

**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  $\alpha_{0.05}$ . 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  $14.0 \pm 0.15$ ,  $26.2 \pm 0.34$  and  $49.9 \pm 0.22$ , FA:  $122.0 \pm 0.20$ ,  $9.2 \pm 0.12$  and  $13.8 \pm 0.46$ , CA:  $30.0 \pm 0.18$ ,  $37.2 \pm 0.70$  and  $31.0 \pm 0.31$  and BA:  $28.0 \pm 0.16$ ,  $12.4 \pm 0.29$  and  $18.0 \pm 0.81$ , respectively. Hydro-flora were; *Commelina gambia* (7.6%), *Marsilea quadrioflia* (21.2%), *Cyprus spp* (7.8%), *Pistia stratiote* (37.0%), *Nymphaea 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<sup>2</sup>), 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* (Odigbo), *Terminalia superba* (Afara), *Triplochiton scleroxylon* (Obeche) and others known in international market (Nigeria's 4<sup>th</sup> 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 scleroxylon* 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 4<sup>th</sup> 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

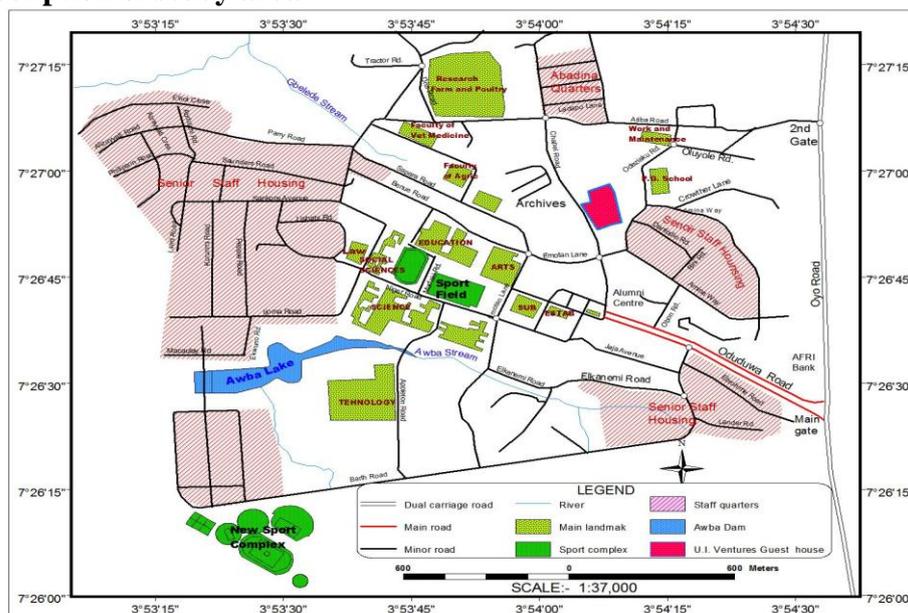


Figure 1: The Map of University of Ibadan showing Awba dam

Source: Field Survey, 2014

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 26 544 to 560 and longitude E 003 53 177 to 236. 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 1: Relative Abundance of Identified Tree species types at Awba dam

Family	Species	Common name	Local name	Origin	Freq	%
Fabaceae	<i>Afzelia bella</i>	Afzelia	Apa	Indigenous	4	2.1
Apocynaceae	<i>Albizia lebbek</i>	East Indian walnut	Ayunre	Exotic	7	3.6
Anacardiaceae	<i>Alstonia boonei</i>	Alstonia	Awun	Indigenous	10	5.2
Meliaceae	<i>Anacardium occidentale</i>	Cashew	Kaju	Exotic	6	3.1
Leguminoceae	<i>Azadirachta indica</i>	Neem	Dogonyaro	Exotic	4	2.1
Myrtaceae	<i>Delonix regia</i>	Flame of the forest	Panseke	Exotic	12	6.2
Euphorbaiceae	<i>Eucalyptus amaldulensis</i>	Redgum	-	Exotic	6	3.1
Irvingiaceae	<i>Elaeis guinensis</i>	Palm tree	Ope	Indigenous	14	7.2
Meliaceae	<i>Irvingia gabonensis</i>	Bush mango	Ooro	Indigenous	6	3.1
Meliaceae	<i>Khaya grandifolia</i>	African mahogany	Oganwo	Indigenous	10	5.2
Verbanaceae	<i>Khaya senegalensis</i>	African mahogany	Oganwo	Indigenous	9	4.6
Anacardiaceae	<i>Gmelina arborea</i>	White teak	-	Exotic	15	7.7
Fabaceae	<i>Lannea egregia</i>	Lannea	Opon	Exotic	7	3.6
Moraceae	<i>Leucaena leucocephala</i>	Leucaena	-	Exotic	14	7.2
Moringaceae	<i>Milicia excelsa</i>	Iroko	Iroko	Indigenous	5	2.5
Pinaceae	<i>Moringa oleifera</i>	Moringa	Ewe-igbale	Indigenous	6	3.1
Mangiferaceae	<i>Pinus caribea</i>	Pitch pine	Aho-yaayaa	Exotic	5	2.5
Sapotaceae	<i>Mangifera indica</i>	Mango	Mangoro	Exotic	9	4.6
Arecaceae	<i>Chrysophyllum albidum</i>	African white star apple	Agbalumo	Indigenous	4	2.1
Sterculiaceae	<i>Roystonea regia</i>	Royal palm	-	Exotic	5	2.5
Vernebaseae	<i>Sterculia setigera</i>	Karaya gum	Osse aware	Indigenous	6	3.1
Combretaceae	<i>Tectona grandis</i>	Teak	Ewe eko	Exotic	8	4.1
Combretaceae	<i>Terminalia catapa</i>	Tropical almond	Furuntu	Indigenous	12	6.2
<i>Terminalia africana</i>	<i>Terminalia africana</i>	White afara	Idigbo	Indigenous	10	5.2
	<b>Total</b>				194	100.0

Source: Field Survey, 2013-2014

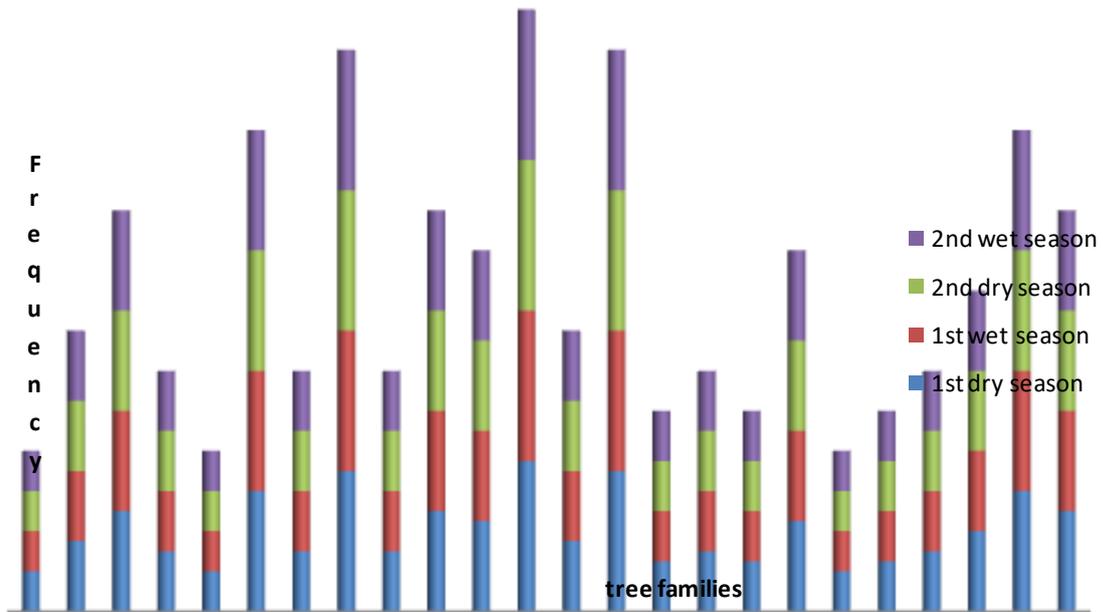


Figure 1: Frequency distribution of tree families  
Source: Field Survey, 2013-2014

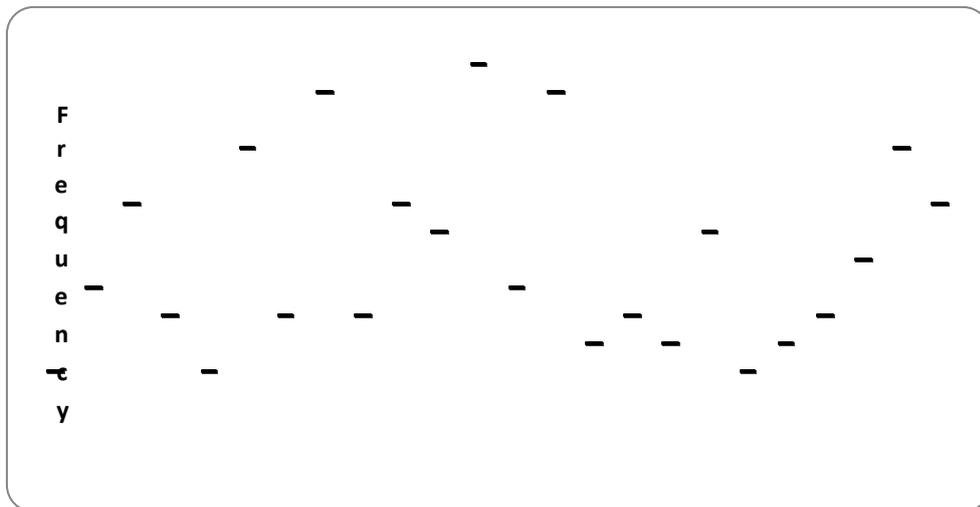


Fig 2: Frequency distribution of tree families  
Source: Field Survey, 2013-2014



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

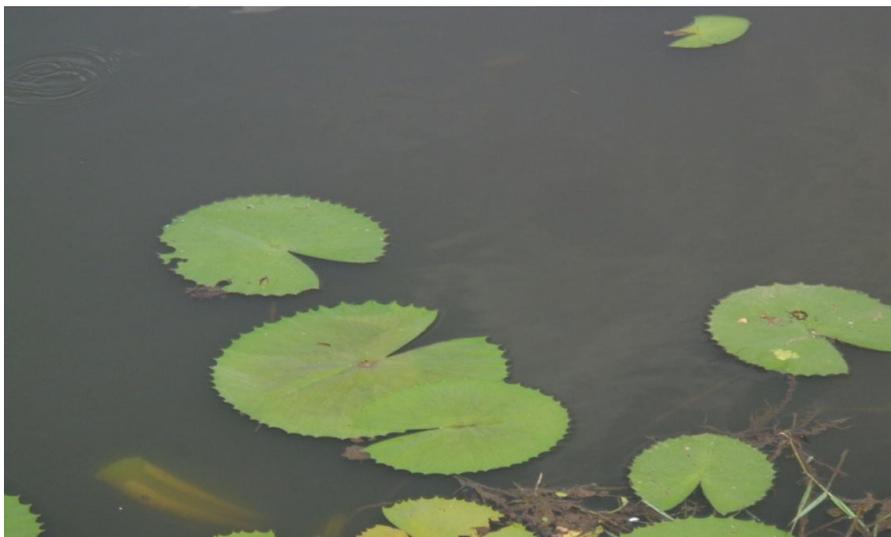


Plate 3: Aquatic flora found at the tourist site  
Source: Field survey, 2014

## **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 gambia*, *Marsilea quadrioflia*, *Cyprus spp*, *Pistia stratiote*, *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: *Azardiracta 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. Hydro-flora were in abundance within the RA at; *Commelina gambia* (7.6%), *Marsilea quadrioflia* (21.2%), *Cyprus spp* (7.8%), *Pistia stratiote* (37.0%), *Nymphoea lotus* (9.0%), *Salvinia spp* (15.0%), *Ceratophyllum spp* (12.3%), and *Utricularia spp* (4.8%).

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## **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 eco touristic capacity of Awba dam tourism centre.

## **REFERENCES**

Adeyanju, A. T., Manu, S. and Ottosson, U. (2011). Effects of introduced tree plantations on the density and diversity of bird species in some parts of the Jos Plateau, Nigeria. *ROAN The Journal of Conservation Foundation*. 5.1:63-75.

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- Aniekan-Abasi E. U. (2014): *Diversity and Abundance of Avifauna of University of Ibadan Environs*. An unpublished M.Sc thesis submitted to the department of Wildlife and Ecotourism Management in partial fulfillment of the award of M.Sc Wildlife Management, University of Ibadan, Nigeria.
- Akin-Oriola, G.A., (2003). The phytoplankton of Awba Reservoir, Ibadan, Nigeria. *Rev. Bio. Trop.*, 51: 99-106.
- Amezaga, J. M., Santamaria, L. and Green, A. L. (2002). Biotic wetland connectivity supporting a new approach for wetland policy. *Acta Oecologica* 23: 213-223.
- Ayodele, I.A. Abe A.J., and Olaniyan, A.O. (1999). Essentials of Zoo management. *Jachin publishers box 21798, U.I. P.O., Ibadan.*
- Barkin, D. (2002): Ecotourism for sustainable regional development. Current issues in Tourism. pp. 5(3-4):245-253.
- Bibby, C. J., Burgess, N. D., Hill, D. A. and Mustoe S. H. (2000). *Bird Census Techniques*. Academic Press, London.
- BirdLife International. (2000). *Threatened Birds of the World*. Barcelona and Cambridge, UK: Lynx Edicions and Bird Life International.
- Dudley, N. (Ed). (2008). *Guidelines for applying protected area management categories*. Gland, Switzerland: IUCN. x + 86.
- FAO (2006). *Forest Surveillance: sample collection from healthy, sick and dead trees*. Rome, Italy. 1-55.
- FAO. (2007a). *Wild habitats: An instruction to applied field research and sampling techniques*. D. Whitworth., S. H Newman., T. Mundkur and P. Harris. Eds. FAO Animal Production and Health manual, No 5. Rome.
- Manu, S. (2002). Effects of habitat fragmentation on the distribution of forest Birds in South Western Nigeria with Particular reference to Ibadan malimbe and other malimbés. PhD Thesis, Edward Grey Institute, Oxford University, UK.
- Manu and Imong I. S.. (2006). *Asurvey of the Cameroon Highlands in Cross River state, Nigeria: Afi mountain wildlife sanctuary, Cross River National Park, Mbe Mountains and Sankwala Mountains*. A survey report submitted to NCF-WCS Biodiversity Research Programme.
- Nigeria's 4<sup>th</sup> *Biodiversity Report*. (2010). <http://www.cbd.int/doc/world/ng/ng-nr-04-en.pdf>. Accessed 01/09/2015.
- Olajuyigbe S.O., Akinyele A.O., Jimoh S.O., Adegeye A.O. (2014): *Tree species diversity in the department of forest resources management, university of Ibadan, Nigeria*. Center for sustainable development Ibadan 2014 edition
- Ramsar Convention Bureau. (1996). [www.ramsar.org](http://www.ramsar.org) downloaded 17<sup>th</sup> May 2010
- University of Ibadan Bulletin: Announcement of the commencement of Awba Dam Tourism Centre, September, 2011.
- World Bank, (2009). *Global monitoring report 2009. A development Emergency of the World Bank*. Washinton D. C., U.S.A.
- Weller, M. W. (1999). *Wetland Birds*: Cambridge University Press, Cambridge, UK.

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