THE VARIETY OF FOREST VEGETATIONS IN SOUTH-EASTERN CAMEROON,WITH SPECIAL REFERENCE TO THE AVAILABILITY OF WILD YAMS FOR THE FOREST HUNTER-GATHERERS

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ABSTRACT Annually reproducing wild yam species (*Dioscorea praehensilis* and *D. semperflorens*) are considered to be the most important food for hunter-gatherer subsistence in terms of energy sources in the central African rainforests. Despite their importance in the rainforest hunter-gatherer's diet, annual yams are not widely distributed over the forest but locally concentrated in particular areas. In this study, I carried out vegetation censuses in two areas, one with abundant annual yam patches and one with few in southeastern Cameroon. The results indicate that the area with abundant annual yam patches is closely associated with the semi-deciduous forest, while the area with few patches was associated with the evergreen forest. Thus the difference in vegetation seems to affect the distribution and the availability of annual yam patches. However, recent studies have found evidence of historical human interventions that may have influenced the formation of semi-deciduous forest over the Congo Basin. Therefore, the degree of human influence on the distribution of the semi-deciduous forest itself, as well as that of annual yam patches, should be carefully examined to explain the abundance of annual yams.

Key Words: Annual yam; Baka hunter-gatherers; Food availability; Forest landscape; Vegetation; Semi-deciduous forest.

INTRODUCTION

In the forests of Cameroon, 15 to 17 species of wild yam (the genus *Dioscorea*) grow (Hladik & Dounias, 1993; Dumont et al., 1994; Hamon et al., 1995). They are divided into two groups, "annual yams" and "perennial yams," classified according to the reproductive cycle of aerial and underground parts of the plant. Annual yams, *D. praehensilis* and *D. semperflorens*, have annual tubers, of which starch reserves reach the maximum during the dry season (Hamon et al., 1995; McKey et al., 1998; Dounias, 2001; Yasuoka, 2006a, 2009). Perennial yams, *D. mangenotiana*, *D. burkilliana* and most other edible yams, have perennial tubers (Hamon et al., 1995) that reach the maximum size relatively irregularly. Hence they are harvestable throughout the year (Dounias, 2001; Yasuoka, 2006a).

Wild yams, including both annual and perennial yams, have been subject to investigation, because their availability is considered to strongly affect the viability of hunter-gatherer subsistence in the rainforests. In the earlier studies (e.g. Turnbull, 1962), most researchers thought that the African forest hunter-gatherers, the so-called “Pygmies,” were the original inhabitants of the central African rainforests, and that they had lived a nomadic way of life depending totally on forest products before they could access agricultural crops in the recent past. In the 1980s, some researchers disputed this traditional understanding, and doubted the viability of pure hunter-gatherer subsistence in the rainforests. Hart & Hart (1986: 41), who conducted ecological studies in the Ituri Forest in the northeastern Congo Basin, pointed out that the Ituri rainforest could not provide the Mbuti hunter-gatherers with sufficient energy sources for more than five months a year, particularly during the dry and early rainy seasons when forest food resources become extremely scarce. Their study has encouraged the revisionist argument on the origin of forest hunter-gatherers (e.g. Headland, 1987; Bailey et al., 1989; Bailey & Headland, 1991). Even though rainforests are generally known as the most productive ecosystem with an amazing diversity of flora and fauna, they insisted that food resources for human subsistence in rainforests were rather scarce, spatially dispersed, and seasonally variable, particularly in terms of energy sources. Then, based on various studies on rainforest hunter-gatherers over the world, Headland (1987) posed the “wild yam question,” because wild yams could be considered the most important key resource, in that their availability strongly affected the viability of pure hunter-gatherer subsistence in the rainforests. His view was that the yams were insufficient as the energy source, and Bailey et al. (1989) also argued it was unlikely that the hunter-gatherers currently living in the forests had inhabited the area before agricultural crops became available.

Concerning this issue of the African rainforests, Bahuchet et al. (1991) and Hladik & Dounias (1993), who conducted their research in the northwestern Congo Basin, argued that Hart & Hart’s conclusion could not be extended to other parts of the Congo Basin, and postulated that in some areas of the central African forests wild yams may supply sufficient energy to hunter-gatherers even in the dry season. However, they did not provide evidence to refute the abovementioned revisionist argument. In fact, Kitanishi (1995: 116-117), who studied the Aka belonging to the same linguistic group as the one studied by Bahuchet et al. (1991), showed that the Aka mostly depended on agricultural crops during the dry season,(1) although he did not support the revisionist argument.

More recently, Mercader and his colleagues excavated late Pleistocene and early Holocene sites in the northeastern and northwestern Congo Basin, and pointed out the existence of ancient hunter-gatherers groups in the lowland forests in the Congo Basin prior to the introduction of farming to the region (Mercader, 2003a, 2003b; Mercader & Martí, 2003). However, the food resources that sustained them are still open to question. Mercader (2003a) pointed out that these ancient hunter-gatherers also exploited the mammal species, nuts, and fruits similar to those used by present hunter-gatherers, whereas the abundance of these resources examined by Hart & Hart (1986) was found to be insufficient for supporting the present hunter-gatherer subsistence.

I agree with Headland (1987) in that wild yams are the key foodstuff to this issue. Sato (2001, 2006), for example, has shown that higher densities of wild yams exist in the southeastern Cameroonian rainforest where the Baka live than those estimated for other parts of the Congo Basin (Hladik et al., 1984; Hart & Hart, 1986; Hladik & Dounias, 1993). Yasuoka (2006a) also provided counter-evidence to Hart & Hart's argument, based on observations of food intake during a long-term foraging expedition (*molongo*, in Baka vernacular) carried out by the Baka. In this particular case, nearly a hundred people stayed in an area with abundant annual yam patches for as long as two months in the dry season. During this period, the Baka in *molongo* camps subsisted on wild food, particularly annual yams.

In addition, Yasuoka (2009) points out the peculiar distribution of annual yams. Despite their importance for the hunter-gatherer's diet, annual yams are not widely distributed over the forest but locally concentrated, often near and around villages abandoned about several decades ago. He thus suggests the possibility that human activities have partly, if not totally, contributed to the expansion of wild yam distribution into the inner forest.

In order to examine the process of increase in the availability of annual yams, and to say that it was influenced by human activities, further studies are needed to reveal the spatial and diachronic relationships among annual yam patches, the disturbed vegetation allowing sunlight to reach the forest floor, and vestiges of human activities over the Congo Basin. This paper compares the compositions of the vegetation inventoried in an area with abundant annual yam patches to those in an area with few, and analyzes the relationship between the characteristic forest vegetation and the distribution of annual yams.

STUDY AREA AND PEOPLE

The field research for this study was conducted in southeastern Cameroon (Fig. 1). The study area is densely wooded with gently rolling hills at an altitude of 400-600 m above sea level. The vegetation is classified as a mixture of evergreen and moist semi-deciduous forests (Letouzey, 1985). The mean annual temperature is around 25 degrees Celsius, which tends to be constant year-round. Annual rainfall at Yokadouma about 100 km northeast of the study site varied from 1291-1680 mm in the years 1983-1993, with the average at 1518 mm (Cameroon Environmental Watch, n.d.). The mean monthly rainfall in the dry season from December to February is less than 50 mm, whereas that in the rainy season (from March to November) is normally more than 100 mm. Rain falls less in June and July than in other months of the rainy season.

The Baka people live in southeastern Cameroon, northwestern Congo-Brazzaville, and northeastern Gabon. Their population is estimated to be from 25,000 to 40,000 (Hewlett, 1996; Joiris, 1998). Thirteen groups of Bantu speaking cultivators and two groups of Adamawa-Eastern speaking cultivators are associated with the Baka. The Baka maintain close economic and social relationships with their neighboring cultivators, as seen in other forest hunter-gatherers in central Africa.

The study site, Zoulabot Ancien, is located halfway between two main roads, which run north to south in the East Province of Cameroon. The total Baka population of Zoulabot Ancien in February 2005 was 160 individuals, comprising 39 households, divided into five patrilineal descent groups (*ye*). According to the elders of the village, it was their parents that started to live around the settlement, namely they settled in the 1950s or 1960s. The population of the Konabembe (an ethnic group of the Bantu cultivators) living in the village at this time was only five, because in the 1970s most of them migrated to Zoulabot Nouveau or other villages along the main road on the eastern side of the Boumba River.

The Baka life is classified into five modes: at the village, at the snare hunting camp, during the long-term foraging expedition (*molongo*), during the gun hunting expedition, and visiting other villages (Yasuoka, 2006a, 2006b). Each household can choose any mode of life whenever they want to, with the exception of gun hunting expeditions, for which a gun needs to be borrowed from the cultivators or merchants. The proportions of household-days spent in each mode of life to the total number of household-days throughout the year were: 48% at the village, 29% at the snare hunting camps, 9% in gun hunting expeditions, 7% in *molongo*, and 7% visiting other villages (Yasuoka, 2006a).

Although the Baka consume wild yams both in village and in forest camps, annual yams are consumed in large quantities only while at *molongo* camps. The *molongo* camps often consist of ten households or more. The Baka stay for two or three months, or even longer at a distance of twenty to fifty kilometers from the village. Throughout this period, they subsist solely on wild foods, in particular, annual yams (Yasuoka, 2006a, 2009).

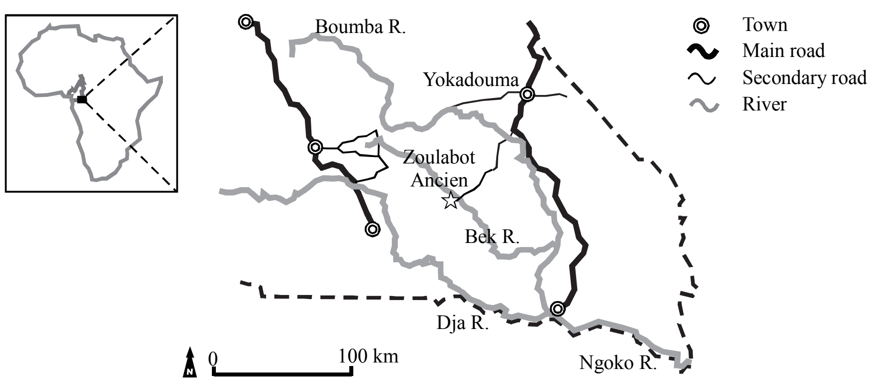

Fig. 1. Southeastern Cameroon and the Study Site (Zoulabot Ancien).

METHODS

Vegetation censuses were carried out in 2001 and 2002 in the forest around the village of Zoulabot Ancien, where annual yam patches were rarely found, and in Jalope area about 40 km southeast of the village, where *molongo* camps were built for several weeks and the people harvested tons of yam tubers (Fig. 2, Yasuoka, 2006a). Jalope area is in the Bek river basin as is the village area, and not far from the divide with the Dja river basin (Figs. 1 & 2).

Four one-hectare transects were set in each area. In this paper, those set around the village are called *Village Transects*, and those set in Jalope area are called *Jalope Transects*. *Village Transects* were situated near the settlement and agricultural fields, but none were ever the objects of agricultural activity at the time of study, according to the people in the village.

All transects were narrowly rectangular in dimension, 10 m by 1000 m, and subdivided into 40 sampling units of 10 m by 25 m, in order to count the relative frequency of species. All trees and lianas greater than 10 cm in diameter at breast height (dbh, using a standard of 1.3 m high) on each transect were measured, tagged, and identified as to their vernacular name with the help of Baka assistants. Phonetic symbols of vernacular names are obtained from Brisson & Boursier (1979) and Brisson (1988). Herbal specimens of inventoried species were collected and subsequently identified at the National Herbarium of Cameroon. Ecological and phytogeographic characteristics of the species were obtained from Vivien & Faure (1985) and Lebrun & Stork (1991-1997), as well as from my observation. The classification criterion of Lebrun & Stork (1991-1997) was primarily employed for the inventory.

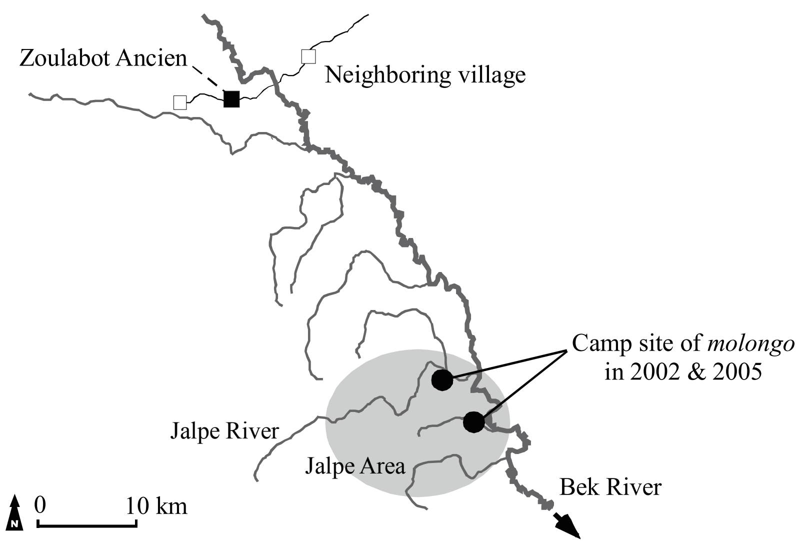

Fig. 2. Village of Zoulabot Ancien and the Jalope Area.

The basal area of each species, the total square meters of plant tissue or wood attributable to individuals of at least 10 cm dbh, was calculated. Based on these measurements, relative density of individual species, relative frequency, and relative dominance for each species were calculated for each transect, by the following formula:

Relative density	=	N / N_{all}	× 100
Relative frequency	=	S / S_{all}	× 100
Relative dominance	=	B / B_{all}	× 100

in which

N	=	Number of individuals of a species
N_{all}	=	Total number of individuals of all species inventoried
S	=	Number of sampling units on which a species occured
S_{all}	=	Total number of occurrences of sampling units for all species inventoried
B	=	Total basal area of a species
B_{all}	=	Total basal area of all species inventoried

Each index sums to 100. The average of these three numerical values indicates the ecological importance value (EIV) for each species(2) (Greig-Smith, 1983, Campbell et al., 1986, Baleé, 1994). A monoculture has an EIV of 100.

In order to calculate the similarity of species composition between the different transects, the percentage similarity (Renkonen, 1938, Wolda, 1981) was used. To compute the coefficients of percentage similarity, each transect sample was standardized as percentages by EIV which sums to 100 in each transect. The coefficient of percentage similarity (P) between Transect 1 and Transect 2 was calculated as:

$$P = \sum \text{minimum } (P_{1i} , P_{2i})$$

in which

P_{1i} = EIV of species i in Transect 1
P_{2i} = EIV of species i in Transect 2

This coefficient ranges from 0 (no similarity) to 100 (complete similarity). In spite of the simplicity, the percentage similarity is one of the best methods to measure the similarity of species composition between the different transects, available as it is relatively little affected by sample size or species diversity (Wolda, 1981).

To test the difference in distribution of the similarity coefficients among for pairs of the Village Transects, for pairs of the Jalope Transects, and for pairs of Village versus Jalope Transects, the Kolmogorov–Smirnov test was used.

RESULTS

I. Outline of the Transects

Following is a brief description of each of the eight transects used for determining densities, frequencies, dominance, and EIV of tree and liana species.

1. Village Transect 1 (V1)

Transect V1 started 3 km southwest of the village and extended south. Transect V1 had 656 individuals, at least 116 species in 35 families, and a total basal area of 42.1 m^2. The ten ecologically most important species in descending order of importance were: *Anonidium mannii* (its EIV in Transect V1 is 8.74, Annonaceae), *Scorodophloeus zenkeri* (7.63, Caesalpinioideae in Fabaceae), *Polyalthia suaveolens* (4.07, Annonaceae), *Coelocaryon preussii* (3.32, Myristicaceae), *Rinorea oblongifolia* (2.87, Violaceae), *Desbordesia glaucescens* (2.57, Irvingiaceae), *Trichilia ornithothera* or *T. rubescens* (2.17, Meliaceae), *Dichostemma glaucescens* (2.16, Euphorbiaceae), *Afrostyrax lepidophyllus* (2.01, Huaceae), and *Cola lateritia* (1.89, Sterucliaceae).

2. Village Transect 2 (V2)

Transect V2 started 0.5 km north of the village and extended to the northwest. Transect V2 had 521 individuals, at least 127 species in 36 families, and a total basal area of 38.7 m^2. The ten ecologically most important species in descending order of importance were: *Entandrophragma cylindricum* (its EIV in Transect V2 is 4.39, Meliaceae), *Scorodophloeus zenkeri* (3.38, Caesalpinioideae in Fabaceae), *Cylicodiscus gabonensis* (2.99, Mimosoideae in Fabaceae), *Polyalthia suaveolens* (2.98, Annonaceae), *Guarea thompsonii* (2.95, Meliaceae), *Afrostyrax lepidophyllus* (2.44, Huaceae), *Celtis mildbraedii* (2.37, Ulmaceae), *Trichilia ornithothera* and *T. rubescens* (2.29, Meliaceae), *Petersianthus macrocarpus* (2.23, Lecythidaceae), and *Staudtia kamerunensis* (2.21 , Myristicaceae).

3. Village Transect 3 (V3)

Transect V3 started 1 km east of the village and extended to the southeast. Transect V3 had 511 individuals, at least 110 species in 39 families, and a total basal area of 29.0 m^2. The ten ecologically most important species in descending order of importance were: *Scorodophloeus zenkeri* (its EIV in Transect V3 is 6.29, Caesalpinioideae in Fabaceae), *Pentaclethra macrophylla* (4.28, Mimosoideae in Fabaceae), *Polyalthia suaveolens* (4.22, Annonaceae), *Pycnanthus angolensis* (3.45, Myristicaceae), *Lasiodiscus mannii* (3.39, Rhamnaceae), *Albizia adianthifolia* (2.65, Mimosoideae in Fabaceae), *Piptadeniastrum africanum* (2.36, Mimosoideae in Fabaceae), *Chrysophyllum boukokoense* (2.34, Sapotaceae), *Anonidium mannii* (2.33, Annonaceae), and *Coelocaryon preussii* (2.20, Myristicaceae).

4. Village Transect 4 (V4)

Transect V4 started 0.5 km southwest of the village and extended west. Transect V4 had 466 individuals, at least 132 species in 39 families, and a total basal area of 27.4 m^2. The ten ecologically most important species in descending order of importance were: *Scorodophloeus zenkeri* (its EIV in Transect V4 is 6.43, Caesalpinioideae in Fabaceae), *Afrostyrax lepidophyllus* (4.66, Huaceae), *Irvingia gabonensis* (4.23, Irvingiaceae), *Pentaclethra macrophylla* (4.18, Mimosoideae in Fabaceae), *Polyalthia suaveolens* (2.69, Annonaceae), *Trichilia ornithothera* or *T. rubescens* (2.62, Meliaceae), *Staudtia kamerunensis* (2.28, Myristicaceae), *Sloetiopsis usambarensis* (2.16, Moraceae), *Strombosia pustulata* (2.07, Olacaceae), and *Strombosiopsis tetrandra* (1.82, Olacaceae).

5. Jalope Transect 1 (J1)

Transect J1 started 5 km north of the molongo long-stay camp (Yasuoka, 2006a) and extended south. Transect J1 had 444 individuals, at least 104 species in 36 families, and a total basal area of 30.0 m^2. The ten ecologically most important species in descending order of importance were *Scorodophloeus zenkeri* (its EIV in Transect J1 is 4.84, Caesalpinioideae in Fabaceae), *Anonidium mannii* (4.33, Annonaceae), *Manilkara obovata* (3.50, Sapotaceae), *Desplatsia chrysochlamys* (3.48, Tiliaceae), *Lophira alata* (3.15, Ochnaceae), *Dichostemma glaucescens* (3.06, Euphorbiaceae), *Panda oleosa* (2.84, Pandaceae), *Duboscia macrocarpa* (2.79, Tiliaceae), *Entandrophragma cylindricum* (2.75, Meliaceae), and *Cola lateritia* (2.69, Sterucriaceae).

6. Jalope Transect 2 (J2)

Transect J2 started at the end point of J1 and extended south. Transect J2 had 357 individuals, at least 93 species in 31 families, and a total basal area of 25.7 m^2. The ten ecologically most important species in descending order of importance were: *Triplochiton scleroxylon* (its EIV in Transect J2 is 8.95, Sterculiaceae), *Cola lateritia* (6.60, Sterucriaceae), *Anonidium mannii* (6.04, Annonaceae), *Celtis adolfi-friderici* (4.77, Ulmaceae), *Dichostemma glaucescens* (3.13, Euphorbiaceae), *Strombosia pustulata* (2.62, Olacaceae), *Newbouldia laevis* or spp. (2.46, Bignoniaceae), *Trichilia ornithothera* or *T. rubescens* (2.40, Meliaceae), *Dialium pachyphyllum* (2.24, Caesalpinioideae in Fabaceae), and *Scorodophloeus zenkeri* (2.16, Caesalpinioideae in Fabaceae).

7. Jalope Transect 3 (J3)

Transect J3 started at the end point of J2 and extended south. Transect J3 had 397 individuals, at least 91 species in 35 families, and a total basal area of 24.1 m^2. The ten ecologically most important species in descending order of importance were: *Scorodophloeus zenkeri* (its EIV in Transect J3 is 6.96, Caesalpinioideae in Fabaceae), *Anonidium mannii* (6.88, Annonaceae), *Celtis mildbraedii* (5.57, Ulmaceae), *Panda oleosa* (3.46, Pandaceae), *Angylocalyx pynaertii* (3.45, Faboideae in Fabaceae), *Celtis adolfi-friderici* (2.85, Ulmaceae), *Desplatsia chrysochlamys* (2.64, Tiliaceae), *Chrysophyllum lacourtianum* (2.26, Sapotaceae), *Picralima nitida* (2.13, Apocynaceae), and *Newbouldia laevis* or spp. (2.09, Bignoniaceae).

8. Jalope Transect 4 (J4)

Transect J4 started at the end point of J3 and extended south. Transect J4 had 388 individuals, at least 106 species in 35 families, and a total basal area of 28.3 m^2. The ten ecologically most important species in descending order of importance were: *Scorodophloeus zenkeri* (its EIV in Transect J4 is 9.57, Caesalpinioideae in Fabaceae), *Afzelia bipindensis* or *A. pachyloba* (4.69, Caesalpinioideae in Fabaceae), *Duboscia macrocarpa* (3.48, Tiliaceae), *Polyalthia suaveolens* (3.34, Annonaceae), *Celtis adolfi-friderici* (3.29, Ulmaceae), *Albizia adianthifolia* (2.68, Mimosoideae in Fabaceae), *Cola lateritia* (2.48, Sterucriaceae), *Celtis mildbraedii* (2.30, Ulmaceae), *Funtumia elastica* (2.12, Apocynaceae), and *Diospyros iturensis* (1.83, Ebenaceae).

Table 1 presents a summary of the results. The average number of individuals inventoried was 539 for Village Transects, and 397 for Jalope Transects. The average basal area was 34.3 m^2 for Village Transects, and 27.0 m^2 for Jalope Transects. It is obvious that the Village Transects contained more individuals and larger biomass than the Jalope Transects.

The average numbers of families and species inventoried were 121 species in 37 families for Village Transects, and 99 species in 35 families for the Jalope Transects. Each Village Transect had more families and species (110-132 species in 34-39 families) than any Jalope Transect (91-106 species in 31-37 families). Thus I point out that alpha diversity,(3) the species richness within a particular transect, is richer in each of the Village Transect than in any of the Jalope Transect.

Table 1. Transect Vegetation Inventory

Transects	Number of individuals	Number of families	Number of species	Basal area (m^2)
Village Transect 1	656	35	116	42.1
Village Transect 2	521	36	127	38.7
Village Transect 3	511	39	110	29.0
Village Transect 4	466	39	132	27.4
Total of VillageTransect 1-4	2154	43	186	137.3
Average for VillageTransect 1-4	539	37	121	34.3
Jalope Transect 1	444	37	104	30.0
Jalope Transect 2	357	31	93	25.7
Jalope Transect 3	397	35	91	24.1
Jalope Transect 4	388	35	106	28.3
Total of Jalope Transect 1-4	1586	46	179	108.1
Average for Jalope Transect 1-4	397	35	99	27.0

Note: The size of each transect is 1 hectare.
Number of species is counted in the vernacular nomenclature.

Table 2. Coefficients of Percentage Similarity among Transects

	V2	V3	V4	J1	J2	J3	J4
V1	59	53	49	42	39	49	45
V2		55	58	43	36	43	43
V3			56	38	31	37	42
V4				36	34	40	44
J1					46	51	45
J2						50	42
J3							55

Average	
Pairs of V & V	: 55
Pairs of V & J	: 40
Pairs of J & J	: 48

In comparison, 186 species in 43 families were inventoried in the four Village Transects, and 179 species in 46 families in the four Jalope Transects. This is to say that the Village Transects had just a little more species in just a fewer families than the Jalope Transects. Therefore, the gamma diversity of each area, the overall species richness for the transects within the village or Jalope areas were similar.

That each Village Transect is richer in alpha diversity, and that the transects are almost equivalent in gamma diversity, automatically means that the Jalope Transects are richer in beta diversity, the difference in species composition among the different transects within the area. Actually, the similarity analysis of species composition among the transects supports this indication. The eight transects yield 28 pairs of transects (Table 2). The similarities of these pairs can be systematically compared using the percentage similarity (Renkonen, 1938, Wolda 1981). On average, the coefficient of percentage similarity for pairs of Village Transects is 55. That for pairs of Jalope Transects is 48. Although significant statistical difference between the coefficients among Village Transects and those of the Jalope Transects is not assured, the tendency of a lower coefficient of similarity among Jalope Transects is consistent with the indication I pointed out above, i.e. there is richer beta diversity among the Jalope Transects.

The average coefficient of similarity for pairs of Village versus Jalope Transects is 40, which is significantly lower than for pairs of the Village Transects (Kolmogorov–Smirnov test, $p<0.001$), or for pairs of the Jalope Transects ($p<0.025$). Therefore, the Village Transects and the Jalope Transects are more homogeneous among themselves than any combination of mixed Village-Jalope Transect pair.

II. Comparison of Floristic Composition between Village Transects and Jalope Transects

In this section, I compare the characteristics of the Village Transects and the Jalope Transects. Table 3 lists the 20 ecologically most important species found in the Village Transects and in that of Jalope Transects. (See Appendix for the complete inventory.) The shaded lines show 6 species found in both the Vil-

Table 3. The 20 Ecologically Most Important Species in Vegetation Inventory of Village and Jalope Transects

Species	Family	Size of tree	Major habitat*[1]	Secondary vegetation*[2]	EIV*[3]
Village Transects					
Scorodophloeus zenkeri	Fabaceae (Cae.)	L	EF		5.93
Anonidium mannii	Annonaceae	M	EF-SDF		3.74
Polyalthia suaveolens	Annonaceae	M	EF-SDF		3.52
Pentaclethra macrophylla	Fabaceae (Mim.)	L	EF	+	2.96
Afrostyrax lepidophyllus	Huaceae	M	EF-SDF		2.63
Trichilia ornithothera, or *T. rubescens*	Meliaceae	S	EF-SDF	+	2.23
Coelocaryon preussii	Myristicaceae	L	EF-SDF	+	1.98
Pycnanthus angolensis	Myristicaceae	L	EF-SDF	+	1.77
Staudtia kamerunensis	Myristicaceae	L	EF		1.72
Irvingia gabonensis	Irvingiaceae	L	EF-SDF		1.71
Entandrophragma cylindricum	Meliaceae	L	SDF		1.67
Guarea thompsonii	Meliaceae	L	EF		1.55
Uapaca guineensis, or *U.* spp.	Euphorbiaceae	M	EF-SDF		1.50
Petersianthus macrocarpus	Lecythidaceae	L	EF-SDF	+	1.46
Cylicodiscus gabunensis	Fabaceae (Mim.)	L	EF-SDF		1.46
Lasiodiscus mannii	Rhamnaceae	S	n/a		1.38
Celtis mildbraedii	Ulmaceae	L	SDF		1.32
Pausinystalia macroceras	Rubiaceae	M	EF-SDF		1.22
Hexalobus crispiflorus	Annonaceae	L	EF-SDF		1.17
Rinorea oblongifolia	Violaceae	S	EF-SDF	+	1.14
Jalope Transects					
Scorodophloeus zenkeri	Fabaceae (Cae.)	L	EF		5.96
Anonidium mannii	Annonaceae	M	EF-SDF		4.69
Cola lateritia	Sterculiaceae	L	SDF	+	3.40
Celtis mildbraedii	Ulmaceae	L	SDF		3.00
Celtis adolfi-friderici	Ulmaceae	L	SDF		2.88
Duboscia macrocarpa	Tiliaceae	L	EF-SDF	+	2.57
Desplatsia chrysochlamys	Tiliaceae	S	EF-SDF		2.31
Polyalthia suaveolens	Annonaceae	M	EF-SDF		2.03
Afzelia bipindensis, or *A. pachyloba*	Fabaceae (Cae.)	L	EF-SDF		1.92
Angylocalyx pynaertii	Fabaceae (Fab.)	L	SDF		1.82
Funtumia elastica	Apocynaceae	L	SDF	+	1.74
Strombosia pustulata	Olacaceae	L	EF-SDF		1.72
Chrysophyllum lacourtiana	Sapotaceae	L	SDF		1.72
Dichostemma glaucescens	Euphorbiaceae	M	EF-SDF	+	1.67
Triplochiton scleroxylon	Sterculiaceae	L	SDF	+	1.56
Lasiodiscus mannii	Rhamnaceae	S	n/a		1.51
Entandrophragma cylindricum	Meliaceae	L	SDF		1.46
Newbouldia laevis, or spp.	Bignoniaceae	M	n/a	+	1.44
Anthonotha macrophylla	Fabaceae (Cae.)	S	SDF	+	1.36
Diospyros iturensis	Ebenaceae	S	n/a		1.33

Note: Shaded lines indicate the species inventoried in both the village area and Jalope area.

*[1] Forest type of where a species mainly appears. EF (Evergreen Forest) and SDF (Semi-Desiduous Forest). Information was obtained from Vivien & Faure (1985), Lebrun & Stork (1991-1997) and Schmitz (1988).

*[2] Species that frequently appears in secondary vegetation, according to Vivien & Faure (1985), Lebrun & Stork (1991-1997), and my observation. Some also appear in old growth forest.

*[3] EIV refers to Ecological Importance Value, the average of relative density, relative frequency, and relative dominance. (See Appendix for the complete inventory.)

lage and Jalope Transects. *Scorodophloeus zenkeri* (its EIV in the total of Village Transects is 5.93, that in the total of Jalope Transects is 5.96), ranking first in both lists, is a tall shade-tolerant tree with evergreen foliage that can grow under closed canopy. It is very common in evergreen forests in southern and southeastern Cameroon (Vivien & Faure, 1985). *Anonidium mannii* (3.74 in the Village, 4.69 in the Jalope), ranking second in both lists, and *Polyalthia suaveolens* (3.52 in the Village, 2.03 in the Jalope), ranking third in the village inventory and 8th in the Jalope inventory, are medium shade-tolerant trees with evergreen foliage. These species are distributed both in the evergreen and semi-deciduous forests (Vivien & Faure, 1985). *Lasiodiscus mannii* (1.38 in the Village, 1.51 in the Jalope), ranking 16th in both inventories, is a shade-tolerant shrub with evergreen foliage.

Two other common species in the two inventories are both shade-intolerant trees. *Entandrophragma cylindricum* (1.67 in the Village, 1.46 in the Jalope), ranking 11th in the village inventory and 17th in the Jalope inventory, is a very tall tree with deciduous foliage. *Celtis mildbraedii* (1.32 in the Village, 3.00 in the Jalope), ranked at 17th in the village inventory and 4th in the Jalope inventory, is also a tall tree with deciduous foliage. These two species commonly appear in the semi-deciduous forest in Cameroon (Vivien & Faure, 1985).

Out of fourteen species listed only in Village Transects, *Pentaclethra macrophylla* (2.96 in the Village, 0 in the Jalope) and *Staudtia kamerunensis* (1.72 in the Village, 0.17 in the Jalope) are distributed mainly in the evergreen forest, and the other twelve appear both in the evergreen forest and semi-deciduous forest (Vivien & Faure, 1985). Seven species often compose the secondary vegetation. In particular, Pentaclethra macrophylla, *Coelocaryon preussii* (1.98 in the Village, 0 in the Jalope), *Pycnanthus angolensis* (1.77 in the Village, 0.20 in the Jalope), and *Petersianthus macrocarpum* (1.46 in the Village, 0.26 in the Jalope) are noted to be common species in the older secondary vegetation in the evergreen forest area (Schmitz, 1988; Chujo, 1992).

In contrast, out of fourteen species listed only in Jalope Transects, at least seven species, *Cola lateritia* (0.74 in the Village, 3.40 in the Jalope), *Celtis adolfi-friderici* (0.95 in the Village, 2.88 in the Jalope), *Angylocalyx pynaertii* (0.99 in the Village, 1.82 in the Jalope), *Funtumia elastica* (0.34 in the Village, 1.74 in the Jalope), *Chrysophyllum lacourtiana* (0.72 in the Village, 1.72 in the Jalope), *Triplochiton scleroxylon* (0 in the Village, 1.56 in the Jalope), *Anthonotha macrophylla* (0.30 in the Village, 1.36 in the Jalope), are trees distributed mainly in the semi-deciduous forest, and most of them frequently appear in secondary vegetation (Letouzey, 1985; Vivien & Faure, 1985; Schmitz, 1988; Chujo, 1992).

I point out that the Village Transects contain more species of the evergreen forest in comparison to those found in the Jalope Transects, which contain more species of the semi-deciduous forest. This finding is also supported by the results shown in Table 1, that Village Transects contain more tree individuals and more biomass, i.e. denser vegetation, than Jalope Transects do. In fact, a very old growth evergreen forest of *Gilbertiodendron dewevrei* (Caesalpinioideae in Fabaceae), few of which are found in the Jalope area, is somewhat widely distributed in the village area, although this species did not occur in any transect and was not inventoried.

DISCUSSIONS

I. Semi-Deciduous Forest and the Distribution of Yam Patches

Wild yams have been studied closely, because their availability is considered to strongly affect the viability of hunter-gatherer subsistence in the rainforests. According to Sato (2001), the perennial yams may have been the potential major energy source for the hunter-gatherers. But Yasuoka (2006a) indicated that annual yams were more crucial for the Baka diet, particularly during long-term foraging (*molongo*) camps held in the dry season when other forest food resource became very scarce. There is no doubt that the increasing availability of annual yams has amply contributed to the diet of the forest hunter-gatherers, even if it is not yet clear whether the availability of annual yams definitively affected the viability of the earlier hunter-gatherers in the central African rainforests.

Yasuoka (2009) points out that, despite their importance for the hunter-gatherer's diet, annual yams are not widely distributed over the forest but locally concentrated in particular areas. The people of Zoulabot Ancien carry out *molongo* in an area at a distance of 40 km from the village (Yasuoka, 2006a). Moreover, according to the elders of Zoulabot Ancien, they have carried out *molongo* in the Jalope area since the 1960s, immediately after their settlement in the present village (Yasuoka, 2006a). Thus it is unlikely that overexploitation caused the depletion of annual yam patches around the present village. The reason why few annual yam patches are distributed around the village is probably because the forest near the village has had less potential as a habitat for annual yams.

The comparison of vegetation inventories indicates that the Jalope area has much more vegetation components of the semi-deciduous forest. Relatively more sunlit condition in the semi-deciduous forest would have a positive effect on the formation of annual yam pathes, because the stems annually renew and grow in the direction suited for photosynthesis at the beginning of the rainy season. In fact, it is reported that yam species with annual stems in general grew in savanna areas (Dumont et al., 1994; Dumont, 1997), and that annual yams found in the forest area also favored habitats with sunlight, i.e. the forest gaps (Yasuoka, 2009). It is thus very probable that the high potential of Jalope as annual yam habitats are strongly associated with the semi-deciduous forest vegetation.

On the other hand, there are few annual yam patches found around the village, where the vegetation components of the evergreen forest is somewhat dominant. The physical conditions, e.g. the light level on the forest floor around the village are less suitable for annual yams to grow than those in the Jalope area.

II. Importance of the Historical Context

I argue that the distribution of annual yam patches is strongly associated with that of semi-deciduous forest. I also argue that the process of formation of annual yam patches is too complicated to conclude that their distribution is determined simply by natural conditions, or by the present magnitude of gathering pressure. Yasuoka (2009) provides some findings that corroborate the role of human influence which may have encouraged the wide distribution of annual yam patches in the Jalope area: 1) There is no village within 40 km from the Jalope area at present, but there used to be several villages of the Konabembe or other related Bantu cultivators in the vicinity of the yam-abundant areas about 100 years ago. There must have been some human interference to the vegetation of the area. 2) The Baka transplant yam tubers, and this practice can encourage the dispersal of wild yams. If these human activities continuously affected the formation of annual yam patches, their distribution would have expanded more easily into the inner forest, in spite of their poor ability of propagation (Yasuoka, 2009). He thus points out that annual yams have the characteristics of the "encouraged weed crop" (Harlan, 1992: 89) that adapt to a forest environment disturbed by man, or to the fringe of cultivated fields and gardens (Yasuoka, 2009).[4] In other words, moderate human activities would have positively influenced the formation of annual yam patches, and the process of increasing availability of annual yams should be reconsidered focusing on the intermediate state of exploitation between simple gathering and full cultivating (Dounias, 1993, 2001; Yasuoka, 2009).

In addition to the direct or daily influence of human activities, longer-term human interventions into the forest landscape that may have taken place over several decades should be considered. Some researchers argue that the semi-deciduous forest in Cameroon, or other parts of the Congo Basin, could have been formed partly due to the long-term human interventions, i.e. the clearing of the forest for shifting cultivation (Richards, 1996; Ichikawa, 2001; White, 2001; Van Gemerden et al., 2003; Shikata, 2006). In fact, forests in eastern Cameroon are characterized by a high frequency of shade-intolerant and semi-deciduous species, e.g. *Triplochiton scleroxylon* and *Entandrophragma cylindricum*, which have a low potential of natural regeneration under the closed canopy (Letouzey, 1985; Chujo, 1992; Shikata, 2006). Chujo (1992) further suggested that the large gaps made from shifting cultivation may have promoted the regeneration of these shade-intolerant and semi-deciduous trees in the region, resulting in a mosaic of semi-deciduous and evergreen forests. *Triplochiton scleroxylon* and *Entandrophragma cylindricum* were found in the Jalope Transects, which are around and near the locations of several villages abandoned several decades ago (Table 3). If this argument is to be generalized, human existence would have influenced the expansion of the semi-deciduous forest, which could have indirectly contributed to the expansion of annual yam distribution into the rainforest area.[5]

Still, the very long-term changes in the forest landscapes, on the scale of natural history, should not be ignored. Through pollen analyses and climatological studies, Maley (2001) argued that the last extensive regression of the forest seemed to have occurred between 2500 and 2000 BP in the African forest block. At this time, deep openings appeared particularly in areas with the highest climatic variability, associated with the frequent occurrence of forest fires. Thus, he suggests that the semi-deciduous forests in southern Cameroon have developed over the past 2 millennia as a result of the establishment and development of pioneer forest formations. He implied that it was possible that the fragmentation of the forest block in the Cameroon region provoked some of the Bantu migrations into the forest area (Maley, 2001). Although it is open to question whether early Bantu people migrated to utilize annual yams or not, locations suitable for annual yam patches in the forest would undoubtedly have increased because of such fragmentation of the forest.

In conclusion, the result of vegetation inventory indicates that annual yam patches tend to form in association with the semi-deciduous forest. It is also important to pay full attention to the human-forest interactions in order to comprehend the process of increasing availability of annual yams in the central African rainforests.(6) The human-forest interactions should be examined at least in two different timescales: 1) several years to a few decades in which human activities directly affect the formation and diminishment of annual yam patches through the transplantation of yam tubers or the clearing of the forest for fields and settlements, and 2) several decades to hundreds of years in which human habitation and migration in an extensive area would have indirectly affected the distribution of annual yams by contributing to the formation of a mixture of semi-deciduous and evergreen forests.

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NOTES

(1) Kitanishi (1995) suggested that the location of the camps near villages caused much consumption of agricultural crops. He also suggested that the Aka consumed much less *D. praehensilis* than the Baka did as described by Yasuoka (2006a).

(2) Balée (1994) used the sum, not the average, of the three indices of each species for its ecological importance value (EIV), for which the sum of all inventoried species was 300.

(3) Three terms for measuring biodiversity over different spatial scales are used: alpha, beta, and gamma diversity (Whittaker, 1972; Hunter, 2002).

(4) The present population of the village is much larger than that before the sedentarization, so that the gathering pressure around the present village would be too high for annual

yam patches to form.

(5) Yasuoka (2009) doubts that the Bantu or other cultivators eagerly planted annual yams in their fields when they lived in these now abandoned villages, because bananas and cassavas, the two major crops in the region, were already available at that time.

(6) In this paper, I emphasized the possibility of human influence on the expansion of the semi-deciduous forest and annual yam patches. However, the possibility cannot be ignored as to the case that sufficient annual yam patches for the hunter-gatherer subsistence had already existed under natural conditions over the Congo Basin before human inhabitation. In this case, the presence of the early forest hunter-gatherers who exploited annual yams and game meat probably attracted the cultivators who later came to the forest area utilized by the hunter-gatherers. Then, the inhabitation of the cultivators would have accelerated the formation of the semi-deciduous forest and the expansion of annual yam patches. More empirical data are needed to construct a more detailed historical model of human inhabitation in the central African rainforests.

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Appendix. Ecological Importance Values in Vegetation Inventory of Village Transects and Jalope Transects

Family and Species*[1]	Vernacular name*[2]	Village Transects				Jalope Transects			
		Ind.*[3]	SU*[4]	BA*[5] (m^2)	EIV*[6] (%)	Ind.	SU	BA (m^2)	EIV (%)
ACANTHACEAE									
Thomandersia laurifolia (T.Anderson ex Benth.) Baill. or *T. hensii* De Wild. & T. Durand	ngóka	26	22	0.2620	0.88	1	1	0.0090	0.05
AGAVACEAE									
Dracaena arborea (Willd.) Link	mbíàto	1	1	0.0154	0.04	4	4	1.2309	0.57
ANACARDIACEAE									
Antrocaryon klaineanum Pierre	gɔ́ngu	1	1	0.0311	0.04				
Antrocaryon micraster A.Chev. & Guillaumin	móyali					3	3	0.2486	0.22
Lannea welwitschii (Hiern) Engl.	kúá	6	6	0.8387	0.41	2	2	0.7582	0.33
Trichoscypha oddonii De Wild.	ngɔ́yɔ	8	8	0.3070	0.35				
Trichoscypha patens (Oliv.) Engl.	mòngolà	1	1	0.0379	0.04	2	1	0.0112	0.05
ANNONACEAE									
Annickia chlorantha (Oliv.) Setten & Maas	ˀèpùe	4	4	0.1508	0.17				
Anonidium mannii (Oliv.) Engl. & Diels	ngbé	108	54	4.3656	3.74	93	55	4.1981	4.69
Cleistopholis patens (Benth.) Engl. & Diels	kíyò	2	2	0.1175	0.10	3	3	0.0887	0.17
Duguetia staudtii (Engl. & Diels) Chatrou	mòlɔ̀mbɔ̀	2	2	0.2197	0.12	2	2	0.0335	0.10
Duguetia staudtii (Engl. & Diels) Chatrou or *Uvariodendron* sp.	màkasa	1	1	0.0336	0.04				
Hexalobus crispiflorus A.Rich.	pòtà	26	20	1.6322	1.17	15	14	1.0647	1.01
Meiocarpidium lepidotum (Oliv.) Engl. & Diels	màmbɛléngɛ	4	3	0.0563	0.13	4	3	0.0511	0.18
Polyalthia suaveolens Engl. & Diels	ɓòtunga	80	63	4.5409	3.52	39	20	2.2142	2.03
Xylopia aethiopica (Dunal) A.Rich. or *X. elliotii* Engl. & Diels	sange	4	4	0.0674	0.15	4	4	0.5294	0.35
Xylopia hypolampra Mildbr.	mónjíè	2	2	0.5760	0.21				
Xylopia quintasii Engl. & Dielsor or *X. staudtii* Engl. & Diels	mbɔ̀ɔ	4	4	0.1210	0.17	1	1	0.3545	0.16
Xylopia sp. 1	mbàbàmbèsambò	1	1	0.0098	0.04	2	2	0.3360	0.20
Xylopia sp. 2	ˀetáli					2	2	0.3150	0.19

Family and Species*[1]	Vernacular name*[2]	Village Transects				Jalope Transects			
		Ind.*[3]	SU*[4]	BA*[5] (m^2)	EIV*[6] (%)	Ind.	SU	BA (m^2)	EIV (%)
APOCYNACEAE									
Alstonia boonei De Wild.	guga	4	4	1.8741	0.59	3	3	0.3670	0.26
Funtumia elastica (P.Preuss) Stapf	ndamà	8	8	0.2633	0.34	31	26	1.3105	1.74
Landolphia sp.	mákpà	1	1	0.0095	0.04				
Picralima nitida (Stapf) T.Durand & H.Durand	mòtokotòkò					15	13	0.2799	0.74
Pleiocarpa bicarpellata Stapf	mòsebe	4	4	0.1197	0.17	16	13	0.2580	0.76
Rauvolfia caffra Sond.	mbonga								
Rauvolfia vomitoria Afzel.	kpánchelu					5	4	0.1038	0.24
Strophanthus sarmentosus DC.	kpo bùli	2	2	0.0207	0.07				
Tabernaemontana sp. 1	pandɔ̀	7	6	0.0729	0.24	6	4	0.0897	0.26
Tabernaemontana sp. 2	mòtɛngɛ	6	6	0.2682	0.27				
ARECACEAE									
Elaeis guineensis Jacq.	mbílà				didi not appear *[7]				
Raphia laurentii De Wild. or *R.monbuttorum* Drude	pèke				did not appear *[7]				
Raphia hookeri G.Mann & H.Wendl.	mɛ̀síɛ̀				did not appear *[7]				
ASCLEPIADACEAE									
Gongronema latifolium Benth.	kpongo	1	1	0.0161	0.04				
ASTERACEAE									
Vernonia sp.	ˀeba					7	6	0.4408	0.44
BIGNONIACEAE									
Fernandoa adolfi-friderici (Gilg & Mildbr.) Heine	mbongɔ̀					7	7	0.4704	0.48
Newbouldia laevis (P. Beauv.) Seem. ex Bureau or *Markhamia* sp. or *Fernandoa* sp.	piàmbè	14	13	0.7705	0.65	25	24	0.9312	1.44
Spathodea campanulata P.Beauv.	mbɛlɛmɛ	4	4	0.2258	0.19				
Stereospermum acuminatissimum K.Schum. or *Fernandoa* sp.	ɓɔ̀tɔtɔ					2	2	0.0270	0.10
BOMBACACEAE									
Bombax buonopozense P.Beauv.	ndòmbì					1	1	0.5308	0.21

Family and Species*[1]	Vernacular name*[2]	Village Transects				Jalope Transects			
		Ind.*[3]	SU*[4]	BA*[5] (m^2)	EIV*[6] (%)	Ind.	SU	BA (m^2)	EIV (%)
Ceiba pentandra (L.) Gaertn.	kúlò	1	1	0.3121	0.11				
BORAGINACEAE									
Cordia platythyrsa Baker	ngbàbì *[8]					1	1	0.0282	0.06
BURSERACEAE									
Canarium schweinfurthii Engl.	sɛnɛ	1	1	0.0109	0.04				
Dacryodes edulis (G.Don) H.J.Lam	lìbabà na sɛnɛ	2	2	0.0545	0.08	8	8	0.2433	0.45
Santiria trimera (Oliv.) Aubrév.	lìbabà	13	13	0.4283	0.55	1	1	0.0098	0.05
CELASTRACEAE									
Salacia letestui Pellegr.	kpo bòsèkò	15	11	0.2254	0.49	2	2	0.0231	0.10
Salacia sp.	kpo kòngà *[8]	2	1	0.0184	0.05				
CHRYSOBALANACEAE									
Maranthes glabra (Oliv.) Prance	ɓòkànjà	6	6	0.2770	0.27	1	1	0.0165	0.05
CLUSIACEAE									
Allanblackia floribunda Oliv.	kpɔmu	9	9	0.1689	0.35	1	1	0.2449	0.12
Allanblackia sp.	meboto a dí *[9]					3	2	0.0683	0.14
Garcinia mannii Oliv.	gámbe	8	7	0.1463	0.29	3	3	0.0612	0.16
Mammea africana Sabine	meboto a ngbengbe *[9]					3	2	0.1153	0.15
Mammea africana Sabine or *Allanblackia* sp.	meboto *[9]	14	14	0.4290	0.58				
COMBRETACEAE									
Pteleopsis hylodendron Mildbr.	móòbitò	2	2	0.2977	0.14	6	6	0.7569	0.52
Terminalia superba Engl. & Diels	ngɔlu	8	8	2.2403	0.82	4	4	0.8340	0.45
EBENACEAE									
Diospyros canaliculata De Wild.	mboloa	7	7	0.1519	0.28	10	8	0.1857	0.48
Diospyros crassiflora Hiern	lɛ̀mbɛ	11	10	0.4656	0.47	1	1	0.0454	0.06
Diospyros hoyleana F.White	ɓòkɛ̀mbeɛ̀	6	6	0.0783	0.22	3	3	0.0345	0.15
Diospyros iturensis (Gürke) Letouzey & F.White	babango					30	20	0.5569	1.33
Diospyros mannii Hiern	mbàbangìlò	3	3	0.2961	0.17	4	4	0.0819	0.21

Family and Species*[1]	Vernacular name*[2]	Village Transects				Jalope Transects			
		Ind.*[3]	SU*[4]	BA*[5] (m^2)	EIV*[6] (%)	Ind.	SU	BA (m^2)	EIV (%)
EUPHORBIACEAE									
Alchornea laxiflora (Benth.) Pax & K.Hoffm.	lo a wùndɔ̀					1	1	0.0272	0.06
or *Mallotus oppositifolius* (Geiseler) Müll.Arg.									
Antidesma venosum E.Mey. ex Tul.	lo a pùla	17	15	0.3223	0.62	13	10	0.3043	0.63
Bridelia grandis Pierre ex Hutch.	tàku	1	1	0.6153	0.18	5	5	0.4335	0.37
Croton oligandrus Pierre ex Hutch.	ndéngo					3	3	1.5593	0.62
Dichostemma glaucescens Pierre	mòngamba	34	18	0.5488	1.00	40	25	0.5568	1.67
Discoglypremna caloneura (Pax) Prain	jìlà	3	3	0.1157	0.13	9	9	0.4675	0.57
Drypetes aframensis Hutch.	masepa	21	17	0.3730	0.73	14	10	0.2972	0.65
Drypetes capillipes (Pax) Pax & K.Hoffm.	gbólóga	4	4	0.0430	0.15	2	2	0.0163	0.10
Drypetes chevalieri Beille ex Hutch. & Dalziel	kpasɔ	14	12	0.1856	0.49				
Drypetes gossweileri S.Moore	gbólóga na ngbenbge	6	5	1.2980	0.50	2	2	0.0227	0.10
Drypetes iturensis Pax & K.Hoffm.	ngɔngɔ	24	17	0.3825	0.78	6	3	0.1442	0.25
Drypetes klainei Pierre ex Pax	tembo	15	14	0.4727	0.61	6	6	0.3603	0.39
Drypetes molunduana Pax & K.Hoffm.	tándi					1	1	0.0098	0.05
Drypetes molunduana Pax & K.Hoffm. or *D. gossweileri* S.Moore	mògaja na pásá					3	3	0.0972	0.17
Drypetes molunduana Pax & K.Hoffm. or *D. gossweileri* S.Moore	mògaja na ngo	5	5	0.1675	0.21	9	6	0.1451	0.39
Drypetes paxii Hutch.	kpáyà	1	1	0.0112	0.04	2	2	0.0216	0.10
Drypetes principum (Müll.Arg.) Hutch.	mòtotòmbo					1	1	0.0091	0.05
Elaeophorbia drupifera (Thonn.) Stapf	sɔngɔlìbilà	1	1	0.0140	0.04	3	3	0.1612	0.19
Keayodendron bridelioides Léandri	mbòndo	9	9	1.3328	0.63	9	7	1.0713	0.70
Macaranga barteri Müll.Arg.	mòsàasàa	17	14	0.4480	0.63	9	9	0.6736	0.63
Maprounea membranacea Pax & K.Hoffm.	bongoy	1	1	0.1561	0.07				
Margaritaria discoidea (Baill.) G.L.Webster	kàngò	3	2	0.4282	0.19	7	7	1.0289	0.65
Margaritaria discoidea (Baill.) G.L.Webster	mòkukuma	1	1	0.0121	0.04				
Neoboutonia mannii Benth.	túbu					1	1	0.0079	0.05
Plagiostyles africana (Müll.Arg.) Prain	ngóle	16	15	0.3098	0.60				

Family and Species*[1]	Vernacular name*[2]	Village Transects				Jalope Transects			
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Ricinodendron heudelotii (Baill.) Pierre ex Heckel	gɔ́bɔ̀	9	8	2.0823	0.79				
Shirakiopsis elliptica (Hochst.) Esser	jɛkɛ́	4	4	0.1160	0.16	1	1	0.0087	0.05
Tetrorchidium didymostemon (Baill.) Pax & K. Hoffm.	njɛ̀nɛ	13	13	0.2643	0.51				
Uapaca guineensis Müll. Arg. or *U. paludosa* Aubrév. & Léandri or *U. staudtii* Pax	sèngì	24	21	3.0149	1.50	10	3	0.9422	0.58
FABACEAE Caesalpinioideae									
Afzelia bella Harms or *A.bipindensis* Harms	màjàgbà	1	1	0.0112	0.04	1	1	0.2725	0.13
Afzelia bipindensis Harms or *A. pachyloba* Harms	timi	13	11	0.7546	0.59	40	31	0.8475	1.92
Amphimas pterocarpoides Harms	kànga	4	4	0.0792	0.16	5	5	2.3103	0.95
Anthonotha macrophylla P. Beauv.	popolo	7	7	0.2473	0.30	27	18	1.0389	1.36
Cassia mannii Oliv.	ˀelèkò	4	4	0.0403	0.15	1	1	0.0174	0.05
Copaifera mildbraedii Harms	mòndùmba	2	2	0.0402	0.08	1	1	0.0160	0.05
Daniellia klainei (Pierre) De Wild.	mbɛli				did not appear *[7]				
Detarium macrocarpum Harms	mbili				did not appear *[7]				
Dialium excelsum Steyaert	mòkɔmbɛ	1	1	0.0596	0.05	2	2	0.0455	0.11
Dialium pachyphyllum Harms	mbelenge	4	4	0.0465	0.15	19	19	0.6127	1.09
Erythrophleum suaveolens (Guill. & Perr.) Brenan	mbàndà	5	5	1.7623	0.60	5	5	0.8490	0.50
Gilbertiodendron dewevrei (De Wild.) J. Léonard	ɓembà				did not appear *[7]				
Lebruniodendron leptanthum (Harms) J. Léonard	gandɔ	6	6	0.9972	0.45	9	7	0.6471	0.57
Pachyelasma tessmannii (Harms) Harms	ngbò				did not appear *[7]				
Plagiosiphon sp.	kopaka	1	1	0.0087	0.04				
Prioria oxyphylla (Harms) Breteler or *Tessmannia africana* Harms	ngɔ̀ndɔ̀	1	1	0.5096	0.16				
Scorodophloeus zenkeri Harms	mìnɛ̀gnyɛ̀	141	86	8.8363	5.93	104	63	6.8783	5.96
Tessmannia anomala (Micheli) Harms var. *anomala*	pàkà	10	10	3.1127	1.10	4	4	0.2396	0.26
FABACEAE Faboideae									
Angylocalyx pynaertii De Wild.	yɔ̀nga	20	18	1.4045	0.99	23	22	2.4565	1.82
Angylocalyx pynaertii De Wild., or sp.	bìtongo	3	2	0.0408	0.09	2	2	0.0659	0.11

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Baphia leptobotrys Harms	sáwɛ̀	did not appear *[7]							
Millettia sanagana Harms	ngánda					4	4	0.0360	0.20
Millettia sp. 1	kpo mongɔ́mbɔ					3	2	0.0603	0.13
Millettia sp. 2	kpo mòkɔ̀kɔ̀dì					4	4	0.2016	0.25
Pericopsis elata (Harms) Meeuwen	mòbayì					1	1	0.3428	0.15
Pterocarpus soyauxii Taub.	ngɛlɛ	12	11	0.8070	0.59	9	8	0.2448	0.47
FABACEAE Mimosoideae									
Acacia brevispica Harms	baàlà					2	2	0.0220	0.10
Albizia adianthifolia (Schumach.) W. Wight	bàmbà / sáa	6	5	2.1538	0.71	7	7	2.8223	1.20
Albizia ferruginea (Guill. & Perr.) Benth.	lɔ̀ndà	2	2	0.0761	0.09	1	1	0.0117	0.05
Calpocalyx dinklagei Harms	pandàkò	6	6	0.1519	0.24	18	15	0.2702	0.86
Cylicodiscus gabunensis Harms	ɓòlùma	16	15	3.8287	1.46				
Pentaclethra macrophylla Benth.	mbalaka	35	33	7.4407	2.96				
Piptadeniastrum africanum (Hook. f.) Brenan	kùngu	10	9	2.8544	1.02				
Albizia dinklagei (Harms) Harms	ɓòkondò	1	1	0.2966	0.11				
Tetrapleura tetraptera (Schumach. & Thonn.) Taub.	jaga	3	3	0.1539	0.14	6	5	0.8444	0.52
FLACOURTIACEAE									
Dasylepis seretii De Wild.	mopambí	4	4	0.0942	0.16				
Oncoba glauca (P. Beauv.) Planch.	gbàgɔ̀lɔ̀	10	7	0.1979	0.33	22	13	0.3025	0.90
Oncoba mannii Oliv. or *O. glauca* (P. Beauv.) Planch.	yangàlè	1	1	0.0109	0.04	2	2	0.0413	0.11
Oncoba sp.	timboma					1	1	0.0804	0.07
Ophiobotrys zenkeri Gilg	mòbàlà	13	12	0.7541	0.61	7	7	0.8419	0.59
HUACEAE									
Afrostyrax lepidophyllus Mildbr.	ngìmbà	62	46	3.3515	2.63	12	10	0.5043	0.67
IRVINGIACEAE									
Desbordesia glaucescens (Engl.) Tiegh.	mɛ̀lɛa / ndòo	27	20	0.9388	1.02				
Irvingia excelsa Mildbr.	payo	14	13	2.3226	1.02	5	5	0.2335	0.31

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Irvingia gabonensis (Aubry-LeComte ex O'Rorke) Baill.	pekè	29	26	3.2066	1.71	6	6	0.8198	0.54
Irvingia grandifolia (Engl.) Engl.	sɔ́ɔ̀lìà	9	8	1.6749	0.70	2	2	0.0326	0.10
Irvingia robur Mildbr.	kòmbèlè	did not appear *[7]							
Klainedoxa gabonensis Pierre ex Engl.	ɓòkɔ̀kɔ̀	7	7	1.7992	0.68	12	12	1.9558	1.17
Klainedoxa macrophylla Pierre ex Tiegh.	bondùlu	1	1	0.0115	0.04				
IXONANTHACEAE									
Phyllocosmus africanus (Hook. f.) Klotzsch	lìkumbì	7	7	0.2256	0.29	12	10	0.8116	0.77
LAURACEAE									
Beilschmiedia louisii Robyns & R.Wilczek	mòbàkòsò	10	10	0.6769	0.51	12	12	0.7159	0.79
LECYTHIDACEAE									
Petersianthus macrocarpus (P. Beauv.) Liben	bɔ̀sɔ	22	21	3.0121	1.46	2	2	0.5513	0.26
LEPIDOBOTRYACEAE									
Lepidobotrys staudtii Engl.	mòsakò a sèkò	10	10	0.2450	0.40				
LINACEAE									
Hugonia spicata Oliv.	kpokɔ ɓɔ pàmɛ̀					1	1	0.0503	0.06
LOGANIACEAE									
Strychnos camptoneura Gilg & Busse	kpo bùku	2	2	0.0173	0.07				
Strychnos sp.	kpo mbòndo	3	2	0.0296	0.09	1	1	0.0084	0.05
MELIACEAE									
Carapa sp.	gòjo	10	9	0.2197	0.38	1	1	0.0172	0.05
Entandrophragma angolense (Welw.) C. DC.	kaki	did not appear *[7]							
Entandrophragma candollei Harms	káanga	4	4	0.1761	0.18	2	2	0.1385	0.14
Entandrophragma cylindricum (Sprague) Sprague	bòyo	19	17	4.3449	1.67	18	17	2.0630	1.46
Entandrophragma utile (Dawe & Sprague) Sprague	ɓokulo	did not appear *[7]							
Guarea cedrata (A. Chev.) Pellegr.	mbɛ̀nya	1	1	0.1572	0.07	3	3	0.0679	0.16
Guarea thompsonii Sprague & Hutch.	njòmbò	41	33	1.2504	1.55	7	6	1.4586	0.75
Lovoa trichilioides Harms	ngɔ̀bèmbà	13	11	0.3228	0.48	1	1	0.0539	0.06

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Trichilia ornithothera J.J. de Wilde or *T. rubescens* Oliv.	mayìmbo	61	48	1.6275	2.23	23	18	0.3677	1.07
Trichilia tessmannii Harms	mayìmbo nà gbanga	29	25	0.9069	1.14	17	14	0.8306	0.98
Turraeanthus africanus (Welw. ex C. DC.) Pellegr.	ˀasàmà	did not appear *[7]							
MORACEAE									
Ficus mucuso Welw. ex Ficalho	língémbè					1	1	0.0167	0.05
Ficus natalensis Hochst. subsp. *leprieurii* (Miq.) C.C. Berg	bɔ̀ngɔ	did not appear *[7]							
Ficus preussii Warb.	ˀètɔ̀ngɔ	1	1	0.0121	0.04				
Ficus sur Forssk.	ˀèwawa	did not appear *[7]							
Milicia excelsa (Welw.) C.C. Berg	ɓàngì	3	3	0.0789	0.12	1	1	1.1316	0.40
Musanga cecropioides R. Br.	kòmbò	12	10	1.9452	0.84				
Myrianthus arboreus P. Beauv.	ngàta	10	9	0.3183	0.40	8	6	0.5701	0.50
Streblus usambarensis (Engl.) C.C. Berg	ndúndu	25	12	0.2685	0.68	7	7	0.0668	0.35
Treculia africana Desc.	pùsa	6	6	0.1764	0.25	1	1	0.0170	0.05
Trilepisium madagascariense DC.	poòngì	11	10	0.5686	0.49				
MYRISTICACEAE									
Coelocaryon preussii Warb.	mbàmbàyòko	53	41	1.6279	1.98				
Pycnanthus angolensis (Welw.) Warb.	ˀètɛ̀ngɛ	39	31	2.4156	1.77	2	2	0.3287	0.20
Staudtia kamerunensis Warb.	màlàngà	43	39	1.3623	1.72	2	2	0.2339	0.17
MYRTACEAE									
Syzygium rowlandii Sprague	ˀesósi	2	2	1.4131	0.41	2	2	0.0257	0.10
OCHNACEAE									
Lophira alata Banks ex C.F. Gaertn.	ngòkèlè					4	3	2.2944	0.87
Ochna calodendron Gilg & Mildbr.	mòlɛmbɛ̀ngòì					3	3	0.5374	0.31
Rhabdophyllum affine (Hook. f.) Tiegh.	lo a ngo					6	3	0.2546	0.28
OLACACEAE									
Heisteria parvifolia Sm.	mòlòmba na ngbengbe	see below *[9]							
Olax subscorpioidea Oliv. or *Ongokea gore* (Hua) Pierre	ɓòsɔlɔ̀	2	2	0.4949	0.19	4	4	0.2577	0.27

Family and Species*[1]	Vernacular name*[2]	Village Transects Ind.*[3]	SU*[4]	BA*[5] (m^2)	EIV*[6] (%)	Jalope Transects Ind.	SU	BA (m^2)	EIV (%)
Strombosia grandifolia Hook. f.	pìndɔ	3	3	0.0806	0.12				
Strombosia pustulata Oliv.	ɓòmbongo	22	19	1.3028	1.01	30	29	1.0714	1.72
Strombosiopsis tetrandra Engl.	ɓòsìko	9	9	1.8299	0.75	9	7	0.9704	0.67
OLEACEAE									
Schrebera arborea A. Chev.	ngolombe					2	2	0.0369	0.11
PANDACEAE									
Microdesmis keayana J. Léonard	pípi	6	6	0.0571	0.22				
Panda oleosa Pierre	kanà	19	17	1.2277	0.91	13	11	0.8902	0.84
PANDANACEAE									
Pandanus candelabrum P. Beauv.	gèja *[8]	1	1	0.0396	0.04				
PASSIFLORACEAE									
Barteria fistulosa Mast.	paàmbò	12	8	0.2843	0.40	8	7	0.1421	0.40
PIPERACEAE									
Piper guineense Schumach. & Thonn.	manjɛ̀mbɛ *[8]					3	3	0.0312	0.15
POLYGALACEAE									
Carpolobia lutea G. Don	mbambe	7	7	0.2723	0.31				
RHAMNACEAE									
Lasiodiscus mannii Hook. f.	ˀèsumà	40	34	0.5121	1.38	33	26	0.4260	1.51
Lasiodiscus mannii Hook. f. or *L.* sp.	ˀèsumà ye makombo	2	2	0.0623	0.08	9	5	0.1865	0.38
Maesopsis eminii Engl.	lɔndɔ	2	2	0.1714	0.11	1	1	0.0282	0.06
RHIZOPHORACEAE									
Anopyxis klaineana (Pierre) Engl.	ɓòmà					3	3	0.6877	0.35
RUBIACEAE									
Aidia genipiflora (DC.) Dandy	mòlòmba na dí	see below *[9]							
Corynanthe pachyceras K. Schum.	móka	4	4	0.0982	0.16	3	3	0.2793	0.23
Fleroya stipulosa (DC.) Y.F. Deng	lángango	did not appear *[7]							
Massularia acuminata (G. Don) Bullock ex Hoyle	mindò	9	9	0.1271	0.34	4	4	0.0474	0.20

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Mitragyna stipulosa (DC.) Kuntze	gɔbɔ́					2	1	0.0487	0.08
Nauclea diderrichii (De Wild. & T. Durand) Merr.	mɔsɛ a yolì	1	1	0.0176	0.04				
Pauridiantha rubens (Benth.) Bremek.	bònjìngà					1	1	0.0110	0.05
Pauridiantha sp. or *Psychotria* sp.	ngbɛ́ɛ	2	2	0.0284	0.08	21	11	0.3772	0.85
or *Maesobotrya* sp. (EUPHORBIACEAE)									
Pausinystalia johimbe (K. Schum.) Pierre ex Beille	toboli	1	1	0.0103	0.04	2	2	0.0186	0.10
Pausinystalia macroceras (K. Schum.) Pierre ex Beille	wasàsà	26	22	1.6741	1.22	23	21	0.9364	1.32
Pavetta sp.	bíbilíbi					15	11	0.3075	0.70
Rothmannia sp. 1	welálikɔ́	21	20	0.3997	0.80				
Rothmannia sp. 2	kopí a bele	2	2	0.0216	0.07	1	1	0.0197	0.05
Sarcocephalus pobeguinii Pobeg.	mɔsɛ	did not appear *[7]							
Schumanniophyton magnificum (K. Schum.) Harms	gogòlogò	1	1	0.0084	0.04				
RUTACEAE									
Zanthoxylum spp.	ɓòlòngo	5	5	0.4605	0.28	3	3	0.1527	0.19
Vepris louisii G.C.C. Gilbert	tánda					1	1	0.0161	0.05
SAPINDACEAE									
Blighia welwitschii (Hiern) Radlk. or *Chytranthus* sp.	tòko	2	2	0.0350	0.08	1	1	1.1863	0.41
Chytranthus atroviolaceus Baker f. ex Hutch. & Dalziel	tokombòlì	1	1	0.0401	0.04				
Chytranthus talbotii (Baker f.) Keay	ngesúà	2	2	0.0265	0.07				
Deinbollia sp., *Eriocoelum* sp. or *Chytranthus* sp.	mòngasá	9	8	0.1643	0.33				
Lecaniodiscus cupanioides Planch.	bìmba	6	6	0.1165	0.23	5	5	0.1277	0.28
SAPOTACEAE									
Baillonella toxisperma Pierre	màɓè	1	1	0.0124	0.04				
Breviea leptosperma (Baehni) Heine	koloka *[8]	9	7	1.5819	0.65	1	1	0.3836	0.17
Chrysophyllum boukokoënse (Aubrév. & Pellegr.) L.Gaut.	mòndɔngɛ	25	20	0.6076	0.91	5	5	0.1189	0.27
Chrysophyllum lacourtianum De Wild.	bámbu	9	9	1.6827	0.72	19	18	2.7580	1.72
Chrysophyllum pruniforme Pierre ex Engl.	jàmà	1	1	0.1044	0.06				

Family and Species*[1]	Vernacular name*[2]	Village Transects				Jalope Transects			
		Ind.*[3]	SU*[4]	BA*[5] (m^2)	EIV*[6] (%)	Ind.	SU	BA (m^2)	EIV (%)
Manilkara obovata (Sabine & G. Don) J.H.Hemsl.	mòngènjà	2	2	0.0438	0.08	16	8	1.3511	0.96
Omphalocarpum procerum P. Beauv.	mbàte	2	2	0.2422	0.13				
Pouteria altissima (A. Chev.) Baehni	konya *[8]					1	1	0.0251	0.06
Pouteria aningeri Baehni	majèjè	4	4	0.0791	0.16	1	1	0.4701	0.19
Tridesmostemon omphalocarpoides Engl.	tubà / bamitole	15	15	0.3806	0.60				
STERCULIACEAE									
Cola acuminata (P. Beauv.) Schott & Endl.	ligɔ́	31	20	0.6574	1.01	17	13	0.5203	0.86
Cola ballayi Cornu ex Heckel	golò					1	1	0.0708	0.07
Cola ballayi Cornu ex Heckel	ɓanga	3	3	0.1063	0.13	1	1	0.0137	0.05
Cola lateritia K. Schum.	pòpòkò	17	14	0.8931	0.74	59	43	3.3520	3.40
Cola rostrata K. Schum.	mɛ̀kɔ̀ɔ	did not appear *[7]							
Eribroma oblongum (Mast.) Pierre ex A. Chev.	ʔègboyo	8	8	2.3726	0.85	5	4	0.5761	0.39
Mansonia altissima (A. Chev.) A. Chev.	mabàmbànjà					2	2	0.2396	0.17
Nesogordonia papaverifera (A. Chev.) Capuron ex N.Hallé	tɛ́kɛlɛ̀kɛ̀	14	13	0.3648	0.55	9	9	0.7190	0.65
Octolobus spectabilis Welw.	gángulu	11	11	0.1296	0.41	15	13	0.2265	0.73
Pterygota bequaertii De Wild.	máàwúyá	1	1	0.0424	0.04				
Sterculia tragacantha Lindl.	yébólò	6	6	0.2156	0.26	2	2	0.4257	0.23
Triplochiton scleroxylon K.Schum.	gbàdɔ̀					1	1	4.9063	1.56
TILIACEAE									
Desplatsia chrysochlamys (Mildbr. & Burret) Mildbr. & Burret	liamba	15	14	0.3968	0.59	43	38	1.3161	2.31
Duboscia macrocarpa Bocq.	nguluma	12	11	2.4842	0.99	34	29	3.5299	2.57
Glyphaea brevis (Spreng.) Monach.	ndakà					7	4	0.0937	0.28
Grewia coriacea Mast.	ʔèbùkù	2	2	0.4749	0.18	14	13	0.4897	0.79
ULMACEAE									
Celtis adolfi-fridericii Engl.	kàkàlà	22	21	0.9141	0.95	38	33	3.9399	2.88
Celtis mildbraedii Engl.	ngombe	21	21	2.4853	1.32	26	23	5.9957	3.00
Celtis mildbraedii Engl. or *Celtis* sp.	ngombe a sèkò					2	2	0.0264	0.10
Celtis tessmannii Rendle	kɛkɛlɛ	16	15	0.9727	0.76	2	2	0.6841	0.31

Family and Species*[1]	Vernacular name*[2]	Village Transects				Jalope Transects			
		Ind.*[3]	SU*[4]	BA*[5] (m^2)	EIV*[6] (%)	Ind.	SU	BA (m^2)	EIV (%)
Holoptelea grandis (Hutch.) Mildbr.	bɛ̀lɛ					2	2	0.0394	0.11
VERBENACEAE									
Vitex doniana Sweet	púlu	9	9	0.3493	0.39	9	7	0.2562	0.45
VIOLACEAE									
Rinorea oblongifolia (C.H. Wright) Marquand ex Chipp	sanjambɔ̀ngɔ̀	35	25	0.5253	1.14	10	5	0.1670	0.39
Rinorea welwitschii (Oliv.) Kuntze	ngindi	3	3	0.0283	0.11	4	3	0.0397	0.18
Aidia genipiflora (DC.) Dandy (RUBIACEAE) *Heisteria parvifolia* Sm. (OLACACEAE)	mòlòmba	31	25	0.7173	1.12				
unidentified 1	guga na kpo	1	1	0.0100	0.04				
unidentified 2	gbanga					1	1	0.3612	0.16
unidentified 3	mendi					2	2	0.1822	0.15
unidentified 4	pùsa na ngo					1	1	0.0393	0.06
unidentified 5	yokokomɛ́					1	1	0.0188	0.05
unidentified 6	kpo ?					1	1	0.0087	0.05
unidentified 7	kíyò na ngo					1	1	0.0079	0.05
Total		2154	1787	137.2518	100.00	1587	1268	108.1104	100.00

Note: Data are drawn from the aggregate of four one-hectare village transects and four one-hectare Jalope transects, respectively. The author inventoried all trees and lianas on those transects >= 10 cm dbh (diameter at breast height).

*[1] The classificatory criterion by Lebrun & Stork (1991-1997) was primarily employed for the inventory.

*[2] Phonetic symbols of vernacular names are obtained from Brisson & Boursier (1979) and Brisson (1988).

*[3] Number of individuals is counted in the vernacular nomenclature.

*[4] Number of sampling units (10 m by 25 m) on which a species occurred, out of a total of 160 sampling units.

*[5] Total basal area (at breast height) of the species.

*[6] EIV refers to Ecological Importance Value, the average of relative density (number of individuals of species divided by the total number of individuals, which was 2154 for the Village Transects and 1587 for the Jalope Transects), relative frequency (number of sampling units on which a species occurred divided by the total number of occurrences, which was 1787 for the Village Transects

*[7] These species did not appear in the transects, but were notably observed in the study area.

*[8] These species were not identified with herbal specimens at the National Herbarium of Cameroon. Their scientific names were obtained from Brisson (1988), using Baka names as reference.

*[9] Difference between the two species was not recognized by the author when the plants were recorded.