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VEGETATION STRUCTURE AND SPECIES COMPOSITION AT THE NORTHERN PERIPHERY OF THE BOUMBA-BEK NATIONAL PARK, SOUTHEASTERN CAMEROON

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ABSTRACT Forest conservation outside protected areas is taking center stage in global conservation discourse. This study was conducted to clarify the species composition, vegetation structure and plant diversity at the northern periphery of the Boumba-Bek National Park, whose timber and Non-Timber Forest Products (NTFPs) have been used by the local peoples and logging companies. A total of 16 transects measuring 5 km in length and 5 m in width were delineated. The survey recorded DBH of all tree individuals above 10 cm. The result shows a total number of 17,583 trees with a density of 439.6 stems/ha (total area = 40 ha). These trees belong to 51 families, 169 genera and 247 species. Shannon-Wiener diversity index (H') ranged from 5.94 to 6.51 and higher diversity was recorded in the Agroforest Zone. The family importance index (FIV) marked highest score for Euphorbiaceae and Combretaceae. The importance index for species (IVI) was higher for *Terminalia superba*, *Musanga cecropioides*, *Anonidium mannii* and *Celtis mildbraedii*. The height-class distribution of the species shows that the majority of trees belong to the height-class of 5–20 m, which accounts for the average of 87.4% of total stems. The diameter-class distribution of the trees shows an inverse J-shape curve. The study concludes that this forest, despite having undergone disturbance in past years driven by logging and agriculture, is relatively rich and diversified.

Key Words: Tropical moist forest; Transect survey; Species composition; Forest structure; Plant diversity.

INTRODUCTION

During the 20th century, the establishment of protected areas became a key element of most tropical forest countries' efforts to achieve biodiversity conservation. This is because most conservationists assumed that biodiversity is best managed in protected areas and other areas where land has not been fragmented due to human activities and population pressure (Molnar et al., 2004; Brown et al., 2009; Watson et al., 2010).

However, the effectiveness of protected areas to reconcile biodiversity conservation and the development of forest dependent communities has been widely criticised in recent years (Hayes & Ostrom, 2005). Besides this, the projected human population increase, 90% of which will occur in developing countries (Potts, 2007) which sustain the greatest proportion of the world's biodiversity, poses many challenges to ecological systems. This is due to the high global deforestation rate (FAO, 2005) and increasing demands for environmental products and services (Houghton, 1994). In recent decades, ecologists have come to realize that human impacts on surrounding lands may cross the boundaries into protected areas (Buechner, 1987; Dasmann, 1988; Schonewald-Cox, 1988). The creation of buffer zones around protected areas has been recommended to minimize negative boundary influences (Noss, 1983). Accordingly, UNESCO's Man and the Biosphere (MAB) program advocated managing the lands around protected areas along a gradient of decreasingly intense land use toward protected area boundaries (Ebregt & de Greve, 2000).

Indeed, biodiversity conservation outside protected areas has started to take centre stage in global conservation discourse (Anyonge-Bashir & Udoto, 2012). Many researchers agree that forests outside formally protected areas are necessary for the maintenance of biodiversity and ecosystems services. Such efforts to mitigate boundary influences on protected areas will be most effective if based on scientific understanding of the underlying ecological mechanisms. Knowledge of the ecological connections could help to answer several management oriented questions.

For example, in an effort to apply the Convention on Biological Diversity, Cameroon has delineated protected areas covering 7.4 million ha, for the moment, 16% of the national territory (WRI, 2011). Approximately 60% of this territory is located in the humid forest zone. The Boumba-Bek National Park is among the country's most important protected areas. The establishment of such a conservation area is associated with the limitation of customary resources use rights of the local peoples. Investigating resources used by the Baka in and around this national park, Njounan Tegomo et al. (2012) argued that to accommodate the Baka customary rights to access the forest resources, the management plan for Boumba-Bek National Park should be partly modified to sufficiently elaborate on the actuality of the Baka traditional use of land and resources.

Since 2012, efforts have been ongoing to combine forest conservation with sustainable use of Non-Timber Forest Products (NTFPs) in this area, within the framework of the Forest Savannah Sustainability project (FOSAS). The major project activities have been carried out in Gribe village located in the northern periphery of the Boumba-Bek National Park. An ecological study aiming to clarify the state of natural vegetation has been conducted in the core zone of the park, with results revealing a rich biodiversity (Nkongmeneck, 1996). However, no study has focused on the periphery zone used by the villagers for NTFPs collection and agriculture. Understanding the forest status of this periphery zone from an ecological point of view is therefore essential for management purposes.

In light of this, the present study aims to clarify the species composition, vegetation structure and plant biodiversity of the forest used by Gribe villagers. Moreover, the study provides a floristic list of the vascular plants as basic information.

METHODS

I. Study Area

The study was carried out in the forest expanding from the Gribe village, at the northern periphery of the Boumba-Bek National Park in the southeastern Cameroon (Fig. 1) from 2011 to 2012. The periphery stretches between 2°55’ N and 3°20’ N and 14°45’ E and 15°00’ E. Almost all the inhabitants belong to one of two ethnic groups: The Baka hunter-gatherers and the Konabembe; the latter are Bantu-speaking agriculturalists. The population of the village stands at 700 inhabitants, while the population ratio in terms of ethnic groups is almost equal.

The vegetation type is classified as semi-deciduous forest where the dominant families are Sterculiaceae and Ulmaceae (Letouzey, 1968). The annual precipitation ranges from 1200 to 1600 mm. The area’s major water basin is the Boumba River, which measures 200 m in width, making it the biggest river of the region.

The studied forest around the Gribe village has been used for a long period of time. The village was established 100–150 years ago by a Kounabembe clan. Since this establishment, the inhabitants have moved their settlement many times, till 1960’s during which a resettlement policy has been established by colonial government. Although they changed location, their moving range was often close to their original position (Toda, 2014, this issue). This indicates that the studied forest has been used by them in parallel with their moving history, and influenced by the shifting cultivation which is a major form of Konabembe livelihood.

The periphery zone of the park is classified into three categories according to the Cameroonian zoning plans established at the end of the 1990s; (1) Logging

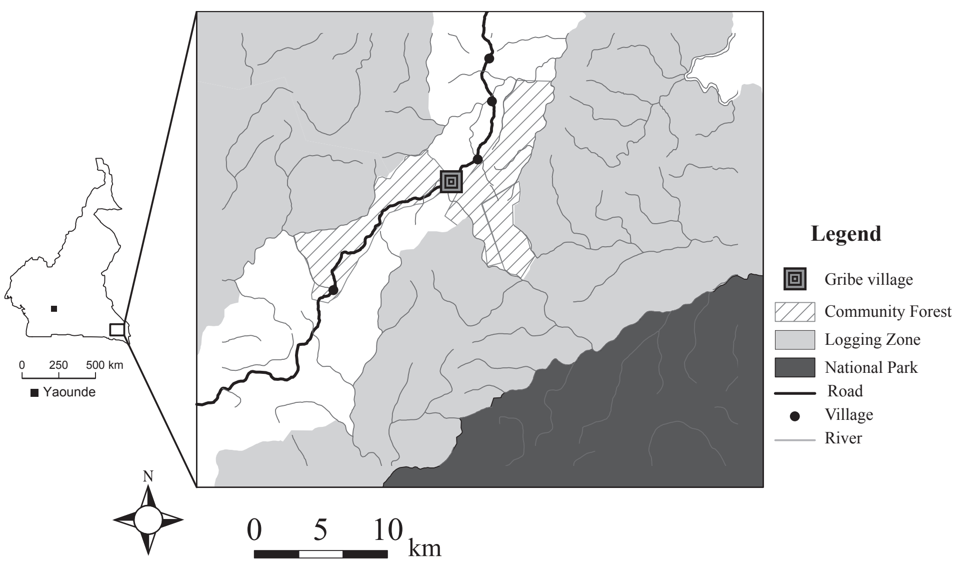

Fig.1. Location of study area.

Zone and ZIC (Zone d'Intérêt Cynégétique) where farming and hunting by the local people is restricted, (2) Agroforest Zone allocated to the people for their agriculture and hunting under limited condition and (3) Community Forests managed by the local communities following a management plan approved by the government's forest authority (Table 1).

II. Data Collections and Analysis

The sampling procedure was essentially based on the establishment of a baseline of approximately 16 km running from the village settlement to the park. From this baseline, 16 transects were delineated. Each transect measured 5 km in length, 5 m in width and 2.5 ha in area. The distance between two consecutive transects was 1 km. They were alternatively placed on both sides of the baseline. The baseline was oriented from NW to SE and all transects were oriented from SW to NE (Fig. 2).

Botanical data were collected along the 16 transects. All trees above 10 cm DBH were measured and species names were identified in the field according to available floras (Letouzey, 1985; Vivien & Faure, 1985; Wilks & Issembé, 2000).

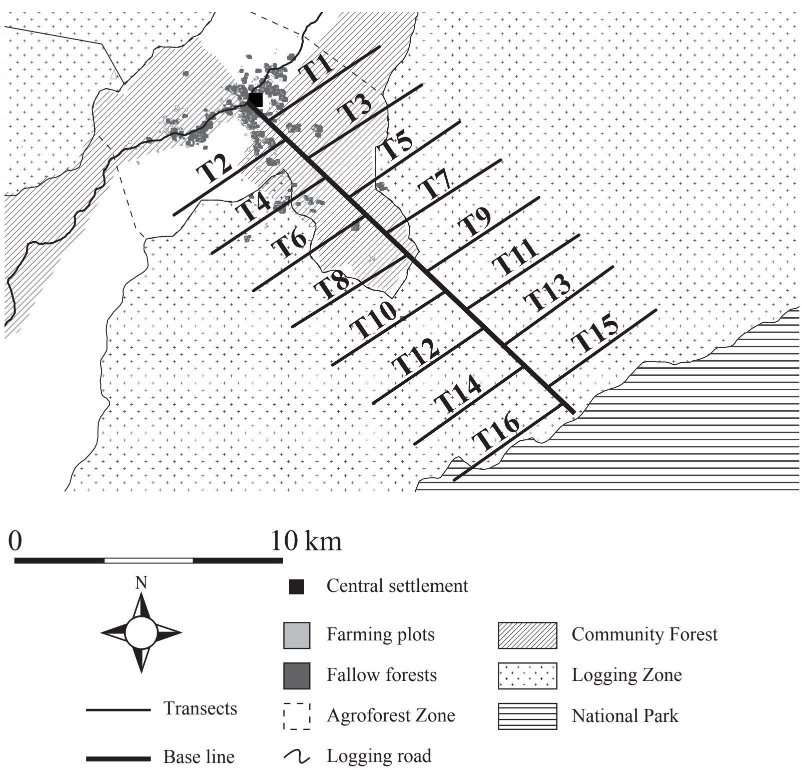

Fig. 2. Transect sampling design in the periphery zone.

Voucher specimens were prepared for unidentified species and identified at the Millennium Ecologic Museum.

For the floristic analyses, overall species, genera and family level richness, tree density (per ha), species diversity and basal area were calculated. The Importance Value Index of species (IVI) was computed as the sum of relative frequency, relative abundance and relative dominance of species:

IVI = Relative frequency + Relative abundance + Relative dominance.

$$\text{Relative frequency (RFr)} = \frac{\text{Frequency of a species}}{\text{Total number of sampling unit}} \times 100$$

$$\text{Relative abundance} = \frac{\text{Individual numbers of each species}}{\text{Total number of individuals in the sample}} \times 100$$

$$\text{Relative dominance} = \frac{\text{Basal area of each species}}{\text{Total basal area}} \times 100$$

Where basal area = $\pi \times (D^2/4)$ where D = DBH of the tree

The family Importance Index used by Campbell et al. (2006) in the Gamba Forest Complex in Gabon and by Fongnzossie et al. (2008) in the Mengamé Gorilla Reserve in South Cameroon, is the sum of relative density, relative basal area and relative diversity of each family.

$$\text{FIV} = \frac{\text{Number of species of family X} \times 100}{\text{Total number of species identified}} + \frac{\text{Number of individuals of family X} \times 100}{\text{Total number of individuals}} + \frac{\text{Sum of basal areas of family X} \times 100}{\text{Total basal area}}$$

In order to demonstrate the plant diversity for all the plots, the Shannon-Wiener diversity index (H') was calculated. The equation is as follows:

$$H' = -\sum_{i=1}^{S} p_i \log_2(p_i)$$ where S is the number of species, p_i is the proportion of the ith species.

The 16 transects were categorized into three zones based on the land use classification established by the Cameroonian government and status of forest use (Table 1). The three zones are: (1) Agroforest Zone which includes transects 1 to 4, (2) Intermediate Zone which includes transects 5 to 8 and (3) Logging Zone

Table 1. Categorization of 16 transects according to the land classification

Land classification	Status of land or forest uses	Corresponding transects
Agroforest Zone	- Shifting cultivation with a long fallow period, cacao farming and NTFPs collection have been practiced by both Konabembe and Baka. - The zone consists of many types of forest: Mature forest, old secondary forest, old and young forest fallows and grass stage fallow. These types of vegetation distribute mosaic-like in the zone. - The density of current agricultural plots with crops and fallows decreases from T1 to T4.	T1 to T4
Intermediate Zone	- Mature and old secondary forests represent the majority. - There are old fallows and old cacao plots, although this is rare. - The zone partly includes the Community Forest where the villagers forecast to cut down commercial trees. However, the logging has not yet started (2012).	T5 to T8
Logging Zone	- Mature and old secondary forests represent the majority. - A logging company has occupied this zone and has been cutting the commercial trees for a few decades. - Logging roads measuring 5–30 m in width run through the zone in a high density.	T9 to T16

which includes transects 9 to 16. Table 1 shows the status of land and forest uses of each zone.

In order to examine floristic similarities in terms of species composition among the transects and categorized lands, the NNESS similarity index was calculated. The NNESS index was used because of size differences among samples. This index is used to compare, with minimum bias, the degree of similarity of the two samples (i and j) on the basis of an identical data size k, which is randomly selected from each sample. The similarity between the two samples (i and j) is expressed by the Morishita-Horn index and by its generalisation, the NNESS index, which is a variant of the NESS index (Grassle & Smith, 1976). The formula is given below and was computed using the software BiodivR 1.0 (Hardy, 2005).

$$\text{NNESS } ij/k = \frac{\text{ESS } ij/k}{(\text{ESS } ii/k + \text{ESS } jj/k)/2}$$

where ESSij/k is the expected number of species shared for random draws of k specimens from sample i and k specimens from sample j.

RESULTS

I. Dominant Families and Genera

A total of 17,583 individuals were recorded across all 16 transects. The average density was 439.6 stems/ha (Total area = 40 ha) while the average basal area was 43.6 m²/ha. These trees belong to 51 families, 169 genera and 247 species. The most dominant families in terms of density were: Annonaceae with density of 48.8 stems/ha, Euphorbiaceae (44.6 stems/ha), Meliaceae (36.7), Sterculiaceae (23.9), Ulmaceae (20.7), Myristicaceae (19.9), Cecropiaceae (19.8), Violaceae (18.1), Olacaceae (18.0) and Rubiaceae (17.0). These families accounted for 59.8% of all the families recorded in the study area.

The most diversified families were Caesalpiniaceae, with 21 species, followed by Sterculiaceae (17 species), Rubiaceae and Euphorbiaceae (15), Meliaceae (14), Sapotaceae (13), Annonaceae (10), Apocynaceae (10), Moraceae (8), Ulmaceae (8), Mimosaceae (8) and Clusiaceae (8).

Based on the FIV index, the 10 most leading dominant families were Euphorbiaceae, Combretaceae, Sterculiaceae, Mimosaceae, Annonaceae, Meliaceae, Ulmaceae, Caesalpiniaceae, Irvingiaceae and Cecropiaceae (Table 2).

The most diversified genera were *Celtis* (Ulmaceae), *Cola* (Sterculiaceae), *Garcinia* (Clusiaceae) with 6 species each; followed by *Drypetes* (Putranjivaceae), *Ficus* (Moraceae) *Irvingia* (Irvingiaceae), *Psychotria* (Rubiaceae) with 5 species, and *Beilschmiedia* (Lauraceae), *Homalium* (Salicaceae), *Diospyros* (Ebenaceae), *Khaya* (Meliaceae), *Rauvolfia* (Apocynaceae), *Rinorea* (Violaceae) with 4 species each. Some genera, including *Anthonotha* (Caesalpiniaceae), *Entandrophragma* (Meliaceae), *Gambeya* (Sapotaceae) and *Xylopia* (Annonaceae) with only 3 species each.

II. Differences in Plant Diversity among Three Zones

Turkey-tests were performed to examine significant differences in the mean number of species, the mean number of individuals and the mean value of diversity index (H’) among the Agroforest Zone (T1–T4, N = 4), Intermediate Zone (T5–T8, N = 4) and Logging Zone (T9–T16, N = 8). The results showed that there were significant differences in all three types of value. More specifically, a significant difference was found between the Agroforest Zone and the other two zones (Table 3).

The mean number of species in Agroforest Zone, Intermediate Zone and Logging Zone were 144 (Standard deviation = 9.9), 137 (SD = 5.5) and 124 (SD = 5.5), respectively. In addition, the numbers of species in the Agroforest Zone and the Intermediate Zone were significantly larger than that in the Logging Zone (P = 0.0011 between Agroforest Zone and Logging Zone, P = 0.0262 between Intermediate Zone and Logging Zone).This elucidated that the species richness were more abundant in Agroforest Zone and Intermediate Zone. The mean value of number of individuals in the Agroforest Zone, Intermediate Zone and Logging

Table 2. Family Importance value (FIV) index for all families recorded in the study site

Rank	Family	Number of species	Number of individuals	Basal area (m^2/ha)	FIV
1	Euphorbiaceae	15	1,784	4.37	191.65
2	Combretaceae	2	285	3.97	161.29
3	Sterculiaceae	16	956	3.69	159.64
4	Mimosaceae	8	567	3.30	138.56
5	Annonaceae	10	1,950	2.78	126.85
6	Meliaceae	13	1,469	2.51	114.53
7	Ulmaceae	7	826	2.51	108.12
8	Caesalpiniaceae	21	444	1.97	89.84
9	Irvingiaceae	6	318	2.00	84.50
10	Cecropiaceae	2	792	1.92	82.32
11	Apocynaceae	10	329	1.58	69.14
12	Moraceae	8	570	1.50	66.62
13	Sapotaceae	13	379	1.42	64.16
14	Olacaceae	5	719	1.08	49.42
15	Papilionaceae	7	366	1.08	48.07
16	Myristicaceae	3	797	0.95	43.81
17	Tiliaceae	4	342	0.95	41.72
18	Rubiaceae	14	613	0.75	39.32
19	Violaceae	4	724	0.44	23.77
20	Flacourtiaceae	7	316	0.41	21.30
21	Ebenaceae	6	465	0.38	20.35
22	Lecythidaceae	3	128	0.42	18.65
23	Anacardiaceae	4	227	0.39	18.53
24	Putranjivaceae	5	339	0.28	15.43
25	Bombacaceae	3	16	0.34	14.87
26	Pandaceae	1	197	0.31	13.90
27	Bignoniaceae	6	132	0.26	13.78
28	Rhamnaceae	2	367	0.22	11.87
29	Phyllanthaceae	2	65	0.26	11.61
30	Lauraceae	4	117	0.19	9.92
31	Sapindaceae	3	141	0.19	9.82
32	Clusiaceae	8	134	0.13	9.41
33	Huaceae	1	120	0.16	7.69
34	Verbenaceae	1	105	0.15	7.21
35	Lepydobotryaceae	1	128	0.14	6.97
36	Burseraceae	2	135	0.12	6.28
37	Chrysobalanaceae	2	10	0.10	4.82
38	Myrtaceae	1	5	0.09	4.21
39	Salicaceae	2	54	0.07	3.77
40	Rutaceae	6	28	0.02	3.37
41	Passifloraceae	1	72	0.03	2.18
42	Melastomataceae	2	8	0.03	2.09
43	Rhizophoraceae	1	7	0.04	1.92
44	Boraginaceae	1	4	0.03	1.57
45	Ixonanthaceae	1	13	0.03	1.54
46	Loganiaceae	3	6	0.00	1.40
47	Anisophylleaceae	1	1	0.01	1.00
48	Thymelaeaceae	2	4	< 0.01	0.93
49	Thomandersiaceae	2	7	< 0.01	0.92
50	Capparaceae	1	1	< 0.01	0.49
51	Menispermaceae	1	1	< 0.01	0.42

Table 3. Difference in tree density, basal area and diversity among three zones

Forest category	Transect	Number of species	Number of individuals	Density (stems/ha)	Basal area (m^2/ha)	H'
Agroforest Zone	T1	158	1,018	407.2	40.5	6.51
	T2	137	875	350.0	43.3	6.35
	T3	139	864	345.6	38.3	6.42
	T4	144	928	371.2	33.7	6.27
	Total	208	3,685			
	Mean	144 A	921.3 A	368.5 A	39.0 A	6.39 A
	SD	9.9	70.3	28.1	4.1	0.10
Intermediate Zone	T5	133	1,238	495.2	46.9	6.03
	T6	145	1,078	431.2	47.5	6.33
	T7	133	1,330	532	58.3	6.32
	T8	138	1,314	525.6	45.9	6.35
	Total	189	4,960			
	Mean	137 A	1,240 B**	496 B**	49.7 B*	6.25 AB
	SD	5.5	115.2	46.1	5.8	0.15
Logging Zone	T9	133	1,304	521.6	45.2	6.30
	T10	127	1,207	482.8	43.1	6.16
	T11	125	1,122	448.8	40.3	6.22
	T12	132	1,221	488.4	42.4	6.21
	T13	119	1,103	441.2	43.3	6.21
	T14	122	1,003	401.2	35.6	6.12
	T15	124	940	376	43.4	6.23
	T16	116	1,038	415.2	49.6	5.94
	Total	186	8,938			
	Mean	124 B** C*	1,117.3 B*	446.9 B*	42.9 AB	6.20 B*
	SD	5.5	122.3	48.9	4.2	0.10
Whole (16 transects)	Total	247	17,583			
	Mean		1,098.9	439.6	43.6	6.24
	SD		156.6	62.6	5.7	0.14

Turkey-tests (ANOVA) were performed to examine significant differences in the mean number of species, individuals or mean density, the mean basal area and the mean value of H' among three zones. Significant differences were examined in order of (1) from Agroforest Zone to Intermediate Zone, (2) from Agroforest Zone to Logging Zone and (3) from Intermediate Zone to Logging Zone. When significant differences were detected, * ($P < 0.05$) or ** ($P < 0.01$) were marked on the latter zones. The mean values with the same letters (A, B and C) were not significantly different.

Zone were 921.3 (SD = 70.3), 1,240 (SD = 115.2) and 1,117.3 (SD = 122.3) respectively, while the Agroforest Zone showed a significantly lower number of individuals compared to the other two zones (P = 0.0011 and 0.0262, respectively). Since the areas of each transect were identical at 2.5 ha, the significant difference of the average density in the three zones corresponds to that of average number of species.

Diversity index (H') ranged from 5.94 (Transect 16) to 6.51 (T1) with a mean value of 6.24. There was a significant difference in the index among different three zones (Fig. 3); the diversity of the Agroforest Zone was higher than that of

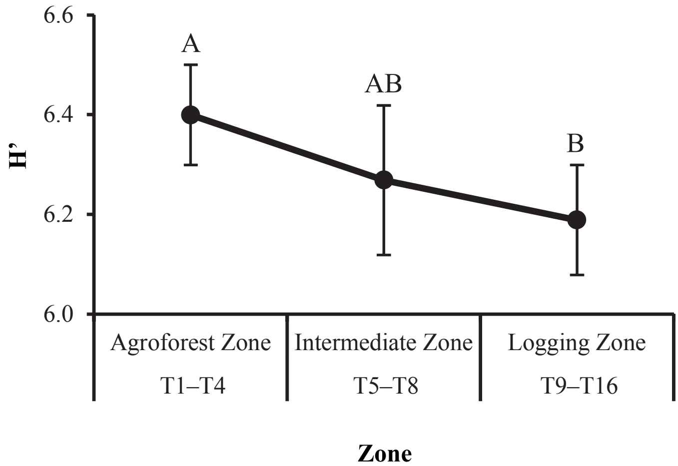

Fig. 3. Difference in mean values of diversity index (H') among the three zones categorized according to the land use status.
See Table 1 for the categorization of the 16 transects into the three zones. The bars indicate standard deviations. A significant difference was found between Agroforest Zone and Logging Zone according to the Turkey-test. The P-values were 0.295, 0.030 and 0.525 between the Agroforest Zone–Intermediate Zone, Agroforest Zone–Logging Zone and Intermediate Zone–Logging Zone, respectively. The mean values with the same letter were not significantly different.

the Logging Zone, while the diversity of the intermediate Zone and Logging Zone was not significant.

III. Differences in Species Composition among Three Zones

(1) Floristic similarity based on NNESS similarity index

The computation of the NNESS similarity index shows that the 16 transects did not differ considerably in terms of species composition (Table 4). This index uses values between zero and one. Where there is no species in common, the pair will be scored zero, and on the contrary, the pair will be scored one if all species match.

For the 16 transects, the number of pairs to be examined totaled 120. The results of the comparison of the 120 pairs yielded a mean, minimum and maximum score in the NNESS index of 0.79, 0.62 and 0.93, respectively. This mean score shall be regarded as relatively high. These findings indicated that the species composition in the 16 transects are generally similar, and thus clarified that many species are commonly found in all of the transects.

Similarities between the vegetation in the transects set in the same zone were much higher. In the Agroforest Zone (among which four transects and six pairs were examined), the mean, minimum and maximum score in the NNESS index were 0.83, 0.81 and 0.86, respectively. Those in the Intermediate Zone were 0.78,

Table 4. Comparison of the species compositions among the 16 transects based on NNESS index

	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16
T1	1															
T2	0.81	1														
T3	0.86	0.82	1													
T4	0.82	0.85	0.84	1												
T5	0.72	0.80	0.70	0.77	1											
T6	0.80	0.84	0.78	0.84	0.80	1										
T7	0.80	0.78	0.78	0.81	0.69	0.83	1									
T8	0.79	0.77	0.76	0.81	0.64	0.82	0.90	1								
T9	0.79	0.76	0.75	0.79	0.72	0.81	0.92	0.90	1							
T10	0.78	0.76	0.76	0.81	0.64	0.82	0.91	0.92	0.91	1						
T11	0.75	0.77	0.75	0.77	0.70	0.80	0.88	0.87	0.90	0.90	1					
T12	0.76	0.76	0.75	0.81	0.64	0.80	0.88	0.91	0.88	0.92	0.91	1				
T13	0.73	0.73	0.73	0.77	0.64	0.78	0.87	0.89	0.90	0.91	0.93	0.93	1			
T14	0.73	0.72	0.70	0.77	0.62	0.78	0.85	0.86	0.85	0.91	0.89	0.93	0.91	1		
T15	0.68	0.77	0.67	0.77	0.73	0.82	0.75	0.76	0.78	0.78	0.84	0.81	0.82	0.82	1	
T16	0.68	0.73	0.67	0.74	0.65	0.77	0.73	0.80	0.76	0.80	0.82	0.85	0.85	0.86	0.86	1

Pairs in low NNESS values are marked with solid lines.

0.64 and 0.9. Those in the Logging Zone were 0.89, 0.88 and 0.91.

Several pairs with rather low similarities were found across different zones. Among these were the pairs of T1 with T15, T1 with T16, T3 with T15 and T3 with T16. As Fig. 2 shows, these transects are distant from each other. As such, there is a possibility that the land use differences were reflected in the species composition as a reason for the relatively lower value shown in these pairs. Another group of pairs with relatively lower similarity were the pairs of T5 and T7 as well as nine consecutive transects up to T16. This may have been caused by a drastic change which took place in T5.

(2) Identification of dominant species based on IVI values and zone-specific species

The number of common species found in the three zones was 145 (58.7%) out of the total 247 species. In addition, more than half of the 145 species marked high IVI values, which is an index used to comprehensively judge dominance of species, exceeding 100 (Fig. 4). These species were common species as well as dominant species in the three zones (hereinafter, co-dominant species). Unlike temperate forests, tropical rainforests, which have higher biodiversity, often encompass dominant species with the same degree of dominance. Based on this understanding, tropical rainforests are sometimes regarded as “forests without dominant species.” However, in this study, the following two conditions were set to identify species with even higher dominance. The conditions were; (1) species that marked over 100 in IVI value in all three zones, and (2) species with even IVI values in the three zones. Shannon-Wiener evenness index (J’) value was used as the index to show evenness here. Co-dominant species whose two conditions were applicable totaled as many as 56 species.

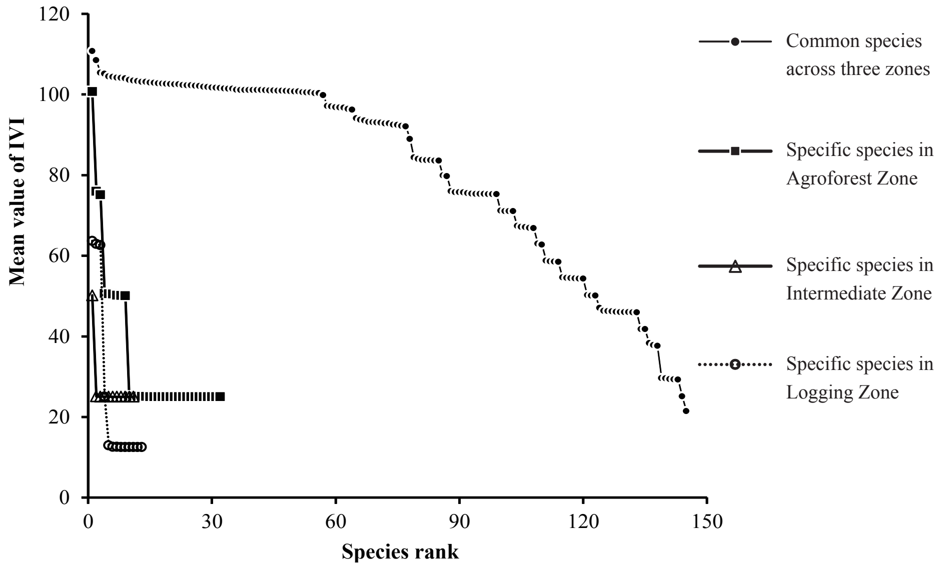

Fig. 4. Species rank-Abundance (IVI) curve.
The vertical axis usually shows number of individuals, while the IVI value showing comprehensive dominance was employed in the axis for this case. The IVI value of the common species shows the mean of the IVI values of the species marked in the three zones.

Table 5 shows the top 20 species which marked the highest mean scores in IVI value among the 56 species in the three zones. They included typical pioneer species which have characteristics of being the first to establish themselves in the gap where the vegetation had been disturbed due to tree falling, land clearance and so on. The following are the species as such; *Terminalia superba*, *Musanga cecropioides*, *Ricinodendron heudelotii*, *Albizia glaberrima*, *Trilepisium madagascariense*, *Pentaclethra macrophylla* and *Alstonia boonei*. Generally speaking, pioneer species are rapidly increasing in terms of individual numbers, fast-growing, but light in wood density together with a short life span. However, co-dominant species included not only the species with strong pioneering characteristics, but also the tree species with high carrying capacity which are slow and low in growth rate and increasing rate of individual number. However, they have a long life with a firm trunk. Species such as *Polyalthia suaveolens*, *Entandrophragma cylindricum*, *Klainedoxa gabonensis*, *Rinorea elliotii* and *Duboscia macrocarpa* were included in the group.

According to the species rank-abundance (IVI) curve (Fig. 4) of these common species, the IVI values show a very gradual decline from *Terminalia superba*, which ranked first to *Baillonella toxisperma* in 145th. The gradual decline of the IVI value shows high diversity in tree species across all three zones, in addition to the significance in number of co-dominant species.

Table 5. Co-dominant species across and zone-specific species in three zones

	No. of Species	% to the total no. of species	Rank	Species	P*	IVI			J'
						Agroforest Zone	Intermediate Zone	Logging Zone	
Co-dominant species across three zones (Top 20 species)	145	58.7	1	*Terminalia superba*	pi	113.3	111.5	107.4	1
			2	*Musanga cecropioides*	pi	110.7	110.8	103.9	1
			3	*Celtis mildbraedii*	np	107.7	104.7	103.8	1
			4	*Anonidium mannii*	np	103.4	103.5	108.5	1
			5	*Ricinodendron heudelotii*	pi	103.7	104.2	105.5	1
			6	*Trichilia heudelotii*	np	104.5	104.2	104.4	1
			7	*Trilepisium madagascariense*	pi	104.4	106.3	101.9	1
			8	*Polyalthia suaveolens*	np	103.8	103.9	104.5	1
			9	*Albizia glaberrima*	pi	104.2	103.4	104.3	1
			10	*Entandrophragma cylindricum*	np	105.2	101.6	104.0	1
			11	*Staudtia kamerunensis*	np	103.3	103.8	103.1	1
			12	*Pentaclethra macrophylla*	pi	103.5	103.0	103.3	1
			13	*Alstonia boonei*	pi	102.0	103.0	104.4	1
			14	*Strombosia pustulata*	np	101.6	104.5	103.3	1
			15	*Rinorea elliotii*	np	103.4	102.9	102.6	1
			16	*Cola lateritia*	-	101.6	103.1	103.9	1
			17	*Duboscia macrocarpa*	np	102.7	102.2	103.3	1
			18	*Dichostemma glaucescens*	np	102.0	101.9	104.1	1
			19	*Klainedoxa gabonensis*	np	101.1	103.5	103.2	1
			20	*Celtis adolfi-friderici*	-	102.6	102.1	103.0	1
Zone-specific species in Agroforest Zone (Top 10 species)	32	13.0	1	*Irvingia* sp.	np	100.7			
			2	*Pavetta* sp.	np	76.0			
			3	*Copaifera mildbraedii*	np	75.1			
			4	*Ficus mucuso*	pi	50.6			
			5	*Samanea dinklagei*	pi	50.6			
			6	*Stemonocoleus micranthus*	-	50.5			
			7	*Calpocalyx* sp.	-	50.3			
			8	*Millettia* sp.	-	50.1			
			9	*Hallea ledermannii*	-	50.1			
			10	*Beilschmiedia* sp.	np	25.2			
Zone-specific species in Intermediate Zone (Top 10 species)	11	4.5	1	*Allanblachia gabonensis*	-		50.2		
			2	*Diospyros abyssinica*	-		25.1		
			3	*Zanthoxylon laurentii*	np		25.0		
			4	*Buchholzia* sp.	-		25.0		
			5	*Beilschmiedia* sp.2	np		25.0		
			6	*Stychnos* sp.2	-		25.0		
			7	*Macaranga spinosa*	pi		25.0		
			8	*Cyttaranthus congolensis*	-		25.0		
			9	*Parinari excelsa*	np		25.0		
			10	*Chytranthus atroviolaceus*	-		25.0		
Zone-specific species in Logging Zone (Top 10 species)	13	5.3	1	*Pterocarpus mildbraedii*	np			63.7	
			2	*Xylopia hypolampra*	-			62.9	
			3	*Dialium* sp.	np			62.6	
			4	*Fagara macrophylla*	-			25.1	
			5	*Entandrophragma utile*	np			12.9	
			6	*Poga oleosa*	-			12.6	
			7	*Brenania brieyi*	-			12.5	
			8	*Rauvolfia macrophylla*	-			12.5	
			9	*Celtis zenkeri*	-			12.5	
			10	*Anthocleista schweinfurthii*	-			12.5	

*: Judgment of whether or not species were pioneering was made based on the vegetation observation in the study area. pi: Pioneer species, np: Non-pioneer, -: Unknown.

In comparison to the common species, the number of species specifically found in each zone was significantly low. Number of such zone-specific species (hereinafter, specific species) were 32, 11 and 13 species in the Agroforest Zone, Intermediate Zone and Logging Zone respectively (Table 5).

The specific species presumably included more species with high carrying capacity than tree species with pioneering characteristics. As far as we can tell at this point, such species were *Irvingia* sp. and *Pavetta* sp. (in Agroforest Zone), *Copaifera mildbraedii*, *Diospyros abyssinica* and *Beilschmiedia* sp. (in Intermediate Zone), and *Parinari excelsa*, *Entandrophragma utile*, *Dialium* sp. and *Pterocarpus mildbraedii* (in Logging Zone).

The species rank-abundance (IVI) curve of the specific species (Fig. 4) shows that only limited species marked high IVI values in all zones, in contrast with the common species. In addition, the curve shows a steep drop. Specific species may serve as indicators to show the states of the vegetation environment. However, we are not yet certain as to whether these specific species may become such indicators for each zone at this stage. This will need to be elucidated through further studies on the habitat preferred by the specific species and the characteristics of the species.

IV. Forest Structure: Diameter and Height-class Distribution

Distribution of density (or number of individuals) by DBH-class showed a common tendency for individuals with smaller diameter to be larger in number of individuals in the Agroforest Zone, Intermediate Zone and Logging Zone (Fig. 5 left). The ratio of the number of the individuals included in the smallest diameter-class (10–30 cm), in the total number of individuals was 71.2% in the Agroforest Zone (N = 3,685), 74.2% in the Intermediate Zone (N = 4,960) and 75.8% in the Logging Zone (N = 8,938). The largest DBH-classes for the Agroforest Zone were 210–230 cm (N = 1, 0.03% of total individuals of the zone) and 250–310 cm for the Intermediate Zone and Logging Zone (one individual in each zone, the percentages were 0.02 in the former and 0.01 in the latter). It was clarified that the distribution of diameter-classes showed a reverse J shape pattern in each zone, which is often found in natural forests.

A Turkey-test was performed in order to examine significant differences in basal area between the three zones. The results (Table 3) showed that the basal area in the Agroforest Zone was significantly lower (P = 0.013) than that in the Intermediate Zone, although it had no significant difference with the Logging Zone (P = 0.358).

A similar pattern was found in distribution of the individual numbers by tree height-classes across three zones (Fig. 5 right). The individuals classified in the 5–20 m height-class were the most numerous in all the zones, and their ratio against total individuals in each zone was 92.7% in Agroforest Zone, 84.9% in the Intermediate Zone and 84.6% in the Logging Zone. The highest classes observed in each zone were 45–50 m for the Agroforest Zone and the Intermediate Zone (N = 12 in each zone, with 0.3% for the former and 0.2 for the latter) and 50–55 m in the Logging Zone (N = 1, 0.01%).

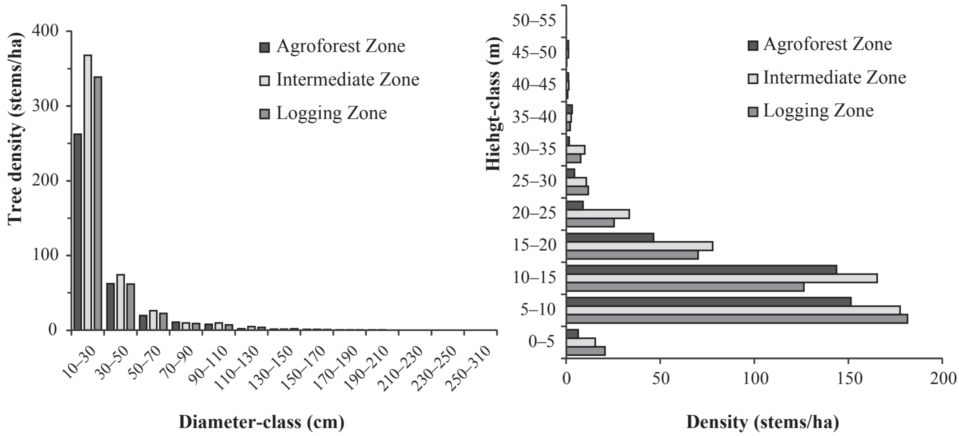

Fig. 5. Size-class distribution by zone.
Left shows the tree density by DBH-class and right indicates tree density by height-class. All individuals with DBH larger than 10 cm were subject of the measurement, and their DBH and height were measured (N = 17,583).

By examining Fig. 5 (right) in the view of the forest stratification, it was hypothesized that each zone was comprised of seven layers, namely (1) lower layer (0–5 m), (2) middle layer I (5–15 m), (3) middle layer II (15–20 m), (4) canopy layer I (20–25 m), (5) canopy layer II (25–35 m), (6) canopy layer III (35–40 m) and (7) emergent layer (40 m or higher). The fact that the forest has seven vertical layers of tree heights can be seen as evidence of the forest's development. It can be said that different species segregating themselves to grow in a vertical direction would mitigate the inter-species competition for light resources, and has contributed to the creation and maintenance of high diversity in plant species.

In order to examine significant differences in DBH and tree height among the three zones, an applicable one way ANOVA paired-test was performed. The result revealed no significant difference among the zones in terms of DBH. On the other hand, a significant difference was found between the Agroforest Zone and the Intermediate Zones in terms of tree height (P = 0.018). From these findings, it was elucidated that the height of the trees grown in the Agroforest Zone tended to be lower than other zones in every tree height-class. However, the difference was slight, and one should observe the fact that the forest in this zone was also comprised of the seven layers in the same way as in other zones.

DISCUSSION

I. Global Floristic Composition

According to Letouzey (1968), the study area is classified as semi-deciduous forest dominated by Sterculiaceae and Ulmaceae. Our results showed that the studied forest was dominated by the families of Annonaceae, Euphorbiaceae, Meliaceae, Sterculiaceae, Ulmaceae, Myristicaceae and Cecropiaceae in terms of FIV values. This observation is in line with Letouzey's description and the findings of Nkongmeneck (1996) who reported the important occurrence of Euphorbiaceae, Sterculiaceae, Rubiaceae, Meliaceae, Caesalpiniaceae, Annonaceae, Fabaceae, Tiliaceae, Ulmaceae and Ebenaceae in the Boumba-Bek National Park, and Annonaceae, Euphorbiaceae, Caesalpiniaceae, Olacaceae, Fabaceae, Meliaceae, Rubiaceae, Sterculiaceae, Tiliaceae and Mimosaceae in the Nki National Park.

Studies conducted in neighboring forests reported the dominance of Euphorbiaceae, Rubiaceae, Caesalpiniaceae, Sapotaceae, Annonaceae, Meliaceae, Sterculiaceae, Mimosaceae, Flacourtiaceae, Apocynaceae, Olacaceae and Sapindaceae in the Dja Biosphere Reserve (Nguenang & Dupain, 2002; Mbolo, 2004; Sonké, 2005; Nzooh Dongmo, 2005), and Euphorbiaceae, Annonaceae, Sterculiaceae, Meliaceae, Caesalpiniaceae, Mimosaceae in the Kom-Mengamé Forest Complex (Fongnzossie et al., 2010).

II. Difference in Plant Biodiversity and Dominant Species among the Three Different Zones

The present study has considered vegetation differences in the three zones with different usage from three perspectives, namely diversity of the trees, species composition, and forest structure. At this point, we compare the three zones in each point of view.

The tree species observed totaled 247 with a density of 439.6 stems/ha across the three zones. Comparing to other regions, Lubini (1997) found 236 stems/ha at Luki. Lomba (2007) identified 183 species arranged in 37 families with a mean density of 506 stems/ha in the Yoko Reserve. Moreover, Nshimba (2008) reported a density of 506 stems/ha from Kisangani Mbiye's Island. Sunderland et al. (2004) conducted their study in the National Park of Mbe (Gabon), and found a density of 539 stems/ha, 97 species and a total basal area of 37.2 m^2/ha. Whitmore (1990) and Doucet (2003) have all mentioned the specific richness of South America and tropical Asia, with approximately 300 species (dbh $\geq$ 10cm) per 1 ha and 711 species (dbh $\geq$ 10cm) per 6.6 ha, respectively. These values show a striking analogy with our results. Indeed, there are certain difficulties which arise when trying to conduct a comparative analysis of the diversity between the studied forest in this work and that on other sites. These difficulties have been cited by many authors, including Lejoly (2003), Senterre (2005), Ngok (2000) and Kangueja (2009). These problems concern the diversity of methods used.

After comparing the diversity between the three divided zones in the study area, it was clear that the diversity was higher in the Agroforest Zone than the Logging Zone and even in the Intermediate Zone. This is because both zones are subject to different land use intensities which affect the forest structure and species composition differently. In the Agroforest Zone, the villagers cut trees every year in order to clear new farming plots, although such cleared plots only constitutes approximately 1% of the whole Agroforest Zone area (Hirai, 2014, this issue). In addition, farming plots would rarely be maintained after three years of the clearance and would be gradually covered by pioneer species afterwards. The villagers only seek their new plots in forests which have not been cleared for 30 to 60 years. Agriculture in this region has been operated based on the premise of the long fallow period, and as such, patches of vegetation in various recovery stages from the clearance are distributed mosaic-like in this zone (Hirai, 2014, this issue). It is conceivable that this is a part of the mechanism which creates tree diversity in the zone. Another important point relating to diversity creation is that the villagers leave many trees after the forest clearance due to factors such as usability, growing location, and easiness to cut (firmness of trunks). Carrière et al. (2002) clarified that such trees left in the farming lands play important roles when abandoned plots are promptly recovered into forests.

In addition, tree regeneration composition in the gaps has been shown to be dependent upon the history of the forest community, seed availability and the biology of the species (Hubbell & Foster, 1992; Putul Bhuyan et al., 2003). This trend in the diversity pattern across three zones is consistent with the Intermediate disturbance hypothesis (Connell, 1979), according to which a forest stand reaches maximum diversity under an intermediate disturbance regime.

It is now fitting to compare the three zones in terms of species composition. The NNESS similarity coefficient between pairs of different transects were relatively high, thus indicating very low floristic difference among three zones. Moreover, the similarities between the transects in the same zone were higher. This indicates that many tree species are commonly found in the three zones. The results of the detailed investigation of common species and zone-specific species show greater dominance of *Terminalia superba*, *Musanga cecropioides*, *Trichilia heudelotii*, *Polyalthia suaveolens*, *Albizia glaberrima*, *Celtis mildbraedii* and *Entandrophragma cylindricum* across all three zones. Most of these leading dominant species are pioneer fast growing trees. Their dominance has been reported in several vegetation assessments in disturbed tropical rainforest areas. However, there were many co-dominant species and not all of them were pioneer species in the study area. For instance, *Duboscia macrocarpa* and *Entandrophragma cylindricum* are species grown often in mature forests. In addition to this, more species with carrying capacity than pioneer species were found among the specific species in the Agroforestry Zone.

III. Vegetation Structure

Finally, we discuss the differences in the three zones from the point of view of forest structure. The tree distribution patterns of both diameter and height-class were common in the three zones. The distribution of trees in this survey into different diameter-classes had an inverse J-shape. This pattern is similar to those obtained in the Dja Biosphere Reserve and the Mengame Gorilla Sanctuary in the southern Cameroon (Sonké, 2005; Fongnzossie et al., 2008). This distribution pattern, similar to the exponential model, characterizes a forest dominated by young and fast growing trees (Rollet, 1974). However, this exponential model does not always means that the forest is dominated by sub-strata species but could prove that the considered species have a high regeneration level (Senterre & Nguema, 2001; Fongnzossie et al., 2008). Gentry (1990) has shown that this capacity of species to maintain the constant rhythm of installation of seedling can be favored by several factors including the faunal diversity, disturbance and the auto-ecology of each species. Compared with the other site (Fongnzossie et al., 2010), the average tree density (439.6 stems/ha) are relatively high and is contrasting with the disturbance history of the site. It is worth mentioning that the forest at the northern periphery of Boumba-Bek National Park still has many trees with high carrying capacity. A unimodal reverse J-shaped curve of diameter-class distribution in most zones is indicative of these forests' regenerating status.

The tree height-class distribution clarified that the forests were divided into seven vertical layers in every zone. Tree height was slightly lower in the Agroforestry Zone in general, although the same number of layers as other zones were found in the zone. The forests in the Agroforestry Zone are most frequently utilised by the villagers as a place for agriculture and collection of NTFPs. Since complicated layer division in forests may be employed as an indicator of forest development, the fact that the divisions were found in the forests under such circumstance suggests the villagers are not in existence only to destroy the forests, contrary to what was thought in the past. There is a need for further development when it comes to understanding the mutual relationship between people and forest through further research on forest vegetation.

CONCLUSION

We conclude that the studied forest keeps a high degree of plant biodiversity despite the frequent use by the villagers. This higher biodiversity would be caused by small scale disturbances of the local peoples' livelihoods such as shifting cultivation with a long fallow period and NTFPs collection, whereas these human impacts have often been considered as major causes of forest degradation. The quantity of information treated through this study at the northern periphery of the Boumba-Bek National Park revealed the high variability of tree species in this habitat. This variation is seen at family and species level. A total of 17,583 trees belong to 51 families, 169 genera and 247 species have been inventoried. Despite the disturbance of the site driven by forest logging and agriculture, the analysis shows that this forest is relatively diverse and probably young. Though only tree species with DBH above 10 cm were inventoried, it is known that this layer contributes to nearly 60% of the total diversity of tropical ecosystems. However, investigations on other sub-strata might be interesting to complete the floral database of this forest. The diversity of tree species encountered in this study is the basis of livelihoods of thousands of population living around this park. Investigation concerning the forest-people interaction will be crucial for establishing a multipurpose forestry system harnessing forest conservation, its uses and the improvement of the livelihood of adjacent communities.

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Appendix I. All family and species recorded in the studied forest

No.	Family	Scientific name	Baka name	IVI
1	Rutaceae	*Aeglopsis chevalieri*	unknown 8	6.3
2	Huaceae	*Afrostyrax lepidophyllus*	*guimba*	101.1
3	Caesalpiniaceae	*Afzelia bipindensis*	*bimba*	100.8
4	Mimosaceae	*Albizia ferruginea*	*londa*	12.6
5	Mimosaceae	*Albizia glaberrima*	*bamba*	104.0
6	Clusiaceae	*Allanblackia floribunda*	*kouom* 1	75.4
7	Clusiaceae	*Allanblackia gabonensis*	*kouom* 2	12.5
8	Apocynaceae	*Alstonia boonei*	*gouga*	103.5
9	Euphorbiaceae	*Amanoa bracteosa*	*mbondo* 1	102.0
10	Caesalpiniaceae	*Amphimas pterocarpoides*	*kanga*	63.5
11	Papilionaceae	*Angylocalyx pynaertii*	*yonga* 1	101.1
12	Papilionaceae	*Angylocalyx vermeulenii*	*yonga* 2	75.4
13	Sapotaceae	*Aningeria robusta*	*moundonguè* 3	37.7
14	Annonaceae	*Anonidium mannii*	*ngwé*	106.0
15	Rhizophoraceae	*Anopyxis klaineana*	*boma*	37.6
16	Loganiaceae	*Anthocleista schweinfurthii*	*molondjo*2	6.3
17	Caesalpiniaceae	*Anthonotha macrophylla*	*koguimba*	69.1
18	Caesalpiniaceae	*Anthonotha* sp.1	*pfhouopfhouolo*	6.3
19	Caesalpiniaceae	*Anthonotha* sp.2	*pfouofoundo*	6.3
20	Anacardiaceae	*Antrocaryon klaineanum*	*gongô*	81.6
21	Sapotaceae	*Baillonella toxisperma*	*mabé*	19.3
22	Passifloraceae	*Barteria fistulosa*	*pambo*	100.5
23	Lauraceae	*Beilschmiedia mannii*	*békéssi*	44.5
24	Lauraceae	*Beilschmiedia obscura*	*mobakosso*	69.0
25	Lauraceae	*Beilschmiedia* sp.1	*bokondo* 2	6.3
26	Lauraceae	*Beilschmiedia* sp.2	*mbatama* 2	6.3
27	Sapindaceae	*Blighia welwitschii*	*toko*	95.0
28	Bombacaceae	*Bombax buonopozense*	*dombi* 1	18.8
29	Rubiaceae	*Brenania brieyi*	*molondjo* 1	6.3
30	Sapotaceae	*Breviea leptosperma*	*koloka*	94.7
31	Euphorbiaceae	*Bridelia grandis*	*takou*	81.8
32	Capparaceae	*Buchholzia* sp.	*ngô'ndo*	6.3
33	Flacourtiaceae	*Buchnerodendron speciosum*	*gwagolo* 1	37.6
34	Flacourtiaceae	*Caloncoba glauca*	*gwagolo* 2	62.6
35	Flacourtiaceae	*Caloncoba* sp.	*gnangalé*	6.3
36	Mimosaceae	*Calpocalyx* sp.	*bambayoko*	12.6
37	Meliaceae	*Carapa procera*	*godjo* 1	38.0
38	Meliaceae	*Carapa* sp.	unknown 19	6.3
39	Bombacaceae	*Ceiba pentandra*	*koulou*	32.0
40	Ulmaceae	*Celtis adolfi-friderici*	*kakala*	102.7
41	Ulmaceae	*Celtis mildbraedii*	*ngombé*	104.9
42	Ulmaceae	*Celtis philippensis*	*gwèguè*	107.8
43	Ulmaceae	*Celtis tessmannii*	*kèkèlè* 1	94.5
44	Ulmaceae	*Celtis zenkeri*	*kongombé*	6.3
45	Sapindaceae	*Chytranthus atroviolaceus*	*tokoboli*	6.3
46	Rutaceae	*Citropsis* sp.	*adjomba*	12.5
47	Annonaceae	*Cleistopholis patens*	*kiyo*	100.5
48	Myristicaceae	*Coelocaryon preussii*	*bambayoko*	32.1
49	Sterculiaceae	*Cola acuminata*	*ligoh* 1	101.1
50	Sterculiaceae	*Cola altissima*	*banga*	75.3
51	Sterculiaceae	*Cola ballayi*	*ligoh* (*goro*)	62.8
52	Sterculiaceae	*Cola lateritia*	*p'hop'hoko*	89.3
53	Sterculiaceae	*Cola* sp.	*mbolé*	63.8

Appendix I. (continued)

No.	Family	Scientific name	Baka name	IVI
54	Sterculiaceae	*Cola pachycarpa*	*mboussoua* 2	6.3
55	Caesalpiniaceae	*Copaifera mildbraedii*	*modoumba*	18.8
56	Boraginaceae	*Cordia platythyrsa*	*gwabi*	25.1
57	Rubiaceae	*Corynanthe pachyceras*	*moka*	102.3
58	Rubiaceae	*Corynanthe* sp.	*ndôo*	12.5
59	Mimosaceae	*Cylicodiscus gabunensis*	*bolouma*	88.7
60	Euphorbiaceae	*Cyttaranthus congolensis*	*poungué*	6.3
61	Burseraceae	*Dacryodes klaineana*	*bo'o*	56.6
62	Tiliaceae	*Desplatsia dewevrei*	*liamba*	101.0
63	Tiliaceae	*Desplatsia* sp.	*libéa*	37.7
64	Caesalpiniaceae	*Detarium macrocarpum*	*mbili* 1	25.4
65	Caesalpiniaceae	*Dialium dinklagei*	*kombé* 2	25.1
66	Caesalpiniaceae	*Dialium* sp.	*mbéléngué* 3	31.3
67	Melastomataceae	*Dichaetanthera africana*	unknown 14	6.3
68	Melastomataceae	*Dichaethantera* sp.	*mbondo* 2	25.1
69	Euphorbiaceae	*Dichostemma glaucescens*	*moungamba*	103.1
70	Thymelaeaceae	*Dicranolepis disticha*	*ngwi* 1	12.5
71	Thymelaeaceae	*Dicranolepis* sp.	*mapèbègnè*	6.3
72	Ebenaceae	*Diospyros abyssinica*	*djama*	6.3
73	Ebenaceae	*Diospyros iturensis*	*babango*	94.2
74	Ebenaceae	*Diospyros canaliculata*	*mbéla*	87.8
75	Ebenaceae	*Diospyros crassiflora*	*lembè*	101.3
76	Ebenaceae	*Diospyros* sp.1	*bandoguilè*	43.9
77	Ebenaceae	*Diospyros* sp.2	*mboloa*	101.4
78	Euphorbiaceae	*Discoglypremna caloneura*	*djila*1	94.1
79	Caesalpiniaceae	*Distemonanthus benthamiana*	*sènè*	75.3
80	Sapotaceae	*Donella ubanguiensis*	*konya*	6.3
81	Putranjivaceae	*Drypetes gossweileri*	*bologa*	100.8
82	Putranjivaceae	*Drypetes ituriensis*	*gongo*	75.3
83	Putranjivaceae	*Drypetes principum*	*mototombo*	6.3
84	Putranjivaceae	*Drypetes* sp.1	*macép'ha*	101.6
85	Putranjivaceae	*Drypetes* sp.2	unknown 2	6.3
86	Tiliaceae	*Duboscia macrocarpa*	*goulouma*	102.9
87	Euphorbiaceae	*Euphorbia drupifera*	*songolibila*	18.8
88	Annonaceae	*Enantia chlorantha*	*ep'houé*	94.3
89	Meliaceae	*Entandrophragma candollei*	*kangâ*	75.3
90	Meliaceae	*Entandrophragma cylindricum*	*boyo*	103.6
91	Meliaceae	*Entandrophragma utile*	*bokoulo*	6.5
92	Sterculiaceae	*Eribroma oblongum*	*egwoyo*	101.0
93	Caesalpiniaceae	*Erythrophleum suaveolens*	*ngwanda*	95.2
94	Rutaceae	*Fagara heitzii*	*bolongo* 1	6.3
95	Rutaceae	*Fagara macrophylla*	*bolongo* 3	12.5
96	Bignoniaceae	*Fernandoa adolfi-friderici*	*bongo*	37.8
97	Moraceae	*Ficus macrosperma*	*djolo*	6.3
98	Moraceae	*Ficus etrangulator*	*bongo'o*	82.1
99	Moraceae	*Ficus exasperata*	*soubéme*	43.9
100	Moraceae	*Ficus mucuso*	*nguéhi*	12.6
101	Moraceae	*Ficus* sp.	*bambamessambo*	37.6
102	Apocynaceae	*Funtumia africana*	*kondo*	94.6
103	Apocynaceae	*Funtumia elastica*	*kondo*	25.2
104	Sapotaceae	*Gambeya boukokoensis*	*madjédjé*	56.5
105	Sapotaceae	*Gambeya lacourtiana*	*bambou*	95.1
106	Sapotaceae	*Gambeya perpulchra*	*moundonguè*1	6.3

Appendix I. (continued)

No.	Family	Scientific name	Baka name	IVI
107	Clusiaceae	*Garcinia afzelii*	*ngambé* 2	25.1
108	Clusiaceae	*Garcinia kola*	*gwel*	12.5
109	Clusiaceae	*Garcinia lucida*	*bako'o*	6.3
110	Clusiaceae	*Garcinia punctata*	*p'handaka*	75.2
111	Clusiaceae	*Garcinia* sp.1	*bongoli*	25.1
112	Clusiaceae	*Garcinia* sp.2	*kèkèlè* 2	62.7
113	Tiliaceae	*Glyphaea brevis*	*andaka*	56.5
114	Meliaceae	*Guarea cedrata*	*djombo*	102.2
115	Meliaceae	*Guarea* sp.	*linga*	31.3
116	Rubiaceae	*Hallea ledermannii*	*moïssé*	12.5
117	Rubiaceae	*Hallea stipulosa*	*langago*	56.6
118	Olacaceae	*Heisteria zimmereri*	*molomba* 2	75.3
119	Annonaceae	*Hexalobus crispiflorus*	*pota*	102.3
120	Ulmaceae	*Holoptelea grandis*	*bèlè*	44.0
121	Flacourtiaceae	*Homalium africanum*	*ngongo*	6.3
122	Salicaceae	*Homalium aylmeri*	*bambi*	31.3
123	Salicaceae	*Homalium letestui*	*tembo*	69.1
124	Flacourtiaceae	*Homalium* sp.	*djèkè*	101.2
125	Apocynaceae	*Hunteria umbellata*	*moundanga*	56.4
126	Irvingiaceae	*Irvingia excelsa*	*payo*	81.8
127	Irvingiaceae	*Irvingia gabonensis*	*péké*	101.6
128	Irvingiaceae	*Irvingia grandifolia*	*solia*	94.9
129	Irvingiaceae	*Irvingia robur*	*kombélé*	18.8
130	Irvingiaceae	*Irvingia* sp.	*bondoulou*	25.2
131	Phyllanthaceae	*Keayodendron bridelioides*	*mbôndo*	50.4
132	Meliaceae	*Khaya anthotheca*	*p'houa*	18.8
133	Meliaceae	*Khaya grandifolia*	*djila* 2	43.8
134	Meliaceae	*Khaya ivorensis*	*ngolo*	12.6
135	Meliaceae	*Khaya* sp.	*mboussoua* 1	6.3
136	Irvingiaceae	*Klainedoxa gabonensis*	*bukoko*	102.8
137	Anacardiaceae	*Lannea welwitschii*	*kwa*	94.5
138	Sapotaceae	*Lasersisia* sp.	*touba* 1	100.3
139	Rhamnaceae	*Lasiodiscus mannii*	*souma*	102.4
140	Sapindaceae	*Lecaniodiscus* sp.	*elinga*	6.3
141	Lepidobotryaceae	*Lepidobotrys staudtii*	*moussako asséko*	101.1
142	Sterculiaceae	*Leptonychia* sp.	*mboké*	18.8
143	Flacourtiaceae	*Lindackeria dentata*	*loagwiyé*	81.5
144	Euphorbiaceae	*Macaranga saccifera*	*moussassah* 2	101.6
145	Euphorbiaceae	*Macaranga spinosa*	*moussassah* 3	6.3
146	Rhamnaceae	*Maesopsis eminii*	*londô*	69.0
147	Euphorbiaceae	*Mallotus oppositifolius*	*ngoka1*	50.1
148	Sterculiaceae	*Mansonia altissima*	*babandja*	82.6
149	Chrysobalanaceae	*Maranthes glabra*	*bokandja*	19.0
150	Phyllanthaceae	*Margaritaria discoidea*	*kango*	81.8
151	Bignoniaceae	*Markhamia lutea*	*gondja*	101.1
152	Annonaceae	*Meiocarpidium lepidotum*	*mabèlenguè*	95.3
153	Caesalpiniaceae	*Mildbraediodendron excelsum*	*ekéla* 1	31.4
154	Moraceae	*Milicia excelsa*	*bangui*	94.6
155	Papilionaceae	*Millettia* sp.	*olinga*	12.5
156	Papilionaceae	*Millettia sanagana*	*nganda*	18.8
157	Cecropiaceae	*Musanga cecropioides*	*kombo*	107.3
158	Rubiaceae	*Mussaenda* sp.	*lip'huètè*	12.5
159	Cecropiaceae	*Myrianthus arboreus*	*ngata*	101.6

Appendix I. (continued)

No.	Family	Scientific name	Baka name	IVI
160	Euphorbiaceae	*Neoboutonia glabrescens*	*toubou*	75.5
161	Moraceae	*Neosloetiopsis kamerunensis*	*doundou*	94.6
162	Sterculiaceae	*Nesogordonia papaverifera*	*tétéké*	101.2
163	Ixonanthaceae	*Ochthocosmus africanus*	*likoumbi*	25.1
164	Sterculiaceae	*Octobolus* sp.	*mbéléngué* 2	43.9
165	Sterculiaceae	*Octobolus spectabilis*	*gagoulou*	43.9
166	Caesalpiniaceae	*Oddoniodendron micranthum*	*bolongo* 2	87.9
167	Sapotaceae	*Omphalocarpum lecomteanum*	*mbaté*	6.3
168	Olacaceae	*Ongokea gore*	*bossolo*	25.2
169	Flacourtiaceae	*Ophiobotrys zenkeri*	*mogwala*	101.1
170	Caesalpiniaceae	*Oxystigma oxyphyllum*	*gondo*	37.8
171	Caesalpiniaceae	*Pachyelasma tessmannii*	*ngouo*	25.4
172	Annonaceae	*Pachypodanthium staudtii*	*molombo*	100.9
173	Pandaceae	*Panda oleosa*	*kana*	101.8
174	Chrysobalanaceae	*Parinari excelsa*	*nombokola*	6.3
175	Mimosaceae	*Parkia bicolor*	*ndembé*	25.4
176	Rubiaceae	*Pausinystalia johimbe*	*wassassah*	95.6
177	Rubiaceae	*Pavetta* sp.	*loapoula*	19.0
178	Menispermaceae	*Penianthus longifolius*	*sombolo* 1	6.3
179	Mimosaceae	*Pentaclethra macrophylla*	*mbalaka*	103.3
180	Papilionaceae	*Pericopsis elata*	*mobai*	44.2
181	Lecythidaceae	*Petersianthus macrocarpus*	*bossô*	95.4
182	Apocynaceae	*Picralima nitida*	*poussah*	87.9
183	Mimosaceae	*Piptadeniastrum africanum*	*koungou*	95.0
184	Euphorbiaceae	*Plagiostyles africana*	*ngolé* 1	50.1
185	Anisophylleaceae	*Poga oleosa*	*p'houo*	6.3
186	Annonaceae	*Polyalthia suaveolens*	*botounga*	104.2
187	Anacardiaceae	*Pseudospondias microcarpa*	*ewoungou*	75.7
188	Rubiaceae	*Psychotria avakubiensis*	*nokomindo*	6.3
189	Rubiaceae	*Psychotria peduncularis*	*gwègwèlè* 2	18.8
190	Rubiaceae	*Psychotria* sp.1	*bitongo*	6.3
191	Rubiaceae	*Psychotria* sp.2	*wélaleko*	56.4
192	Rubiaceae	*Psychotria vogeliana*	unknown 5	18.8
193	Combretaceae	*Pteleopsis hylodendron*	*mobito*	75.9
194	Papilionaceae	*Pterocarpus mildbraedii*	*nguèlè* (b)	31.8
195	Papilionaceae	*Pterocarpus soyauxii*	*nguèlè* (r)	89.5
196	Sterculiaceae	*Pterygota bequaertii*	*mawouya* 2	18.9
197	Sterculiaceae	*Pterygota macrocarpa*	*ngoaka*	6.3
198	Myristicaceae	*Pycnanthus angolensis*	*tengué*	102.4
199	Apocynaceae	*Rauvolfia caffra*	*mbonga* 1	43.9
200	Apocynaceae	*Rauvolfia grandifolia*	*mbonga* 2	25.1
201	Apocynaceae	*Rauvolfia macrophylla*	*mbonga* 3	6.3
202	Apocynaceae	*Rauvolfia vomitoria*	*loli*	37.6
203	Bombacaceae	*Rhodognaphalon brevicuspe*	*tenonou*	6.3
204	Euphorbiaceae	*Ricinodendron heudelotii*	*gobo*	104.7
205	Violaceae	*Rinorea aylmeri*	*nguindi* 1	50.1
206	Violaceae	*Rinorea elliotii*	*sandjabongo*	102.8
207	Violaceae	*Rinorea lepidobotrys*	*nguindi* 2	18.8
208	Violaceae	*Rinorea* sp.	*técendé*	95.9
209	Caesalpiniaceae	*Samanea dinklagei*	*bokondo* 1	12.6
210	Burseraceae	*Santiria trimera*	*libaba* 2	63.2
211	Caesalpiniaceae	*Scorodophloeus zenkeri*	*minguègnè*	38.5
212	Euphorbiaceae	*Spondianthus preussii*	*godjo* 2	65.5

Appendix I. (continued)

No.	Family	Scientific name	Baka name	IVI
213	Myristicaceae	*Staudtia kamerunensis*	*malanga*	103.4
214	Caesalpiniaceae	*Stemonocoleus micranthus*	*gondou*	12.6
215	Sterculiaceae	*Sterculia subviolacea*	*yébolo*	82.1
216	Sterculiaceae	*Sterculia tragacantha*	*bototo*	31.4
217	Olacaceae	*Strombosia pustulata*	*bobongo*	103.3
218	Olacaceae	*Strombosiopsis* sp.	*p'huindo*	50.4
219	Olacaceae	*Strombosiopsis tetrandra*	*bossiko*	102.4
220	Loganiaceae	*Strychnos ternata*	*dingwa*	18.8
221	Loganiaceae	*Strychnos* sp.2	*boukou*	6.3
222	Caesalpiniaceae	*Swartzia fistuloides*	*eloukou*	12.5
223	Caesalpiniaceae	*Swartzia* sp.	*ganda*	18.8
224	Sapotaceae	*Synsepalum aubrevillei*	*djingo*	75.2
225	Myrtaceae	*Syzygium rowlandii*	*essossi*	25.2
226	Apocynaceae	*Tabernaemontana crassa*	*paadok*	50.2
227	Combretaceae	*Terminalia superba*	*ngolou*	109.9
228	Caesalpiniaceae	*Tessmania africana*	*paka* 2	31.3
229	Mimosaceae	*Tetrapleura tetraptera*	*djaga*	100.5
230	Euphorbiaceae	*Tetrorchidium didymostemon*	*djènè*	62.7
231	Thomandersiaceae	*Thomandersia hensii*	*ngoka* 2	25.0
232	Thomandersiaceae	*Thomandersia laurifolia*	*ngoka* 3	6.3
233	Sapotaceae	*Tieghemella africana*	*kolo*	57.7
234	Ulmaceae	*Trema orientalis*	*messiongo*	25.2
235	Rubiaceae	*Trichalysia* sp.1	*molomba* 1	50.2
236	Rubiaceae	*Trichalysia* sp.2	*molomba* 2	6.3
237	Meliaceae	*Trichilia heudelotii*	*mayimbo* 1	104.3
238	Meliaceae	*Trichilia welwitschii*	*mayimbo agwanga*	102.6
239	Anacardiaceae	*Trichoscypha acuminata*	*ngoyo*	100.3
240	Sapotaceae	*Tridesmostemon omphalocarpoides*	*touba* 2	31.3
241	Moraceae	*Trilepisium madagascariense*	*pongui*	103.7
242	Sterculiaceae	*Triplochiton scleroxylon*	*gwado*	60.4
243	Euphorbiaceae	*Uapaca guineensis*	*séngui*	97.8
244	Rutaceae	*Vepris louisii*	*tanda*	50.1
245	Verbenaceae	*Vitex grandifolia*	*p'houlou* 2	101.0
246	Annonaceae	*Xylopia hypolampra*	*moundjiè*	31.4
247	Annonaceae	*Xylopia phloidora*	*sangué*	100.9
248	Annonaceae	*Xylopia* sp.	*loabano*	87.9
249	Rutaceae	*Zanthoxylum laurentii*	*djoumgwé*	6.3

We did not include two species of No. 58 and No. 85 into our analysis due to a high ambiguity of identifications; the total number of species, therefore are 247 in the body text.

Appendix II. Individual number (IN) and Basal area (BA) (m^2/ha) of the species by transect

No.	Species	T1		T2		T3		T4		T5		T6		T7		T8		T9		T10		T11		T12		T13		T14		T15		T16	
		IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA
1	*Aeglopsis chevalieri*					1	<0.01																										
2	*Afrostyrax lepidophyllus*	3	0.08	3	0.08	5	0.08	11	0.37	1	<0.01	10	0.10	11	0.35	21	0.42	6	0.13	6	0.10	3	0.04	8	0.14	9	0.29	5	0.10	13	0.26	5	0.09
3	*Afzelia bipindensis*	4	0.06	2	0.04	9	0.14	4	0.05	17	0.18	6	0.39	7	0.10	3	0.05	8	0.08	2	0.02	10	0.15	2	0.01	7	0.07	6	0.05	4	0.03	3	0.13
4	*Albizia ferruginea*					1	0.21																					1	0.14				
5	*Albizia glaberrima*	11	1.79	3	0.53	10	1.63	10	1.08	5	0.98	7	0.77	19	2.69	5	0.90	12	2.03	5	1.40	13	2.29	19	2.04	7	0.30	15	1.30	11	0.92	11	0.94
6	*Allanblackia floribunda*									3	0.03	1	<0.01	8	0.07	2	0.01	2	0.04	5	0.07	5	0.15	7	0.19	6	0.07	5	0.08	1	0.02	2	0.07
7	*Allanblackia gabonensis*											4	0.06	2	0.01																		
8	*Alstonia boonei*	2	0.45	6	0.72	5	0.86	5	0.38	10	1.09	6	0.74	5	1.46	5	1.59	6	1.06	4	1.15	9	2.53	3	1.47	5	1.61	8	2.15	11	2.75	3	0.51
9	*Amanoa bracteosa*	3	0.11	3	0.06	2	0.07	2	0.14	2	0.11	5	0.19	7	0.36	15	0.92	14	1.23	14	0.76	23	0.91	12	0.51	16	0.73	11	0.70	14	0.35	16	0.59
10	*Amphimas pterocarpoides*	8	0.71	1	0.05	1	<0.01	1	<0.01	6	0.40	5	0.30	7	0.42	5	0.53	6	1.25	2	1.73												
11	*Angylocalyx pynaertii*	3	0.03	7	0.08	4	0.12	3	0.07	4	0.05	8	0.05	22	0.41	11	0.22	11	0.65	8	0.09	10	0.18	10	0.17	4	0.23	6	0.35	4	0.04	2	0.05
12	*Angylocalyx vermeulenii*			4	0.03			1	<0.01			3	0.06	5	0.05	1	0.15	4	0.10	3	0.01	2	0.07	2	0.07			2	0.05	5	0.17	6	0.17
13	*Aningeria robusta*	3	0.10	5	0.17	4	0.11	3	0.05	9	0.08	1	0.03																				
14	*Anonidium mannii*	18	0.25	35	1.02	6	0.16	23	0.42	8	0.14	31	0.47	28	0.50	56	0.83	15	0.21	51	1.82	50	0.87	78	1.18	33	0.57	68	1.12	58	1.22	149	2.89
15	*Anopyxis klaineana*	1	<0.01					1	<0.01			1	0.22	1	0.08	2	0.16			1	0.13												
16	*Anthocleista schweinfurthii*																													1	0.01		
17	*Anthonotha macrophylla*											1	<0.01	1	<0.01	9	0.06	6	0.03	5	0.03	3	0.02	10	0.06	4	0.03	6	0.04	2	0.02	4	0.03
18	*Anthonotha* sp.1			1	<0.01																												
19	*Anthonotha* sp.2	1	0.02																														
20	*Antrocaryon klaineanum*			4	0.03	3	0.02			1	0.02	2	0.01	4	0.02			1	<0.01	5	0.13	8	0.04	4	0.14	3	0.05	1	<0.01	9	0.12	1	<0.01
21	*Baillonella toxisperma*							1	0.28			1	3.10					1	0.10														
22	*Barteria fistulosa*	4	0.02	3	0.03	3	0.03	4	0.03	4	0.02	2	0.02	2	0.01	5	0.03	2	0.01	6	0.04	10	0.08	6	0.06	5	0.03	4	0.03	8	0.05	4	0.02
23	*Beilschmiedia mannii*											60	1.40			15	0.22	1	0.06	8	0.19	1	<0.01	1	0.01			1	<0.01				
24	*Beilschmiedia obscura*	5	0.15	2	0.01	4	0.22	2	0.01			1	0.02	1	0.11	4	0.05	3	0.37			1	0.02	1	0.06			1	<0.01				
25	*Beilschmiedia* sp.1	4	0.10																														
26	*Beilschmiedia* sp.2															1	0.03																
27	*Blighia welwitschii*	20	0.37	2	0.03	7	0.09	6	0.10	6	0.04	2	0.04	8	0.20	13	0.11	24	0.52	11	0.44	11	0.10	9	0.06	8	0.20	8	0.75			4	0.02
28	*Bombax buonopozense*	2	0.03	1	0.08																							1	0.34				
29	*Brenania brieyi*																											1	0.10				
30	*Breviea leptosperma*	10	0.75	15	0.26	16	0.51	3	0.18	24	0.50	7	0.16	5	0.12	5	0.06	2	0.03	1	0.02	2	0.03	3	0.25	1	<0.01	2	0.01	1	0.02		
31	*Bridelia grandis*	3	0.02	1	0.05							4	0.08	2	0.05	2	0.04	3	0.29	1	0.03	5	0.38	4	0.06	5	0.44	3	0.03	3	0.46	3	0.03
32	*Buchholzia* sp.									1	0.03																						
33	*Buchnerodendron speciosum*	4	0.04	1	<0.01	2	0.01									1	<0.01							1	<0.01	1	<0.01						
34	*Caloncoba glauca*					1	<0.01	3	0.02	2	0.01					2	0.02	2	0.01	1	<0.01	2	<0.01	1	<0.01			2	0.01			2	<0.01
35	*Caloncoba* sp.	1	<0.01																														
36	*Calpocalyx* sp.	2	0.12			1	0.11																										
37	*Carapa procera*	6	0.07	3	0.04	11	0.09	11	0.13	7	0.09	21	0.47																				
38	*Carapa* sp.			1	<0.01																												

39	*Ceiba pentandra*	2	0.10	2	0.12	1	0.32			5	2.97	1	1.47																				
40	*Celtis adolfi-friderici*	13	0.16	11	0.35	19	1.26	7	0.20	12	0.20	14	0.98	10	0.67	16	0.30	13	0.63	20	0.42	15	0.85	8	0.50	16	0.73	11	0.80	11	0.38	24	1.46
41	*Celtis mildbraedii*	28	1.93	36	2.43	34	1.54	23	0.91	26	1.41	31	1.55	20	0.78	27	1.44	12	0.43	30	1.32	17	0.76	24	1.07	12	0.37	20	0.36	13	1.15	22	1.95
42	*Celtis philippensis*	3	0.17	14	1.22	2	0.38	8	0.33	30	1.49	12	0.80	3	0.17	5	0.29	8	0.32	1	0.01	7	0.16	3	0.13	4	0.08	2	0.07	20	0.89	7	0.39
43	*Celtis tessmannii*	5	0.31	7	0.29	9	0.30	5	0.09			1	0.04	6	0.10	4	0.03	3	0.05	8	0.21	4	0.33	5	0.09	3	0.02	4	0.06	2	0.48	3	0.09
44	*Celtis zenkeri*																					1	0.04										
45	*Chytranthus atroviolaceus*											1	<0.01																				
46	*Citropsis* sp.							1	<0.01	4	0.03																						
47	*Cleistopholis patens*	2	0.02	5	0.13	1	0.03	5	0.10	4	0.17	3	0.16	5	0.17	3	0.06	3	0.13	1	0.04	3	0.09	3	0.03	5	0.05	7	0.16	3	0.04	2	0.10
48	*Coelocaryon preussii*	5	0.20	18	0.43	21	0.43	38	0.75	19	0.40																						
49	*Cola acuminata*	7	0.05	7	0.05	3	0.05	10	0.09	8	0.12	21	0.23	15	0.13	8	0.10	15	0.24	6	0.07	11	0.08	7	0.05	13	0.09	7	0.05	12	0.15	8	0.06
50	*Cola altissima*	4	0.19	3	0.08	1	<0.01			2	0.22			6	0.05	2	0.02	3	0.02	1	<0.01			1	0.02	3	0.02	2	0.03			2	0.03
51	*Cola ballayi*													5	0.07	12	0.12	9	0.18	2	0.01	2	<0.01	5	0.05	1	<0.01	1	<0.01	1	<0.01	1	<0.01
52	*Cola lateritia*	1	0.05	2	0.60	7	0.38	13	0.52	15	3.01	12	0.60	13	0.53	6	0.10	14	0.90	15	0.18	15	0.17	23	1.17	23	0.66	16	0.44	20	1.27	23	2.82
53	*Cola pachycarpa*			1	<0.01																												
54	*Copaifera mildbraedii*			1	0.01	1	0.03	1	<0.01																								
55	*Cordia platythyrsa*	1	0.05	1	0.07							1	<0.01													1	0.33						
56	*Corynanthe pachyceras*	11	0.12	9	0.11	18	0.35	11	0.25	24	0.50	15	0.20	10	0.13	9	0.19	14	0.23	22	0.37	24	0.49	13	0.18	26	0.53	12	0.18	30	0.58	28	0.58
57	*Cylicodiscus gabunensis*	2	1.27	2	0.03			1	<0.01			1	<0.01	2	0.03	5	0.10	3	0.54	2	0.83	8	1.50	4	0.23	6	0.65	3	0.04	10	0.72	5	0.46
58	*Cyttaranthus congolensis*													1	<0.01																		
59	*Dacryodes klaineana*	1	0.05	8	0.18	11	0.20	1	0.02			1	<0.01	7	0.14	6	0.07			1	0.01					2	0.01						
60	*Desplatsia dewevrei*	4	0.11	4	0.07	1	0.01	9	0.19	10	0.13	5	0.11	8	0.07	9	0.08	9	0.36	13	0.13	11	0.17	13	0.15	13	0.12	8	0.07	10	0.13	5	0.06
61	*Desplatsia* sp.															3	0.02	11	0.10	3	0.03			1	<0.01	8	0.04	1	<0.01				
62	*Detarium macrocarpum*	1	<0.01	1	0.92									1	0.83									2	1.04								
63	*Dialium dinklagei*					2	0.17					1	<0.01					1	<0.01					1	0.20								
64	*Dialium* sp.																							1	0.01	2	0.03	1	0.06	1	0.07	1	0.05
65	*Dichaetanthera africana*																							1	<0.01								
66	*Dichaethantera* sp.			1	0.09			1	<0.01	1	0.09					4	0.30																
67	*Dichostemma glaucescens*	17	0.13	15	0.38	16	0.09	11	0.07	3	0.02	5	0.03	36	0.24	37	0.29	57	0.43	27	0.19	57	0.34	44	0.27	74	0.49	35	0.21	2	0.01	17	0.11
68	*Dicranolepis disticha*									2	0.01											1	<0.01										
69	*Dicranolepis* sp.					1	0.02																										
70	*Diospyros abyssinica*									3	0.03																						
71	*Diospyros iturensis*	3	0.04	8	0.08	5	0.05	12	0.11			2	0.02	2	0.02	6	0.07	11	0.07	4	0.02	7	0.03	3	0.02	4	0.02	1	<0.01	1	<0.01	1	<0.01
72	*Diospyros canaliculata*	1	<0.01	2	0.02	3	0.02	2	0.05	5	0.05	1	<0.01					1	<0.01	1	0.01	6	0.08	2	0.01	1	0.01	1	0.02	8	0.09	3	0.04
73	*Diospyros crassiflora*	2	0.02	7	0.40	1	<0.01	2	0.03	3	0.02	2	0.18	7	0.46	14	0.29	9	0.30	11	0.30	8	0.07	10	0.09	17	0.25	16	0.26	13	0.15	19	0.39
74	*Diospyros* sp.1							2	0.05	2	0.04	3	0.09	1	<0.01			3	0.04	1	<0.01									1	0.02		
75	*Diospyros* sp.2	9	0.04	15	0.12	6	0.05	10	0.08	36	0.33	14	0.14	6	0.04	10	0.06	16	0.13	7	0.06	12	0.07	2	0.02	4	0.04	6	0.04	37	0.26	11	0.07
76	*Discoglypremna caloneura*	3	0.05	1	0.01	1	0.05	2	0.25	4	0.10	1	0.06	4	0.02	4	0.07	1	0.01	3	0.11	1	0.11	2	0.03	2	0.02			2	0.03	3	0.04
77	*Distemonanthus benthamiana*	1	<0.01	1	0.02	1	<0.01	1	<0.01	1	0.02					1	0.18	5	0.84			1	<0.01	5	0.07	1	<0.01	1	0.20	2	0.09		
78	*Donella ubanguiensis*	1	<0.01																														
79	*Drypetes* sp.1	5	0.03	20	0.29	5	0.03	9	0.07	32	0.22	10	0.08	31	0.22	14	0.08	26	0.19	9	0.04	17	0.09	16	0.07	11	0.06	4	0.02	15	0.11	6	0.05

Appendix II. (continued)

No.	Species	T1		T2		T3		T4		T5		T6		T7		T8		T9		T10		T11		T12		T13		T14		T15		T16	
		IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA
80	*Drypetes gossweileri*	3	0.05	3	0.28	16	0.88	7	0.23	1	0.03	4	0.03	3	0.04	3	0.03	1	0.02	7	0.47	5	0.12	2	<0.01	2	0.04	4	0.12	5	0.11	5	0.03
81	*Drypetes ituriensis*	6	0.08	1	<0.01	9	0.09	1	0.02	4	0.04	1	<0.01	7	0.06	1	0.02	2	0.02	1	<0.01							1	<0.01	1	0.02		
82	*Drypetes principum*	1	<0.01																														
83	*Drypetes* sp.2	2	<0.01																														
84	*Duboscia macrocarpa*	13	0.18	10	0.58	7	0.84	15	0.65	16	0.89	12	0.51	5	0.48	7	0.94	9	0.25	9	0.47	5	0.74	18	1.49	14	2.23	9	0.20	7	0.81	16	1.80
85	*Euphorbia drupifera*	1	<0.01			1	<0.01			2	<0.01																						
86	*Enantia chlorantha*	2	0.01	6	0.13	3	0.05	5	0.04	4	0.08	5	0.19	7	0.31	4	0.06	5	0.16	2	0.04	4	0.11	7	0.14	3	0.04	3	0.04			2	0.02
87	*Entandrophragma candollei*	2	0.01	1	<0.01	1	<0.01					1	0.04			1	0.04			2	0.02	2	0.02	3	0.03	3	0.02	3	0.46	4	0.07	7	0.15
88	*Entandrophragma cylindricum*	9	2.62	11	2.24	8	0.77	3	1.08	2	0.15	6	0.69	8	0.85	9	0.56	7	0.73	15	2.38	5	1.07	12	2.84	8	1.23	6	1.69	6	1.22	3	0.02
89	*Entandrophragma utile*																															1	1.47
90	*Eribroma oblongum*	1	0.02	2	0.04	3	0.68	3	0.04	3	0.40	2	0.08	3	0.29	7	0.08	4	0.06	7	0.26	9	0.62	8	0.72	7	0.19	3	0.06	7	0.31	1	0.06
91	*Erythrophleum suaveolens*	3	0.34	2	0.32	4	1.18	1	0.03			3	0.51	2	0.22	4	0.62	4	0.50	3	0.52	3	0.85	4	0.39	3	0.31	3	0.65	3	1.27	2	0.59
92	*Fagara heitzii*	3	0.01																														
93	*Fagara macrophylla*																							2	0.07					1	<0.01		
94	*Fernandoa adolfi-friderici*	2	0.06	4	0.23			4	0.24			5	0.37	1	0.02															3	0.07		
95	*Ficus macrosperma*	2	0.16																														
96	*Ficus etrangulator*	1	0.03					2	0.08	3	0.12	2	0.09	4	0.36	7	1.15	3	0.34	2	0.06	3	0.06	7	0.17	1	0.03	8	0.62			10	0.48
97	*Ficus exasperata*			2	0.02					1	<0.01	15	0.20	1	0.01			1	<0.01	1	0.07			1	0.02								
98	*Ficus mucuso*	16	0.13			1	0.16																										
99	*Ficus* sp.			3	0.40	2	0.12	1	0.04	1	0.01			1	<0.01	1	<0.01																
100	*Funtumia africana*	5	0.09	6	0.12	4	0.09	4	0.12			5	0.12	4	0.12	6	0.17	4	0.02	5	0.15	9	0.19	6	0.08	10	0.21	8	0.19	6	0.11	8	0.34
101	*Funtumia elastica*	7	0.11			1	<0.01			15	0.22					1	0.03																
102	*Gambeya boukokoensis*							3	0.05	1	0.02	2	0.33	2	0.03			2	0.54			2	0.04	1	<0.01					2	<0.01	3	0.04
103	*Gambeya lacourtiana*	2	0.02			1	<0.01	4	0.37	5	0.31	4	0.09	5	0.54	12	0.34	9	0.11	13	0.15	11	0.10	13	0.31	20	1.23	11	0.10	8	0.12	13	0.27
104	*Gambeya perpulchra*							1	<0.01																								
105	*Garcinia afzelii*	1	<0.01			5	0.03	2	0.03	1	<0.01																						
106	*Garcinia kola*	2	0.02											1	<0.01																		
107	*Garcinia lucida*			1	0.01																												
108	*Garcinia punctata*	3	0.03	4	0.05	8	0.06	2	0.02			2	0.02	1	<0.01			1	0.02			1	<0.01			1	0.01	1	<0.01	1	0.03	3	0.02
109	*Garcinia* sp.1	1	<0.01	1	0.02			6	0.07	7	0.14																						
110	*Garcinia* sp.2					2	<0.01	1	<0.01	1	0.03	1	0.02			7	0.26			3	0.05	2	0.06	4	0.05	2	0.14			2	0.03		
111	*Glyphaea brevis*							1	<0.01							1	<0.01			2	0.02	8	0.04	7	0.04	4	0.02	7	0.03	4	0.02	4	0.03
112	*Guarea cedrata*	12	0.22	9	0.28	14	0.66	8	0.06	2	0.01	12	0.16	25	0.38	20	0.38	17	0.20	32	0.39	19	0.45	24	0.63	19	0.45	15	0.17	19	0.36	11	0.28
113	*Guarea* sp.	1	0.01	1	0.02	2	0.02	2	0.02	1	<0.01																						
114	*Hallea ledermannii*			1	<0.01			1	<0.01																								
115	*Hallea stipulosa*	4	0.25			2	0.11	2	0.01			1	<0.01			10	0.70	3	0.06			1	0.06	1	0.10			2	0.39				
116	*Heisteria zimmereri*	1	<0.01			3	0.03	1	0.06	1	<0.01	2	0.01	6	0.06			10	0.12	4	0.05	6	0.05	4	0.02			1	<0.01	3	0.03		
117	*Hexalobus crispiflorus*	14	0.42	19	0.86	9	0.40	4	0.25	8	0.33	17	0.33	17	0.30	21	0.70	15	0.28	12	0.53	17	0.38	18	0.27	13	0.34	7	0.22	15	0.54	23	0.61

118	*Holoptelea grandis*	1	0.01	2	0.51	1	0.09			2	0.13	1	0.22	1	0.18																	1	0.03
119	*Homalium africanum*																	1	<0.01														
120	*Homalium aylmeri*															2	0.04					1	0.02					1	0.02	2	0.04	1	0.02
121	*Homalium letestui*	8	0.17	2	0.09			8	0.14	7	0.14	4	0.02	10	0.09	2	0.03	2	0.02	2	0.15					1	<0.01					1	0.03
122	*Homalium* sp.	3	0.08	6	0.11	5	0.09	4	0.06	1	0.02	8	0.12	10	0.15	21	0.40	16	0.29	14	0.16	23	0.35	4	0.03	14	0.36	3	0.20	10	0.13	8	0.07
123	*Hunteria umbellata*					2	0.02			1	0.01					2	0.02	1	<0.01			1	<0.01	2	0.01			2	0.02	1	<0.01	2	0.05
124	*Irvingia excelsa*	2	0.37					3	0.21	2	0.01	1	<0.01	3	0.12	4	0.38	3	0.42	2	0.19	1	0.05	1	0.02	2	0.32	3	0.20			4	0.26
125	*Irvingia gabonensis*	4	0.06	4	0.46	5	0.61	17	0.91	1	0.02	5	0.06	8	1.11	14	1.28	7	0.47	10	0.33	3	0.05	7	0.19	7	0.28	3	0.22	6	0.39	5	0.39
126	*Irvingia grandifolia*	2	0.74	2	0.15	3	0.02			1	<0.01	3	0.02	8	1.20	4	0.55	2	0.03	1	0.11	9	2.29	4	0.32	2	0.30	3	0.52	2	0.14	1	<0.01
127	*Irvingia robur*					1	0.09	1	0.32			1	0.16																				
128	*Irvingia* sp.	1	0.08	3	0.03	3	0.67	1	0.04																								
129	*Keayodendron bridelioides*	2	0.12	5	0.16	3	0.17	2	0.13	8	0.47	4	0.42	2	0.02									1	0.03								
130	*Khaya anthotheca*									1	0.08			1	<0.01							1	0.41										
131	*Khaya grandifolia*	1	0.02	1	0.02					1	<0.01			3	0.03			2	0.03					1	0.03							2	0.03
132	*Khaya ivorensis*							1	0.21									1	0.11														
133	*Khaya* sp.	1	<0.01																														
134	*Klainedoxa gabonensis*	3	0.03	7	0.32	5	0.02	2	0.67	11	1.23	8	0.48	13	2.49	12	0.95	11	1.86	8	2.66	12	0.50	8	1.56	7	0.45	8	0.94	4	0.57	4	0.16
135	*Lannea welwitschii*	5	0.16	3	0.08	6	0.48	1	<0.01	10	0.73	7	0.15	4	0.08	6	0.14	5	0.13	4	0.05	7	0.29	4	0.20	1	<0.01	1	0.14	3	0.12		
136	*Lasersisia* sp.	1	0.03	1	<0.01	1	0.02	1	<0.01	1	<0.01	1	<0.01	6	0.06	1	0.01	4	0.06	10	0.09	1	<0.01	5	0.05	2	0.03	5	0.07	1	0.02	3	0.03
137	*Lasiodiscus mannii*	31	0.25	10	0.08	43	0.32	12	0.09	7	0.05	18	0.13	43	0.30	32	0.21	51	0.41	20	0.26	21	0.15	18	0.11	35	0.40	2	0.01	1	<0.01	2	0.01
138	*Lecaniodiscus* sp.			1	0.01																												
139	*Lepidobotrys staudtii*	7	0.09	8	0.16	4	0.07	8	0.18	5	0.17	6	0.09	13	0.19	15	0.29	11	0.20	12	0.22	6	0.21	7	0.11	5	0.06	11	0.17	2	0.01	8	0.10
140	*Leptonychia* sp.							1	<0.01											2	0.02									1	<0.01		
141	*Lindackeria dentata*	1	<0.01	1	<0.01			1	<0.01	12	0.05	3	0.02	1	<0.01	1	<0.01	2	<0.01	1	<0.01	3	0.02	2	<0.01					3	0.03	3	0.01
142	*Macaranga saccifera*	11	0.11	7	0.08	5	0.20	5	0.09	16	0.15	10	0.20	5	0.04	10	0.09	32	0.31	10	0.20	13	0.12	22	0.44	11	0.23	8	0.11	33	0.20	5	0.21
143	*Macaranga spinosa*															1	<0.01																
144	*Maesopsis eminii*	3	0.04					2	0.03	1	0.02	3	0.01	1	0.02	2	0.03			2	0.02			1	<0.01	1	<0.01			2	0.01	3	0.56
145	*Mallotus oppositifolius*	1	<0.01	1	<0.01							1	<0.01			4	0.02			1	<0.01	3	0.01	1	<0.01			1	<0.01				
146	*Mansonia altissima*	3	0.51	7	0.87	3	0.19	2	0.05	19	1.55	6	1.07	3	0.17	1	0.04	6	0.46	1	0.06	2	0.23							8	1.03	4	0.44
147	*Maranthes glabra*					3	0.87	5	0.07															1	0.63								
148	*Margaritaria discoidea*	7	0.10	1	<0.01	4	0.28	2	0.07	2	0.59	10	0.29			1	<0.01	1	0.11	1	<0.01			2	0.02			1	0.50	3	0.16	3	0.49
149	*Markhamia lutea*	3	0.07	2	0.05	5	0.24	1	0.03	29	1.09	8	0.20	7	0.22	2	0.07	11	0.31	4	0.08	4	0.11	4	0.09	6	0.05	9	0.21	8	0.16	10	0.25
150	*Meiocarpidium lepidotum*	8	0.10			1	<0.01	1	0.01	23	0.22	15	0.16	16	0.20	3	0.04	12	0.19	5	0.03	36	0.32	15	0.15	26	0.27	29	0.33	16	0.17	11	0.15
151	*Mildbraediodendron excelsum*											1	<0.01	1	0.53	2	0.02			1	0.20							1	0.06				
152	*Milicia excelsa*	8	0.07	9	0.25	7	0.46	5	0.42	1	0.02	3	0.15	3	0.09	1	0.09	1	0.30	3	0.24	2	0.42	1	0.11			2	0.42	3	0.45	2	0.56
153	*Millettia* sp.	1	<0.01			3	0.05																										
154	*Millettia sanagana*	2	<0.01	1	<0.01					6	0.02																						
155	*Musanga cecropioides*	85	2.89	31	1.80	14	1.19	71	2.34	117	2.89	34	2.92	55	3.69	30	2.53	68	2.12	35	1.87	16	0.81	9	1.05	6	0.22	13	0.24	12	0.11	3	0.56
156	*Mussaenda* sp.							3	0.03	2	0.09																						
157	*Myrianthus arboreus*	6	0.08	7	0.13	8	0.19	8	0.09	21	0.29	9	0.20	4	0.06	16	0.26	11	0.16	8	0.16	15	0.33	28	0.55	17	0.32	15	0.24	9	0.14	11	0.25
158	*Neoboutonia glabrescens*					1	<0.01					1	<0.01	6	0.16	6	0.15	10	0.29	8	0.25	4	0.13	1	0.03	9	0.13	8	0.17	1	0.02	1	<0.01

Appendix II. (continued)

No.	Species	T1		T2		T3		T4		T5		T6		T7		T8		T9		T10		T11		T12		T13		T14		T15		T16	
		IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA
159	*Neosloetiopsis kamerunensis*	23	0.11	6	0.02	13	0.05	4	0.02	5	0.02	9	0.04	19	0.10	15	0.07	7	0.04	7	0.03	5	0.02	2	0.01	5	0.02	2	<0.01	10	0.04		
160	*Nesogordonia papaverifera*	9	0.10	10	0.27	8	0.09	9	0.24	12	0.15	11	0.13	3	0.05	6	0.06	9	0.13	8	0.08	11	0.17	10	0.64	6	0.08	5	0.12	7	0.28	13	0.18
161	*Ochthocosmus africanus*	3	0.01	1	0.12	6	0.16																									3	0.13
162	*Octobolus* sp.					2	0.03					4	0.02	1	<0.01	3	0.04	3	0.01	1	<0.01	4	0.06										
163	*Octobolus spectabilis*											1	<0.01			7	0.04	3	0.02	2	<0.01	1	<0.01	1	<0.01	2	0.01						
164	*Oddoniodendron micranthum*					8	0.11	2	0.02	8	0.21	2	0.05	1	0.02	1	0.01	3	0.05	1	0.04	2	0.04	1	0.01	4	0.10	4	0.06	3	0.04	2	0.04
165	*Omphalocarpum lecomteanum*									1	<0.01																						
166	*Ongokea gore*	3	0.38			3	0.26	1	0.05									1	0.11														
167	*Ophiobotrys zenkeri*	3	0.19	2	0.09	2	0.36	1	<0.01	1	0.09	5	0.14	8	0.10	6	0.23	13	0.43	7	0.19	8	0.13	6	0.40	10	0.24	7	0.37	6	0.12	17	0.56
168	*Oxystigma oxyphyllum*	2	0.53	1	0.12	1	<0.01	1	0.23					1	0.73															1	0.54		
169	*Pachyelasma tessmannii*					1	0.17					1	0.67			1	0.76									1	0.85						
170	*Pachypodanthium staudtii*	5	0.06	4	0.03	1	<0.01	2	0.02	3	0.03	7	0.07	13	0.11	3	0.16	8	0.09	20	0.17	6	0.05	8	0.05	12	0.09	19	0.18	5	0.05	5	0.09
171	*Panda oleosa*	11	0.31	14	0.24	6	0.22	12	0.36	8	0.23	11	0.33	13	0.46	18	0.37	17	0.33	17	0.40	8	0.23	19	0.30	9	0.20	13	0.32	7	0.30	14	0.32
172	*Parinari excelsa*											1	<0.01																				
173	*Parkia bicolor*	4	0.03	3	0.56	3	0.49																									3	0.94
174	*Pausinystalia johimbe*	13	0.23	12	0.26	9	0.27	9	0.18			15	0.41	26	0.52	24	0.43	18	0.25	16	0.35	3	0.09	18	0.26	8	0.06	17	0.37	18	0.25	10	0.14
175	*Pavetta* sp.	13	0.20			10	0.14	3	0.07																								
176	*Penianthus longifolius*			1	<0.01																												
177	*Pentaclethra macrophylla*	11	1.05	8	0.23	13	1.35	15	0.85	3	0.28	10	0.50	30	1.71	20	0.98	8	0.46	16	1.71	9	0.24	29	2.07	11	1.16	17	0.71	8	0.47	11	0.32
178	*Pericopsis elata*	3	0.30					3	0.42			1	0.25			1	0.04					1	0.38	1	0.16					4	0.95		
179	*Petersianthus macrocarpus*	7	0.30	2	0.48	5	0.15	3	0.02			6	0.74	12	0.33	9	0.18	14	0.58	11	0.39	6	0.40	12	0.67	11	0.56	14	0.94	5	0.35	11	0.58
180	*Picralima nitida*	4	0.03	1	<0.01	1	<0.01	8	0.08	5	0.06	2	0.02	6	0.10	5	0.06	4	0.03	2	0.02	1	<0.01	2	0.01	4	0.16			2	0.06		
181	*Piptadeniastrum africanum*	5	0.07	1	0.46	9	1.16	3	0.48			4	0.23	8	1.82	4	0.12	3	0.04	5	0.78	2	0.14	4	0.09	1	0.04	8	0.17	2	0.57	1	0.34
182	*Plagiostyles africana*											2	0.04	4	0.05	1	<0.01	2	0.01	1	<0.01			1	<0.01			1	<0.01	1	0.01		
183	*Poga oleosa*																					1	0.24										
184	*Polyalthia suaveolens*	19	0.54	18	0.53	18	0.70	26	0.76	6	0.09	34	0.81	25	1.25	48	1.13	29	0.74	35	0.70	19	0.49	31	0.73	26	0.67	50	1.60	24	0.74	25	0.73
185	*Pseudospondias microcarpa*					1	<0.01	5	0.04	7	0.48	5	0.10	13	0.78	5	0.10	2	0.04			5	0.23	9	0.25	7	0.11			6	0.18	1	0.09
186	*Psychotria avakubiensis*	4	0.04																														
187	*Psychotria peduncularis*													1	<0.01	1	<0.01													1	<0.01		
188	*Psychotria* sp.1							3	0.02																								
189	*Psychotria* sp.2	6	0.03	3	0.02			1	<0.01	5	0.05			1	<0.01					2	0.01	1	<0.01			2	0.02			1	0.01		
190	*Psychotria vogeliana*	1	<0.01							2	0.06	1	<0.01																				
191	*Pteleopsis hylodendron*	1	0.06	1	0.04			2	0.07			1	0.20	4	0.11	5	0.56			6	0.53	2	0.26	2	0.10	7	0.64	4	0.98			5	0.89
192	*Pterocarpus mildbraedii*																							2	0.06	5	0.21	10	0.36	17	1.24	11	0.41
193	*Pterocarpus soyauxii*	8	1.16	24	1.60	10	0.32	11	0.40	17	0.70	10	0.50	9	0.85	12	1.08	9	0.19	6	0.41	5	0.08	10	0.15	7	1.17	1	<0.01				
194	*Pterygota bequaertii*			3	0.09	2	0.27																					2	0.08				

195	*Pterygota macrocarpa*	1	0.02																														
196	*Pycnanthus angolensis*	19	0.72	17	0.24	24	0.76	5	0.22	11	0.17	12	0.29	19	0.97	11	0.41	18	0.95	20	1.05	16	1.36	16	0.34	16	0.56	7	0.09	2	0.01	9	0.09
197	*Rauvolfia caffra*	5	0.20			1	0.04	3	0.12	1	<0.01	1	0.06			1	<0.01					1	0.24										
198	*Rauvolfia grandifolia*	7	0.15							1	<0.01	2	0.13																			1	<0.01
199	*Rauvolfia macrophylla*																	1	0.09														
200	*Rauvolfia vomitoria*	2	<0.01	3	0.03									1	0.01	1	<0.01											1	0.01			2	0.06
201	*Rhodognaphalon brevicuspe*							1	<0.01																								
202	*Ricinodendron heudelotii*	6	1.16	2	0.59	7	1.59	9	1.40	10	1.29	6	0.46	16	4.23	6	0.79	19	4.98	4	1.18	6	1.85	8	1.14	10	3.86	3	0.41	7	1.08	7	2.05
203	*Rinorea aylmeri*	3	0.04			3	0.03	1	<0.01	2	<0.01			4	0.02							4	0.07							1	<0.01	1	<0.01
204	*Rinorea elliotii*	26	0.23	28	0.24	21	0.13	30	0.21	22	0.20	39	0.31	25	0.18	34	0.22	12	0.06	36	0.23	15	0.08	39	0.26	15	0.09	41	0.25	12	0.10	25	0.22
205	*Rinorea lepidobotrys*									3	0.01	1	<0.01																	1	<0.01		
206	*Rinorea* sp.			20	0.39	4	0.10	18	0.28	32	0.55	18	0.21	16	0.24	12	0.18	22	0.31	17	0.17	17	0.21	14	0.16	25	0.32	27	0.27	22	0.28	17	0.25
207	*Samanea dinklagei*	12	0.15	1	0.16																												
208	*Santiria trimera*	3	0.03					4	0.04	11	0.25	8	0.09	22	0.21	8	0.08	15	0.15	23	0.29	1	0.01			2	0.03						
209	*Scorodophloeus zenkeri*							2	0.04	2	0.16					23	0.92							12	0.52	11	0.45					34	1.32
210	*Spondianthus preussii*													53	1.45	59	0.88	46	0.82	74	1.14	29	0.36	31	0.59	37	0.86	28	0.44	2	0.04	3	0.05
211	*Staudtia kamerunensis*	25	0.29	16	0.28	22	0.23	31	0.35	35	0.27	30	0.32	45	0.51	42	0.45	53	0.50	54	0.50	25	0.19	33	0.30	21	0.19	20	0.13	10	0.08	12	0.07
212	*Stemonocoleus micranthus*	2	0.10			2	0.49																										
213	*Sterculia subviolacea*							3	0.06	2	0.14	4	0.15	9	0.54	6	0.15	9	0.24	5	0.08	5	0.05	8	0.12	10	0.53	6	0.27	10	0.10	8	0.25
214	*Sterculia tragacantha*	2	<0.01	7	0.10	5	0.34			4	0.13															1	0.04						
215	*Strombosia pustulata*	10	0.15	12	0.19	7	0.10	14	0.31	43	0.64	35	0.59	37	0.68	40	0.73	31	0.77	25	0.69	30	0.43	22	0.44	16	0.25	17	0.48	16	0.33	29	0.77
216	*Strombosiopsis* sp.			7	0.15					14	0.45	6	0.11	6	0.08	2	0.06	4	0.09			4	0.18	1	<0.01								
217	*Strombosiopsis tetrandra*	9	0.29	23	0.38	7	0.25	8	0.12	20	0.47	14	0.35	13	0.19	13	0.75	16	0.59	13	0.35	34	1.04	10	0.22	18	0.47	13	0.26	16	1.15	14	0.42
218	*Strychnos ternata*	1	<0.01					1	0.02	2	0.01																						
219	*Strychnos* sp.2									1	0.01																						
220	*Swartzia fistuloides*	1	0.02																			1	0.03										
221	*Swartzia* sp.	1	<0.01			2	<0.01																							1	<0.01		
222	*Synsepalum aubrevillei*			1	<0.01					3	0.05	1	<0.01	5	0.07	1	0.02	3	0.05	3	0.03	5	0.05			2	0.02	3	0.05	2	0.04	1	0.02
223	*Syzygium rowlandii*							1	0.09									1	0.03							1	0.37	2	1.02				
224	*Tabernaemontana crassa*	4	0.06	9	0.08			3	0.02	5	0.04	1	0.01			1	0.01	2	<0.01											1	<0.01		
225	*Terminalia superba*	16	6.14	18	5.32	8	1.65	20	4.94	12	3.45	28	5.05	15	6.06	17	5.43	8	1.02	10	2.14	11	2.40	14	2.25	18	5.40	15	2.38	16	2.57	19	2.86
226	*Tessmania africana*			1	0.02	1	0.04					1	<0.01			1	0.32													1	0.02		
227	*Tetrapleura tetraptera*	2	0.03	1	0.04	2	0.01	6	0.11	5	0.12	2	0.05	3	0.05	4	0.16	6	0.15	4	0.08	2	0.02	3	0.19	2	0.04	1	0.05	3	0.17	7	0.29
228	*Tetrorchidium didymostemon*	5	0.03			1	<0.01	1	<0.01			1	0.04	2	0.03	8	0.04	5	0.04	1	0.03					2	0.06	2	0.08				
229	*Thomandersia hensii*			1	<0.01																			1	<0.01	1	<0.01	3	0.01				
230	*Thomandersia laurifolia*							1	<0.01																								
231	*Tieghemella africana*			2	1.53							1	0.02					2	1.77	2	0.63	1	0.45	1	0.06	1	<0.01			1	2.83	4	2.19
232	*Trema orientalis*	12	0.08							8	0.12	2	0.05					1	<0.01														
233	*Trichalysia* sp.1					5	0.04	1	0.05					10	0.09	1	0.01	3	0.03	1	<0.01			2	0.01							1	0.02
234	*Trichalysia* sp.2																	1	<0.01														
235	*Trichilia heudelotii*	29	0.17	19	0.11	40	0.43	49	0.45	57	0.39	32	0.29	54	0.60	28	0.20	42	0.31	42	0.30	58	0.44	52	0.37	36	0.35	26	0.15	36	0.28	33	0.27
236	*Trichilia welwitschii*	11	0.19	6	0.05	6	0.17	11	0.13	6	0.09	11	0.23	23	0.48	27	0.49	30	0.37	32	0.48	22	0.39	39	0.49	26	0.51	30	0.57	21	0.40	17	0.29

Appendix II. (continued)

No.	Species	T1		T2		T3		T4		T5		T6		T7		T8		T9		T10		T11		T12		T13		T14		T15		T16	
		IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA	IN	BA
237	*Trichoscypha acuminata*	5	0.04	2	<0.01	3	0.02	2	0.03	1	<0.01	2	0.02	1	<0.01	2	0.02	5	0.03	6	0.05	1	0.01	5	0.11	4	0.04	3	0.02	3	0.02	3	0.02
238	*Tridesmostemon omphalocarpoides*									2	0.02					2	0.03			4	0.05							1	0.03	3	0.06		
239	*Trilepisium madagascariense*	21	1.36	24	0.84	18	0.65	14	0.69	74	3.45	28	1.18	26	1.42	14	0.68	13	0.82	6	0.69	8	0.49	6	0.30	14	0.81	5	0.31	10	0.63	3	0.07
240	*Triplochiton scleroxylon*	1	0.01	14	4.12	2	0.58	7	1.34	14	3.64	14	5.39											4	1.35					15	4.15	16	4.85
241	*Uapaca guineensis*	19	0.98	4	0.26	16	1.21	21	0.98	1	0.06	8	0.25	33	3.33	27	1.49	18	0.86	27	1.09	21	1.23	40	1.42	27	1.70	25	1.45	5	0.29		
242	*Vepris louisii*	1	0.01			6	0.05	1	<0.01			1	<0.01	1	<0.01			1	0.02	3	0.02					1	<0.01						
243	*Vitex grandifolia*	10	0.26	1	0.02	8	0.17	4	0.06	2	0.03	1	0.02	6	0.23	15	0.35	4	0.05	8	0.19	9	0.21	8	0.12	6	0.20	7	0.09	5	0.21	11	0.26
244	*Xylopia hypolampra*																			1	0.11			4	0.47	1	0.25	1	0.07	1	0.15		
245	*Xylopia phloidora*	3	0.11	2	0.08	1	0.02	1	0.03	1	<0.01	2	0.04	6	0.17	6	0.12	9	0.29	7	0.14	2	0.02	6	0.05	8	0.15	4	0.17	1	0.04	10	1.93
246	*Xylopia* sp.	5	0.10	5	0.09	2	0.05					3	0.08	6	0.07	2	0.08	7	0.15	4	0.08	2	0.03	3	0.02	5	0.07	1	0.02	1	0.02	3	0.02
247	*Zanthoxylum laurentii*													1	0.05																		