A SYSTEMATIC COMPILATION OF ENDEMIC FLORA IN NIGERIA
FOR CONSERVATION MANAGEMENT

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Abstract: Endemic species with limited geographical ranges are more susceptible to extinction than widely ranging species, and effective conservation management of endemic species requires detailed knowledge of their status and distribution. This study was conducted to assemble a comprehensive list of flora endemic to Nigeria. While earlier reports listed as many as 205 endemic plant species, only 91 species belonging to 44 families were found in this study, with Rubiaceae accounting for the highest number of species. The list contains 23 trees, 26 herbs, 22 shrubs, 14 epiphytic orchids and bryophytes, three vines and three ferns. The Oban Division of the Cross River National Park houses 41 endemic plants, while other notable locations for endemic flora include Eket, Naraguta, Degema, Idanre hills, Ukpon River Forest Reserve, Calabar and Anara Forest Reserve. Only 15 of the endemic plants are listed in the IUCN Red List of Threatened Species version 2013.2, ranging from Vulnerable to Critically Endangered.

Keywords: Biodiversity, biogeography, conservation, distribution range, endangered species, endemic flora, Nigeria, Rubiaceae, Transboundary Protected Areas.

French Abstract: Les espèces endémiques avec les zones géographiques limitées sont plus sensibles à l’extinction que largement allant espèces et efficace gestion de la conservation des espèces endémiques exige une connaissance détaillée de leur statut et de la distribution. Cette étude a été menée à dresser une liste complète de la flore endémique au Nigeria. Alors que les rapports précédents énumérés jusqu’à 205 espèces de plantes endémiques, seulement 91 appartenant à 44 familles ont été trouvés dans cette étude, avec Rubiaceae représente le plus grand nombre d’espèces. La liste contient 23 arbres, 26 herbes, 22 arbustes, 14 orchidées épiphytes et bryophytes, trois vignes et trois fougères. La Division Oban du Parc National de Cross River abrite 41 Plantes endémiques, tandis que d'autres endroits remarquables de la flore endémique comprennent Eket, Naraguta, Degema, collines Idanre, réserve forestière Ukpon River, Calabar et la réserve forestière de Anara. Seuls 15 des plantes endémiques sont répertoriés dans la Liste rouge de l’UICN 2013,2 Version espèces, allant de Vulnérable à En danger critique.
INTRODUCTION

Naturalists and botanists have recognised the existence of rare and endemic species for centuries. The origin of the word “endemic” as it applied to the distribution of organisms is ascribed to De Candolle (1855). An endemic species is one that is restricted to a particular geographic area; the geographical area can be defined by political boundaries, such as country or department endemics, or by ecological boundaries (Gaston 1991; Beck et al. 2007; Young 2007). The degree of endemism for an area is often cited as a measure of the uniqueness of the flora, and consequently is important for prioritizing sites for conservation (Myers et al. 2000; Brooks et al. 2002; Knapp 2002; Young et al. 2002). It should be noted that the confinement of endemic species to a single habitat renders them extremely vulnerable to environmental change. More than half of the endemic cichlid fishes in Lake Victoria have disappeared since the introduction of Nile perch, a voracious predator, as a game fish by Ugandan officials in the 1920s (Wilson 2010).

Endemism has attracted the attention of biologists and biogeographers since the 19th century (López-Pujol, et al. 2011). Plant and animal endemism is the principal criterion for determination of hotspot status because endemic species are entirely dependent on a single area for their survival, and by virtue of their more restricted ranges, are often the most vulnerable (Myers et al. 2000). These species, confined to highly threatened ecosystems, will almost certainly be the first to be hit by extinction processes, and hence need rapid and effective conservation action (Heywood & Watson 1995). The 25 hotspots cover only 1.4% of the Earth’s land surface, and account for 1,33,149 plant species (44% of all plant species worldwide) and 9,645 vertebrate species (35%) (Myers et al. 2000). More than ever before, conservationists have begun using data on the geography of biodiversity to set priorities for locating protected areas (Brooks et al. 2006).

Many of the world’s hotspots for biodiversity are found in nations with tropical moist forests, but these nations also face profound socio-economic difficulties that cause widespread habitat loss and degradation. Given that endemism and extinction risk are closely coupled (IUCN 2001), actions to minimize global extinction need to focus on patterns in endemism and range-restricted species (Pimm et al. 1995; Myers et al. 2000; Pimm & Brooks 2000). The major issue with endemism is that most species are not scientifically described, and consequently little if anything is known about their ecology or geographical distributions (Pimm & Brooks 2000). Stuart et al. (2010) noted that only 3.9% of 2,82,000 known species have been studied and evaluated for their conservation status (Stuart et al. 2010).

Rarity is central to tropical forest conservation (Kenfack et al. 2006). The African mainland has between 40,000 and 60,000 plant species (Beentje et al. 1994; Beentje 1996), of which approximately 35,000 are endemic. At least a sixth of the world’s estimated 2,70,000 plant species (Groombridge & Jenkins 2002) are endemic to Africa, while five of the 20 global centres of plant diversity are located in Africa (Barthlott et al. 2005). Yet for most African nations the number of endemic plant species is unknown or poorly estimated, and there is little research or conservation activities concerning them.

Brenan’s 1978 report of plant diversity in Nigeria was based on his analysis of the geographical distribution of all species reported in previous publications (Hepper 1965; Morton 1972; Clayton & Hepper 1974) and the revised editions of Flora of West Tropical Africa (FWTA) (Hutchinson & Dalziel 1958, 1963, 1972). This figure of endemic species was further emphasized in the FEPA (1992) Nigerian biodiversity report. However, since many more species have been discovered after the last edition of the FWTA in 1972, some of the plants that were thought to be endemic to one country have been subsequently recorded from others. This study was carried out to review the current list of endemic species in Nigeria and compile an updated comprehensive list in order to highlight conservation priorities.

METHODS

Brenan’s (1978) account of endemism was based on analysis of Flora in Africa and other related studies. In this study identification of Nigerian endemic flora was done primarily via comprehensive secondary data mining of plant records in books, reliable internet resources and herbarium collections, performed between September 2012 and April 2014. The books used were Trees of Nigeria (Keay 1989); Nigerian Trees, volumes 1 and 2 (Keay & Onochie 1964a,b); second and revised edition of Flora of West Tropical Africa (FWTA), volume 1 (parts 1 and 2) (Hutchinson & Dalziel 1958), volume 2 (Hutchinson & Dalziel 1963), and volume 3 (parts 1 and 2) (Hutchinson & Dalziel 1972), and The Useful Plants of West Tropical Africa volumes 1–5 (Burkill 1985, 1994, 1995, 1997, 2000). There exists no nationwide plant
survey in Nigeria, thus biogeographical knowledge comes primarily from existing editions of Flora of West Tropical Africa (FWTA). Additional information on the natural distribution of taxa was obtained from the Herbarium (FHI) in Forestry Research Institute of Nigeria (FRIN), Ibadan. References were also made to other publications on checklists of orchids (Segerback 1983), pteridophytes (Alston 1959; Kornas 1983; Nwosu 2002) and bryophytes (O’Shea 2006) in Nigeria. Other vital publications consulted included Keay (1953), Hepper (1965), Bridson (1978), Morton (1972), Clayton & Hepper (1974). Furthermore, reference was also made to the list of Nigerian plants with new names and taxonomic adjustments published by Lowe & Soladoye (1990).

Having compiled the list of endemic plant species in Nigeria, it was screened on updated online Plant Systematics databases such as African Plant Database (2012), IUCN Red list of Threatened Species (IUCN 2013), Rhind (2013), Glenn (2006), Govaerts et al. (2011), IPNI (2012), Angiosperm Phylogeny Group (2009), JSTOR (2013), GBIF (2010), the Plant List (2013) and Tropicos (2014). The plant names, family, growth habit and habitat of the identified endemic plant taxa were noted.

RESULTS

Figure 1 shows a map of Nigeria illustrating the geographical locations of endemic plants listed in Table 1. A total of 91 plant species were identified spread across 44 families, including 23 trees, 22 shrubs, 26 herbs, 14 epiphytes (orchids and bryophytes), three vines and three ferns (Fig. 2). Rubiaceae has the highest number of species (11), followed by Orchidaceae (8), Acanthaceae (7), Papilionaceae and Caesalpiniaeae (5 each), Annonaceae and Malvaceae (4 each; Fig. 3). The endemic flora of Nigeria is spread across 17 states in 55 locations, of which 32 (58.2%) are forest and the rest

Figure 1. Tally of endemic flora of Nigeria

Legend

- States with less than seven endemic species
- States with seven or more endemic species
- States with no endemic species
Table 1. List of endemic plant species in Nigeria

| Plant name                        | Family           | Life form | Natural Distribution                                    | Remarks                                      |
|----------------------------------|------------------|-----------|--------------------------------------------------------|----------------------------------------------|
| Aeschynomone neglecta Hepper     | Papilionaceae    | Herb      | Abinsi (Benue State); Naraguta, Jos (Plateau State); Bauchi Plateau (Bauchi State) | Syn: Bakrophytos neglectum (Hepper) Maheshw. |
| Alphitonia virgata Hemsli.        | Orobancheaceae   | Herb      | Lagos area                                             |                                              |
| Allophylus nigericus Bak. f.     | Sapindaceae      | Shrub     | Calabar, Ukpon FR, Oban Division, Cross River National Park (Cross River State) |                                              |
| Anemia nigerica Alston.          | Schizaceae       | Fern      | Idanre hills (Ondo State)                              |                                              |
| Athyrium globatum (Mett. ex Kuhn.) Alston. | Woodsiaaceae | Fern      | River Ata, below Mt. Koloishe (Cross River State)      |                                              |
| Begonia salisburyana Irmsh.      | Begoniaceae      | Herb      | Okeomu National Park (Edo State), Oban Division, Cross River National Park (Cross River State) |                                              |
| Beilschmiedia foliosa (S. Moore) Robyns & Wilczek | Lauraceae       | Shrub     | Oban Division, Cross River National Park (Cross River State) | Syn: Tylosteeman foliosus S. Moore          |
| Berlingia hollandii Hutch. & Dalz. | Caesalpiniaaceae | Tree      | Itu (Akwa Ibom State); Oban Division, Cross River National Park (Cross River State). | Endangered on the IUCN Red List of Threatened Species |
| Caesaria stipitata Mast.          | Samydiaceae      | Tree      | Aboh (Kogi State)                                      | Collect on Aboh on the River Niger over 100 years ago and not recorded ever since |
| Cassipourea ektensis Bak. f.     | Rhiizophoraceae  | Tree      | Oban Division, Cross River National Park (Cross River State), Eket (Akwa Ibom State) | Critically Endangered on the IUCN Red List of Threatened Species |
| Chlorophytum caulescens (Baker) Marais & Reilly | Asparagaceae | Herb      | Iorin (Kwara State) to Jebba (Niger State)              | Syn: Anthericum caulescens Bak.             |
| Chlorophytum dalzielii (Hutch ex Hepper) Nordal | Asparagaceae | Herb      | Bukuru, Jos (Plateau State)                             | Syn: Anthericum dalzelii Hutchinson ex Hepper |
| Clerodendrum tomentellum Hutch. & Dalz. | Verbenaceae | Tree      | Vom, Jos, Naraguta FR (Plateau State)                   |                                              |
| Cola gigas Bak. f.               | Sterculiaceae    | Tree      | Oban Division, Cross River National Park (Cross River State) | Vulnerable on the IUCN Red List of Threatened Species |
| Cola globra Brenan & Keay        | Sterculiaceae    | Tree      | Akure FR, Owena FR (Ondo State)                         | Vulnerable on the IUCN Red List of Threatened Species |
| Cola philippi-jonesii Brenan & Keay | Sterculiaceae | Shrub     | Boje, AR Mountain Wildlife Sanctuary (Cross River State) |                                              |
| Costus talbotii Ridl.            | Costaceae        | Herb      | Oban Division, Cross River National Park (Cross River State) |                                              |
| Cryptosepalum diphylleum Duvign    | Caesalpiniaaceae | Tree      | Ukpon River FR, Ekang river, Obubra (Cross River State) | Endangered on the IUCN Red List of Threatened Species |
| Dactyladenia dichotoma (De Wild) Prance and F. White | Chrysobalanaceae | Tree      | Eket (Akwa Ibom State)                                 | Syn: Acia dichotoma De Wild. Critically Endangered on the IUCN Red List of Threatened Species |
| Dalbergia albizflora subsp. echinocarpea Hepper | Papilionaceae | Tree      | Enugu extension FR, Ekulu, Milliken hill (Enugu State) |                                              |
| Diaphanothera dorotheae (Rendle) Summerh. | Orchidaceae | Epiphyte  | Oban Division, Cross River National Park (Cross River State) |                                              |
| Dichapetalum obanense (Bak. f.) Hutch. & Dalz. | Dichapetalaceae | Tree      | Oban Division, Cross River National Park (Cross River State) | This species is also called O. thomsonii var. obanense by some taxonomists |
| Dichapetalum thomsonii (Oliv.) Engl. | Dichapetalaceae | Tree      | Calabar (Cross River State)                            | Syn: Dichapetalum obanense (Baker f.) Baker f. ex Hutch. & Dalziel |
| Dischistocalyx obanensis S. Moore | Acanthaceae      | Shrub     | Oban Division, Cross River National Park (Cross River State) |                                              |
| Dioscorea planthoporum (Hutch.) | Melastomataceae  | Herb      | Jema (Nasarawa State), Naraguta (Plateau State)         |                                              |
| Dioscorea idanriensis Brenan      | Melastomataceae  | Shrub     | Idanre hills (Ondo State), Osun river (Osun State)      |                                              |
| Dracocea talbotii Rendle          | Agavaceae        | Herb      | Oban Division, Cross River National Park (Cross River State) |                                              |
| Drypetes talbotii S. Moore        | Euphorbiaceae    | Shrub     | Oban Division, Cross River National Park (Cross River State) |                                              |
| Eriocaulum pungens var. inermis Keay | Sapindaceae | Tree      | Eket (Akwa Ibom State), Degema (Rivers State)           |                                              |
| Plant name                        | Family                           | Life form | Natural Distribution          | Remarks                                                                 |
|----------------------------------|----------------------------------|-----------|------------------------------|-------------------------------------------------------------------------|
| Fissidens nigerianus             | Fissidentaceae                   | Epiphyte  | Garki Kurmi, Abuja           | This taxon is a moss                                                    |
| Genyorchis apertiflora           | Orchidaceae                      | Epiphyte  | Mountain Gousun, Ibadan Hills (Ondo State) |
| Habenaria linguiformis           | Orchidaceae                      | Epiphyte  | Zongon Katab, Zaria; Bukuru, Kuru (Plateau State) |
| Habenaria nigerica               | Orchidaceae                      | Epiphyte  | Mando FR, Mongu FR (Plateau State); Zongon Katab, Zaria (Kaduna State) |
| Habenaria phylocoecaera          | Orchidaceae                      | Epiphyte  | Vom, Ropp (Plateau State)    |                                                                         |
| Habenaria prionocraspedon        | Orchidaceae                      | Epiphyte  | Bosh (Cross River State)     |                                                                         |
| Hibiscus grewiaoides             | Malvaceae                        | Tree      | Oban Division, Cross River National Park (Cross River State) |
| Hibiscus sineauleatus            | Malvaceae                        | Herb      | Anara FR (Kaduna State)      | Some taxonomic notes consider it a synonym to H. scotellii Baker f.    |
| Huernia nigeriana                | Asclepiadaceae                   | Herb      | Mongu FR (Plateau State)     |                                                                         |
| Hypoestes talbotii S. Moore      | Acanthaceae                      | Shrub     | Oban Division, Cross River National Park (Cross River State)             | Syn: Hypoestes rosae P. Beauv.                                         |
| Indigofera hutchinsoniana J.B. Gillet | Papilionaceae                | Herb      | Jebba, River Niger, Lokoja (Kogi State)      | Syn: Microcaris tenella Benth.                                         |
| Indigofera latseptala Gillett    | Papilionaceae                    | Herb      | River Niger (Kogi State)     |                                                                         |
| Indigofera withuensis var. occidentalis Gillet | Papilionaceae                | Herb      | Bauchi Plateau (Bauchi State) |                                                                         |
| Ixora nigerica subsp. nigerica Keay | Rubiaceae                      | Shrub     | Ndeali FR, Ukpan River FR, (Cross River state)                         | It is listed as vulnerable in IUCN redlist                            |
| Justicia nigerica S. Moore       | Acanthaceae                      | Shrub     | Oban Division, Cross River National Park (Cross River State)             |                                                                         |
| Justicia tenuipes S. Moore       | Acanthaceae                      | Herb      | Oban Division, Cross River National Park (Cross River State)             |                                                                         |
| Leptotrichella ligulifolia        | Dicranaceae                      | Epiphyte  | Unknown                      | This taxon is a moss                                                    |
| Leptotrichella moenkemeyeri  (Müll. Hal.) Ochryra | Dicranaceae                | Epiphyte  | Unknown                      | Syn: Seligeria moenkemeyeri Müll. Hal. This taxon is a moss             |
| Macrolobum talbotii              | Caesalpiniaceae                  | Tree      | Oban Division, Cross River National Park (Cross River State)             |                                                                         |
| Monodora unwinii Hutch. & Dalz.  | Annonaceae                       | Tree      | Unwin (Edo State)            | Vulnerable on the IUCN Red List of Threatened Species                  |
| Mussenda afzelioidei Wernham     | Rubiaceae                        | Vine      | Oban Division, Cross River National Park (Cross River State)             |                                                                         |
| Napoleonaea jutoe Bak. f. ex Hutch. & Dalz. | Lecythidaceae        | Tree      | Ekta (Akwa Ibom State)       | Critically Endangered on the IUCN Red List of Threatened Species        |
| Napoleonaea reptans Bak. f. ex Hutch. & Dalz. | Lecythidaceae        | Shrub     | Ekta (Akwa Ibom State)       | Critically Endangered on the IUCN Red List of Threatened Species        |
| Diospermum nigritoanum Benth.    | Asteraceae                       | Herb      | Quorra (River Niger)          | Formerly known as Xinghamia nigritoanum (Benth.) C. Jeffrey            |
| Oldenlandia rhabdina Bremek      | Rubiaceae                        | Herb      | Bangwele (Bauchi State)      |                                                                         |
| Oxytoma rosea Sprague & Hutch.   | Annonaceae                       | Shrub     | Oban Division, Cross River National Park (Cross River State)             | Syn: Friesodielsia roseae (Sprague & Hutch.) Steenis                   |
| Oxystigma sp. Harms              | Caesalpiniaceae                  | Tree      | Omo FR, Etemi FR (Ogun State); Af Mountain Wildlife Sanctuary, Oban Division, Cross River National Park (Cross River State) |                                                                         |
| Papillaria moenkemeyeri (Müll. Hal.) Paris | Meteoriaceae                | Epiphyte  | Unknown                      | Syn: Pilotrachelia moenkemeyeri (Müll. Hal.) Kindb. The taxon is a moss |
| Panaristolochio teniucula (S. Moore) Keay | Aristolochiaceae         | Vine      | Oban Division, Cross River National Park (Cross River State)             |                                                                         |
| Plant name                  | Family               | Life form | Natural Distribution                                           | Remarks                                                                 |
|----------------------------|----------------------|-----------|---------------------------------------------------------------|-------------------------------------------------------------------------|
| Pavetta obanica Bremek.    | Rubiaceae            | Shrub     | Oban Division, Cross River National Park (Cross River State)  |                                                                         |
| Pavetta talbotii Wernham   | Rubiaceae            | Shrub     | Oban Division, Cross River National Park (Cross River State)  |                                                                         |
| Physocactus talbotii S.    | Acanthaceae          | Herb      | Oban Division, Cross River National Park (Cross River State); Eket (Akwa Ibom State) | Vulnerable on the IUCN Red List of Threatened Species                   |
| Piptostigma giganteum      | Annonaceae           | Tree      | Oban Division, Cross River National Park (Cross River State)  |                                                                         |
| Rhipidoglossum longicalcar | Orchidaceae          | Epiphyte  | Oban Division, Cross River National Park (Cross River State)  | It is synonymous to Diaphananthe longicalcar (Sumner.) Sumner.           |
| Pavetta obanica Bremek.    | Rubiaceae            | Shrub     | Oban Division, Cross River National Park (Cross River State)  |                                                                         |
| Pavetta talbotii Wernham   | Rubiaceae            | Shrub     | Oban Division, Cross River National Park (Cross River State)  |                                                                         |
| Physocactus talbotii S.    | Acanthaceae          | Herb      | Oban Division, Cross River National Park (Cross River State); Eket (Akwa Ibom State) | Vulnerable on the IUCN Red List of Threatened Species                   |
| Piptostigma giganteum      | Annonaceae           | Tree      | Oban Division, Cross River National Park (Cross River State)  |                                                                         |
| Rhipidoglossum longicalcar | Orchidaceae          | Epiphyte  | Oban Division, Cross River National Park (Cross River State)  |                                                                         |
| Pavetta obanica Bremek.    | Rubiaceae            | Shrub     | Oban Division, Cross River National Park (Cross River State)  |                                                                         |
| Pavetta talbotii Wernham   | Rubiaceae            | Shrub     | Oban Division, Cross River National Park (Cross River State)  |                                                                         |
| Physocactus talbotii S.    | Acanthaceae          | Herb      | Oban Division, Cross River National Park (Cross River State); Eket (Akwa Ibom State) | Vulnerable on the IUCN Red List of Threatened Species                   |
| Piptostigma giganteum      | Annonaceae           | Tree      | Oban Division, Cross River National Park (Cross River State)  |                                                                         |
| Rhipidoglossum longicalcar | Orchidaceae          | Epiphyte  | Oban Division, Cross River National Park (Cross River State)  |                                                                         |
| Pavetta obanica Bremek.    | Rubiaceae            | Shrub     | Oban Division, Cross River National Park (Cross River State)  |                                                                         |
| Pavetta talbotii Wernham   | Rubiaceae            | Shrub     | Oban Division, Cross River National Park (Cross River State)  |                                                                         |
| Physocactus talbotii S.    | Acanthaceae          | Herb      | Oban Division, Cross River National Park (Cross River State); Eket (Akwa Ibom State) | Vulnerable on the IUCN Red List of Threatened Species                   |
| Piptostigma giganteum      | Annonaceae           | Tree      | Oban Division, Cross River National Park (Cross River State)  |                                                                         |
| Rhipidoglossum longicalcar | Orchidaceae          | Epiphyte  | Oban Division, Cross River National Park (Cross River State)  |                                                                         |
| Pavetta obanica Bremek.    | Rubiaceae            | Shrub     | Oban Division, Cross River National Park (Cross River State)  |                                                                         |
| Pavetta talbotii Wernham   | Rubiaceae            | Shrub     | Oban Division, Cross River National Park (Cross River State)  |                                                                         |
| Physocactus talbotii S.    | Acanthaceae          | Herb      | Oban Division, Cross River National Park (Cross River State); Eket (Akwa Ibom State) | Vulnerable on the IUCN Red List of Threatened Species                   |
| Piptostigma giganteum      | Annonaceae           | Tree      | Oban Division, Cross River National Park (Cross River State)  |                                                                         |
| Rhipidoglossum longicalcar | Orchidaceae          | Epiphyte  | Oban Division, Cross River National Park (Cross River State)  |                                                                         |
| Pavetta obanica Bremek.    | Rubiaceae            | Shrub     | Oban Division, Cross River National Park (Cross River State)  |                                                                         |
| Pavetta talbotii Wernham   | Rubiaceae            | Shrub     | Oban Division, Cross River National Park (Cross River State)  |                                                                         |
| Physocactus talbotii S.    | Acanthaceae          | Herb      | Oban Division, Cross River National Park (Cross River State); Eket (Akwa Ibom State) | Vulnerable on the IUCN Red List of Threatened Species                   |
savannah.

Forty-one endemic species are located in the Oban division of Cross River National Park, while other notable locations include Eket (8 species), Naraguta (4 species), Degema, Idanre Hills, Ukpon River FR, Calabar and Anara FR (3 species each) (Table 1). Nine locations accounting for 57 endemic species are in montane regions, including Idanre Hills, Cross River National Park (Oban division), Bauchi Plateau, Jos Plateau, Gawa hills and Afif Mountain Wildlife Sanctuary. Eight locations accounting for 12 species are located in riparian areas, especially around river Niger. While classifying locations by State boundaries it was noted that Cross River state housed 57 endemic species, followed by Akwa Ibom State (9), Kaduna State (10), Plateau State (8), Ondo State (7), Niger and Kogi States (5 each) and Lagos State (4), while 19 states of the federation had no endemic plant species recorded.

Screening the list of endemic flora in Nigeria in the 2013.2 version of IUCN Red List of Threatened Species revealed that only 15 have been assessed by IUCN, of which eight were classified as “Vulnerable”, three as “Endangered” and the remaining four were “Critically Endangered” (Table 1).

Table 2 shows the list of 153 plants that were once thought to be endemic to Nigeria but have since been found in other African countries, including Cameroon, Gabon, Equatorial Guinea and Democratic Republic of Congo.

**DISCUSSION**

**Changes in plant species endemism in Nigeria**

Brenan (1978) gave a detailed account of endemism in tropical Africa. This included 205 endemic species and five endemic genera in Nigeria, 26 in Senegal, 1 in Gambia, 88 in Guinea, 11 in Mali, 74 in Sierra Leone, 59 in Liberia, 41 in Côte d’Ivoire, 43 in Ghana, 20 in Togo, 11 in Benin Republic and 156 in Cameroon. These are in addition to 108 in Sao Tome and Principe, 259 in Somalia Republic, 553 in Ethiopia (and Eritrea), 449 in Tanzania, 378 in Angola and 106 in Kenya among others (Brenan 1978). The West African (Guinean) Forests, of which Nigerian tropical rainforests is part of, is one of the 25 biodiversity hotspots of global significance for conservation priorities (Myers et al. 2000). In addition, the Nigerian rainforest was identified as one of the centres of diversity in Africa (Davis et al. 1994; Beentje et al. 1994; Beentje 1996).

Nigeria was reported to harbour 7,895 plant species from 338 families and 2,215 genera, in addition to 1,489 identified species of microorganisms (Brenan 1978). It was further reported that Nigerian biodiversity comprises 4,903 species of angiosperms, 32 species of gymnosperms, 155 pteridophyte species, 80 bryophyte species, 134 plankton species, 55 bacteria species, 784 algae species, 3,423 fungi species and more than 500 species of viruses (FEPA 1992). Brenan (1978) further stated that 20 plant species had become extinct since 1950, about 431 species were endangered, 45 species were classified as rare, and 20 species were vulnerable. 205 species were endemic, the ninth highest number of endemic species among 42 African countries (Brenan 1978). Out of these 205 endemic species the northern region, with Sudanian affinities, has 39 endemic species, western and central regions have 38, and the eastern region is a host to 128 endemic species (Brenan 1978). In addition, eight moss (bryophytes) species were reported to be endemic to Nigeria (O’Shea 1997). Furthermore, Nigeria is said to rank 11th in Africa in terms of plant
### Table 2. List of previously thought endemic species in Nigeria

| Plant name                  | Family              | Habit      | Distribution in Nigeria                                                                 | New locations                                                                 |
|-----------------------------|---------------------|------------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| **1** Acalypha nigritiana Müll.Arg  
(Syn: Acalypha ornata Hochst. ex A. Rich) | Euphorbiaceae       | Shrub      | Yoruba forests, Lagos                                                                  | Burkina Faso, Central African Republic, Cameroon, Eritrea, Democratic Republic of Congo, Equatorial Guinea, Guinea, Rwanda, Congo Rep., Sudan, Ethiopia, Malawi, Kenya, Tanzania, Uganda, Zimbabwe, Botswana, Mozambique, Swaziland, Angola, Tuvalu |
| **2** Acioa talbotii Bak. f.  
(Syn: Dactyladenia staudtii (Engl.) Prance & F.White) | Chrysobalanaceae    | Tree       | Oban                                                                                   | Nigeria, Cameroon, Gabon                                                       |
| **3** Actinopéters australis (Linn.f.) Link | Adiantaceae         | Herb       | Kabir, Pankshin District                                                               | Myanmar, Kenya, Tanzania, Uganda, Bunundi, Comoros, Democratic Republic of Congo, Ethiopia, Madagascar, Malawi, Mozambique, Réunion, Somalia, Sudan, Zambia, Zimbabwe |
| **4** Aframomum stanfieldii Hepper | Zingiberaceae       | Herb       | Owo, Ongimgbari Forest Reserve [FR]                                                    | Ghana, Côte d'Ivoire, Cameroon                                               |
| **5** Agelaea pilosa G. Schellenb  
(Syn: Agelaea pentagyna [Lam.] Baill.) | Connaraceae         | Shrub      | Usonigbe FR, Sapoba FR (Edo State); Degenma (Rivers State); Ikom (Akwa Ibom state)     | Guinea Republic, Guinea Bissau, Côte d'Ivoire, Ghana, Togo, Benin Republic, Liberia, Sierra Leone, Equatorial Guinea, Cameroon, Central African Republic, Angola, Gabon, Congo Republic, Kenya, Tanzania, Mozambique, Madagascar Republic, Zambia |
| **6** Allexis obanensis (Bak. f.) | Violaceae           | Tree       | Oban                                                                                   | Cameroon                                                                     |
| **7** Anchomone nigritanus Rendle | Acanthaceae         | Herb       | Etara, Oban                                                                            | Cameroon, Gabon                                                               |
| **8** Ancistrocladus guineensis Oliv. | Ancistrocladaceae   | Liana      | Etemi FR, Omo FR, Sapoba FR                                                           | Cameroon, Gabon                                                               |
| **9** Ancistrocladus unicinatus Hutch. & Dals.  
(Syn: Ancistrocladus guineensis Oliv.) | Ancistrocladaceae   | Liana      | Eket (Akwa Ibom State)                                                                 | Cameroon, Gabon and Congo Republic                                           |
| **10** Angraecum angustum (Rolfe) Summer. | Orchidaceae         | Herb       | Itu                                                                                     | Cameroon                                                                     |
| **11** Annona barteri Benth.  
(Syn: Duguetia barteri (Benth.) Chatrou and Pachypodanthium barteri (Benth.) Hutch. & Dalt.) | Annonaceae          | Tree       | Koton Karifi Swamp FR, Ibaji Ojoku, Kabba                                                | Gabon and Cameroon                                                            |
| **12** Anthocleista obanensis Hepper | Asparagaceae        | Herb       | Anara FR, Zaria, Jos Plateau                                                           | Democratic Republic of Congo, Kenya, Tanzania                                 |
| **13** Anthostelea obanensis Wernham | Loganiaceae         | Liana      | Sapoba FR (Edo State); Eket (Akwa Ibom State); Oban Division, Cross River National Park (Cross River State) | Cameroon and Gabon                                                            |
| **14** Anthospatha obanensis (Bak. f.) J. Leonard  
(Syn: Isomacrolobium obanense [Baker f.] Aubrèv. & Pellegr.) | Caesalpiniaceae     | Tree       | Idanne hills (Ondo State); Degenma (Rivers State); Obudu, Oban Division, Cross River National Park (Cross River State) | Liberia, Sierra Leone, Côte d'Ivoire, Cameroon, Gabon, Angola, Democratic Republic of Congo. Vulnerable on the IUCN Red List of Threatened Species |
| **15** Aporrhiza talbotii Baker f.  
(Syn: Aporrhiza purpurea N.E. Br.) | Sapindaceae         | Tree       | Oban Division, Cross River National Park (Cross River State)                          | Gabon                                                                        |
| **16** Artabotrys cocineus Keay | Annonaceae          | Liana      | Ibadan South FR (Oyo State)                                                           | Benin Republic                                                               |
| **17** Asplenium cornutum Alston | Aspleniacae         | Herb       | Mambilla Plateau                                                                       | Cameroon, Equatorial Guinea                                                 |
| **18** Baissea subessilis (Benth.) Stapf ex Hutch  
(Syn: Baissea cananepulata (K.Schum.) de Kruif) | Apocynaceae         | Shrub      | Ishagama, Osun FR, Ongigambari FR to Ibadan                                           | Ghana, Côte d'Ivoire, Cameroon, Equatorial Guinea, Gabo, Democratic Republic of Congo, Congo Republic, Angola, Central African Republic |
| **19** Batesanthus talbotii S. Moore  
(Syn: Batesanthus purpureus N.E. Br.) | Asclepiadaceae      | Herb       | Oban Division, Cross River National Park (Cross River State)                          | Angola, Sierra Leone, Guinea, Cameroon, Gabon, Central African Republic and Democratic Republic of Congo |
| **20** Begonia cilio-brocketa Warb. | Begoniaceae         | Herb       | Awu FR                                                                                 | Cameroon, Ghana, Democratic Republic of Congo                                 |
| Plant name | Family | Habit | Distribution in Nigeria | New locations |
|------------|--------|-------|--------------------------|---------------|
| 21 Beilschmiedia myrciifolia (S. Moore) Robyns & R. Wilczek | Lauraceae | Shrub | Oban Division, Cross River National Park (Cross River State) | Cameroon |
| 22 Belonophora talbotii (Wernham) Keay | Rubiaceae | Tree | Oban Division, Cross River National Park (Cross River State) | Gabon. Vulnerable on the IUCN Red List of Threatened Species |
| 23 Brachystegia nigraensis Hoyle & A. Jones | Caesalpinaceae | Tree | Ongambari FR, Olua FR, Sapoba FR, Urhonigbe FR, Onitsha, Unwin, Awka | Cameroon |
| 24 Bulbophyllum calvum Summerh. | Orchidaceae | Herb | Maisamari, Mambilla Plateau | Cameroon |
| 25 Butomia marginalis G. Taylor [Syn: Socolofella marginalis [G.Taylor] C.Cusset ex Cheek] | Podostemataceae | Herb | Oban Division, Cross River National Park (Cross River State). | Cameroon, unconfirmed records from Ghana and Niger Rep. |
| 26 Campylosperrum oliveri (Van. Tegh.) Farron | Ochnaceae | Tree | Calabar, Cross River State. | Cameroon, Gabon and Côte d’Ivoire |
| 27 Canthium inaequilaterum Hutch. & Dalz. [Syn: Keetia inaequalata (Hutch. & Dalziel) Bridson] | Rubiaceae | Shrub | Oban | Congo Republic |
| 28 Carpadinus talbotii Wernham [Syn: Landonia stenognaya Fichon] | Apocynaceae | Shrub | Oban Division, Cross River National Park (Cross River State). | Gabon and Cameroon |
| 29 Cephalonema polyanthrum K. Schum [Syn: Clapperotonia polyantra (K. Schum. ex Sprague) Bech.] | Tiliaceae | Herb | Oruikim and Oroku, Uyo (Akwa Ibom State) | Democratic Republic of Congo, Congo Republic, Cameroon and Gabon |
| 30 Chamaegia lanceolata Summerh. | Orchidaceae | Herb | Sapoba FR, Oban | Cameroon |
| 31 Chassalia cupularis Hutch & Dalz | Rubiaceae | Shrub | Oban, AR River FR | Cameroon |
| 32 Chassalia subnuda (Hiern) Hepper | Rubiaceae | Shrub | Calabar | Congo Republic |
| 33 Chryanthus ellipticus Hutch. & Dalz. | Sapindaceae | Tree | Sapoba FR, Okomu National Park (Edo State); Oban Division, Cross River National Park (Cross River State); Eket (Akwa Ibom State) | Unconfirmed reports from Liberia |
| 34 Cleistanthus libericus N.E Br. | Euphorbiaceae | Tree | Shasha FR, Okomu National Park | Ghana, Côte d’Ivoire, Liberia, Sierra Leone, Congo Rep, Gabon, Guinea, Democratic Republic of Congo |
| 35 Cleistanthus ripicola Leonard | Euphorbiaceae | Tree | Koton Karfi Swamp FR, Osse River, Lower Enyong FR | Ghana, Côte d’Ivoire, Central African Republic, Congo Rep, Democratic Republic of Congo |
| 36 Cleistopholus staudtii Engl. & Diels | Armonaceae | Tree | Shasha FR | Cameroon, Central African Republic, Gabon |
| 37 Clematopsis scabiosafoila (DC.) Hutch. Subsp. oliveri (Hutch.) Brumn. | Ranunculaceae | Herb | Bauchi Plateau (Bauchi State) | Cameroon |
| 38 Clerodendrum talbotii Wernham [Syn: Clerodendrum capitatum (Willd.) Schumach.] | Verbenaceae | Tree | Oban Division, Cross River National Park (Cross River State) | Senegal, Mali, Guinea, Côte d’Ivoire, Ghana, Togo, Benin Republic, Somalia Republic, Cameroon, Gabon, Democratic Republic of Congo, Zambia, Uganda |
| 39 Cnestis mannii (Bak.) Schellend. | Connaraceae | Shrub | Shasha FR (Ogun State); Oban Division, Cross River National Park (Cross River State). | Angola, Gabon, Congo Rep, Cameroon, Madagascar |
| 40 Cola nigerica Brenan & Keay | Sterculiaceae | Tree | Shasha FR, Oban, Etomi FR | Cameroon (IUCN reports it might be extinct there) and Gabon |
| 41 Combretum excelsum Keay [Syn: Combretum peccaense Exell] | Combretaceae | Tree | Cross River North FR (Cross River State) | Gabon, Angola and Democratic Republic of Congo |
| 42 Cordyla sp. a null | Caesalpinaceae | Tree | Iborin, New Bussa, Yakumase | Togo |
| Plant name                          | Family               | Habit  | Distribution in Nigeria                                      | New locations                                                                 |
|------------------------------------|----------------------|--------|----------------------------------------------------------------|--------------------------------------------------------------------------------|
| 43 Crateranthus talbotii Baker f.  | Lecythidaceae        | Tree   | Oban, Calabar, Cross River National Park (Cross River State)   | Gabon                                                                         |
| 44 Crossandra abanensis Heine      | Acanthaceae          | Shrub  | Oban Division, Cross River National Park (Cross River State)   | Cameroon                                                                      |
| 45 Crossandra talbotii S. Moore    | Acanthaceae          | Herb   | Oban Division, Cross River National Park (Cross River State);  | Cameroon, Gabon and Ghana                                                    |
| 46 Crossonephelis africana         | Sapindaceae          | Shrub  | Ilaro FR (Ogun State)                                         | Tanzania, Mozambique, Togo, Zimbabwe, Ghana, Benin Republic and Kenya         |
| 47 Croton membranaceus Müll. Ang   | Euphorbiaceae        | Shrub  | Lokoja, Onitsha                                              | Côte d'Ivoire                                                                 |
| 48 Cuviera trilocularis Hiern      | Rubiaceae            | Shrub  | Oban, Calabar, Cross River National Park (Cross River State)   | Cameroon                                                                      |
| 49 Cuviera truncata Hutch. & Dalz. | Rubiaceae            | Shrub  | Sanga river FR, Onitsha, Degema, Oban, Vogel Peak, Gangumi    | Cameroon                                                                      |
| 50 Dacrydium eketensis             | Melastomataceae      | Herb   | Idanre hills (Ondo State)                                     | Equatorial Guinea                                                            |
| 51 Dactyladenia ektesensis         | Chrysobalanaceae     | Tree   | Eket (Akwa ibom State)                                        | Gabon. Critically Endangered on the IUCN Red List of Threatened Species      |
| 52 Dissotis eketensis              | Melastomataceae      | Herb   | Balleghete, Obudu, Koloishe mountains, Ikwette               | Cameroon, Guinea, Liberia                                                    |
| 53 Dissotis fruticosa              | Melastomataceae      | Herb   | Idanre hills (Ondo State)                                     | Equatorial Guinea                                                            |
| 54 Dolichos brevicaulis Bak.       | Papilionaceae         | Herb   | Jebba (Kogi State); Yola (Adamawa State); Bauchi Plateau (Bauchi State) | Cameroon and Ghana                                                           |
| 55 Dorothea obanensis Hutch. & Dalziel | Moraceae            | Tree   | Oban Division, Cross River National Park (Cross River State) | Guinea, Côte d’Ivoire, Ghana, Gabon, Equatorial Guinea, Congo Republic, Democratic Republic of Congo |
| 56 Dracaena goldiaeana Bull        | Agavaceae            | Herb   | Uwet, Calabar                                                | Cameroon, Gabon                                                               |
| 57 Drypetes abanensis S. Moore     | Euphorbiaceae        | Tree   | Oban Division, Cross River National Park (Cross River State) | Côte d’Ivoire, Cameroon, Gabon. Vulnerable on the IUCN Red List of Threatened Species |
| 58 Enneastemon foliosus            | Annonaceae           | Shrub  | Okomu National Park                                         | Cameroon                                                                      |
| 59 Eriocaulus intrusus Meikle      | Eriocaulaceae        | Herb   | Naraga, Plateau state                                        | Democratic Republic of Congo, Tanzania, Angola, Malawi, Mozambique, Zambia   |
| 60 Eriosema bauchiense Hutch. & Dalz | Sapindaceae         | Tree   | Eket, Afiriver FR, Aboabam-Arimakpan path                    | Gabon. Data Deficient on the IUCN Red List of Threatened Species             |
| 61 Eugenia obanensis              | Myrtaceae            | Herb   | Vorn (Plateau State)                                         | Cameroon, Tanzania, Democratic Republic of Congo, Malawi                      |
| 62 Eugenia talbotii Keay           | Myrtaceae            | Shrub  | Oban Division, Cross River National Park (Cross River State) | Cameroon                                                                      |
| 63 Fagara buesgenii Engl.          | Rutaceae             | Shrub  | Oban Division, Cross River National Park (Cross River State) | Cameroon and Gabon                                                           |
| 64 Fagara melanorhachis Hoyle      | Rutaceae             | Tree   | Sapoba FR (Edo State), Enugu (Enugu State)                   | Cameroon, Ghana, Guinea, Gabon, Sierra Leone, Liberia, Côte d’Ivoire, Togo, Benin Republic, Equatorial Guinea, Democratic Republic of Congo, Zambia, Zimbabwe, Ethiopia, Kenya, Tanzania, Mozambique |
| 65 Filistris nigritana C.B.Cl      | Orchidaceae          | Herb   | Nupe                                                        | Togo                                                                          |
| 66 Filistris nigritana C.B.Cl      | Orchidaceae          | Herb   | Nupe                                                        | Togo                                                                          |

Endemic flora of Nigeria

Borokini
| Plant name | Family | Habit | Distribution in Nigeria | New locations |
|------------|--------|-------|-------------------------|---------------|
| *Friesodielsia soyauxii* | Annonaceae | Shrub | Ibadan South FR (Oyo State) | Gabon, Congo Rep, Democratic Republic of Congo and Central African Republic |
| *Garcinia obamensis* | Clusiaceae | Tree | Oban Division, Cross River National Park (Cross River State) | Cameroon, Gabon and Equatorial Guinea |
| *Garcinia ovalifolia var.?* | Guttiferae | Tree | Recorded from forests of Benin only | Guinea, Mali, Ethiopia, Uganda, Angola |
| *Gladiolus melleri* | Iridaceae | Herb | Jos Plateau, Naranda mountain | Burundi, Democratic Republic of Congo, Tanzania, Angola, Malawi, Mozambique, Zambia. Nigeria is the only place it was reported in West Africa |
| *Globulostylis minor* | Rubiaceae | Shrub | Oban Division, Cross River National Park (Cross River State) | Cameroon. |
| *Globulostylis talbotii* | Rubiaceae | Shrub | Oban Division, Cross River National Park (Cross River State) | Cameroon. Globulostylis has only two species, and both species are thought to be endemic to Nigeria |
| *Garcinia obamensis* | Clusiaceae | Tree | Oban Division, Cross River National Park (Cross River State) | Cameroon. |
| *Globulostylis talbotii* | Rubiaceae | Shrub | Oban Division, Cross River National Park (Cross River State) | Cameroon. |
| *Habenaria keayi* | Orchidaceae | Herb | Kaduna, Dogon Kurmi, Sara mountains, Bauchi, Naraguta FR, Ibadan | Togo, Cameroon, Ethiopia, Arabian Peninsula |
| *Hugonia talbotii* | Rubiaceae | Shrub | Oban Division, Cross River National Park (Cross River State) | Cameroon. |
| *Inversodicraea tenuifolia* | Podostemaceae | Herb | Boje-Aboabam road, Afi River Wildlife Sanctuary | Gabon and Cameroon. Critically Endangered on the IUCN Red List of Threatened Species |
| *Ixia degemensis* | Rubiaceae | Shrub | Degema (Rivers State) | Cameroon. Endangered on the IUCN Red List of Threatened Species |
| *Jatropha neriifolia* | Euphorbiaceae | Shrub | Jos Plateau | Benin Rep., Ghana, Guinea Bissau, Guinea, Côte d’Ivoire, Liberia, Senegal, Sierra Leone, Central African Republic, Gabon, Democratic Republic of Congo |
| *Justicia talbotii* | Acanthaceae | Shrub | Eket (Akwa Ibom State) | Democratic Republic of Congo |
| *Lobelia lelyana* | Lobeliaceae | Herb | Jos Plateau | Guinea, Burundi, Central African Republic, Rwanda, Cameroon, Kenya, Tanzania, Uganda, Malawi |
| *Markhamia lutea* | Bignoniaceae | Tree | Abeokuta | Ghana, Côte d’Ivoire, Senegal, Togo, Sierra Leone, Cameroon, Central African Republic, Democratic Republic of Congo, Tanzania, Malawi, Mozambique, Sudan, Kenya, Uganda |
| *Memecylon fosteri* | Melastomataceae | Shrub | Idanre hills (Ondo State) | Cameroon, Sao Tome and Principe |
| Plant name          | Family               | Habit    | Distribution in Nigeria                                      | New locations                                                                 |
|---------------------|----------------------|----------|----------------------------------------------------------------|-------------------------------------------------------------------------------|
| Memecylon meiklei Keay [Syn: Warnekea guineensis (Keay) Jacq.-Fél.] | Melastomataceae | Shrub    | Ibadan (Oyo State)                                             | Côte d'Ivoire, Liberia and Ghana                                               |
| Memecylon obanense Bak. f. [Syn: Memecylon engleriensem Cogn. var. engleriensim] | Melastomataceae | Shrub    | Oban Division, Cross River National Park (Cross River State)   | Guinea, Liberia, Côte d'Ivoire, Cameroon, Congo Republic                     |
| Mendocia iodioides (S. Moore) Heine [Syn: Afrormendocia iodioides S. Moore] | Acanthaceae     | Shrub    | Oban Division, Cross River National Park (Cross River State)   | Equatorial Guinea, Gabon and Congo Republic                                  |
| Millettia pilosa Hutch. & Dalz. | Papilionaceae | Shrub    | Oban Division, Cross River National Park (Cross River State); Umushia (Aïla State) | Cameroon                                                                      |
| Neobauomannia hedyotidea var longipilglo Brenan [Syn: Knokia hedyotidea (K. Schum.) Puff. & Robb.] | Rubiaceae     | Shrub    | Idanre hills, Akure FR, Aponmu FR                             | Ghana, Togo, Cameroon                                                          |
| Oxymitra glaucifolia Hutch. & Dalz. [Syn: Friesodia glaucifolia (Hutch. & Dalziel) Steenis] | Annonaceae     | Shrub    | Oban Division, Cross River National Park (Cross River State)   | Cameroon                                                                      |
| Oxymitra obanensis Sprague & Hutch. [Syn: Unona obanensis Baker & Friesodia engghina (Diels.) Verdc.] | Annonaceae     | Shrub    | Oban Division, Cross River National Park (Cross River State)   | Liberia, Sierra Leone, Côte d'Ivoire, Ghana, Central African Republic, Democratic Republic of Congo, Gabon. |
| Pancovia sessiliflora Hutch. & Dalz. | Sapindaceae | Shrub    | Etemi FR, Olokemeji FR, Omo FR, Okeigbo, Ikoyi plains, Agege   | Ghana                                                                         |
| Pararistolochia ju-ju (S. Moore) Hutch & Dalz. [Syn: Pararistolochia manni (Hook. f.) Keay] | Aristolochiaceae | Liana    | Degema (Rivers State)                                          | Côte d'Ivoire, Benin Republic, Gabon, Ghana, Togo, Congo Republic.            |
| Pararistolochia talbotii (S. Moore) Keay [Syn: Pararistolochia promissa (Mast.) Keay & Aristolochia talbotii S. Moore.] | Aristolochiaceae | Herb    | Oban Division, Cross River National Park (Cross River State)   | Côte d'Ivoire, Ghana, Central African Republic, Cameroon, Democratic Republic of Congo, Gabon. |
| Pararistolochia tribrachiata (S. Moore) Hutch & Dalz. [Syn: Pararistolochia macrocarpa (Duch.) Ponsy] | Aristolochiaceae | Liana    | Oban Division, Cross River National Park (Cross River State)   | Liberia, Côte d'Ivoire, Ghana, Cameroon, Central African Republic, Democratic Republic of Congo, Gabon, Congo Rep., Equatorial Guinea |
| Pauridiantha insculpta (Hutch. & Dalz.) [Syn: Empogona talboltii (Wernham) Tosh & Robb.] | Rubiaceae     | Shrub    | Oban                                                            | Congo Republic, Cameroon                                                      |
| Pausinystalia talbotii Wernham | Rubiaceae | Tree     | Oni river, Omo FR, Oban, Calabar                              | Cameroon                                                                      |
| Paxia liberossepolia (Bak. f) Schellenb ex Hutch. & Dalz. [Syn: Rourrea myrianta Baille.] | Connaraceae     | Liana    | Oban Division, Cross River National Park (Cross River State)   | Cameroon, Gabon, Democratic Republic of Congo, Equatorial Guinea, Madagascar |
| Pennisetum dalzielii Stapf & C.E. Hubb. [Syn: Pennisetum sieberianum Schitr.] Stapf & C.E. Hubb. | Poaceae        | Shrub    | Sokoto                                                        | Eritrea, Angola, Gambia, Senegal, Togo, Cameroon, Chad, Ethiopia, Sudan       |
| Phaulopsis talbotii S. Moore | Acanthaceae | Herb    | Oban Division, Cross River National Park (Cross River State)   | Sierra Leone, Liberia and Cameroon                                            |
| Phragmanthera talbotorum (Sprague) Balle [Syn: Phragmanthera talbotora (Sprungel) S. Balle & Loranthus talbotorum Sprague] | Loranthaceae   | Shrub    | Eket (Akwa Ibom State); Oban Division, Cross River National Park (Cross River State) | Cameroon and Gabon                                                             |
| Pohliaella filabellata G. Tayl. [Syn: Saxicolella filabellato (G.Taylor) C. Cusset] | Podostemataceae | Herb    | Afi River FR on Aboabam-Bojie path                            | Cameroon, Ghana, Niger                                                         |
| Plant name                                    | Family          | Habit     | Distribution in Nigeria                                                                 | New locations                        |
|----------------------------------------------|-----------------|-----------|----------------------------------------------------------------------------------------|---------------------------------------|
| Polystachya camandoides Summerh              | Orchidaceae     | Herb      | Calabar                                                                                | Cameroon, Guinea                      |
| Polystachya odorata var trilepidis Summerh   | Orchidaceae     | Herb      | Mountain Orosun, Idanre                                                                | Cameroon                              |
| Protea argyrophaea Hutch (Syn: Protea madiensis Oliv. subsp. madiensis) | Proteaceae      | Shrub     | Bauchi Plateau (Bauchi State)                                                          | Found throughout West, Central and East Africa |
| Psammmites nigerica Hepper (Syn: Psammmites madagascariensis (Bonat) Eib. Fisch. & Hepper) | Scrophulariaceae | Herb      | Badagry (Lagos State)                                                                  | Madagascar. Brenan (1978) reported that this genera is endemic to this region of Nigeria. |
| Pseudospondias microcarpa var hirsuta Brenan | Anacardiaceae   | Tree      | Eleyele, Ibadan (Oyo State), Omo FR, Etemi FR (Ogun State)                              | Zimbabwe. Vulnerable on the IUCN Red List of Threatened Species and present only in Nigeria. Hyde et al. (2014) listed it in Zimbabwe and Mozambique. |
| Pseudospondias microcarpa var longifolia (Engl.) Keay | Anacardiaceae | Tree      | Benin (Edo State)                                                                      | Cameroon                              |
| Psophocarpus longepedunculatus Hassk. var. banteri Baker | Papilionaceae   | Tree      | Unspecified                                                                            | Throughout Central and parts of West and East Africa, and Madagascar. |
| Psychotria arborea Hiern                   | Rubiaceae       | Tree      | Calabar (Cross River State)                                                            | Cameroon                              |
| Psychotria dalzielii Hutch. (Syn: Psychotria eminiana var. eminiana) | Rubiaceae       | Shrub     | Mando FR, Zaria                                                                        | Burundi, Central African Republic, Cameroon, DR Congo, Chad, Sudan, Tanzania, Angola, Malawi, Mozambique, Zambia |
| Psychotria potanthera Wernham               | Rubiaceae       | Shrub     | Oban Division, Cross River National Park (Cross River State)                            | Cameroon                              |
| Psychotria rowlandii Hutch. & Dals. (Syn: Psychotria gabanica Hiern.) | Rubiaceae       | Shrub     | Lagos, Omo FR                                                                         | Côte d'Ivoire, Liberia, Sierra Leone, Central African Republic, Congo Republic, Gabon |
| Psychotria talbotii Wernham                 | Rubiaceae       | Shrub     | Idanre, Oban, Kwa Falls, Akampa Estate, Calabar                                        | Cameroon                              |
| Psychotria viticoides Wernham               | Rubiaceae       | Shrub     | Oban Division, Cross River National Park (Cross River State)                            | Cameroon and Gabon                    |
| Pterocarpus asun Craib.                     | Papilionaceae   | Tree      | Ilbadan Forest Reserve (IITA) (Oyo State); Unwin, Benin City (Edo State); Ikom (Akwa Ibom State); Obubra (Cross River State) | Cameroon and Gabon. Recent descriptions of the plant distribution range do not include other African countries, as earlier noted in FWTA, Part 1 Volume 2. |
| Pycnanthus microcephalus (Benth.) Warb.     | Annonaceae      | Tree      | Oban, Ikom                                                                             | Cameroon, Equatorial Guinea           |
| Radlkofera calodendron Gilg.               | Santanidaceae   | Tree      | Oban, Olokmu National Park                                                              | Cameroon, Democratic Republic of Congo |
| Rangaeris longicaudata (Roife) Summerh.     | Orchidaceae     | Herb      | Lagos, Cross River North FR                                                             | Cameroon, Gabon, Côte d'Ivoire         |
| Rinorea ardisiflora (Welw. Ex. Oliv.) D. Ktze. | Violaceae      | Tree      | Iyamoyong FR                                                                           | Democratic Republic of Congo          |
| Rinorea crassifolia (Bak. & DeWild) (Syn: Alsodecia crassifolia Bak. & DeWild) | Violaceae     | Shrub     | Oban Division, Cross River National Park (Cross River State)                            | Cameroon                              |
| Ritchiea obanensis Hutch. & Dalziel         | Capparidaceae   | Shrub     | Oban Division, Cross River National Park (Cross River State)                            | Equatorial Guinea, Gabon, Cameroon and Congo Rep. Some taxonomic publications consider it synonym to R. polypetalo Hook. f. |
| Ritchiea pentaphylo Gilg. & Benedict (Syn: Ritchiea erecta Hook. f.) | Capparidaceae | Shrub     | Lagos State, Ilaro, Abeokuta (Ogun State)                                              | Equatorial Guinea, Gabo, Cameroon and Congo Rep. |
| Rubus apetalus var (?) Poir (Syn: Rubus apetalus Poir) | Rosaceae     | Shrub     | Bauchi Plateau (Bauchi State)                                                           | Southern Africa                       |
| Rubus rosifolius Sm.                        | Rosaceae        | Shrub     | Gembu, Mambilla Plateau                                                                 | More abundant in East Africa (Malawi, Zambia, Zimbabwe) and Cameroon, introduced to East Asia |
| Plant name                  | Family         | Habit       | Distribution in Nigeria                                                                 | New locations                                                                 |
|----------------------------|----------------|-------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| Rutidea pavettoides        | Rubiaceae      | Liana       | Ibaro FR, Lagos, Etumi FR, Obin                                                              | Côte d'Ivoire, Senegal, Central African Republic, Cameroon, Gabon, Democratic Republic of Congo |
| Rutidea nglerica           | Rubiaceae      | Shrub       | Etumi FR                                                                                 | Benin Rep., Cameroon, Central African Republic                                  |
| Salacia hispida Blakelock  | Celastraceae    | Tree        | Okomu National Park                                                                        | Democratic Republic of Congo                                                   |
| Salacia sylbalti Baker f.  | Celastraceae    | Tree        | Oban Division, Cross River National Park (Cross River State)                              | Cameroon                                                                      |
| Salix nigerica Skan.       | Salicaceae     | Shrub       | Katagum, Lake Chad (Borno State)                                                           | Egypt, Libya, Sudan and parts of Southern Africa                               |
| Scaphophetulum eterstii   | Sterculiaceae   | Shrub       | Oban                                                                                      | Gabon, Congo Republic                                                          |
| Sherbournia amaraliocarpa   | Rubiaceae      | Shrub       | Benin Rep., Cameroon, Central African Republic                                              |
| Solanum clerodendroides    | Solanaceae     | Shrub       | Eket (Akwa Ibom State)                                                                    | Equatorial Guinea, Gabon, Democratic Republic of Congo                          |
| Solenostemon minor J.K Morton | Lamiaceae | Herb       | Kagoro hills, Jos, Mount Kiloshie, Obudu                                                  | Cameroon, Guinea                                                               |
| Soyauxia sylbalti Baker f. | Medusandraceae  | Tree        | Eket (Akwa Ibom State)                                                                    | Cameroon. Endangered on the IUCN Red List of Threatened Species               |
| Strombosa pustulata Oliv.  | Olacaceae      | Tree        | Gashaka-Gumti National Park, Gangumi, Ongambarsi FR, Owo FR, Apongmu FR, AF River FR, Ohsu FR, Okomu National Park, Awka, ikom | Sierra Leone, Cameroon                                                        |
| Tacaeeza barteri Baii.     | Asclepiadaceae  | Liana       | Kogi State                                                                                | Scattered throughout West, Central and Southern Africa                         |
| Tarenna baconoides Wernham  | Rubiaceae      | Shrub       | Oban                                                                                      | Cameroon                                                                      |
| Tarenna eketensis Wernham   | Rubiaceae      | Shrub       | Sapoba FR                                                                                 | Benin Republic, Ghana, Côte d'Ivoire, Liberia, Central African Republic, Cameroon, Democratic Republic of Congo, Gabon, Guinea, Equatorial Guinea, Zambia |
| Tricyclusia pleiomeru Hutch. | Rubiaceae      | Tree        | Oban                                                                                      | Cameroon, Congo Republic, Democratic Republic of Congo                          |
| Trichoscypha longipetala  | Anacardiaceae   | Tree        | Oban Division, Cross River National Park (Cross River State)                              | Sierra Leone, Liberia, Cameroon, Gabon, Congo Rep., Equatorial Guinea, Ghana and Côte d'Ivoire |
| Trichoscypha sylbalti Bak.  | Anacardiaceae   | Tree        | Oban Division, Cross River National Park (Cross River State)                              | Cameroon, Gabon, Congo Rep., Democratic Republic of Congo, Equatorial Guinea    |
| Tridactyle lagousenensis   | Orchidaceae     | Herb        | Lagos, Eket                                                                               | Cameroon, Equatorial Guinea, Gabon                                               |
| Trochomera dalzieli Bak.    | Cucurbitaceae   | Liana       | Kotangora, Katagum, Abinsi, Jira, Mada hills (Plateau State)                               | East, South and parts of West and Central Africa                                |
| Tylostemon conferus S. Moore | Lauraceae      | Tree        | Eket (Akwa Ibom State)                                                                    | Congo Rep, Democratic Republic of Congo, Cameroon, Gabon and Equatorial Guinea |
| Ubetelinia nigerica Turrill | Caryophyllaceae | Herb        | Obudu Cattle Ranch (Cross River State)                                                    | Eritrea, Ethiopia, Cameroon, Kenya and Tanzania                                  |
| Ulera sylbalti Rendle       | Urticaceae      | Liana       | Oban Division, Cross River National Park (Cross River State)                              | Gabon                                                                          |
| Wonecsea guineensis (Kay)   | Melastomataceae | Shrub       | Near Eleyele hill, Ibadan (Oyo State)                                                       | Côte d'Ivoire, Liberia and Ghana                                               |
| Zneraellia citrina Taub.    | Caesalpinaceae  | Tree        | Oban                                                                                      | Cameroon                                                                      |
Endemic flora of Nigeria

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diversity (Brenan 1978).

As much as it is important to conserve endemic flora, it is equally important to accurately identify them in order to accord them conservation priorities. However, this study scrutinized the endemic flora in Nigeria and found only 91 to be true endemics in Nigeria, in contrast to 205 earlier reported by Brenan (1978). Likewise, Globulostylis and Psammetes, which were among the reported five endemic genera in Nigeria, have lost their endemic status. A total of 153 species thought to be endemic to Nigeria have been found in other countries (Table 2). Similar findings were reported in India, where 62 earlier reported endemic genera of angiosperms have been found in other countries, while some taxonomic changes to some genera have affected their status (Irwin & Narasimhan 2011). Furthermore, of the 147 earlier reported endemic genera in India (Nayar 1996), Irwin & Narasimhan (2011) concluded that only 49 genera are actually endemic.

This reduction in the number of endemic species in Nigeria may be due to the fact that recent taxonomic and herbarium records show that many have been found in other countries, especially neighbouring Cameroon. Brenan (1978) gave examples of such endemics such as Pennisetum dalzielli, Psychotria dalzielli, Allexis obanensis, Globulostylis talbotii, G. minor and Pohliella flabellata among others, which have been discovered in other countries, thus losing their endemic status in Nigeria (Table 2). In addition, changes in plant adaptability and physiology, gradual spread and increased dispersal capacity, human disturbance, new pests and diseases and new consumers could make some plants cross their natural distribution range to other political boundaries and thus lose their natural endemic status in Nigeria.

As taxonomic records are being improved, some of the endemic species “imperfectly known” in the Flora of West Tropical Africa (FWTA) are being properly described, given binomial names and their geographical distribution determined. For example, Coccinia sp C of FWTA has been properly named as C. adoensis, Cordyla sp. B. as C. pinnata (Lepr. ex A. Rich) Milne-Redhead, Crotalaria sp. A as C. cuspidata Taub, Croton sp. A and sp. B as Croton sylvatica, Diospyros sp. 1 as D. obliquifolia (Hiern ex Gurke) F. White, Diospyros sp. B as Nigerian Trees (Keay 1989) as D. platanooides Letouzeey & F. White, Salacia sp. D as S. camarunwensis Loes, Salacia sp. E as S. lateritia Halle, Salacia sp. J as S. pynaertii De Wild, Placodiscus sp. A as P. opacus Radl. among many others listed in Lowe & Soladoye (1990). Some of the imperfectly known endemic species in FWTA are in genera such as Psychotria, Ouratea and Eugenia. With the continuous incidence of discovery of new plants globally and as more scientific information is available and shared among countries, updating of documented records of flora is inevitable.

Indeed, there are still many plants yet to be identified in some areas of the country. For instance, it was reported by Chapman & Chapman (2001) that plant species of the mountainous landscape of Mambilla Plateau in Taraba State of Nigeria are endemic and yet to be properly identified. Similarly, it was reported in a short article on Cross River National Park by the Nigerian Park Service that four plant species new to science have been discovered in the Park, which include Tridactyle sp. nov. (Orchidaceae), Uapaca sp. nov. (Euphorbiaceae), Habenaria sp. nov. (Orchidaceae) and Afrocalathea flavida sp. nov. (Marantaceae) (http://crnp.nigeriaparkservice.org/). To confirm this knowledge gap, WWF and IUCN (1994) noted that floral inventory of the Cross River National Park is yet to be completed.

Possible evolutionary trends among endemic species

Rubiaceae was observed to have the highest number of species representatives in the endemic flora of Nigeria, as discovered in this study. Series of plant diversity studies carried out in various parts of Nigeria also show Rubiaceae to be one of the families with the highest number of species representatives (Ojo 2004; Soladoye et al. 2005; Borokini et al. 2010).

Rubiaceae was reported to be among the most diversified and largest of the families in the African rain forest (Robbercht 1996), and the family is identified as the fourth largest plant family globally, with 13,143 species, classified into 611 genera (Davis et al. 2009), more than 40 tribes, and three subfamilies (Goevarts et al. 2006). They occur on all continents (Guevarts et al. 2006), but most taxa are in tropical or subtropical areas (Bremer & Eriksson 2009). Endemism was reported to be generally high in Rubiaceae because many species have restricted distributions. Recording eight out of 11 endemic species of Rubiaceae in Cross River National Park (Oban Division) alone is of scientific interest, all of which are shrubs except for one vine. The same goes for endemic species in families such as Orchidaceae, Acanthaceae, Lecythidaceae and Annonaceae which are found in the same locations and having the same growth habit. It has been reported earlier that endemic species belonging to the same families sharing the same natural habitat must have originated from a single ancestral species (Wilson 2010). Similar situation of discovery of
over 500 endemic haplochromine cichlid fish species in Lake Victoria, originating from a single ancestral species was reported by Meyer (1993).

In the same vein, eight endemic species of Orchidaceae were identified in this study. Orchidaceae is the largest plant family on earth, having an estimated 25,000 species, grouped into 850 genera, with over 70% being epiphytes (Gravendeel et al. 2004). Segerback (1983) described 104 species of orchids for Nigeria, but Jayeola (1991) otherwise encountered over 400 species for Nigeria. The African continent harbours around 2,400 orchid species (Madison 1977). The high numbers of representative species of these two families—Rubiaceae and Orchidaceae—indicate a high diversity of these families in Nigerian flora, and therefore, there is the need for thorough studies on the phylogenetic relationship among these species.

Factors that could be responsible for their evolution include development of adaptive features to climate change that occurred thousands of years ago, changes in flowering time, dispersal capacity and some of them may be sun-loving or shade tolerant, with preference for altitudes. Furthermore, it is scientifically accepted that geographical barriers could isolate populations of a single species, leading to allopatric speciation (Templeton 1981; Slatkin 1987; Coyne 1992; Palumbi 1994). The tropical rainforests are a big candidate for any form of speciation—allopatry, parapatry, peripatry, sympatry and ecological. This is because high diversification rate and biogeographic history of tropical environments, abundance of geographical barriers (e.g., mountains, rivers, hills and deep valleys), new niche evolution, species survival in mountainous refugia during the pleistocene age, biotic interactions among species (such as predation, association and competition), spatial heterogeneity, higher metabolic rate, rapid accumulation of genetic incompatibilities and other intrinsic and extrinsic isolating mechanisms could lead to speciation that gave rise to the present species richness and endemism in the present tropical regions (Mittelbach et al. 2007; Schemske et al. 2009; April et al. 2013). Genetic bottlenecks, behavioural isolation and the effects of landscape and metapopulation processes have been demonstrated and reported for several plants and animals, including Lahontan Cutthroat Trout Fish in Nevada and California, United States of America (Neville et al. 2006; Peacock & Dochtermann 2012).

Mountain Biodiversity

The present study shows that nine of the geographical locations of these endemic flora are hills and mountains, harbouring 57 species out of the entire 91 endemic flora, indicating that 62.6% of the endemic species are found in mountainous regions. Literatures have shown that a large fraction of the world’s most precious gene pools are preserved in mountains, while nearly half of the world’s biodiversity hotspots are concentrated on mountains (Spehn et al. 2010), with tropical montane forests noted for their high levels of species endemism and diversity (Gentry 1992, 1993; Kapos et al. 2000; Schmitt et al. 2010). In addition, from Ethiopia to the Cape (South Africa), mountains contain several centres of endemism for birds, mammals, and plants (Fjeldså & Lovett 1997; de Klerk et al. 2002; Goodman & Benstead 2003; Jetz et al. 2004). All these indicate that mountains are centres of biodiversity and endemism, and this should therefore encourage intensive ecological studies on the plant diversity of hills, mountains and inselbergs that spread across Nigeria, for which research information are currently lacking. In addition to this, 32 out of the entire 55 locations are within tropical rainforest ecoregions. The concentration of most of the endemic plants in tropical rainforests in Nigeria is supported by previous findings by Myers et al. (2000), McNeely et al. (1990) and Mittermeier et al. (2000) among others.

Biodiversity of the Nigerian-Cameroon forest complex

The ecological importance and the significance of the biodiversity of the Cameroon-Nigerian forest complex cannot be overemphasised. And recording 66 (72.5%) species out of 91 endemic species in southern Nigeria (Cross River, Akwa Ibom and Rivers states) is another confirmation of not only the global significance of its biodiversity, but also of the species richness of endemic flora in the region. The Korup National Park shares boundaries with Nigeria’s Cross River National Park (Oban Division), while the Okwango division of the Cross River National Park borders the Takamanda Forest Reserve in Cameroon, forming an extensive trans-boundary corridor of biodiversity complex (Fig. 4). This forest ecoregion is a part of the Guineo-Congolese regional centre of endemism (White 1983). Among the taxa that exhibit particularly high levels of species richness and endemism in this trans-boundary ecoregion are primates (Eeley & Lawes 1999; Oates et al. 2004; Sarmiento & Oates 2000; Hilton-Taylor 2000), mammals (AECGG 1991; Happold 1994), amphibians (Lawson 1993; Schütz 1999; Kamdem-Toham et al. 2003; Conservation International 2007), birds (Collar & Stuart 1988; Stattersfield et al. 1998), butterflies (Larsen 1997), dragonflies (Vick 1999), fish (Reid 1989), mammals (Burgess et al. 2000), and vascular plants (Cable & Cheek
The biogeographical barriers of the Sanaga River in Cameroon and the Cross River in Nigeria define the mainland boundaries of this ecoregion. These rivers are particularly important geographical barriers for primates, Red-eared Guenon *Cercopithecus erythrotis* and amphibians, such as Dizangue Reed Frog *Hyperolius bopeleti*. However, they are significant to global conservation because they are only found within a restricted ecosystem shared between the two countries. In Cameroon’s Korup National Park, 1,700 species of vascular plants have been recorded, as many as 5% of which are narrow endemics (Davis et al. 1994). These support the need for a stronger framework for transboundary management of biodiversity.

**Coexistence of endemic plants and animals**

Cross River National Park is the peak of Nigeria’s biodiversity, being the largest tract of the remaining and surviving primary rainforest in Nigeria. About 78% of primate diversity finds home in the protected areas; while it harbours another 30 species of non-primate mammals, including the African Forest Elephant *Loxodonta cyclotis*, Hippopotamus *Hippopotamus amphibious*, Forest Buffalo *Syncerus cafer nanu*, Giant Otter Shrew *Potomagale velox* (Stuart et al. 1990). Over 30% of Nigeria’s 860-bird species are found in the Park, including the endangered Red-headed Rock *Picathartes oreas*, the rare Green Ibis *Bostrychia olivacea*, the Violet-backed Flycatcher *Hyloïta violacea*, and the Black Guinea Gowl *Agalacea niger*, Bannerman’s Weaver, White-throated Babbler, Bat Hawk, Cassin’s Hawk-eagle, Grey-throated Rail, Olive Long-tailed Cuckoo, Bare-cheeked Trogon, Lyre-tailed Honeyguide, Green-backed Bulbul, Grey-throated Flycatcher and Rachel’s Malimbe (Manu & Imong 2006). Eniang & Ijeomah (2011) reported 56 species of snake in the Oban division while 28 snake species were reported for the Okwango division (Eniang et al. 2002) of the Cross River National Park. Larsen (1997) estimated about 950 butterfly species in the Oban division, of which the Cross River National Park officials reported that two are endemic and another two—*Tetrahanius okwangwo* and *T. oboti*—are new to science. Furthermore, the Park officials reported that two new frog species were identified, namely *Didynamitus sjooestati* and *Nyctibates corrugatus*, which are new records for Nigeria. The floral diversity of the National Park was reported to be 1,568 species from 523 genera in 98 families. These include 1,303 flowering plants, 141 lichens and 56 moss species. These information strongly support high mutual
existence of endemic flora and fauna; and agrees with earlier reports of association of high floral diversity with high faunal diversity by Siemann et al. (1998), Knops et al. (1999) and Haddad et al. (2001) among others. Species endemism richness, as described by Kier et al. (2009) is the mutual coexistence of endemic flora and fauna in the same geographical area; this was observed in Hawaiian islands where over 10,000 known endemic insects, 100 endemic birds and about 1,000 endemic flowering plants were reported (Wagner et al. 1990, 2005; Wilson 2010). Similar ecological coexistence was found in the Ash Meadows National Wildlife Refuge in Mojave Desert where about 26 endemic plants and animals (including fishes and insects) were found (U.S. Fish and Wildlife Service 1990) and the east slopes of the Andes Mountains in Peru and Bolivia (Beck et al. 2007). Consequently, areas with the highest percentage of the world’s biodiversity have been proven to harbour a high density of humans with rich cultural diversity (Balmford et al. 2001; Brooks et al. 2002).

**Threats to the endemic species**

These results present some troubling news with respect to the reported hotspots of this Nigerian endemic flora. For instance, some endemic plants noted to be located in Lagos and Calabar have been completely overtaken by urbanization. Several forest reserves in Nigeria are being de-reserved and concessions given to timber companies for logging, and replacing them with monocultural plantations of exotic trees such as *Tectona grandis, Gmelina arborea* and *Eucalyptus camaldulensis*. Furthermore, the indigenous people around around these forest reserves clear significant sections for farming, as well as hunting for wild animals. The presence of those endemic species in those locations and their population status should be investigated. Eket is a big town in Akwa Ibom State in the southern region of Nigeria, housing eight endemic plants in addition to high biodiversity in the region; but is plagued by problems such as oil spillage and gas flaring from commercial oil exploration and acid rain (Nduka et al. 2008; IUCN 2013). These threats have been identified as a major threat to the endemic plants, some of which are already assessed by the IUCN Red List of Threatened species (IUCN 2013).

Collins (1990) and Mittermeier et al. (2000) reported that the West African Guinean forest is the worst damaged of the 25 global hotspots which, due to logging and clearance, have destroyed at least 85% of the rainforests. All these probably support the report that 20 plants are extinct in Nigeria (FEPA 1992). Worse still, a recent survey conducted on the plant collections of all botanic gardens in Nigeria shows that none of these endemic species is being conserved ex situ, as a back-up to these endemics in their natural habitats (see BGCI Garden Search Database for Nigerian botanic gardens <http://www.bgci.org/garden_search.php>). In addition, database search on JSTOR and ISI Web of Science produced very few published research works on any of the endemic plants, indicating a very wide research and knowledge gap on these endemic species, let alone their conservation in Nigeria. For example, in order to ensure effective conservation of threatened species, population viability analysis (PVA) should be conducted to predict their survival in the future.

Therefore, there is the need for intensive conservation of the remaining endemic flora in Nigeria. It is important to note that since timber resources in free public lands have been exhausted in Nigeria, pressure is on timber resources in protected areas, through illegal logging and indiscriminate allocation of forest concessions and de-reservation of forest reserves and other in situ conservation sites. It is safe to say that in situ conservation sites in Nigeria have been heavily disturbed, though efforts are being increased to protect the remaining tracts, especially in Southern Nigeria. Ecological restoration, through re-vegetation of disturbed areas should be done, using indigenous tree species. Community Forestry should be adopted and introduced in the forest reserves and national parks, as a way of combating illegal activities and enhancing participatory forest management. In addition, existing policies governing the management of these protected areas need to be critically reviewed so as to increase transparency in decision making and reducing corruption. Intensive taxonomic and phylogenetic studies, vegetation surveys and biogeographical research should be conducted on the Nigerian flora; in situ conservation efforts have to be supported by adequate ex situ conservation measures.

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