EVALUATION OF FLORA DIVERSITY AND ABUNDANCE IN AWBA DAM TOURISM CENTRE, IBADAN, NIGERIA

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ABSTRACT
The study evaluated flora diversity and abundance in Awba Dam Tourism Centre, Ibadan, Nigeria. Complete enumeration of trees (>10cm diameter at breast height (dbh)), saplings, and small trees growing within 50m radius of the Awba dam was carried out. The percentage canopy cover of tree species (to the nearest 5%) was estimated by observing through the small lens of a pair of binoculars. The percentage ground cover was determined by ocular estimation (to the nearest 5%). Number of lianas or woody climbers were counted manually while grass height (<0.5 m tall, 0.5-1.0 m tall, and > 1 m tall) was measured using polythene measuring tape. Data was analysed using descriptive statistics and ANOVA at α = 0.05. Total of one hundred and ninety four (194) trees were enumerated with 24 species distributed among 22 genera in 16 families. Gmelina arborea had the highest frequency representing (7.2%) while Chrysophyllum albidum had the lowest of (2.1%) respectively. Trees, shrubs and herbs in RA were 14.0±0.15, 26.2±0.34 and 49.9±0.22, FA: 122.0±0.20, 9.2±0.12 and 13.8±0.46, CA: 30.0±0.18, 37.2±0.70 and 31.0±0.31 and BA: 28.0±0.16, 12.4±0.29 and 18.0±0.81, respectively. Hydroflora were; Commelina gambia (7.6%), Marsilea quadrioflia (21.2%), Cyprus spp (7.8%), Pistia straticole (37.0%), Nymphoea lotus (9.0%), Salvinia spp (15.0%), Ceratophyllum spp (12.3%), and Utricularia spp (4.8%). Dominant climbers and lianas were Combretum spp (2.2) and Dioscorea spp (0.8), while under-storey of small shrubs such as Chassalia kolly, Mallotus oppositifolius and Sphenocentrum jollyanum were 1.6, 1.9, and 2.3, respectively. The site is rich in flora diversity; a potential for ecotourism development. Much of the reservoir area were overgrown with invasive hydro-flora species suggesting need for effective management and conservation of the flora resources as well as the touristic capacity of Awba dam tourism centre.

Key words: Awba dam tourism centre, Ecotourism, invasive hydro-flora species

INTRODUCTION
Inland water ecosystems occupy only a small area of the planet but are perhaps the most heavily impacted and threatened by human activities of all biomes and habitats (Dudley, 2008). Several efforts have been made by governments and the conservation community in general to conserve inland water species and habitats, but unavoidably these commitments and goals have not been realized fully. The term inland waters (inland wetlands), freshwater systems, and simply wetlands are often used interchangeably, but there are some differences. Inland water or inland wetlands refer to non-marine aquatic systems; and whether transitional systems like estuaries are included is a matter of interpretation. There are also man-made wetlands such as fish and shrimp ponds, farm ponds, irrigated agricultural land, salt pans, reservoirs, gravel pits, sewage pits, sewage farms, and canals (Ramsar Convention Bureau, 1996; Weller, 1999; Amezaga et al., 2002; Dudley, 2008). Nonetheless, natural inland wetlands include permanent and temporary rivers and streams, permanent lakes; seasonal lakes, marshes, and swamps, including flood plains, forested wetlands, marshes, and swamps; alpine and tundra wetlands; springs, oases and geothermal wetlands; and underground wetlands, including caves and groundwater systems.
Tropical Forest Status

Tropical forests have assumed a status of global significance out of the World’s entire habitat in recent years. Although the tropical forest account for a relatively small proportion of global land average (about 7% or 10.9 million km$^2$), they accommodate a very high proportion of species in all major groups. African forests, for example are estimated to hold about 84% of the continent’s primates species, 66% of butterflies and about 8,000 species of plants (BirdLife International, 2000). The World Bank (2009) estimates that the fastest rate of forest loss in the world between 1990 and 2005 was the Sub Saharan African region (7.1%), followed closely by Latin America (7.0). Deforestation which is the complete removal of forest cover and replacement with other forms of land use and forest degradation (the impoverishment of the structure and composition of the forest) result in the reduction of potentials of flora and fauna to provide and support environmental processes (FAO, 2007b).

Also FAO (2004) reports that Cape Verde produces industrial supply of hardwood and round wood that top the Sub Saharan region. Nigeria tops the list of countries which produce wood charcoal. Large areas of natural forests are being exploited for tree species such as the mahoganies, Nauclea diderrichii (opepe), Terminalia ivorensis (Odigho), Terminalia superba (Afara), Triplochiton sceleroxylon (Obeche) and others known in international market (Nigeria’s 4th Biodiversity Report, 2010). High intensity of logging and illegal exploitation of these and other species has continued to pose serious threats to the country’s forest resources. Non-timber forest products (NTFPs) are used for food, medicines, oil, resin, tannin, household equipment, fuel wood and furniture and building materials.

The subsistence rural dwellers have continued to exploit these products for income generation. Varieties of NTFPs of other economic uses include the rattan cane (Laccosperma sedndiflora), chewing sticks (Garcinia manii), wrapping leaves such as Thaumatococcus danielli which also produces fruits that are sweeter than sugar. Triplochiton sceleroxylon is known to be the host of the larvae of Enaphae venata, a moth species which apart from producing cocoons that are good material for local silk (“Sanyan”) are also good sources of animal protein to both the urban poor and rural dwellers. There has been a trend of increasing use of medicinal plants amongst both urban and rural dwellers. This trend has grave consequences on the survival of some plant species. This is because of the unsustainable manner in which many species are harvested. Furthermore, the downturns in the national economy and inflationary trend have led to the excessive harvesting of non-timber forest products. Some of the species are now threatened. Examples are Hymenocardia acida, Kigelia africana and Cassia nigricans (Nigeria’s 4th Biodiversity Report, 2010).

Few studies had been carried out in the past to assess the habitat of Awba Dam Tourism Centre (ADTC) with respect to avifauna diversity. However, none was done in order to assess the ecotourism relevance of the flora species. Furthermore, past studies have mainly focused on the evaluation of ecotourism in different locations in Oyo state such as Old-Oyo National Park, Asejire lake, IITA lake etc, which achievement of specific conservation and development principles of ecotourism were discussed (Akinyemi, 1996), while some have emphasized the impacts of ecotourism on such places (Ayodele et al, 1988), none of such had been done with the Awba dam tourism centre. The main objective of this study is to carry out an assessment of flora diversity in ADTC.
MATERIALS AND METHOD

Description of study area

Geographically, ADTC is located in the southern area of the University of Ibadan campus at an altitude of about 185 meters above sea level (Akin-Oriola, 2003). It lies between the latitude N 07 26 54.4 to 56.0 and longitude E 003 53 17.7 to 23.6. The dam was created by damming the Awba stream in April 1964 with the sole aim of storing water for domestic consumption, laboratory use and table fish culture. It is also used for hydrobiology and fisheries research purposes (Ogundele, 1990). However, the site had been converted from being a conventional water dam/reservoir to a tourism site in 2011 (University bulletin, 2011).

Data collection

The study was carried out over a period of two consecutive wet and dry seasons. Study area was divided into 4 subdivisions: Reservoir Area (RA), Forest Area (FA), Cultivated Area (CA), and Built-Up Area (BA) using line transects. Line transects were cut along the shores of the Awba lake as Bibby et al. (2000) showed it to be the most efficient method in terms of data gathered per unit effort. A quadrat of 2m x 2m dimension was laid out within each 1 m sections of each transect. All trees within the quadrat were counted and recorded. These quadrats were designed following measurements taken following Manu (2002) and Manu and Imong (2006). The number of saplings and small trees (diameter <1 cm and at least 1 m tall, 1-10 cm, and >10 cm) were recorded as well as the percentage canopy cover (to the nearest 5%) estimated by observing through the small lens of a pair of binoculars. This gives a small view area of the canopy allowing an assessment of cover to be made. The percentage ground cover was determined by ocular estimation (to the nearest 5%). Number of lianas or woody climbers were counted manually while grass height (<0.5 m tall, 0.5-1.0 m tall, and > 1 m tall) was measured using polythene measuring tape.
RESULTS

<table>
<thead>
<tr>
<th>Family</th>
<th>Species</th>
<th>Common name</th>
<th>Local name</th>
<th>Origin</th>
<th>Freq</th>
<th>%</th>
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<tbody>
<tr>
<td><strong>Fabaceae</strong></td>
<td>Afzelia bella</td>
<td>Afzelia</td>
<td>Apa</td>
<td>Indigenous</td>
<td>4</td>
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<tr>
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<td>East Indian walnut</td>
<td>Ayunre</td>
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<td>7</td>
<td>3.6</td>
</tr>
<tr>
<td>Anacardiaceae</td>
<td>Alstonia boonei</td>
<td>Alstonia</td>
<td>Awun</td>
<td>Indigenous</td>
<td>10</td>
<td>5.2</td>
</tr>
<tr>
<td>Meliaceae</td>
<td>Anacardium occidentale</td>
<td>Cashew</td>
<td>Kaju</td>
<td>Exotic</td>
<td>6</td>
<td>3.1</td>
</tr>
<tr>
<td>Leguminosae</td>
<td>Azadirachta indica</td>
<td>Neem</td>
<td>Dogonyaro</td>
<td>Exotic</td>
<td>4</td>
<td>2.1</td>
</tr>
<tr>
<td>Myrtaceae</td>
<td>Delonix rega</td>
<td>Flame of the forest</td>
<td>Panseke</td>
<td>Exotic</td>
<td>12</td>
<td>6.2</td>
</tr>
<tr>
<td>Euphorbaiceae</td>
<td>Eucalyptus amaludensis</td>
<td>Redgum</td>
<td>-</td>
<td>Exotic</td>
<td>6</td>
<td>3.1</td>
</tr>
<tr>
<td>Irvingiaceae</td>
<td>Elaeis guinensis</td>
<td>Palm tree</td>
<td>Ope</td>
<td>Indigenous</td>
<td>14</td>
<td>7.2</td>
</tr>
<tr>
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<td>Irvingia gabonensis</td>
<td>Bush mango</td>
<td>Ooro</td>
<td>Indigenous</td>
<td>6</td>
<td>3.1</td>
</tr>
<tr>
<td>Meliaceae</td>
<td>Khaya grandifolia</td>
<td>African mahogany</td>
<td>Oganwo</td>
<td>Indigenous</td>
<td>10</td>
<td>5.2</td>
</tr>
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<td>Khaya senegalensis</td>
<td>African mahogany</td>
<td>Oganwo</td>
<td>Indigenous</td>
<td>9</td>
<td>4.6</td>
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<td>Anacardiaceae</td>
<td>Gmelina arborea</td>
<td>White teak</td>
<td>-</td>
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<td>Ewe-igbale</td>
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<td>Pitch pine</td>
<td>Aho-yaayaa</td>
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<td>5</td>
<td>2.5</td>
</tr>
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<td>Mangifera indica</td>
<td>Mango</td>
<td>Mangoro</td>
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<td>4.6</td>
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<tr>
<td>Arecaceae</td>
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<td>African white star apple</td>
<td>Agbalumo</td>
<td>Indigenous</td>
<td>4</td>
<td>2.1</td>
</tr>
<tr>
<td>Sterculiaceae</td>
<td>Roystonea regia</td>
<td>Royal palm</td>
<td>-</td>
<td>Exotic</td>
<td>5</td>
<td>2.5</td>
</tr>
<tr>
<td>Vernebaceae</td>
<td>Sterculia setigera</td>
<td>Karaya gum</td>
<td>Osse awere</td>
<td>Indigenous</td>
<td>6</td>
<td>3.1</td>
</tr>
<tr>
<td>Combretaceae</td>
<td>Tectona grandis</td>
<td>Teak</td>
<td>Ewe eko</td>
<td>Exotic</td>
<td>8</td>
<td>4.1</td>
</tr>
<tr>
<td>Combretaceae</td>
<td>Terminalia catapa</td>
<td>Tropical almond</td>
<td>Furuntu</td>
<td>Indigenous</td>
<td>12</td>
<td>6.2</td>
</tr>
<tr>
<td>Terminalia africana</td>
<td>Terminalia africana</td>
<td>White afara</td>
<td>Idigbo</td>
<td>Indigenous</td>
<td>10</td>
<td>5.2</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>194</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Field Survey, 2013-2014
Figure 1: Frequency distribution of tree families
Source: Field Survey, 2013-2014

Figure 2: Frequency distribution of tree families
Source: Field Survey, 2013-2014
Plate 1: *Milicia excelsa*
Source: Field Survey, 2013-2014

Plate 2: Matured grasses and shrubs
(Picture taken at the on-set of the dry season)
Source: Field survey, 2014

Plate 3: Aquatic flora found at the tourist site
Source: Field survey, 2014
DISCUSSION
There was an exciting blend of 13 indigenous and 11 exotic tree species in the study area. This is a true representation of a pristine environment where tourism can be best practice in any urban area with fewer disturbances to the environment. This study corroborates what Olajuyigbe et al (2014) documented within the same university campus although the study was carried out at a distance of almost 2km away from Awba dam; the department of Forest Resource Management to be precise. ADTC is also rich in grasses, herbs and shrubs. Common among them were Panicum maximum, Pennisetum purpureum, Andropogon, Commelina gambi, Marsilea quadrioflia, Cyprus spp, Pistia stratiole, Nymphoea lotus, Salvinia spp, Ceratophyllum sp Utricularia sp Samina samel and so on (See Plate 1-3).
A mixture of fast-growing pioneer species, such as Ceiba pentandra, Newbouldia laevis and Albizia spp were found in ADTC. Slow-growing emergents such as Milicia excelsa (See Plate 1) and Antiaris africana interspersed with the fast growing ones. There are abundant climbers and lianas, especially Combretum spp, Dioscorea spp and an understorey of small shrubs such as Chassalia kolly, Mallotus oppositifolius and Sphenocentrum jollyanum (Barkin, 2002). However, ADTC is generally a modified ecosystem where the natural ecosystem is converted to building of facilities for ecotourism development, there by affecting flora composition. Trees such as Gmelina arborea, Tectona grandis, Casuarina have been planted to replace the indigenous tree species (Adeyanju et al., 2011).
In the residential area, the diversity of trees is increasingly less and trees such as Delonix regia, Parkia biglobosa, Boheavia spp, shrubs and flowers were found in this area. Other vegetation types found in ADTC were mini plantation forests, and aquatic vegetation. Few species of trees were seen to be dominant which include: Azadiracta indica (2.1), Mangifera indica (2.1) and Delonix regia (6.2), respectively (See Table 1). Water hyacinth is the dominant invasive flora species in the reservoir area dam which could constitute major challenge to aqua-fauna organisms and other species. The above differences in habitats also indicate diverse richness of flora species.
Generally, total of (194) trees were enumerated with 24 species distributed among 22 genera in 16 families. Gmelina arborea had the highest frequency representing (7.2%) while Chrysophyllum albidum had the lowest of (2.1%) respectively. Trees, shrubs and herbs in Reservoir Area (RA) were 14.0±0.15, 26.2±0.34 and 49.9±0.22, Forest Area (FA): 122.0±0.20, 9.2±0.12 and 13.8±0.46, Cultivated Area (CA): 30.0±0.18, 37.2±0.70 and 31.0±0.31 and Built-up Area (BA): 28.0±0.16, 12.4±0.29 and 18.0±0.81, respectively. Hydroflora were in abundance within the RA at; Commelina gambia (7.6%), Marsilea quadrioflia (21.2%), Cyprus spp (7.8%), Pistia stratiole (37.0%), Nymphoea lotus (9.0%), Salvinia spp (15.0%), Ceratophyllum sp (12.3%), and Utricularia sp (4.8%).
Dominant climbers and lianas were Combretum spp (2.2) and Dioscorea spp (0.8), while under-storey of small shrubs such as Chassalia kolly, Mallotus oppositifolius and Sphenocentrum jollyanum were 1.6, 1.9, and 2.3, respectively.

CONCLUSION
The site is rich in flora diversity; a potential for ecotourism development. Much of the reservoir area were overgrown with invasive hydro-flora species suggesting need for effective management and conservation of the flora resources as well as the ecotouristic capacity of Awba dam tourism centre.

REFERENCES


University of Ibadan Bulletin: Announcement of the commencement of Awba Dam Tourism Centre, September, 2011.


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