

## Chapter 2

### A rapid botanical survey of the Boké Préfecture, Guinea

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#### INTRODUCTION

The Upper Guinea Forest has been singled out to be of taxonomic importance. According to Myers et al (2000) the area has 9000 spp. of which 2250 are endemic, though Jongkind and Wieringa (2004) have recently increased this to 2800 species. Forest areas are noted to have the highest concentration of rare and endemic plants, favouring areas of high rainfall. The Fouta Djallon in Guinea and Sierra Leone is exceptional in its location and species richness. The species found in Upper Guinea forests are often more genetically distinct than their Lower Guinean counterparts (Wieringa and Poorter 2004) making these forests highly significant.

A strong correlation between humidity, rainfall and species richness is thought to exist (Hall and Swaine 1976). However, Wieringa and Poorter (2004) looked at diversity using grid cells and found that areas of high rainfall, such as those along the coastal areas of Guinea, Liberia and Sierra Leone, showed much lower plant diversity levels. They propose that the relationship between the length and severity of the dry season and species richness in an area is stronger. Drier areas also tend to have fewer endemic species than the wetter forest areas, though the very presence of these rare species increases their conservation value.

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#### SITE DESCRIPTION

Three areas were sampled in Guinea's Boké Préfecture; the first site was Sarabaya in the Rio Kapatchez sub-préfecture, the second around the Kamsar sub-préfecture and the third in the Sangaredi sub-préfecture. The entire area visited in the study consisted of a matrix of gallery forest and wooded grassland and is heavily influenced by human activity. The sites ranged from coastal islets to coastal mainland and sites further inland. The gallery forest areas are perhaps more significant since they harbor the most diversity and provide valuable resources for the surrounding communities such as timber, fruit and medicinal plants. This forest is important for the conservation of water for both people and their crops. It also provides valuable habitat for animals that are dependent on many of the same resources, which can cause conflict with the villagers.

It is under increasing threat from the slash-and-burn technique of farming, which has resulted in the spread of the wooded grassland vegetation. The Boké Préfecture appeared to be quite densely populated and the farming land that surrounds the villages is extensive. There are general rules about the length of time between crop rotations; these vary from village to village but usually range between 5 and 8 years. During this time the vegetation begins to recover, but it is not long enough for tree species to reach a decent height due to the long annual dry season. In some areas the vegetation changes and one species becomes dominant such as *Dichrostachys glomerata* (Forsk.) Chiov.

The area is dominated by the economically important oil palm (*Elaeis guineensis* Jacq.). Because only the nuts are harvested, the area below the trees are cleared and planted, making them conspicuous in the landscape. Many other useful trees are left during the land clearance for example, those used for fruit (*Parkia biglobosa* (Jacq.) Benth.) or those used for timber such as *Ceiba pentandra* (L.) Gaertn.

## METHODS

A total of 14 days were spent looking at the different vegetation in the three areas and assessing their conservation value. At all sites a species inventory was made and was complete as possible. Presence/absence of species was recorded at all sites visited. Changes in the vegetation were recorded using GPS for GIS mapping. Vegetation classification was recorded using F. White's classification system; use of the area was noted and the disturbance level and topography was also recorded. This was done for all sites visited and also some sites travelling between the sub-préfectures. For species that could not be identified in the field, herbarium specimens were taken and will be identified at the Royal Botanic Gardens (RBG), Kew, UK. The specimens were preserved using the Schweinfurth method and dried on arrival at RBG, Kew.

The first site in the Rio Kapatchez area was located 2.6 km from the village of Sarabaya. This area was a matrix of vegetation made up primarily of wooded grassland and riverine gallery forest. Sampling at this site was done using the river as a transect and identifying all the species found within a 5m boundary on either side. In the wooded grassland area 20mx20m quadrats were used to identify and to quantify the species found. Subtle changes in the vegetation due to wetter soil patches were compared.

In the sites in the Kamsar sub-préfecture (site 2) species were harder to quantify and the surveys took on a meandering method, noting all the different species found. The majority of this area was under cultivation and little natural habitat remains. A number of individual localities were visited within the Kamsar sub-préfecture: Taïgbé West, Taïgbé East, Tarénsa, Kaiboutou and Kataméne.

At the last set of sites in the Sangaredi sub-préfecture, the majority of the surveying used rivers as transects. Five sub sites were looked at in this area: Boulléré, Bandodjhou, Loumbirdeguéné, Guerguéré and Bandodji-touguidje. Many of the areas along the gallery forest edges had been recently slashed and burnt. One hillside survey was conducted to assess the damage/ influence of the crop rotation in the area and the wooded grassland area was also assessed.

## RESULTS

The gallery forests of the area are the most diverse in comparison to the surrounding vegetation. Some large trees remain and despite tree cutting, there is not one single dominant species. The shrub layer in these forests is also fairly diverse though in comparison to intact forest they are impoverished. There has been noticeable degradation of the area through agriculture, thus the diversity is inconsistent and quite patchy along the length of the river.

The wooded grassland areas are less diverse and have been heavily influenced by people and agriculture. There are areas with dominant species such as *Diospyros* sp., *Anthostema* sp., and *Lophira lanceolata* Van Tiegh. ex Keay. In some areas there is a virtual monoculture of *Dichrostachys glom-*

*erata* (Forsk.) Chiov. The vegetation in these areas is between 2-4m high and punctuated by larger trees of *Parkia biglobosa* (Jacq.) Benth., *Pterocarpus erinacea* Poir. and *Elaeis guineensis* Jacq. At the Kamsar sites there was also a higher density of *Ceiba pentandra* (L.) Gaertn. and *Bombax costatum* Pellegr. & Vuillet. The third set of sites had a higher diversity of legume species such as *Samanea dinklagei* (Harms) Keay and *Danniellia oliveri* (Rolfe) Hutch. & Dalz., also species that had not grown above 4m at previous sites were found as large trees. A full breakdown of species for the different sites is listed in Appendix 1.

A total of 222 herbarium specimens were collected (Couch 200-415) and are lodged at the Royal Botanic Gardens, Kew. In this case a second set was not left in country due to the lack of a national herbarium facility. The majority of the specimens were vegetative which can make identification difficult. Therefore it has not been possible to identify all the specimens to species level.

### Sarabaya, Rio Kapatchez sub-préfecture

The gallery forest along the river in this area was the most diverse of the gallery forests we surveyed. There are large trees remaining at low densities due to tree cutting, *Pari-nari excelsa* Sabine, *Parkia biglobosa* (Jacq.) Benth., *Hallea stipulosa* (DC.) Leroy, *Coelocaryon* sp. and *Ficus* sp. were the most frequent species found. The under-storey is rich in Rubiaceae species, *Maesobotrya* spp., *Heisteria parvifolia* Sm., *Dichapetalum* spp., *Klainedoxa gabonensis* Pierre ex. Engl. and *Campylopermum squamosum* (DC.) Farron. The wooded grassland area was dominated by *Diospyros heudelotii* Hiern, *Combretum micranthum* G. Don, *Sorindeia juglandifolia* (A. Rich.) Planch. ex Oliv., *Salacia senegalensis* (Lam.) DC. and *Aniosphylla laurina* R.Br. ex. Sabine. This area had been influenced in the past by farming and the vegetation was uniformly 3m tall with some larger trees present and the palm *Elaeis guineensis* Jacq. In the village area, cultivated species dominated such as *Mangifera indica* L, *Persia americana* Mill. and *Citrus* spp. Some native trees are deliberately planted for their fruit such as *Adansonia digitata* L.

### Kamsar sub-préfecture

Taïgbé West and Taïgbé East islands had significant mangroves of *Rhizophora harrisonii* Leechman, *Avicennia germinans* (L.) L. and *Laguncularia racemosa* Gaertn. which were being degraded by harvesting of *R. harrisonii* Leechman for firewood and construction. In this area in particular, there exists a cottage industry that uses the mud from the mangroves to make salt. This process uses *Rhizophora* as the firewood source and is a destructive and seemingly inefficient way of distilling salt.

**Taïgbé West** has a reasonable area of remaining palm forest. Palm nuts from *Elaeis guineensis* Jacq. are collected and the main disturbance in this area is from path cutting and minimal clearing around the palm trees. However, much of the island is used for agriculture and large areas have been cleared for rice plantation and tropical agriculture. The ma-

jority of the vegetation can be classified as wooded grassland with two main types of grass growing in the area (unidentifiable due to the time of year), one species of which was harvested for use as thatching material. Taïgbé West inhabitants also harvested the larger *Ceiba pentandra* (L.) Gaertn. trees to hollow out for pirogues (small boats) for travel between the island and mainland.

**Taïgbé East** was connected to the mainland by a bridge made from palm trunks and *Avicennia*. There was no palm forest remaining as it had been cleared for rice plantation and peanuts. The vegetation was predominately wooded grassland dominated by *Anthostema* sp., *Vitex doniana* Sweet, *Pterocarpus erinaceus* Poir., *Sorindeia juglandifolia* (A. Rich.) Planch. ex Oliv., *Dichrostachys glomerata* (Forsk.) Chiov. and *Salacia senegalensis* (Lam.) DC., *Nauclea latifolia* Sm. and *Terminalia scutifera* Planch. ex Laws. were recorded as tree species.

**Kaiboutou** and the surrounding area has a large number of plantations of *Anacardium occidentale* L. and due to the time of year of the survey, much of the land was being cleared in preparation for the planting season. The diversity in this area was considerably less than in the gallery forest due to slash and burn agriculture and plantations. The dominant species were *Anthothona crassifolia* (Baill.) J. Léonard and *Lophira lanceolata* Van Tiegh. ex Keay. The only large trees left were *Elaeis guineensis* Jacq., *Parkia biglobosa* (Jacq.) Benth. and *Bombax costatum* Pellegr. & Vuillet; *Parkia* was seen being chopped down for planks, though there are introduced species used for timber such as *Gmelina arborea* Roxb. and *Tectona grandis* L. f. present.

Around **Tarénsa** the vegetation was very similar to Kaiboutou, the height of the vegetation is 3–4m high with *Diospyros heudelotii* Hiern and *Salacia senegalensis* (Lam.) DC. the dominant woody species. However, in recently cut areas, there is a high density of *Dichrostachys glomerata* (Forsk.) Chiov. *Lophira lanceolata* Van Tiegh. ex Keay is the most frequent regenerating tree species; *Parkia biglobosa* (Jacq.) Benth., *Pterocarpus erinaceus* Poir. and *Elaeis guineensis* Jacq. were the most common large trees. There were isolated patches of slightly moister ground around streams causing subtle changes in vegetation, *Uapaca guineensis* Müll. Arg. and *Xylopia aethiopia* (Dunal) A. Rich. appear here and some degraded mangrove vegetation is also present.

**Kataméne** was the only site in this area that had some forest remaining on the bank of the river. The riverbank was dominated by lianas and *Ricinodendron heudelotii* (Baill.) Pierre ex Pax, but lacked a contiguous canopy. This site was not used by the villagers and, in that respect, remains untouched in the interior though some tree cutting was observed around the edges of the forest. The surrounding area was wooded grassland similar in species composition to Kaiboutou.

### **Boulléré, Sangaredi sub-préfecture**

At the third site there was a mosaic of vegetation ranging from gallery forest to open grassland, to rocky outcrops of bauxite. The vegetation was highly disturbed due to nearby settlement's agricultural practices.

The gallery forest in this area was inconsistent in quality with some very large girth trees interspersed among smaller girth trees and shrubs. The majority of species seen were similar to those found in the gallery forest at Sarabaya, though some different species were observed here such as *Uapaca heudelotii* Baill., *Homalium africanum* (Hook. f.) Benth. and *Cola caricaefolia* (G. Don) K. Schum., this can be seen from Appendix 1. It also appeared to be wetter than the forest at Sarabaya due to the high frequency of stilt rooted trees and traces of water left in the streams. There is considerable pressure on the gallery forest from agriculture on the banks and clearance for rice plantations. This is perpetuating the spread of wooded grassland vegetation.

On some of the surrounding hillsides the rotation system of agriculture has left a virtual monoculture of *Dichrostachys glomerata* (Forsk.) Chiov. punctuated by some larger trees of *Parkia biglobosa* (Jacq.) Benth. and *Parinari excelsa* Sabine that have survived the frequent fires.

The wooded grassland area is extensive and richer in some families than the previous sites. There were more legume species present and of a greater size than at any of the other sites; full grown specimens of *Danniellia oliveri* (Rolfe) Hutch. & Dalz. and *Albizia adianthifolia* (Schum.) W. F. Wight were found here. *Lophira lanceolata* Van Tiegh. ex Keay and *Anthostema* sp. were the most abundant shrubs in regenerating areas. The density of trees was much higher in the wooded grassland of this area than at any of the previous sites, the height of the vegetation was 3–4.5m, with the taller trees up to 15m tall.

### **Breakdown of families and species per site**

The diversity of each site can be compared using Table 2.1. This table details the number of families observed at each site and the total number of species per site. The two sites with gallery forest in surrounding wooded grassland have the highest diversity. There is only a difference of 5 families, but a larger number of species in Sarabaya; it is unclear if this is due to the larger and less fragmented nature of the gallery forest or due to other factors. The Kamsar sites are reasonably similar in the number of families and the number of species, thus reflecting their similarity in composition.

The largest families in the area are the Rubiaceae (37 spp.), Leguminosae (36 spp.), Euphorbiaceae (17 spp.), Apocynaceae (16 spp.), Moraceae (15 spp.) and Combretaceae (11 spp.). There are many families represented by only one or two species such Asteraceae (1), Acanthaceae (1), Dichapetalaceae (2) and Icacinaceae (2), but this does not lessen the importance of these species in the composition. It should not be implied that these are particularly rare species; rather they are just infrequent in the landscape. There are very few species found in the survey that are listed by the IUCN.

**Table 2.1.** Enumeration of Families and Species per site.

Location	No. of families	No. of species
Sarabaya, Rio Kapatchez	54	159
Taïgbé Ouest	30	51
Taïgbé Est	29	56
Kaiboutou	32	65
Tarénsa	39	74
Kataméne	30	64
Boulléré	49	132
<b>Total from survey area</b>	<b>69</b>	<b>287</b>

\*No. of species per site includes unidentified species.

## DISCUSSION

The first and last sites from this assessment have a similar composition. This is to be expected since the geography of both sites was comparable. There was gallery forest and wooded savanna in the two locations though the local climatic conditions varied. There are species consistent with open woodland and secondary forest such as *Harungana madagascariensis* Lam. ex Poir. and *Alchornea cordifolia* (Schum. & Thonn.) Mull. Arg. (Schnell 1976). There are also species that are suggestive of relic forest such as *Chlorophora excelsa* (Welw.) Benth. and *Margaritaria discoidea* (Baill.) Webster, Meliaceae and Sterculiaceae species (Steenroft 1988). Although there are some species of Meliaceae and Sterculiaceae present they are few in number, which implies that the area has undergone considerable change either as a result of natural or human action. This may be a result of forest expansion post glaciation, when the forest split over the Dahomey Gap or these particular forests were originally species poor (Wieringa and Poorter 2004). The vegetation structure of the wooded grassland implies that the forest previously extended into this area since the existing tall trees have straight trunks and few branches low down. This is consistent with the vegetation at the edges of the gallery forest; Lykke (1996) documented the transition of gallery forest into savanna in Senegal, their findings support this observation and they suggest that there is a positive feedback loop that sustains it.

The coastal vegetation also holds true to the premise of Wieringa and Poorter (2004) that the coastal vegetation is much poorer, since the sites directly on the coast, Taïgbé East and Taïgbé West, have a much lower diversity than those further inland. The coastal mangroves are much impoverished in comparison to other parts of the world, but are also poor in comparison to other West African sites. There was only one species of *Rhizophora* found, plus *Avicennia* and *Laguncularia*. The layering reported by Schnell (1976) was not evident, since there was a lack of species such as *Anogeissus leiocarpus* (DC.) Guill. & Perr. and *Conocarpus erectus* L. further inland.

Although the areas sampled in the Boké Préfecture

are not particularly diverse, they are important elements of the ecosystem and provide valuable functions within the landscape. The Sarabaya site is an important refuge for the wildlife of the area and migratory birds for example; the sites also provide materials and food for the human population and conserve water in an otherwise hostile environment. The transects showcased the variation in land use patterns very well, highlighting the pressure that both these areas are under from the growing population.

This survey has highlighted a population extension for *Klainedoxa gabonensis* Engl.; there is also a possible extension of *Ficus ingens* var. *tomentosum* (Couch 401), though this needs to be confirmed. There were few species found in the surveys that are listed on the IUCN Red List. *Afzelia africana* Sm., *Hallea stipulosa* (DC.) Leroy and *Nauclea diderichii* (De Wild. & Th. Dur.) Merrill are listed as Vulnerable; there were no other red listed species or restricted endemics found in this survey. Most of the species found in this area are wide ranging over the Upper Guinea region, for example *Elaeis guineensis* Jacq., *Dialium guineense* Willd. and *Parkia biglobosa* (Jacq.) Benth., *Dichrostachys glomerata* (Forsk.) Chiov. and species such as *Pseudoconyza viscosa* (Mill.) d'Arcy are widespread weed species. It is difficult to determine the rarity of species within Guinea, since herbarium records are limited and many areas are better collected than others such as the Fouta Djallon and Mount Nimba. The vegetation types visited in this survey do not seem uncommon and therefore the species within them are likely to be similar and not in a vulnerable state.

## CONSERVATION RECOMMENDATIONS

Due to the enormous pressure exerted on this area from agriculture and a growing population, it is recommended that there be conservation of the gallery forest areas, particularly those in the Boulléré area, which are the most at risk from slash-and-burn agriculture practices. This has the effect of conserving the sites with the highest biodiversity and preserving the watershed thus benefiting both the vegetation and the inhabitants. The villagers in this area have noticed that the level of water in the rivers has decreased over the years with the result that presently the rivers carry no water during the dry season. The burning regime of this area is such that the gallery forests have been marginalized and can no longer provide their original ecosystem functions. Similarly, this burning regime has affected the gallery forest at Sarabaya, though to a lesser extent since part of this area is now protected as a Ramsar site.

The mangrove areas in the coastal sites should also be considered for increased protection. Mangroves are important habitat for birds and mammals and are also essential fish breeding grounds. They are also important for preventing coastal erosion and more recently have been shown to lessen the impact of tidal waves. Salt production and clearance for rice fields have contributed to the decline of mangrove habitat in Sarabaya and Kamsar sub-préfectures. In addition, the

demand for *Rhizophora harrisonii* as fuelwood in the towns is exacerbating the degradation of this habitat, altering the composition and diversity of the area.

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