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PLANT DIVERSITY ASSESSMENT IN AN URBAN RECREATIONAL POND

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ABSTRACT
Plant diversity profile and water quality assessment in a recreational pond was investigated in March 2014 .A total of 20 plant species belonging to 17 families were identified in the study area. The results obtained showed that the species richness increased significantly (p= 0.05) away (< 5m) from pond. The pH value of the pond was found to be 5.06. Chemical oxygen demand was 12.80mg/l. Nitrate level of the pond was high, with a value of 12.51mg/l. Heavy metals found in the pond with high values were iron and cadmium (23.26mg/l and 4.5mg/l), respectively. The results obtained from this study suggests that the use of inorganic fertilizers and nutrient based around water bodies should be avoided as it results in acidification and eutrophication of the pond . It therefore shows from the study, that the use of the pond for recreational activities by the surrounding communities be discouraged as this may cause health hazards for humans and other grazing animals.
Keywords: Eutrophication, recreational activities, pond, heavy metals, Akwa Ibom

INTRODUCTION
The term "pond" is in widespread use among researchers as well as professionals and definitions have been provided in a number of ways. Bigs *et al.* (2005) defined pond as a man-made or natural water body which is between $1m^2$ and $20,000m^2$ in area, which holds water for at least four months of the year or more. It is an earthen container for storing water. The surface area of the stored water normally varies from a fraction of a hectare to tens of hectares. Limnologist and freshwater biologist defined ponds as quiet, shallow bodies of water that allow enough sunlight to penetrate to the bottom of the water body and bodies of water which lack wave action on the shore. The sunlight supports the growth of rooted plants from shore to shore. A pond can also be seen as a type of freshwater ecosystem that is largely based on the autograph algae which provides the base trophic level for all life in the area. Ponds can result from a wide range of natural processes. They may arise naturally in floodplains as a part of a river system, or they may be somewhat isolated depressions (examples include vernal pools and prairie pot holes.). These can be very important to breeding fish, particularly in large river systems (Ro McConnel, 1975). Ponds just like other water systems offer a variety of benefits to Man or play different roles in fish and reptiles breeding, serve as a food reserve for man, provide irrigation reservoirs at times of drought, serve, as a vital resource used for industrial cooling and power generation and are important for recreational activities. This study seeks to compare plant diversity status within and around a recreational pond in Uyo, AkwaIbom State and to evolve with an authentic check list of species found in the area in order to complement global wetlands conservation efforts.

MATERIALS AND METHODS
Description of Study Area
This research was carried out in Uyo the capital city of Akwa Ibom State, Nigeria. Uyo lies between latitude 5.02^0N-6.10^0N and longitude 7.92^0E-9.48^0E within South-South, Nigeria. It has an average temperature of 25.1-27.8^0C and an annual rainfall range of 33-37.8mm with the land mass of $115km^2$ and

the population of 1,400 million persons/km2. The Local Government Area is geographically bounded on the East by Uruan Local Government Area, Abak Local Government Area in the West, Ibiono Ibom Local Government Area in the North and Ibesikpo Asutan Local Government Area by the South.

Vegetation Sampling

Systematic sampling was used in sampling the vegetation and soil (Knight, 1978). Species were sampled in twenty 10m x 10m quadrants, spaced at regular intervals of 20m. In each quadrat, plants were enumerated and species were properly identified to the species level. Voucher specimens of unknown species were collected for proper identification at the Botany and Ecological Studies Departmental Herbarium. Total number of plant species encountered per sampling unit (quadrat) was recorded in the research diary.

Diversity Analysis

Analysis of Plant diversity status included computation of number of Taxa, Individuals, Shannon index, Dominance value, Simpson inverse index and vegetation profile sketch within 5 metres away from the pond using Paleontological Software**.**

RESULTS

The floristic abundance or occurrence of plant species (per quadrat) in the pond is recorded in Table 1. A total of 20 plant species from 17 families were identified. In the pool of water, *Persicaria senegalensis*, *Commelina benghalensis* and *Ludwigia erecta* were the most abundant species having been found present in 7, 6 and 6 quadrats respectively whereas *Mimosa pudica* and *Sida acuta* were the least having recorded quadrat presence values of 1 and 2 respectively. About 5m away from the pond these Species: *Sida acuta, Calapogoniu mmuconoides* and *Agerantum conyzoides* were identified as most present having clinched the quadrat presence values of 6 each. Also, the pond had one ferns and a fern-ally present. These were *Diplazium sammatt*i and *Selaginella masorus*. Generally, the species richness increased away (<5m) from the pond.

Table 1: Showing Quadrat Distribution Species presence in the pond

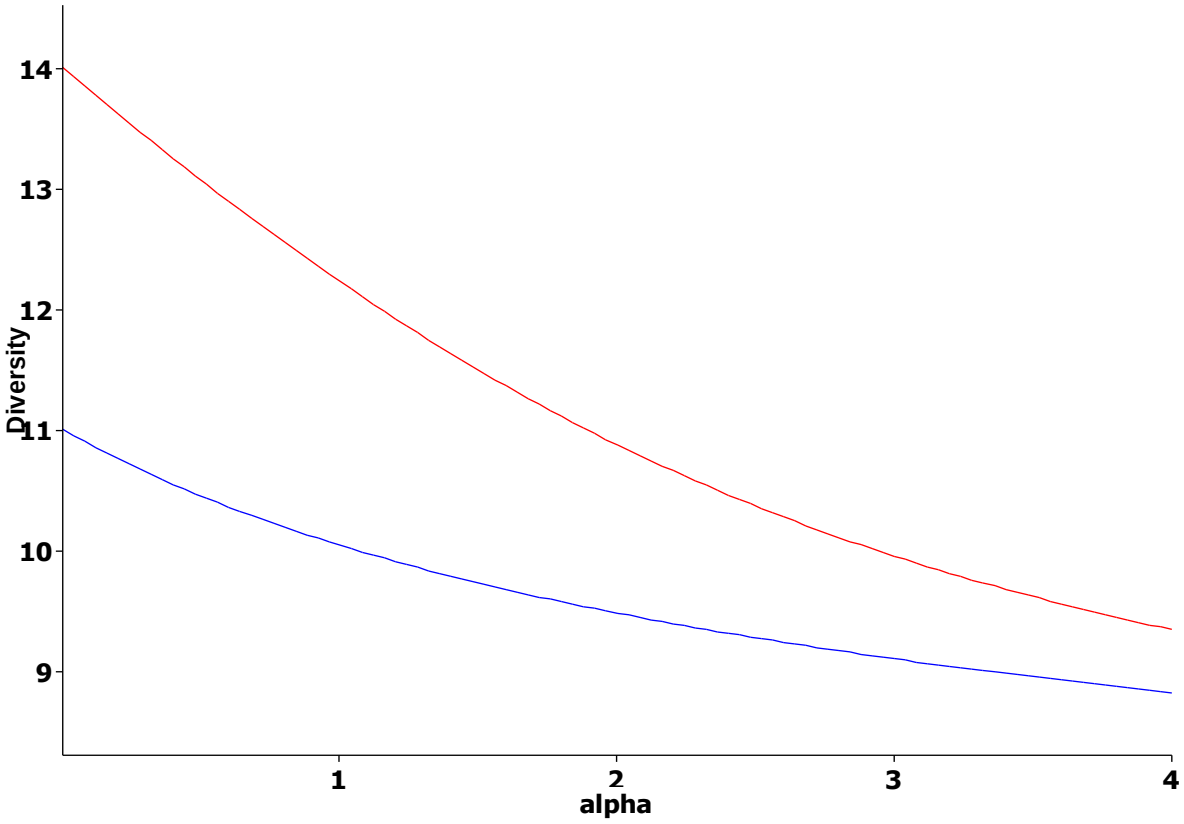
Plant	Families	Within Pond	<5m From the Pond
Ageratum conizoides Linn.	Asteraceae	4	6
Aspillia Africana (Pers.) C.D.Adams	Asteraceae	0	2
Azolla africana Desv	Salviniaceae	5	0
Bambusa vulgaris Schrad. ex Wendel	Gramineae/Poaceae	0	2
Calapogonu mmuconoides Desv.	Fabaceae	0	6
Commelina benghalensis L.	Commelinaceae	6	4
Diplazium sammati (Kuhn) C. Chr.	Polypodiaceae	0	2
Hura crepitans L. Hort. Cliff	Euphorbiaceae	0	1
Ipomoea carnae Jacq. *subsp.fistulosa* (Mart. ex Choisy)D.F.Austin	Convulvucaceae	0	4
Cyperus iria Linn.	Cyperaceae	3	0
Lonchocarpus griffoneonus (Baillon) Dunn.	Fabaceae	0	2
Ludwigia erecta(L.) Hara.	Onagraceae	6	0
*Mimosa pudica*Linn.	Mimosaceae	1	2
Nymphaea lotus Linn.	Nympheaceae	4	0
Panicum maximum Jacq.	Panicoidae	4	3
*Persicaria senegalensis*R.Br.	Polygonaceae	7	0
Sellaginella myosurus (Sw.) Alston	Scrophulariaceae	0	2
Setaria verticillata(Schum).	Panicoidae	5	0
Sida acuta Burm.	Malvaceae	2	6
Lagenaria breviflora (Benth) Roberty	Cucurbitaceae	0	2

Table 2 shows the diversity status of the pond. The result shows that both the water column (11) and its surroundings (14) supported a good number of species. Also, the sum of individual plants numbered up to 47 in the pond and 44 outside the pond. Dominance (0.105) was more in the pond than was outside (0.091). Both Shannon and Simpson indices of diversity had values of 2.5 and 0.91 respectively outside the pond. These values were 2.31 and 0.89 respectively within the pond.

Table 2: Showing Diversity Status of the pond

	POND	5m AWAY
Taxa S	11	14
Individuals	47	44
Dominance D	0.1055	0.09194
Shannon H	2.307	2.504
Simpson 1-D	0.8945	0.9081

Figure 1 shows the diversity trend of the two habitats (within the pond and 5m away from the pond). It shows that both the surroundings and the water front have a rich flora comprising up to 14 and 11 species each.



Legend:
Red = Diversity profile for pond surroundings.
Blue = Diversity profile for the pond.

DISCUSSION

The Species composition of the pond and its surroundings revealed a rich diversity having recorded up to 20 species from 17 families. A similar trend was reported by Clarence (2001). The presence of macrophytes species such as *Azolla sp, Nymphea sp, Persicaria senegalensis, Agerantum conyzoides* and *Settaria verticillata* in the flora is characteristic for wetlands. The high diversity and low dominance values obtained in the study reveals healthy inter-specific competition in the area. High dominance value recorded by obligate aquatic species such as seen in the result reflects their ability to adapt to the predominant anoxic and anaerobic pedological situation. The diversity profile diagrams reflect the rich diversity and healthy competitive situation within and outside the pond. This agrees with the views of Ubom *et al.* (2012).

According to Bai (2004), species diversity has two primary components: species richness which is invariably the number of species in a local community and species composition (the identity of the species present in a community). This group of researchers suggested that species diversity is an index of productivity since they both vary together. They maintained that different species occurring together differ in their resource use, environmental tolerances and interaction with other species. The variation observed in the species distribution pattern of the pond and its surroundings corroborates this fact. Also the high species diversity is believed to contribute to proper ecosystem functioning and stability in that it fosters complementary resource use and healthy competition within and among species (McCann, 2000).

According to Kumara *et al.* (2011) numerical quantification of biological diversity and (or) its elements can be of great value because that kind of evaluation is objective and enables a comparison of current biodiversity status to be made between similar habitats. The numeric strength of species in the pond and at its banks testifies of the rich nutrient conditions of this wetland which support a good number of obligate and facultative species. According to Kling and Nkanta, (1991), erosion ensures the washing away of the nutrient rich sandy loam surface of the soil. This could contribute to the high diversity pattern in this wetland. Also the low density of some species reflects their inability to adapt to the prevailing environmental situations in the area. The close range of occurrence values of some species in the result is suggestive of high level of competition in the pond.

CONCLUSION AND RECOMMENDATIONS

A study on the diversity trend of this recreational pond revealed a productive ecosystem which supports a good number of obligate and facultative aquatic plants. The study revealed that the surrounding of the pond recorded more diversity and so clinched a higher Shannon index of 2.5 than inside the pond 2.3 (Ubom *et al.,* 2012). This diversity trend corroborates with the profile diagrams found in this result. However, the following measures are suggested for perpetuation and healthy functioning of this ecosystem:

i. Refuse should not be dumped into the water bodies.
ii. Use of inorganic fertilizer around the water bodies should be avoided as it results in acidification and eutrophication of the pond.
iii. This water is not suitable for drinking.
iv. Relevant government agencies should curb the activities of nomads in and around the pond in order to prevent pollution and biodiversity loss.

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