats. Rapid increase in population have led to the development of several infrastructural facilities so as to provide comfort to insatiable humans wants, have of course led to the destruction of almost all the ancestral vegetation in and within the study area and its proximate vegetation for urbanization and other commercial activities which are socioeconomic problems, and are too difficult to be controlled. Attempt to list the tree species that exist in this area was by Orebamjo and Njoku (1968), but since then, only skeletal attempt has been made so far, example include (Adekambi and Ogundipe, 2009; Shonubi and Okusanya, 2007). Hence, there is a need to provide a detailed checklist of the remnant plants

species so as to decide on adequate conservation measure which will be afforded for posterity. Therefore, this work is aimed at providing a checklist for the entire trees of the study area and to document the rate of depletion on the floras.

MATERIAL AND METHODS

Description of study area

The study was conducted in Akoka campus of University of Lagos, Yaba, Lagos, south-western Nigeria. The area which is largely surrounded by the scenic view of the Lagos lagoon comprises a total of 802 acres (3.25 km^2) of land. It is located on longitude 3° 24' E and latitude 6° 30' N and on elevation of 40-90 m, which makes flooding difficult (Figure 1). The vegetation in this area is half cleared and developed, and the remainder is represented by mangrove vegetation and most of the species recorded by Orebamjo and Njoku (1970) have diminished in number and density. It has an undulating terrain, half of which represents buildings, with various fresh water channels and creeks passing across at different location of this area. A large area of mangrove swamps, roughly 50%, dominates the vegetation. In the north and southeast lies the brackish lagoon water which supports a typical terrestrial habitat, and experiences less human disturbance while in the south and southwest lies the fresh water, where the soil is highly rich and supports a rich flora which is highly favored by the climate type much disturbed by human activities. A rich lush of *grasses species such as Panicum subalbidum, Panicum maximum, Andropogon sp, Hyparrhenia sp, Sporobolus sp, Andropogon sp,* whereas the herbaceous are made up of *Chromolaena odorata, Ipomoea aquatic Combretum sp, Paspalum sp Asystasia gangentica, Typha australis,* and the Sedges dominated by *Scleria depressa, Kyllinga erecta, Cyperus esculentus, Cyperus javanicus, Centrosema pubescens, Saccharum officinarum, Bambusa vulgaris, Luffa cylindrical, Sida acuta, Bidens pilosa among others,* well represented in each sampling plot.

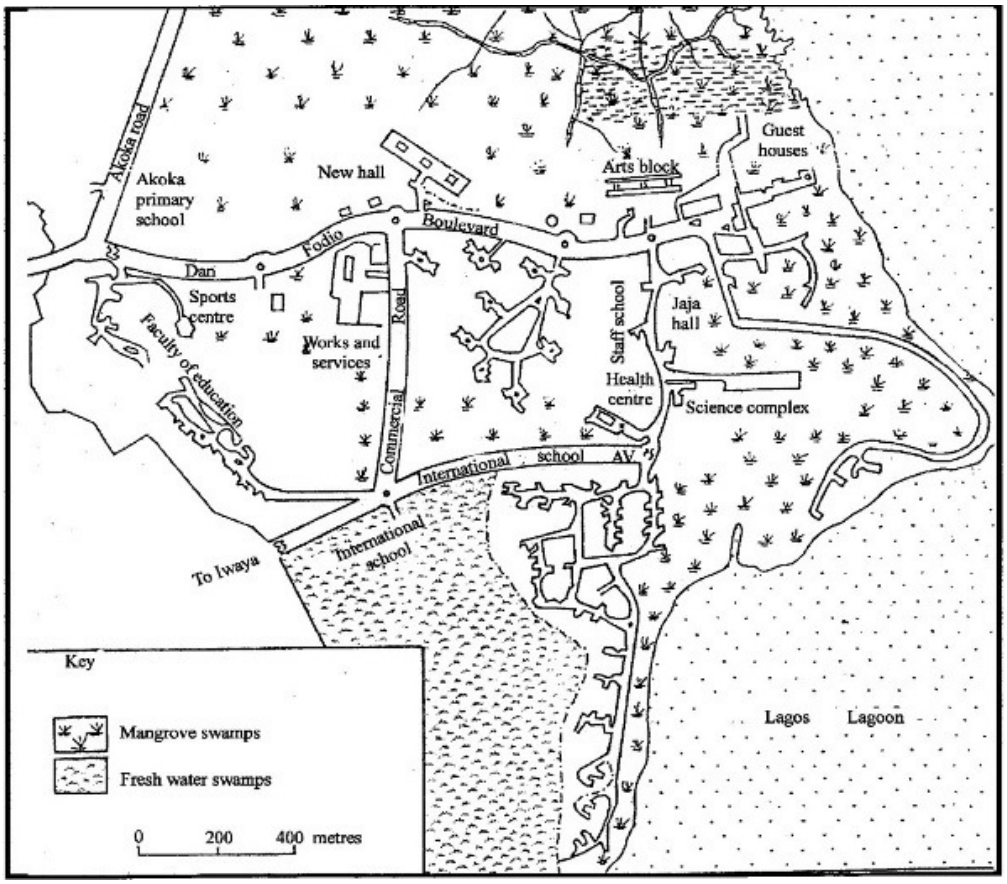

Figure1: Map showing study area fresh and mangrove swamp of University of Lagos
Source: Shonubi and Okusanya, 2007

Plant Sampling

This study is based on intensive field surveys conducted in University of Lagos campus Akoka Yaba, Lagos. A Global Position System (GPS) was used during the sampling period. For sample collection, the study area was divided into four sampling plots. Trees were enumerated in 50 x 20 m plots, whereas 0.5 x 2 m quadrat was used to study herbs and grasses. Samples were collected at random within each plot, and identify, the assessment of native versus introduced status is based on the information provided by the literature sources e.g. (Keay, 1989; Keay *et al.,* 1964; Hutchison and Dalziel, 1954; Dalziel, 1937). Voucher specimens of all plants were collected and deposited at the University of Lagos Herbarium.

Data Analysis

The data were analyzed using different indices such as Shannon & Wiener (Ubom, 2010; Magurram, 1988; Kent and Coker, 1985). Assessment of the conservation status of the plant species encountered during this study was done following CITES (2012), IUCN (2011),

Onana, (2011) and IUCN (2010). The Shannon & Wiener Diversity Index, which accounts for species richness and how the species are distributed, is derived from the relation

$$H^1 = \sum_{i=1} P_i \ln P_i$$

Where: H^1 = Shannon-Weiner index

S = Number of species

Pi = Proportion of individuals or abundance of the i^{th} species expressed as a proportion of the total number of individuals of all species.

In = log base10

RESULTS AND DISCUSSION

The result of this survey recorded a total of 67 woody tree species capable of attaining a maximum height of 12 m and girth of 60 cm (Redhead, 1971) all belong to 57 genera within 27 families (Table 1).

Table 1: Total number of species per family encountered in the study area

S/N	Family	Number of species encountered
1.	Anacardiaceae	4
2.	Annonaceae	1
3.	Apocynaceae	3
4.	Arecaceae	5
5.	Avicennaceae	1
6.	Bignonaceae	3
7.	Bombacaceae	3
8.	Boraginaceae	1
9.	Calophyllaceae	1
10.	Caricaceae	1
11.	Casuarinaceae	1
12.	Chrysophyllaceae	1
13.	Combretaceae	4
14.	Euphorbiaceae	2
15.	Lauraceae	1
16.	Fabaceae	13
17.	Loganiaceae	2

18.	Lyrathaceae	1
19.	Malvaceae	1
20.	Meliaceae	2
21.	Moraceae	7
22.	Myrtaceae	2
23.	Rubiaceae	1
24.	Rutaceae	1
25.	Sapindaceae	1
26.	Sterculiaceae	3
27.	Verbenaceae	1

Of the 67 species, 43 species (64.17%) are native to the Nigeria and West Africa and 24 species (35.83%) are considered exotic or non- native and are naturalized (Keay, 1989). The diversity index $\mathbf{H^1}$ for species nativity is, 6.9 and 4.0 for exotic species, and this is high. Thus this statistics illustrate the great numbers of exotic plants that have become established in native habitats, with more being expected every year. Of all the families encountered, fourteen families were recorded to have only 1 species each, four families have 2 species each and 3 species each respectively, two families have 4 species each while the other families consists of 5 species, 7 species and 13 species respectively. Of these, the family Fabaceae has the highest frequency (13 species representing 19.40% of total species encountered) occurring in all the plots followed by Moraceae which consists of 7 species (10.45%) (Table 2).

Table 2: List of Species studied and their Conservation Status

S/N	**Species**	**Family**	**Conservation status**
1.	*Adansonia digitata* A.L	Bombacaceae	LC *
2.	*Albizzia lebbeck* Benth	Fabaceae	LC
3.	*Albizzia zygia* (DC.) Macbor.	Fabaceae	LC
4.	*Alstonia boonei* De Wild.	Apocynaceae	LC
5.	*Anacardium occidentale* De Wild.	Anacardiaceae	LC
6.	*Annona muricata* L	Annonaceae	LC *
7.	*Anthocleista djalonensis* A Chev	Loganiaceae	LC
8.	*Anthocleista vogelii* Planch	Loganiaceae	LC

9.	*Artocarpus communis* J.R Forst. & G. Forst	Moraceae	LC
10.	*Avicennia germinans* (L.) L	Avicennaceae	LC
11.	*Azadirachta indica* A Juss	Meliaceae	LC
12.	*Bauhinia monandra* Kurz	Fabaceae	LC
13.	*Blighia sapida* K. Koenig	Sapindaceae	LC
14.	*Bombax buonopozense* P Beauv	Bombacaceae	LC
15.	*Bridelia micrantha* (Hochst) Baill	Euphorbiaceae	LC
16.	*Calophyllum inophyllum* L	Calophyllaceae	LR *
17.	*Carica papaya* L.	Caricaceae	LC
18.	*Senna siamea* (Lamarck) Irwin et. Barneby	Fabaceae	LC
19.	*Casuarina equisetifolia* L	Casuarinaceae	LC *
20.	*Ceiba pentandra* (L.) Gaertn	Bombacaceae	LC *
21.	*Chrysophyllum albidum* G. Don	Chrysophylloideae	LC *
22.	*Citrus sinensis* Osbeck	Rutaceae	LC
23.	*Cocos nucifera* G. Don	Arecaceae	LC
24.	*Cola gigantea* L	Sterculiaceae	LC
25.	*Cola nitida* et. Endl. Schot	Sterculiaceae	LC
26.	*Cordia abyssinica* Lam	Boraginaceae	LC *
27.	*Delonix regia* (Hook)Raf	Fabaceae	VU
28.	*Dialium guineensis* Willd	Fabaceae	LC
29.	*Elaeis guineensis* Jacq	Arecaceae	LC
30.	*Erythrina senegalensis* DC	Fabaceae	LC
31.	*Eugenia malaccensis* L.	Myrtaceae	LC *
32.	*Ficus congoensis*	Moraceae	LC
33.	*Ficus exasperata* L.	Moraceae	LC
34.	*Ficus sycomorus* L	Moraceae	LC
35.	*Ficus vallis-chaudae* L	Moraceae	LC
36.	*Gliricidia sepium* (Jacq) Kunth	Fabaceae	LC
37.	*Gmelina arborea* Roxb	Anacardiaceae	LC

38.	*Holarrhena floribunda* (G. Don) T. Durand& Schinz	Apocynaceae	LC
39.	*Hildagardia barteri* Roxb	Malvaceae	LC
40.	*Hura crepitans* L	Euphorbiaceae	LC *
41.	*Jacaranda mimosifolia* G. Don	Bignonaceae	VU
42.	*Khaya grandifoliola* C.DC	Meliaceae	VU
43.	*Lagerstroemia speciosa* (L.) Pers	Lythraceae	LC
44.	*Mangifera indica* L	Anacardiaceae	LC
45.	*Milicia excelsa* (Welw.) C.Berg	Moraceae	EN*
46.	*Millettia thonningii* (Schum. &Thonn.)Baker	Fabaceae	LC
47.	*Morinda lucida* Benth	Rubiaceae	LC
48.	*Newbouldia laevis* (P.Beauv.) Seeman ex Heyne	Bignonaceae	LC
49.	*Peltophorum pterocarpum* (DC.) Baker ex Heyne	Fabaceae	LC *
50.	*Persea americana* Mill	Lauraceae	LC
51.	*Phoenix reclinata* Jacq	Arecaceae	LC
52.	*Pithecelobium dulce* (Roxb.)Benth	Fabaceae	LC *
53.	*Psidium guajava* L	Myrtaceae	LC
54.	*Raphia hookeri* Marm Wendland	Arecaceae	LC
55.	*Rauvolfia vomitora* Afzel	Apocynaceae	LC
56.	*Roystonea oleraceae* O.F. Cook	Arecaceae	LC
57	*Senna alata*	Fabaceae	LC
58	*Senna fistula*	Fabaceae	LC
59	*Spondias mombin* L	Anacardiaceae	LC*
60.	*Sterculia tragacantha* Lindl	Sterculiaceae	LC
61.	*Tabebuia rosea* (Bertol.)DC.	Bignonaceae	LC
62.	*Tectona grandis* L	Verbenaceae	LC *
63.	*Terminalia catappa* L	Combretaceae	LC
64.	*Terminalia randii* Baker. f	Combretaceae	LC
65	*Terminalia ivorensis*	Combretaceae	VU

66.	*Terminalia superba* Engl.et Diels	Combretaceae	LC *
67.	*Treculia africana* Decne	Moraceae	LC *

KEY: LC - Least Concerned, LR – Local Risk, VU – Vulnerable, EN – Endangered,
* Protected by CITES

The distribution pattern of the tree species reveals total decimation in the species number, with the highest densities of occurrence recorded in the botanic gardens whereas some sampling site were observed to be without even a single tree, and the entire vegetation in such locations is seriously been destroyed as result of unsustainable human activities.

It is believed that before the establishment of University of Lagos, the biodiversity of northeastern Lagos was covered with huge lush of Mangrove forest, but the rapid urbanization from the 1970s onwards that followed a series of successive redevelopments for higher intensity land use, which have culminated, and is escalating in an unprecedented manner. Although the main drivers of deforestation in the country have been outlined and highlighted by several authors, (Durugbo *et al.,* 2012; Alamu and Agbeja 2011; Pelemo, *et al.*, 2011; NBSAP, 2001) to include agriculture, logging and mining, use of fuel wood and logging amongst others, these pose various degree of threats to biodiversity conservation in Nigeria. However, in this study, habitat conversion into residential area (urbanization), indiscriminate degradation and reclamation of mangrove for development of several infrastructural facilities in order to satisfy the insatiable humans wants, and subsistence farming were observed to be the stringent problems facing the flora of this area (Figures 2 and 3). In fact, the entire vegetation in the study area has been degraded such that the secondary vegetation and Mangrove forest are cleared to build public housing or infrastructures; drainage patterns were drastically changed, and streams are straightened, redirected and made into concretized canals and ditches. This result agrees with the earlier suggestion of; Abere and Opara, 2012; Adewuyi, 2012; Nodza, 2011; Omofonmwan and Edoh, 2008.

Figure 2: Reclaiming of Mangrove at a site in the study area

However, these problems could be exacerbated by the influx of human population in Lagos, where the study area is situated, and is inextirpable, and now is considered the most populated city in Nigeria in terms of human population (Pelemo *et. al.,* 2011, NPC 2011, Ayeni 1979).

Figure 3: Land clearing for subsistence farming behind the Faculty of Environmental sciences

The increase in population often leads to enrolling of more students into the institution, especially as it is considered the "*institution of first choice*" in Nigeria, and this has resulted into developing of more infrastructural facilities for conducive learning environment.

Consequently, this encourages continuous degradation of the remnant vegetation to pave way for these infrastructural facilities which puts the continual existence of the tree species growing in this area in jeopardy. This supports the report published by Orebamjo and Njoku (1968) that the population of several indigenous species present in the study area is adversely affected especially species such as *Anogeissus leiocarpus, Triplochyton scleroxylon, Daniellia ogea, Celtis spp,* and *Entandrophragma spp among* others which have now been replaced with the exotic species such as *Roystonea oleraceae, Terminalia catappa,* and *Tabebuia rosea*. These exotic plant introductions came through ornamentals that were used for street scapes or landscaping the built-up areas as implemented by the then administrative management. Today, Akoka campus of University of Lagos floras is growing in a mosaic of surviving primary vegetation and patches of low secondary vegetation, with more visible plants as mixture of both wild and introduced species, in botanical gardens and scrub and re-growth mangrove forests. In fact the species of *Avicennia* have totally declined in numbers as result of constant sand filling of the environment for structure development, and the decimation of such habitats caused by unsustainable management pose a great challenge to the survival of biodiversity in this area. Some of the plants that are endemics to coastal environments, such as *Avicennia spp* and *Rhizophora racemosa* are now known from few sites unlike it was before and now need high conservation priority.

This checklist has summarizes the rate of genetic depletion on the flora species that exist in the study area, with which if adequate measures are not taken, may render most of the vulnerable species extinct or those with low risk vulnerable or threatened. In view of these, devising an effective means of conserving the trees species growing in this area has become imperative, as global concerns about the loss of valuable genetic resources in recent times has prompted several international action plant to conserve biodiversity at all levels.

CONCLUSION

This checklist has provided details on the tree species growing in the study area and highlighted the various anthropogenic activities posing threat to the remnant flora of the area. However, it is very evident that *in situ* conservation is no longer effective to conserve the trees species growing in this area as a result of indiscriminate reclamation and various forms

of degradation processes exacerbated by population growth. Hence, there is a need to deduce an effective means of conserving the species through ex situ method, by upgrading the botanical garden, restocking the herbarium, and possibly collecting the germplasm for conservation in appropriate repositories.

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