FLORAL DIVERSITY IN THE WETLANDS OF IBEJU-LEKKI AREA, LAGOS, NIGERIA

***Adeniyi, T. A.[a], Oyebanji, O. O.[a] and Adeonipekun, P. A.[a]**
[a]Department of Botany, University of Lagos, Akoka, Nigeria
*Corresponding Author: Adeniyi, T. A. dessytwa@yahoo.com; +2348073116409
(Received: 2nd June, 2016; Accepted: 30th August, 2016)

ABSTRACT

Until very recently poor attention has been given to the management of wetlands in Nigeria despite their significance in the global food and water supply, energy needs and disaster management. Due to the rapid development of the Lagos coastal areas for commerce and industrial purposes, the natural coastal vegetation made up of various wetlands are destroyed daily. In ten years' time, much of these wetlands would have given way to industrial structures and the biodiversity will be difficult to reconstruct. Therefore, to document the taxa of these wetlands and show the importance of the wetlands of Lekki, Lagos Nigeria, a vegetation mapping and survey of wetlands in Ibeju-Lekki Area was conducted. Three wetland sites designated A, B and C, proposed to be affected by the new Lekki Port, were mapped and studied within a 5 km radius of the axis, extending from the beach vegetation to the hinterland of the Lekki lagoon. A total of 49 species in 45 genera belonging to 29 families were identified. Members of the Cyperaceae family, *Nymphaea lotus* Linn.*, Raphia hookeri* G. Mann et H. Webdl.*,* and *Pteridium aquilinum* (L.) Kuhn were common in the three sites. Site A has the highest number of species (35), Simpson's, Shannon-Wienners and Margalef index values of 0.9385, 3.057 and 5.225 respectively. The sites with the highest anthropogenic activities indicated the lowest floral diversity (Site B) and abundance of weeds (76.8 %). The high floral diversity found in the undisturbed site (site C) indicates that the wetlands are correlated with their functions in biodiversity and other indirect benefits. Hence, the conservation of these wetlands is encouraged.

Keywords: Lagos; wetlands; biodiversity; anthropogenic activities; weeds; conservation

INTRODUCTION

Wetlands are found where the topography or geology slows down or obstructs the movement of water through the catchment causing the surface soil layers in the wetland area to be temporarily, seasonally or permanently wet (NRC, 1992). The functions of wetland make an important ecological component of the environment involved in the sustainability of such environment. They reduce the severity of droughts and floods by regulating stream flow, purify water and provide habitat for many different plants and animals. They also provide many resources such as fiber for making crafts (Kotze, 1996). In spite of these important functions in the environment, wetlands are among the most threatened ecosystems of the world due to negligence and carelessness of man. They have been reduced in number and extent as reported by Dixon and Sherman (1990) because of the need for more agricultural lands. Erosion from runoff, oil spillage and effluent pollutants further threaten wetlands in Nigeria. In fact, most wetlands in urban centers in Nigeria are cultivated in the dry season to boost the supply of vegetables. This apart from the fact that recently most of these urban wetlands that survived dry season cultivation, give way to estate development for offices and other developmental structures. What would have been stretches of wetlands along contiguous streams and rivers have been and are being fragmented by small dam and road constructions, and industrial development (Olubode *et al.,* 2011). Yet not much is known about the diversity of the plant communities in these wetlands.

The wetlands in the outlying ecosystems are not spared the biodiversity erosion, which is loss of biodiversity as a result of disappearance of native species from the ecosystem. Wetlands are being rapidly taken over by invasive exotic plant species, as well as being often overgrazed in the dry season (Olubode *et al.,* 2011). This study is a comparative assessment of the flora of three wetlands in Ibeju-Lekki Area, Lagos State, Nigeria. The wetlands occur in the same ecozone and are within 5 km of one another. The objectives of the research were to evaluate and compare the flora components of the three wetlands with a view to determining their

floristic dissimilarity or similarity and also to evaluate the effect of anthropogenic disturbances on the wetlands. This would help to suggest appropriate management strategies that will ensure their sustainable utilization.

MATERIALS AND METHODS

Study Area:

Lagos state is the most populated state in the country with over 20 million people (Ogundele, 2012). It is situated in South Western Nigeria approximately between longitudes 2º42'E to 3º42'E and latitudes 6º22'N to 6º42'N. It has a humid tropical climate bordering a monsoon tropical climate characterized by two wet (April to July and October and November) and dry (August and September and December to March) seasons (Ogundele, 2012). Mean annual rainfall varies between 1381.7 mm and 2733.4 mm with an average of 2500 mm while monthly rainfall ranges between 25 mm to over 400 mm. Maximum temperature ranges between 29 ºC and 34 ºC and minimum ranges between 24 ºC and 28 ºC. Relative humidity is high throughout the year, above 70 % throughout the year (Ogundele, 2012). The wind directions are synchronous to the seasonal positions of the Inter Tropical Convergence Zone (ITCZ). During the wet season months, the southwest winds prevail as the front moves to the north. But as from October when the front moves south wards, the northeast winds sweep in the dry season. Lagos State, however, experiences predominantly South-westerly wind and sea breezes all-year-round (Ogundele, 2012).

The study area is on the south-eastern Nigerian Coast in the Ibeju-Lekki Local Government Area (LGA) of Lagos State (Figs. 1 and 2). The study site has recently been considered for the construction of a sea port, a power plant and dam for the power plant. The vegetation cover in the study area encompasses lowland rainforests, freshwater swamp forests, agriculture tree crop plantations, and intensive small-holder rain-fed agricultural vegetation. Ibeju-Lekki is becoming an increasingly popular tourist destination. The Lekki Peninsula, for example, attracts both tourists and musicians during special festivals. A sixty-hectare Murtala Muhammed Botanical Gardens is also popular among visitors and is approximately 35 kilometers from the study area. Satellite images of the studied area were taken using Google Earth software, 2012 (Table 1 and Fig. 3).

Vegetation Study:

Transects and quadrats (50 cm x 50 cm) were the sampling tools used to gather the information about the species. All plant specimens encountered were identified to species level either on the field or in the herbarium, using appropriate Floras, Manuals and Monographs such as Hutchinson and Dalziel (1954), Alston (1959), Keay *et al.* (1964), and Akobundu and Agyakwa (1998). Identification was further confirmed at the University of Lagos Herbarium (LUH), Nigeria. Classification into families was based on APG III (2009) and Ayodele and Yang (2012).

Table 1: Details of the Study Area

S/N	COORDINATES		REMARKS
	LATITUDE	LONGITUDE	
A	6º25'24.41''N	4º00'56.81''E	A disturbed Freshwater swamp habitat, located in an area beyond the reach of tidal waters.
B	6º26'11.21''N	4º01'06.86''E	Larger area of freshwater swamp forest adjacent to the Lekki Lagoon and heavily disturbed.
C	6º26'23.47''N	4º01'26.61''E	Small, undisturbed, shallow swamp leading to Epe Lagoon. It was accessed using a canoe. It is mainly a network for transporting timber and fishing by the natives.

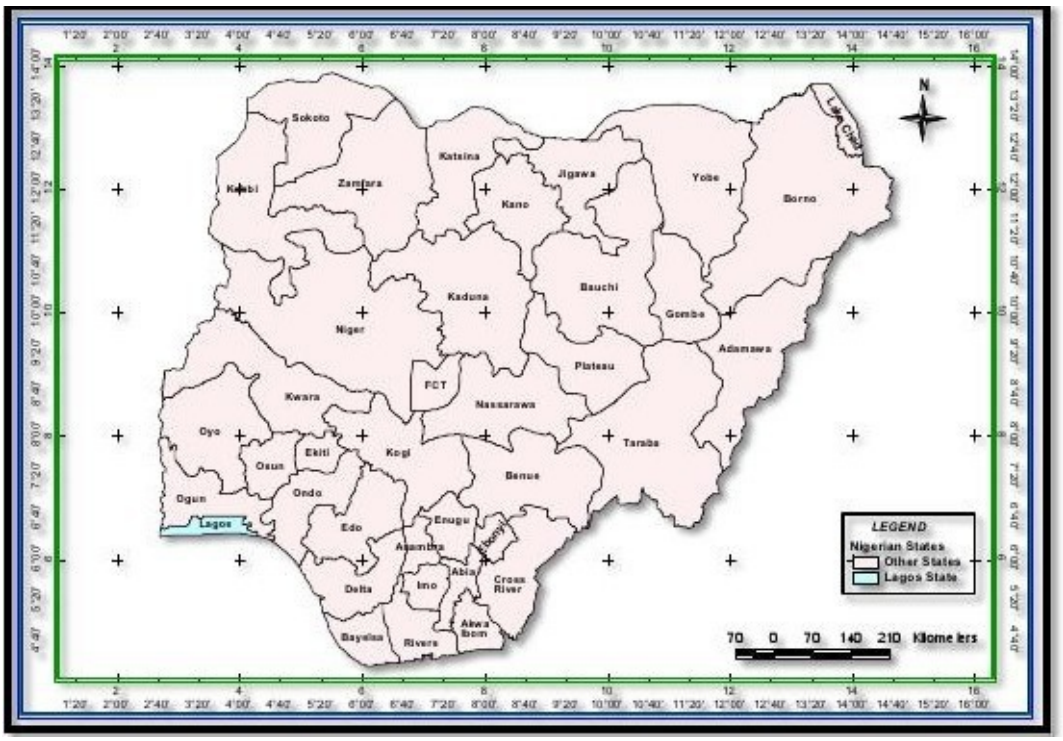

Figure 1: Map of Nigeria showing Lagos State

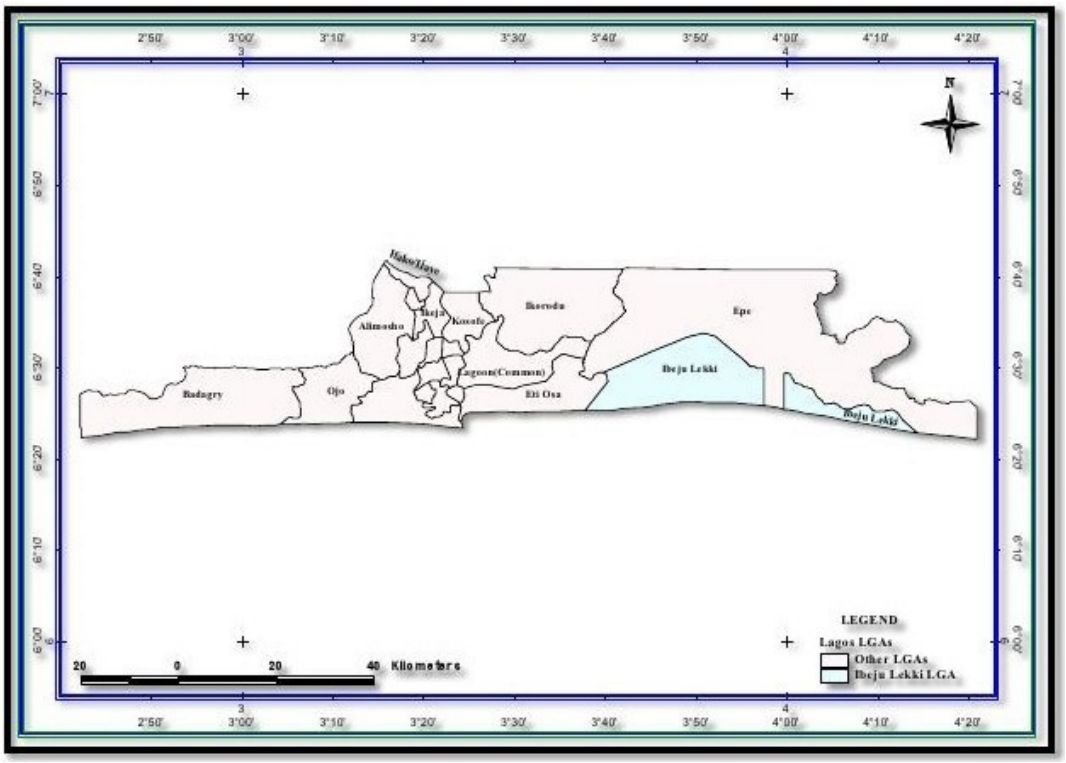

Figure 2: Map of Lagos State showing Ibeju-Lekki

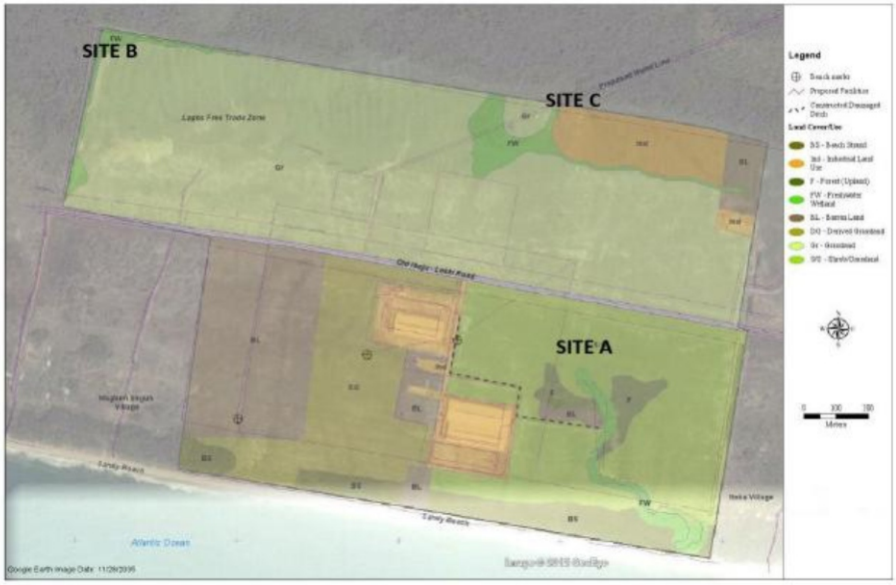

Figure 3: Map Showing Location of Study Sites

RESULTS

A total of 49 species in 45 genera belonging to 29 families were identified. The dominant family was Cyperaceae represented by 3 species. *Mariscus alternifolius*, *Nymphaea lotus*, *Raphia hookeri*, and *Pteridium aquilinum* were recorded in all sites. *Raphia hookeri* is the most abundant species encountered across the study area. Site A has the highest number of species (35), Simpson's, Shannon-Wienners and Margalef index value of 0.9385, 3.057 and 5.225 respectively compared to site B and C. However, highest sum of individuals of species was recorded for Site C while highest dominance value of 0.1113 was recorded for Site B. Highest species evenness was encountered in site B (Table 2).

Site A. Thirty six species distributed in 21 families were recorded in this site with the dominant species being *Cocos nucifera* (10.2 %), *Chrysobalanus icacao* (7.3 %), *C. orbicularis* (8.8 %), *Mariscus alternifolius* (7.3 %), *Cynodon dactylon* (11.0 %), *Pteridium aquilinum* (a fern) (6.6 %) and *Nymphaea lotus* (a floating plant) (5.1 %). Weeds accounted for 51.2 % of the total plants counted (Table 3).

Site B. Fifteen species distributed in 10 families were recorded in this site with the dominant species being *Raphia hookeri* (16.1 %), *Cyperus articulatus* (12.5 %), *C. esculentus* (8.9 %), *C. rotundus* (14.3 %), *Mariscus alternifolius* (8.9 %), *Coix lacryma-jobi* (6.3 %) and *Pteridium aquilinum* (9.8 %). Other dominant plants include the climber *Chasmanthera dependens* (3.6 %) and *Spigelia anthelma* (1.8 %). Weeds accounted for 76.8 % of the total plants counted (Table 4).

Site C. Most parts of this site are undisturbed. It contains 26 species distributed among 15 families. Dominant plants in the site include: *Alstonia boonei* (7.0 %), *A. congensis* (7.0 %), *Raphia hookeri* (12.6 %), *Aspilia africana* (7.0 %), *Nymphaea lotus* (11.2 %), *Paspalum vaginatum* (11.9 %), *Coix lacryma-jobi* (9.1 %), *Pteridium aquilinum* (4.9 %) and *Salvinia natans* (8.4 %). Weeds accounted for 41.9 % of the total plants counted (Table 5).

Table 2: Species Diversity Indices for the Studied Areas

	Site A	Site B	Site C
Taxa (Species)	35	15	26
Individuals	670	560	714
Dominance	0.0615	0.1113	0.07943
Simpson Index	0.9385	0.8887	0.9206
Shannon Index	3.057	2.335	2.738
Evenness	0.6077	0.6887	0.5945
Margalef	5.225	2.212	3.805

Table 3: Frequency, Habit, and Economic Importance of Plant Species found in Site A

Scientific Name	Economic Use(s)	Habit	Frequency (%)
Acanthaceae			
Asystasia gangetica (L.) T. Anderson	Weed, Medicinal	Herb	1.5
Amaranthaceae			
Philoxerus vermicularis (L.) Beauv.	Weed	Creeper	2.2
Anacardiaceae			
Mangifera indica L.	Food, Medicinal	Tree	1.5
Apocynaceae			
Alstonia boonei De Wild.	Wood, Medicinal	Tree	0.7
Catharanthus roseus (L.) G. Don	Weed, Ornamental	Creeper	0.1
Rauvolfia vomitoria Afzel.	Medicinal	Tree	0.4
Arecaceae			
Cocos nucifera L.	Food, Fibre, Medicinal	Tree	10.2
Raphia hookeri G. Mann et H. Webdl.	Fibre, Medicinal	Tree	3.6
Asteraceae			
Aspilia africana (Pers.) C. D. Adams	Weed, Medicinal	Herb	2.9
Melanthera scandens (Schumach. et Thonn.) Roberty	Weed, Medicinal	Herb	1.5
Tridax procumbens L.	Weed	Creeper	2.2
Chrysobalanaceae			
Chrysobalanus icaco L.	Medicinal	Shrub	7.3
Chrysobalanus orbicularis Schumach.	Medicinal	Shrub	8.8
Cyperaceae			
Cyperus articulatus L.	Weed	Sedge	1.5
Cyperus esculentus L.	Weed	Sedge	2.9
Cyperus iria L.	Weed	Sedge	2.9
Cyperus rotundus L.	Weed	Sedge	3.6
Mariscus alternifolius Vahl	Weed	Sedge	7.3
Hydrocotylaceae			
Hydrocotyle bonariensis Lam.	Medicinal	Creeper	0.4
Lamiaceae			
Hyptis suaveolens (L.) Poit.	Food, Medicinal	Herb	1.5
Loganiaceae			
Anthocleista djalonensis A. Chev.	Wood	Tree	0.7
Anthocleista vogelii Planch.	Wood	Tree	0.7
Nymphaeaceae			
Nymphaea lotus L.	Medicinal	Floating	5.1
Papilionaceae			
Canavalia rosea (Sw.) DC.	Medicinal	Creeper	0.1
Desmodium triflorum (L.) DC.	Weed	Creeper	0.7
Poaceae			
Bambusa vulgaris Schrad. ex Wendel	Wood	Tree	2.9
Cynodon dactylon (L.) Pers.	Weed	Grass	11.7
Panicum maximum Jacq.	Weed	Grass	2.2
Paspalum vaginatum Sw.	Weed	Grass	1.5
Pteridiaceae			
Pteridium aquilinum (L.) Kuhn	Weed	Fern	6.6
Rhizophoraceae			
Rhizophora racemosa G. Mey.	Medicinal	Tree	2.9
Rubiaceae			
Mitracarpus scaber Zucc. ex Schult. et Schult. f.	Weed, Medicinal	Herb	0.7
Spigeliaceae			
*Spigelia anthelmia*L.	Weed	Herb	0.1
Verbenaceae			
Stachytarpheta indica (L.) Vahl	Medicinal	Herb	0.3
Vitiaceae			
Vitex doniana Sweet.	Food, Medicinal	Tree	0.3
Zingiberaceae			
Aframomum melegueta K. Schum.	Food, Medicinal	Herb	0.3

Table 4: Frequency, Habit, and Economic Importance of Plant Species found in Site B

Scientific Name	Economic Use(s)	Habit	Frequency (%)
Arecaceae			
Raphia hookeri G. Mann et H. Webdl.	Fibre, Medicinal	Tree	16.1
Convolvulaceae			
Ipomoea involucrata P. Beauv.	Weed	Creeper	0.9
Cyperaceae			
Cyperus articulatus L.	Weed	Sedge	12.5
Cyperus esculetus L.	Weed	Sedge	8.9
Cyperus iria L.	Weed	Sedge	13.4
Cyperus rotundus L.	Weed	Sedge	14.3
Mariscus alternifolius Vahl	Weed	Sedge	8.9
Loganiaceae			
Anthocleista djalonesis A. Chev.	Wood	Tree	0.9
Anthocleista vogelii Planch.	Wood	Tree	0.9
Menispermaceae			
Chasmanthera dependens Hochst.	Food, Medicinal	Creeper	3.6
Nymphaeaceae			
Nymphaea lotus L.	Medicinal	Floating	0.9
Poaceae			
Coix lachrima-jobi L.	Weed, Medicinal	Herb	6.3
Pteridiaceae			
Pteridium aquilinum (L.) Kuhn	Weed	Fern	9.8
Spigeliaceae			
Spigelia anthelma L.	Weed	Herb	1.8
Zingiberaceae			
Aframomum melegueta K. Schum.	Food, Medicinal	Herb	0.9

Table 5: Frequency, Habit, and Economic Importance of Plant Species found in Site C

Scientific Name	Economic Use(s)	Habit	Frequency (%)
Amaryllidaceae			
Crinum scabrum A. Chev.	Medicinal	Floating	2.8
Apocynaceae			
Alstonia boonei De Wild.	Wood	Tree	7.0
Alstonia congensis Engl.	Wood	Tree	7.0
Catharanthus roseus (L.) G. Don	Weed	Herb	0.1
Arecaceae			
Cocos nucifera L.	Food, Fibre, Medicinal	Tree	2.8
Elaeis guineensis Jacq.	Food, Fibre, Medicinal	Tree	2.1
Raphia hookeri G. Mann et H. Webdl.	Fibre, Medicinal	Tree	12.6
Asteraceae			
Aspilia africana (Pers.) C. D. Adams	Weed, Medicinal	Herb	7.0
Melanthera scandens (Schumach. et Thonn.) Roberty	Weed, Medicinal	Herb	0.4
Caesalpinaceae			
Senna podocarpa Guill. et Perr.	Medicinal	Shrub	0.7
Cercopiaceae			
Musanga cecropioides R. Br. ex Tedlie	Wood	Tree	0.7
Convolvulaceae			
Ipomoea involucrata P. Beauv.	Weed	Creeper	0.3
Cyperaceae			
Mariscus alternifolius Vahl	Weed	Sedge	0.1
Malvaceae			
Sida cordifolia L.	Weed	Herb	0.3
Menispermaceae			
Chasmanthera dependens Hochst.	Food, Medicinal	Creeper	2.8
Mimosaceae			
Entada gigas (L.) Fawc. et. Rendle	Food, Medicinal	Creeper	2.1
Nymphaeaceae			
Nymphaea lotus L.	Medicinal	Floating	11.2
Papilionaceae			
Phaseolus vulgaris L.	Food	Creeper	0.7
Poaceae			
Bambusa vulgaris Schrad. ex Wendel	Wood	Tree	0.7
Coix lachrima-jobi L.	Weed, Medicinal	Herb	9.1
Cynodon dactylon (L.) Pers.	Weed	Grass	0.7
Paspalum vaginatum Sw.	Weed	Grass	11.9
Pennisetum purpureum Schumach.	Weed	Grass	2.8
Pontederiaceae			
Eichhornia crassipes (Mart.) Solms	Weed, Medicinal	Floating	0.7
Pteridiaceae			
Pteridium aquilinum (L.) Kuhn	Weed	Fern	4.9
Salviniaceae			
Salvinia natans (L.) All.	Weed	Floating	8.4

DISCUSSION

The results of the study indicated that only Site C showed relationship to a typical wetland flora in the investigated area based on its species composition. There was variation in species composition and population density of each species among the three sites, despite their nearness. These indices suggest that the different flora diversity/distribution in the study area could be attributed to anthropogenic or edaphic factors rather than meteorological factors in the sites since the sites are subjected to the meteorological

factors. Site A and Site B had increased anthropogenic activities caused mainly by construction of the Lekki Port and Lekki Free Trade Zone respectively. Nonetheless, minimal anthropogenic activities such as fishing and timber transport were observed in Site C which relatively affected the floral composition.

Weeds are associated with man and his activities; more so they can survive unfavourable ecological conditions by producing abundant seeds, storage organs and efficient mechanisms for seed dispersal (Ogunyemi, 1977). Weed species increased with increase in anthropogenic activities. The site with the highest anthropogenic activity (Site B) has the highest percentage of weeds while site C with the least anthropogenic activity has the lowest. The dominance of edaphic factors over climate and crop types on weed flora has been stressed by Ogunyemi (1977).Olubode *et al.* (2011) has also confirmed the superiority of edaphic factors such as water retention capacity over climate or crop type on the occurrences of species of weeds. Though the soils of the sites were not studied empirically, it was observed that site B has a dry compact soil while the other two sites are marshy and could only be accessed by canoe. Therefore, the different water retention capacities of the soils could have impacted on the type of weeds found in each of the sites. Each site contains different dominating weeds: grasses and sedges (*Cynodon dactylon* and *Mariscus alternifolius*) dominated Site A*;* sedges only (*Cyperus* spp. and *Mariscus alternifolius*) dominated Site B*;* while Site C contains only grasses (*Paspalum vaginatum* and *Coix lacryma-jobi*).

Adekanmbi and Ogundipe (2009) have also reported the dominance of weeds in the wetlands around Lagos lagoon and outlined the threat of weeds like *Typha australis, Chromolaena odorata, Paspalum* spp.*, Andropogon* spp.*, Panicum* spp. and *Cyperus javanicus* in the areas they studied. They attributed the threat to anthropogenic activities. Similar work carried out by Olubode *et al.* (2011) on wetlands in Ibadan, an inland part of Southwest Nigeria, recorded dominance of inland weeds such as *Tithonia diversifolia, Cynodon nlemfluensis* and *Calopogonum mucunoides.*

The occurrence of common Lagos wetland species such as *Raphia* and *Nymphaea* were recorded in this work just as reported by Adekanmbi *et al.* (2008). However, the low salinity of the water probably accounted for the absence of mangrove species and salt water ferns as recorded by Adekanmbi and Ogundipe (2009). The low salinity of the Lekki lagoon has already been reported by Adesalu and Nwankwo (2009; 2010). This could also account for the higher diversity of species in this work.

Raffia palms are mostly found growing in wetlands, especially around flood plains and river valleys (Mphoweh *et al.,* 2004). Their presence in several regions has led to the growth and development of particular plant and animal species which are linked up into a complex web of feeding relationships (Mphoweh *et al.,* 2004). The presence of such important values and functions in the plants has led to the massive exploitation of raffia palms for their goods and services (Mphoweh *et al.,* 2004). Such activities are however detrimental to this ecosystem in several parts of the world. Raffia palms were the most abundant species in the study area. Their relative abundance indicates that there is need for rapid conservation of the unique ecosystem created by these plants before man will descend on them.

The need to reduce to the barest minimum the loss of biodiversity due to infrastructural development has been stressed by Erwin (2009). Therefore, the laws, legislation and regulations (Federal Environmental Protection Agency Act, 1988 Cap 131 LFN 1990; Environmental Impact Assessment Act, 1992 and Nigerian Urban and Regional Planning Act, 1992) have to be updated and appropriately applied as recommended by Nwafor (2006).

CONCLUSION

Despite the proximity of the three sites growing under the same climatic conditions, different accessibilities caused by different soil nature seem to determine the level and effect of anthropogenic activities in each of the sites which led to their floral differences. This is because site C with water-logged soil is less disturbed by man and therefore contains the highest biodiversity. Appropriate policies and laws on biodiversity conservation need to be developed and enforced

to conserve or protect these sites and other undisturbed wetlands in Nigeria. Also, for a more feasible protection, the natives should be enlightened on the need to safeguard the wetlands, and possibly integrate them in the conservation activities.

REFERENCES

Adekanmbi, O.H. and Ogundipe, O.T. 2009. Mangrove Biodiversity in the Restoration and Sustainability of the Nigerian Natural Environment. *J. Eco. Nat. Environ.* 1, 64-72.

Adekanmbi, O.H., Ogundipe O.T. and Olowokudejo, J.D. 2008. Floral Diversity of Nigeria Coastal Environments. *J. Sci. Res. Devpt.* 11, 9-20.

Adesalu, T.A. and Nwankwo, D.I. 2009. A checklist of Lekki lagoon diatoms. *Int. J. Bot.* 5, 126-134.

Adesalu, T.A. and Nwankwo, D.I. 2010. A checklist of desmids of Lekki lagoon Nigeria. *Int. J. Bio. Con.* 2, 33-36.

Akobundu, I.O. and Agyakwa, C.W. 1998. *A handbook of West African weeds.* I.I.T.A., Ibadan. 298 pp.

Alston, A.H.G. 1959. *The Ferns and Fern-allies of West Tropical Africa*. Crown Agents for Overseas Governments and Administrations, London. 1764 pp.

Angiosperm Phylogeny Group III (APG III). 2009. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG III. *Bot. J. Linn. Soc.* 161, 105–121.

Ayodele, A. and Yang, A. 2012. *Diversity and Distribution of Vascular Plants in Nigeria*. Qingdao Publishing House, China. 350 pp.

Dixon, J.A. and Sherman, P.B. 1990. *Economics of Protected Areas: A new Look at Benefits and Costs*. Earthscan Publications Ltd, London. 190 pp.

Erwin, K.L. 2009. Wetlands and global climate change: the role of wetland restoration in a changing world. *Wetlands Eco. Mgt.* 17, 71-84.

Hutchinson, J. and Dalziel, J. 1954. *Flora of West Tropical Africa*. Crown Agents for Overseas Governments and Administrations, London. 2154 pp.

Keay, R.W.J., Onochie, C.F.A. and Stanfield, D.P. 1964. *Nigerian Trees.* Federal Department of Forest Research, Ibadan, Nigeria. 1169 pp.

Kotze, D.C. 1996. *Wetlands and people: what benefits do wetlands have and how are these benefits affected by our land-use activities? Wetland Use Booklet 1.* Howick Share Net, South Africa. 35 pp.

Mphoweh, J.N., Tchindjang, M. and Mfondoum, N.A.H. 2004. The degradation of raffia palms and it's socio-economic and ecological consequences: the case study of Bamunka, Ndop, North West province Cameroon. http://cameroon-tour.com/geography/Jude_article.pdf. 24 pp.

National Research Council (NRC). 1992. *Restoration of Aquatic Ecosystems*. National Academy Press, Washington, D.C. 162 pp.

Nwafor, J. C. 2006. *Environmental Impact Assessment for Sustainable Development. The Nigerian Perspective*. Environmental and Development Policy Centre for Africa (EDPCA). 160 pp.

Ogundele, F. O. 2012. Variation in the Physico-chemical Properties of Badagry and Ikorodu Soils, Lagos Nigeria. *Int. J. Human. Soc. Sci.* 2, 244-258.

Ogunyemi, S. 1977. The distribution of some weeds of arable crops in Southwestern Nigeria. *Proc. 7th Ann. Conf. Weed Sci. Soc. Nig.* 29–45.

Olubode, O. S., Awodoyin, R.O. and Ogunyemi, S. 2011. Floral Diversity in the Wetlands of Apete River, Eleyele Lake and Oba Dam in Ibadan, Nigeria: Its Implication for Biodiversity Erosion. *West Afr. J. Appl. Eco.* 18, 109–119.