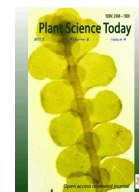




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Plant Science Today<http://horizonepublishing.com/journals/index.php/PST>**Research Article**

A checklist of angiosperm diversity surrounding Awba Dam: an important reservoir in Ibadan, Nigeria

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The present study undertakes an enumeration of the existing flora species around Awba dam, located within the University of Ibadan, Ibadan, Nigeria. Methods followed conventional practice as reported by previous authors of related studies. Findings showed that the study area is very rich in biodiversity. A total of 119 species in 47 families were recorded. The large number of species recorded, especially herbs which contribute 37% of the total enumeration suggest that the site may be further accessed for medicinal plant species which could possess beneficial health properties. Nonetheless, the presence of fauna and phytoplankton species also indicates their role in ecosystem balancing and thus sustaining human livelihood. With the continuous developmental activities, practical conservation approaches is ideal if the study area is to be saved from total loss of species.

Keywords

Awba dam; flora; biodiversity; conservation

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Introduction

Assessment of biological diversity in a particular area has continued to be of interest to scientists around the world. Nigeria, with numerous flora and fauna species, has been faced with challenges to species conservation, gradually leading to total disappearance of these human sustainers (plants and animals). Several authors have documented the existing angiosperm species in some parts of the country (Soladoye *et al.*, 2005; Soladoye *et al.*, 2011; Ariwaodo *et al.*, 2012; Ayodele *et al.*, 2013), and with particular reference to their medicinal values (Gills, 1992; Adesina *et al.*, 1995; Schmidt, 1996; Soladoye & Oni, 1996; Okoli *et al.*, 2007; Odugbemi, 2008; Soladoye *et al.*, 2012). Gbile *et al.* (1978) recorded 492 plant species in 112 families to be threatened, and in 1981 they compiled 480 rare plant species. Oguntala *et al.* (1996) reported 85 endangered tree species for Cross River State and its environs. As put by Valdecasas & Camacho (2003), the value of any biodiversity analysis and the adequacy of conservation measures depend on the quality of basic data. The data for biodiversity and conservation however, is mainly taxonomic. Much has been discussed about the phytoplankton and water quality of Awba reservoir (Akin-Oriola,

2003; Anago *et al.*, 2013; Okeniyi *et al.*, 2013; Tyokumbur & Okorie, 2013), but little is known about the rich angiosperm diversity which this important dam accommodates. With the recent threats resulting from the depletion of ozone layer, deforestation activities and rapid rate of urbanization, it has become imperative to constantly conduct biodiversity assessment of our forests and the entire ecosystems. This work thus takes into account, the existing flora species around Awba dam, located within the University of Ibadan, Ibadan, Nigeria. It also highlights the importance of some identified plant species and discourages further habitat destruction by the university community, to checkmate species extinction.

Materials and methods**Study area**

Awba dam reservoir is located at the south-western end of the University of Ibadan. It was constructed in 1964 by draining the Awba stream and impounding the water at a point where it flows through a natural valley. It lies on latitude 7°26'N and longitude 3°53'E, and at an altitude of 209 m above sea level (Fig 1). The

Table 1. List of identified species around the study area

S/No	Species	Family	Habit	Local Name
1	<i>Acalypha ciliata</i> Forssk.	Euphorbiaceae	Herb	Jinwinini
2	<i>Alchornea cordifolia</i> (Schumach. et Thonn.) Mull. Arg.	Euphorbiaceae	Shrub	Ewe-ifa, ipa
3	<i>Alchornea laxiflora</i> (Benth.) Pax et K. Hoffm.	Euphorbiaceae	Shrub	Ijan
4	<i>Bridelia ferruginea</i> Benth.	Euphorbiaceae	Tree	Ira-odan
5	<i>Croton lobatus</i> L.	Euphorbiaceae	Herb	Eru
6	<i>Euphorbia graminea</i> J.Koenig ex Boiss.	Euphorbiaceae	Herb	-
7	<i>Euphorbia heterophylla</i> L.	Euphorbiaceae	Herb	Egele
8	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Herb	Emile
9	<i>Hura crepitans</i> L.	Euphorbiaceae	Tree	-
10	<i>Mallotus oppositifolius</i> (Geiseler) Mull. Arg.	Euphorbiaceae	Herb	Ebewosa
11	<i>Manihot esculenta</i> Crantz.	Euphorbiaceae	Shrub	Paki
12	<i>Margaritaria discoidea</i> (Baill.) G.L. Webster	Euphorbiaceae	Tree	-
13	<i>Phyllanthus amarus</i> Schumach. et Thonn.	Euphorbiaceae	Herb	Eyin-olobe
14	<i>Ricinus communis</i> L.	Euphorbiaceae	Shrub	Upe-erenla
15	<i>Securinega virosa</i> (Roxb. ex Willd.) Baill.	Euphorbiaceae	Shrub	-
16	<i>Ageratum conyzoides</i> L.	Asteraceae	Herb	Imi-esu
17	<i>Aspilia africana</i> (Pers.) C.D. Adams	Asteraceae	Herb	Yunriyun
18	<i>Chromolaena odorata</i> (L.) R.M. King et H. Rob.	Asteraceae	Herb	Akintola
19	<i>Melanthera scandens</i> (Schumach. et Thonn.) Roberty	Asteraceae	Herb	Abo-yunyun
20	<i>Synedrella nodiflora</i> (L.) Gaertn.	Asteraceae	Herb	Akoyunyun
21	<i>Tithonia diversifolia</i> A. Gray	Asteraceae	Shrub	Agbale
22	<i>Vernonia amygdalina</i> Delile	Asteraceae	Shrub	Ewuro
23	<i>Vernonia cinerea</i> (L.) Less.	Asteraceae	Herb	Bojure
24	<i>Antians toxicaria</i> var. <i>africana</i> A. Chev.	Moraceae	Tree	Ooro
25	<i>Ficus exasperata</i> Vahl	Moraceae	Tree	Epin
26	<i>Ficus lutea</i> Vahl	Moraceae	Tree	Oba-odan
27	<i>Ficus mucuso</i> Welw. ex Ficalho	Moraceae	Tree	Obobo
28	<i>Ficus natalensis</i> subsp <i>lepreurii</i> (Miq.) C.C. berd	Moraceae	Tree	Abadan, ogabe
29	<i>Milicia excelsa</i> (Welw.) C.C. Berg.	Moraceae	Tree	Iroko
30	<i>Morus mesozygia</i> Stapf.	Moraceae	Tree	Aye
31	<i>Calopogonium mucunoides</i> Desv.	Papilionaceae	Creepers	Apalofa, Agbiri
32	<i>Centrosema pubescens</i> Benth.	Papilionaceae	Climber	Ewa-ahun
33	<i>Desmodium gangeticum</i> (L.) DC.	Papilionaceae	Shrub	Ewe-emo
34	<i>Desmodium scorpiurus</i> (Sw.) Desv.	Papilionaceae	Climber	-
35	<i>Gliricidia sepium</i> (Jacq.) Walp.	Papilionaceae	Tree	Agunmaniyé
36	<i>Indigofera spicata</i> Forssk.	Papilionaceae	Creepers	-
37	<i>Milletia thonningii</i> (Schum. et Thonn.) Baker.	Papilionaceae	Tree	Ito
38	<i>Alternanthera brasiliana</i> (L.) Kuntze	Amaranthaceae	Herb	-
39	<i>Alternanthera sessilis</i> (L.) DC.	Amaranthaceae	Herb	Rekureku
40	<i>Celosia leptostachya</i> Benth.	Amaranthaceae	Herb	Ajefawo
41	<i>Cyataula prostata</i> (L.) Blume	Amaranthaceae	Herb	Sewerepepe
42	<i>Gomphrena celosioides</i> Mart.	Amaranthaceae	Herb	Ipopo ale
43	<i>Azelia africana</i> Sm.	Caesalpiniaceae	Tree	Apa
44	<i>Delonix regia</i> (Hook.) Raf.	Caesalpiniaceae	Tree	Sekeseke
45	<i>Senna hirsuta</i> (L.) H.S.Irwin & Barneby	Caesalpiniaceae	Shrub	Rere
46	<i>Senna obtusifolia</i> (L.) H.S.Irwin & Barneby	Caesalpiniaceae	Shrub	Eru asundegbe
47	<i>Senna siamea</i> (Lam.) H.S.Irwin & Barneby	Caesalpiniaceae	Tree	-
48	<i>Hibiscus asper</i> Hook.f.	Malvaceae	Shrub	Isapa
49	<i>Malvastrum coromandelianum</i> (L.) Garcke	Malvaceae	Herb	-
50	<i>Sida corymbosa</i> R. E. Fr.	Malvaceae	Herb	Isekotu
51	<i>Sida veronicifolia</i> Lam.	Malvaceae	Creepers	-
52	<i>Urena lobata</i> L.	Malvaceae	Shrub	Efore-loka
53	<i>Borreria ocymoides</i> (Burm. f.) DC.	Rubiaceae	Herb	-
54	<i>Chassalia kolly</i> (Schumach.) Hepper	Rubiaceae	Herb	Tutugbo
55	<i>Diodia scandens</i> Sw.	Rubiaceae	Herb	-
56	<i>Morinda lucida</i> L.	Rubiaceae	Tree	Oruwo
57	<i>Oldenlandia corimbosa</i> L.	Rubiaceae	Herb	Oyigi
58	<i>Albizia lebeck</i> (L.) Benth.	Mimosaceae	Tree	Igbagbo
59	<i>Albizia zygia</i> (DC.) J.F. Macbr.	Mimosaceae	Tree	Ayunre
60	<i>Leucaena leucocephala</i> (Lam.) de Wit	Mimosaceae	Tree	-
61	<i>Mimosa invisa</i> Mart.	Mimosaceae	Herb	-
62	<i>Andropogon</i> sp.	Poaceae	Shrub	-
63	<i>Bambusa vulgaris</i> Schrad. ex Wendel	Poaceae	Shrub	Oparun
64	<i>Saccharum officinarum</i> L.	Poaceae	Shrub	Ireke
65	<i>Tridax procumbens</i> L.	Poaceae	Herb	Igbalode
66	<i>Allophylus africanus</i> P. Beauv. f.	Sapindaceae	Tree	Eekan-ehoro
67	<i>Blighia unijugata</i> Baker	Sapindaceae	Tree	Isin-oko
68	<i>Blighia sapida</i> K.D. Koenig	Sapindaceae	Tree	Isin
69	<i>Paullinia pinnata</i> L.	Sapindaceae	Climber	Itakun-okere
70	<i>Ipomoea asarifolia</i> (Desr. et Schult.) Roem. et Schult.	Convolvulaceae	Herb	Ewe-gboro
71	<i>Ipomoea involucreta</i> P. Beauv.	Convolvulaceae	Climber	Alukere
72	<i>Merremia kentrocaulos</i> Rendle	Convolvulaceae	Creepers	-

Table 1. List of identified species around the study area *Contd.*

S/No	Species	Family	Habit	Local Name
73	<i>Citrullus lanatus</i> (Thunb.) Matsum. et Nakai	Cucurbitaceae	Creeper	Egusi-baara
74	<i>Luffa cylindrica</i> M. Roem.	Cucurbitaceae	Climber	Aya-oyinbo
75	<i>Momordica charantia</i> L.	Cucurbitaceae	Climber	Ejinrin
76	<i>Andrographis paniculata</i> Nees	Acanthaceae	Herb	-
77	<i>Asystasia gangetica</i> (L.) T. Anders.	Acanthaceae	Herb	Lobiiri
78	<i>Mangifera indica</i> L.	Anacardiaceae	Tree	Mango
79	<i>Spondias mombin</i> L.	Anacardiaceae	Tree	Iyeye
80	<i>Alstonia boonei</i> De Wild.	Apocynaceae	Tree	Ahun
81	<i>Holarrhena floribunda</i> (G. Don et Schinz) T. Durand et Schinz	Apocynaceae	Tree	Ako-ire, irena
82	<i>Combretum racemosum</i> P. Beauv.	Combretaceae	Climber	Ogan-ibule
83	<i>Combretum</i> sp.	Combretaceae	Climber	-
84	<i>Commelina benghalensis</i> L.	Commelinaceae	Herb	Gbagodo
85	<i>Commelina</i> sp.	Commelinaceae	Herb	-
86	<i>Byrsocarpus coccineus</i> Schumach. et Thonn.	Connaraceae	Climber	Orikoteni
87	<i>Cnestis ferruginea</i> Vahl ex DC.	Connaraceae	Shrub	Ekanyin
88	<i>Dioscorea bulbifera</i> L.	Dioscoreaceae	Climber	Isu-ahun
89	<i>Dioscorea</i> sp.	Dioscoreaceae	Climber	-
90	<i>Platostoma africanum</i> P. Beauv.	Lamiaceae	Herb	-
91	<i>Solenostemon monostachyus</i> (P. Beauv.) Briq.	Lamiaceae	Shrub	Ironpolo
92	<i>Adenia lobata</i> (Jacq.) Egl.	Passifloraceae	Herb	Yaga
93	<i>Passiflora foetida</i> L.	Passifloraceae	Creeper	Ahe enyi
94	<i>Laportea aestuans</i> (L.) Chew	Urticaceae	Herb	Fiyafiya
95	<i>Pouzolzia quineensis</i> Benth.	Urticaceae	Herb	Aboloko-piran
96	<i>Cleistopholis patens</i> (Benth. et Diels) Engl. et Diels	Annonaceae	Tree	Apako
97	<i>Elaeis guineensis</i> Jacq.	Arecaceae	Tree	Igi ope
98	<i>Parquetania nigrescens</i> (Afzel.) Bullock	Asclepiadaceae	Climber	Ogbo
99	<i>Newbouldia laevis</i> (P. Beauv.) seem. ex Bureau.	Bignoniaceae	Tree	Akoko
100	<i>Ceiba pentandra</i> (L.) Gaertn.	Bombacaceae	Tree	Araba
101	<i>Cleome ciliata</i> Schumach. et Thonn.	Capparaceae	Herb	Akuya-aaja
102	<i>Mariscus alternifolius</i> Vahl	Cyperaceae	Herb	Ikeregund
103	<i>Hippocratea pallens</i> Planch. ex Oliv	Hippocrateaceae	Climber	Ameran babo
104	<i>Icacina trichantha</i> Oliv.	Icacinaceae	Herb	Gbegbe
105	<i>Spigelia anthelmia</i> L.	Loganiaceae	Herb	Aparan
106	<i>Azadirachta indica</i> A. Juss.	Meliaceae	Tree	Dogoyaro
107	<i>Musa paradisiaca</i> L.	Musaceae	Shrub	Ogede
108	<i>Pycnanthus angolensis</i> (Welw.) Warb.	Myristicaceae	Tree	Akomu
109	<i>Microdesmis puberula</i> Hook. f. ex Planch.	Pandaceae	Shrub	Ido-apata
110	<i>Peperomia pellucida</i> (L.) H.B. et Kunth	Piperaceae	Herb	Rinrin
111	<i>Polygonum senegalense</i> Meisn.	Polygonaceae	Herb	-
112	<i>Talinum triangulare</i> (Jacq.) Willd.	Portulacaceae	Shrub	Gbure
113	<i>Chrysophyllum albidum</i> G. Don	Sapotaceae	Tree	Agbalumo
114	<i>Physalis angulata</i> L.	Solanaceae	Herb	Koropo
115	<i>Hildergardia barteri</i> (Mast.) Kosterm.	Sterculiaceae	Tree	Okurugbedu
116	<i>Corchorus olitorius</i> L.	Tiliaceae	Herb	Eweddu
117	<i>Trema orientalis</i> (L.) Blume	Ulmaceae	Tree	Afere
118	<i>Stachytarpheta cayennensis</i> (Rich.) Schau.	Verbenaceae	Herb	Akisan
119	<i>Cissus arguta</i> Hook.f.	Vitaceae	Climber	-

Reservoir has a surface area of 6 ha. According to Ugwumba (1990), the Reservoir is 8.3 m high, 110 m long with a crest of 12.2 m high. It has a maximum depth of 5.5 m and a maximum length of 700 m. It can hold about 230 million litres of water (Omosho, 1981). The mean daily air temperature is 24.6°C. The reservoir is noticeable by two seasons: the wet and dry seasons. Rainy season occurs between April and October while the dry season is between November and March. The water level in the Reservoir is regulated at a spill-way through which excess water flows out so the level remains almost constant throughout the rainy season. However, during the dry season, the water level Reduces.

Species enumeration

The study was initiated in June, 2013 and completed in October, 2014. Field collection of plant species

occurring at 50 meters distance on both sides of the dam was documented. The species were identified using the taxonomic keys provided in Hutchinson *et al.* (1954-1972), Lowe & Stanfield (1974), Lowe (1989), Keay (1989) and comparison with previous collections deposited at Forest Herbarium, Ibadan (FHI) (Holmgren *et al.* 1990). Scientific names were checked and verified from the International Plant Name Index (IPNI) website (<http://www.ipni.org>). The species were thereafter carefully documented, along with their families, habits and local name(s) with which they are known within the study area.

Results and Discussion

A total of 119 angiosperm species belonging to 47 families were recorded from the enumeration. These constitute trees, shrubs, herbs and climbers. The most prominent of all the families is Euphorbiaceae, with 15

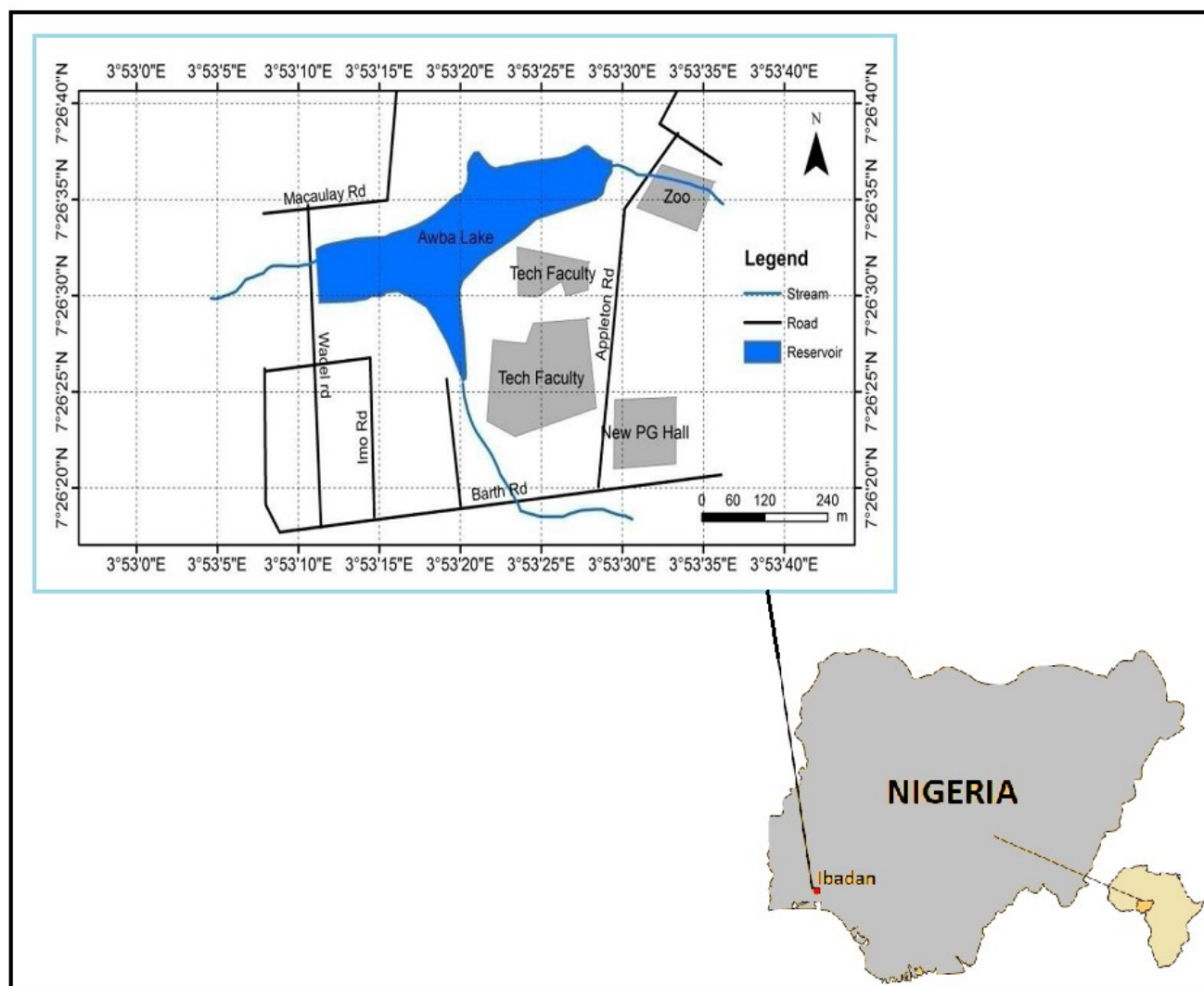


Fig 1. Map of the study area

species, thus constituting 12.6% of the total enumeration (Table 2). This is closely followed by Asteraceae (8 species; 6.7%), Moraceae and Papilionaceae with 7 species each (5.9%). However, a total of 4 families were represented with 5 species each, 3 families had 4 species each, 2 families had 3 species each, 10 families had 2 species each while the remaining 24 families were represented with one species each. The occurrence of these families with single species is a reflection of their role in ecosystem maintenance. Observations also showed that the Legumes generally contributed the largest number of species (Papilionaceae - 7; Caesalpiniaceae - 5; and Mimosaceae - 4). Of these 16 legumes, 8 (50%) were trees while the remaining 8 comprises shrubs (3), herb (1) climber and creepers (2 each) as shown in Table 1. The presence of these taxa is noteworthy, and as nitrogen fixers, may be said to be responsible for the high fertility nature of the soil around the study area, which has continued to be reliable in the cultivation of several food crops especially vegetables and tubers.

Further results based on the life forms of these plant species also revealed that the study area is dominated by herbs, trees and a number of shrubs. The herbs constitute 44 species (37%) of the entire enumeration while the trees contribute 35 species (29%) and the shrubs, 20 species (17%). Nonetheless, climbers and creepers were also recorded, with 14 species (12%) and 6 species (5%) respectively (Fig 2). It is also interesting to note that of all the 47 plant families identified, the herbs are dominant, and are represented in 22 of these angiosperm families, followed by the trees in 18 families and the shrubs in 11 families. The climbers and creepers are also represented in 10 and 5 families respectively as shown in Fig 3.

The avalanche of species, especially herbs, as recorded in this work is an indication that the study area is home to many plant species that could be screened for medicinal properties, thus reflecting the biodiversity richness of the study area and the University community at large. These plants have overtime been collected by the local people and used in the traditional treatment or management of ailments

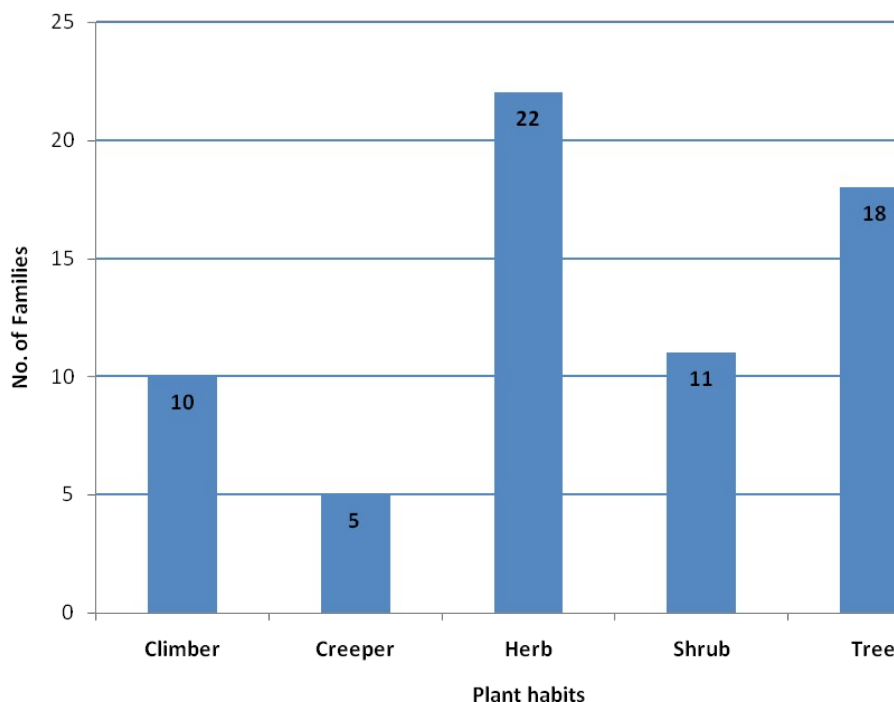


Fig 3. Number of families represented by each plant habit

and have also been reported by some authors of medicinal plants studies such as Gills (1992), Odugbemi (2008) and Soladoye *et al.* (2012) to mention but a few, while a number of them are also consumed as food in one way or the other. Some of these include: *Blighia sapida*, *Carica papaya*, *Mangifera indica*, *Spondias mombin*, *Talinum triangulare*, *Vernonia amygdalina* etc. Some of the plants identified in this work have also been earlier reported by Ayodele *et al.* (2013) to be occurring within the zoological garden of the University, where they occur *ex-situ*. This therefore justifies the importance of plant species in the maintenance of ecosystem and as a source of livelihood for man.

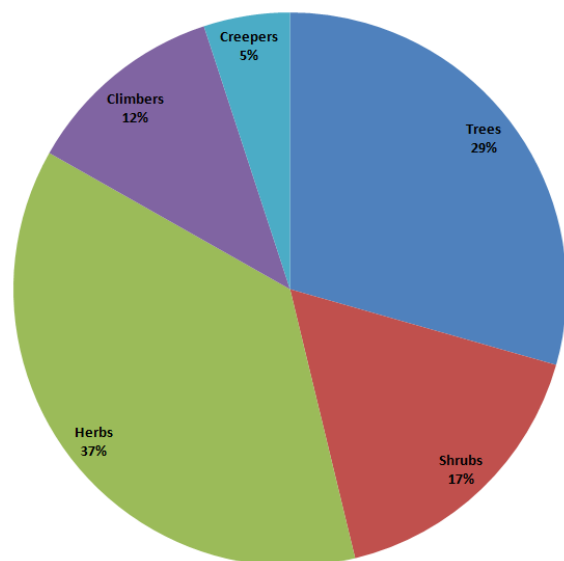


Fig 2. Number of species represented by each plant habit

Aside the numerous flora species reported in this work, the study area also supports the existence of some birds species such as Reed Cormorant (*Phalacrocorax africanus*), White-Faced Whistling Duck (*Dendrocygna viduata*), Black-Crowned Night Heron (*Nycticorax nycticorax*), Common Bulbul (*Pycnonotus barbatus*), Woodland Kingfisher (*Halcyon senegalensis*), Black Kite (*Milvus migrans*), Pied Crow (*Corvus albus*), Cattle Egret (*Bubulcus ibis*), Intermediate Egret (*Mesophoyx intermedia*), Grey Hornbill (*Tockus nasutus*), Western-Grey Plantain-Eater (*Crinifer piscator*), Broad-Billed Roller (*Eurystomus glaucurus*), Fork-Tailed Drongo (*Dicrurus adsimilis*), etc. These were observed and documented during the course of this work, and identified by the second author. Tyokumbur & Okorie (2013) in their work also reported the presence of phytoplankton such as *Microcystis flos-aquae*, *Microcystis aeruginosa*, *Oscillatoria limnetica*, *Oscillatoria formosa*, *Pediastrum simplex*, *Pediastrum duplex*, *Closterium*, *peridinium*, *Euglena*, *Anabaenopsis*, some zooplanktons: *Paramecium*, *Brachionus*, *Anuraeopsis*, *Diaphanosoma*, *Macrocylops* etc in the study area. All these in collaboration, ensures that the study area remains a functional ecological system. However, our rich biodiversity is fast disappearing owing to several human activities as earlier mentioned. The fact that some habitats have been disturbed, either in whole or in part, does not mean that we cannot reinstate them or minimize the adverse effects posed from the current developmental activities. This point was stressed by the Association of Conservation Biology workshop. They noted that it is important to understand that protecting biological diversity, as a practical matter, is independent of the pursuit of the Holy Grail of "pristine". Just because a system is not pristine does not

mean that it has no value for conservation. The task of conservation is not to preserve some ideal pristine nature; rather, its task is to protect diversity as noted by Arne (1992). Edwin-Wosu and Edu (2013) also pointed out clearly that, for conserving biodiversity, it is fundamental to arrest the loss of natural plant resources by adopting proper conservation strategies and protection of natural regeneration of plant species.

Table 2. Percentage occurrence of species within families

S/No	Family	Species (%)
1.	Acanthaceae	1.7
2.	Amaranthaceae	4.2
3.	Anacardiaceae	1.7
4.	Annonaceae	0.8
5.	Apocynaceae	1.7
6.	Arecaceae	0.8
7.	Asclepiadaceae	0.8
8.	Asteraceae	6.7
9.	Bignoniaceae	0.8
10.	Bombacaceae	0.8
11.	Caesalpinaceae	4.2
12.	Capparaceae	0.8
13.	Combretaceae	1.7
14.	Commelinaceae	1.7
15.	Connaraceae	1.7
16.	Convolvulaceae	2.5
17.	Cucurbitaceae	2.5
18.	Cyperaceae	0.8
19.	Dioscoreaceae	1.7
20.	Euphorbiaceae	12.6
21.	Hippocrateaceae	0.8
22.	Icacinaceae	0.8
23.	Lamiaceae	1.7
24.	Loganiaceae	0.8
25.	Malvaceae	4.2
26.	Meliaceae	0.8
27.	Mimosaceae	3.4
28.	Moraceae	5.9
29.	Musaceae	0.8
30.	Myristicaceae	0.8
31.	Pandaceae	0.8
32.	Papilionaceae	5.9
33.	Passifloraceae	1.7
34.	Piperaceae	0.8
35.	Poaceae	3.4
36.	Polygonaceae	0.8
37.	Portulacaceae	0.8
38.	Rubiaceae	4.2
39.	Sapindaceae	3.4
40.	Sapotaceae	0.8
41.	Solanaceae	0.8
42.	Sterculiaceae	0.8
43.	Tiliaceae	0.8
44.	Ulmaceae	0.8
45.	Urticaceae	1.7
46.	Verbenaceae	0.8
47.	Vitaceae	0.8

Conclusion

This research reveals that the surrounding ecosystem of Awba dam and Nigeria's ecosystems in general, are important sources of food, raw material, medicine and items of trade for mankind. They hold a great potential to transform the nation's agricultural system and contribute to health care improvement. But on the contrary, our species are gradually disappearing. Findings from this work reiterate the fact that, practical conservation of the entire biodiversity especially the flora species existing within and outside the study area is very crucial if species extinction is to be averted, and ecosystem balancing is to be maintained. It may be proper to suggest a close monitoring of the study area to avoid indiscriminate habitat destruction by the inhabitants, visitors to the dam and the entire university community. Consequently, the University management has a great role to play if these goals are to be achieved.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

ECC and TAA initiated the research, and participated in its design and coordination. ECC identified the plant species while the two authors drafted the manuscript. ECC performed the statistical analysis. All authors read and approved the final manuscript.

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