

## NAMES, USE AND ATTRIBUTES OF PLANTS AND ANIMALS AMONG THE ITURI FOREST FORAGERS: A COMPARATIVE ETHNOBOTANICAL AND ETHNOZOOLOGICAL STUDY

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**ABSTRACT** Ethnobotanical and ethnozoological surveys have been conducted from the 1970s among Ituri forest hunter-gatherers, the Mbuti and Efe, revealing interesting points on the relationships between the hunter-gatherers and the flora and fauna. In this paper, names, use and attributes given to plants and animals by the foragers are described and compared. Although the Efe and the Mbuti use completely different languages now, not a few names, uses and attributes of plants and animals are common to both groups. It has become clear that the use of plants and attributes given to animals are more durable than the names in the transition of their culture through contact with farmers. The common names, uses and attributes may suggest the existence of original Pygmy words and plant and animal culture in the Ituri forest.

**Key Words:** Efe; Mbuti; Tropical rain forest; Plant names; Animal names; Plant use; Animal attributes; Original Pygmy language

### INTRODUCTION

The study of the recognition and use of wild plants and animals by hunter-gatherers contributes to an understanding of the relationships they have with their natural environment. How do they recognize and use wild plants and animals around them? From the early 1970s to the beginning of the 1990s, ethnobotanical and ethnozoological surveys have been undertaken by various researchers among the Ituri Forest foragers often called the Pygmies.

Through a series of ethnobotanical research on plant use (Tanno, 1981; Terashima et al., 1988; Terashima & Ichikawa, 2003) information on more than 750 plant species has been accumulated into a database named AFlora. In total, AFlora contains more than 3,500 records of plant use from all over Africa (AFCOM, 1988; Terashima et al., 1991). As for animals, several surveys on mammals and birds have been done (Carpaneto & Germi, 1989; Aunger, 1992; Ichikawa, 1998; Terashima, 2002b), but not yet incorporated into a database.

One of the merits of a database is that we can easily compare data from various points of view. Already it has enabled comparison of plant use among several groups of the Ituri foragers (Ichikawa & Terashima, 1996; Terashima & Ichikawa, 2003). It has become clear that there is a strong diversity in plant use among the groups. The category of food use showed a rather high similarity index<sup>(1)</sup>, from 0.34 to 0.52. The average was 0.42, which means that nearly 60% of food plants of one local groups were similarly used as food in another group, but 40% were not so. The similarity indexes for material culture and

medicine were very low, from 0.16 to 0.21 and from 0.11 to 0.26, respectively. Moreover, the same plants were not necessarily used in the same way among different groups. Among 205 medicinal plants, 25 species were used by two groups, of which 10 species had the same or quite similar use between them; 4 species, fairly similarly; 5 species only slightly similarly; and 6 species completely differently (Terashima, 2002a).

The diversity in plant use among the Ituri foragers should not be considered a reflection of the irrational or unscientific way of observation and thinking about the natural world. On the contrary, the Ituri foragers are “great observers of natural phenomena” and “Their ability as systematists of plants and animals matches that of trained specialists...” (Cavalli-Sforza, 1986:418), and thus, finely adapted to the natural environment. Plant use is not only determined by natural attributes of the plants, but many cultural and historical factors.

The Pygmy hunter-gatherers in the Ituri forest are divided into two main groups: One group is called the Efe living chiefly in the north-eastern and eastern part of the forest. They have a very close relationship with the Lese farmers who came originally from the savanna areas northeast of the forest. Now the Efe speak Lese as their mother tongue, which belongs to the central Sudanic language group. The other group is called the Mbuti living mostly in the central and southern part of the forest with the Bira farmers, speaking Bira, a Bantu language. The Bira are said also to have come from the savanna areas west of the forest. The hunter-gatherers and the farmers have a long history of close contacts not only in economic but also in social and cultural areas.

Although no direct information is available on the status of the forest people before farmers came into the forest, it seems most likely that Pygmies had been living in the forest as one ethnic group.<sup>(2)</sup> After the farmers arrived, the Efe and the Mbuti divided into two entirely different language groups. Today, they communicate among each other with Kingwana, a lingua-franca of the Ituri forest. But apart from the language, both groups show a very strong similarity: a simple hunting<sup>(3)</sup> and gathering economy with band organization; food sharing among the band members; a marriage system with a stress on sister-exchange; an egalitarian social system avoiding any authority; cultural norms including food restrictions, rites for the initiation of boys and girls, powerful songs and dances, etc. There is certainly a definite Pygmy culture common to the Efe and the Mbuti.

The contrast between the complete difference in language, and the strong similarity among the economic, social and cultural features is quite remarkable, which poses important questions about the history of the Ituri foragers and the relationship between language and culture. It is generally considered that the original Pygmy language has been entirely lost after the contact with farmers, but some authors have argued that some original Pygmy words should still exist. Letouzey (1976) has explored plant terminology of the Bibaya (Baka) Pygmies of the southern Cameroon and various farmer groups and found that at least 104 Bibaya vernaculars possibly originated from the proper language.

In this article, I will attempt a comparison of plant and animal names, plant use, and animal attributes in the Efe and the Mbuti to clarify linguistic and cultural commonality between the two groups, drawing on ethnobotanical and ethnozoological data. And through this comparison, I hope to gain insight into the relationships that the foragers have with plants and animals around them.

**Table 1.** Patterns of names and frequency in two-place plants

pattern	frequency
<i>same-language groups</i>	
1: (a, a)*	50 (88%)
2: (a, b)	7 (12%)
<i>different-language groups</i>	
3: (a), (a)*	5 (12%)
4: (a), (b)	36 (88%)
total	98

Note: \* A vernacular name of plant is represented by alphabets “a” and “b.” Names in the same parentheses mean that they belong to the same-language groups (Patterns 1 and 2). When the two names are in different parentheses, it means that they belong to different-language groups (Patterns 3 and 4).

## PLANT NAMES AND USE

In total, 782 plant species and ethnobotanical information have been recorded among the four local hunter-gatherer groups in the Ituri forest, of which two groups belong to the Efe and the other two belong to the Mbuti. The areas utilized by each group were not overlapped at all. Here, I extract the information on 651 plant species out of 782 species, excluding those on ferns and species unidentified even on the family level. Among the 651 species, 453 species were collected only in one local group, 98 species in two local groups, 41 species in three local groups, and 63 species in all four local groups. I refer to the plants collected in two local groups as “two-place plants,” three local groups as “three-place plants,” and four local groups as “four-place plants.” The more places plants were found, the higher their commonality.

### I. Comparison of Names and Commonality of Plants

#### 1. *Two-place plants*

Ninety-eight plants were collected in two groups. Table 1 shows the name patterns in the plant list and the frequency of each pattern. When two names of the same plant belonged to the same-language groups, that is, Pattern 1 and Pattern 2, most names accorded well. It is quite natural that two hunter-gatherer groups of the same-language group share the same plant names. So, it is noteworthy that 7 of 57 species have different names even in the same-language groups (Pattern 2). When two names belonged to different-language groups, that is, Pattern 3 and Pattern 4, most names differed. But 5 of 41 species have the same names even in different-language groups (Pattern 3).

The ratio of accordance in plant names in the same-language groups was calculated at 88%.<sup>(4)</sup> The accordance ratio in plant names in different-language groups was calculated at 12%.<sup>(5)</sup>

**Table 2.** Patterns of names and frequency in three-place plants

pattern	frequency	name status between language groups
1: (a,a), (a)	9 (22%)	same
2: (a,a), (b)	27 (66%)	different
3: (a,a+b)*, (b)	1 (2%)	intermediate
4: (a,b), (c)	4 (10%)	different
total	41	

Note: \* “a+b” represents that a plant has two names in a local group.

### 2. Three-place plants

Forty-one plants belong to this category. In this category, two of three names always belonged to the same-language group and the other belonged to a different-language group. Four name patterns were found (Table 2). Pattern 1 is where all three names accorded. Pattern 2 is where two names in the same-language groups accorded, but differed from the different-language group. Pattern 3 is an intermediate case, where a plant had two names within a local group (“a” and “b”), and each was identical to the name used in the other two local groups. Pattern 4 is the case where all three names differed.

Pattern 2 showed the highest frequency. The ratio in name accordance in the same-language groups was 90%, omitting Pattern 3 from calculation, and the accordance ratio in different-language groups was 23%.

### 3. Four-place plants

Sixty-four plants belong to this category. Five name patterns were found. Pattern 1 is where all names were the same. Pattern 2 is where the names in the same-language groups accorded well, but the names differed between language groups. Pattern 3 is an intermediate type between Pattern 1 and Pattern 2, where at least in one local group, a plant had two names: one was the same with the name called in the other same-language group, and the other was the same with the name in a different-language group. Pattern 4 and Pattern 5 are where a plant had entirely different names in the same-language groups. Pattern 5 is certainly an exception.

Pattern 2 appeared most frequently. The ratio in the accordance of names in the same-language groups was very high. The discrepancy of names in the same-language groups was only found in one group of Pattern 4, and two groups of Pattern 5. The accordance ratio in same-language groups is calculated at 96%, omitting “(a+b, b)” of Pattern 3 from calculation. The accordance ratio in different-language groups was 30%, omitting Pattern 3 from calculation.

From the comparison of the names of collected plants, two points were notable concerning the similarity of names and commonality of plants: (a) Plants collected in any two groups of the same-language groups mostly have the same vernacular names. When the commonality of plants is low, however, there is some discrepancy of names. (b) Plant names are likely to be different between different-language groups, but some are the same. The ratio in name accordance in different-language groups increases as the commonality of plants increases (Table 4).

**Table 3.** Patterns of names and frequency in four-place plants

pattern	frequency	name status between language groups
1: (a, a), (a, a)	17 (27%)	same
2: (a, a), (b, b)	35 (55%)	different
3: (a, a), (a+b, b)	8 (13%)	intermediate
4: (a, a), (b, c)	3 (5%)	different
5: (a, b), (c, d)	1 (2%)	different
total	64	

**Table 4.** Accordance ratio of plant names in same-language groups and between different-language groups

plant category	accordance ratio	
	same-language group	different-language group
1: two-place plants	88%	12%
2: three-place plants	90%	23%
3: four-place plants	96%	30%

## II. Names and Use Pattern of Commonly Used Plants

Here I look into the use of plants drawing from the data of four-place plants, the most used plants. These plants can be classified roughly into two groups: 1) plants with the same name in Efe and Mbuti, and 2) plants with different names in different-language groups. The former plants are referred to as “same-name plants” and the latter, as “different-name plants.”

Appendix 1 lists all the names and uses of four-group plants. Table 5 is the tally for same-name plants and different-name plants. Following points are notable:

- (a) Almost all plants in this group are important and used fairly similarly among all four groups.
- (b) Food and material culture comprise 71% of plant use (42% for food, and 29% for material culture). The foragers’ interest in food and material culture is apparent. Food is one prominent category, considering the total number of food plants collected so far is 123, only about 20% of the total collected species. The plants for material culture accounted for nearly half of the total plants (372 species), but they accounted for only 29% of total species.
- (c) Concerning plant use, there seems to be no meaningful difference between the same-name plants and the different-name plants.

**Table 5.** Tally for same-name plants and different-name plants

usage category	same-name plants	different-name plants	total
1) food	6	16	22
2) material	3	12	15
3) medicine	0	1	1
4) ritual	1	1	2
5) indirect*	3	3	6
6) poison	0	1	1
7) narcotics	2	0	2
8) other**	2	1	3
total	17	35	52

Notes: \* Indirect: host plants for edible caterpillars, host plants for ants which are used by men, nectar plants. \*\* Plants which show no accordance in use.

- (d) Botanical categories of plants do not seem to have much to do with plant names. For example, among the four species of *Dioscorea* tubers, one is called identically among all groups, and the other three, differently. For three species of *Irvingia* nuts, two are called identically among all groups, and one, differently.

## NAMES AND ATTRIBUTES OF ANIMALS

### I. Mammals

More than 60 mammals live in the Ituri forest. Here, I draw from data on 44 species with vernacular names available in both the Mbuti and Efe (Appendix 2). Among 44 species, 10 species (23%) have the same names, and the remaining 34 (77%) mammals have different names. Concerning the relation between the zoological categories and name accordance, it is difficult to recognize any meaningful pattern.

The importance of animals as food does not seem to have any relation to the accordance of names. Six species of duikers (*Cephalophus* spp.), water-chevrotains, pygmy antelopes, and brush-tailed porcupines are very important animals in the net hunting for the Mbuti and the bow-and-arrow hunting for the Efe, but none has the same name. Elephants, buffaloes, bush-pigs are also important large animals in spear-hunting both for the Efe and the Mbuti, but none has the same name.

Mammals have various attributes and symbolic meanings (Ichikawa, 1987; Terashima, 2001). Among them, food restrictions are most important. Animals as food are classified into various groups such as “completely good food,” “completely bad food,” “totemic animals,” “food only for old people,” “food forbidden to initiates,” “eke” or “kuweri.” Some animals are feared as “eke” by the Efe, and as “kuweri” by the Mbuti, because they bring on a severe disease, also called “eke” or “kuweri,” to the children of parents who eat

**Table 6.** Accordance of mammal attributes in different-language groups

	attributes		accordance ratio of attributes
	same	different	
same-name mammals	6	4	60%
different-name mammals	19	15	56%
total	25	19	57%

such animals. The children may suffer high fever, convulsions, etc., and may die. Since children's mortality rate is quite high in the Ituri forest, people show a strong anxiety for such "bad" animals.

Twenty-five mammals (57%) have almost the same attributes both for the Efe and the Mbuti in terms of food restrictions, especially "eke" and "kuwari" taboo. Nineteen mammals (43%) have different attributes. The accordance in attributes is much higher than the accordance ratio of names.

No significance was found between the accordance of attributes in the same-name mammals and that in the different-name mammals (Table 6).

## II. Birds

Birds are also important animals for the Ituri hunter-gatherers not particularly as food but as bearers of symbolic meanings. Published data on the ethno-ornithology of the Ituri people are very limited. For the Mbuti, I use data collected by Ichikawa (1998), and for the Efe, I use my data (Terashima, 2002b). Among the Mbuti, 101 birds and unidentified 16 species are recorded, and for the Efe, I recorded 72 species and 21 unidentified species. Thirty-six species were recorded both in the Mbuti and in the Efe. A comparison was made on the 35 species, excluding one species of which the vernacular name was not collected in Efe (Appendix 3).

Fourteen species (40%) are found to have the same names in Efe and Mbuti, and twenty-one species (20%) have different names. The name accordance ratio of birds is twice as high as that of mammals. One reason for this seems to be the onomatopoeia used for bird names. Actually, many bird names are from their calls. Among the 14 species of same-name birds, at least 8 names (57%) seem to come from the call of the birds. The ratio of onomatopoeic names among the total birds is 33% for the Efe and 38% for the Mbuti. So, birds with the same names have a fairly high ratio of onomatopoeic names.

Bird calls seem to convey special meanings for the foragers. For example, the great blue turaco is the most conspicuous bird in the Ituri forest, very large and spectacular with brilliant colors. It is called "kalikoko" in Efe and "kulukoko" in Mbuti. The birds often come to woods near human dwellings in a pair or small parties and make an impressive loud sound, "krraou, krraou, kok kok kok kok." The call is considered the very nature of the bird. Quite a strong tie exists between the name and the call. The Senegal coucal also has an unmistakable morphology, and very impressive call, "i fi fi, i fi fi" with a sullen

**Table 7.** Accordance of bird attributes in different-language groups

	attributes		accordance ratio of attributes
	same	different	
same-name birds	10	4	71%
different-name birds	12	9	57%
total	22	13	63%

fading note. It is called “ififi” in Efe and “fifi” in Mbuti. They are certainly unforgettable calls and names.

Birds are associated with various food restrictions, too. The great blue turaco is feared as a very strong “eke” among the Efe. The Senegal coucal is considered completely bad food that nobody can eat. Among the Efe, 20 of 35 species are considered bad or restricted food, and among the Mbuti, 14 of 35 species.

Some birds are said to be associated with certain mammals. Kingfishers are said to be the birds of elephants. They teach the foragers if an elephant is near, calling out loudly around them, or pointing to the direction of the elephant with their conspicuous red bills. Some bulbul are called “the birds of duikers” because they are often found with a herd of duikers. The leopards, pangolins, okapis, buffaloes, and bush-pigs are said to have a close relationship with certain birds (Table 6 in Appendix 3). It is, however, questionable whether this kind of association has some utilitarian meaning.

Wagtails are called “the birds of the village.” They are respected and no harm may be done against them. In contrast, owls and Senegal coucals are despised and feared as “the birds of evils.”

Among the 35 species, 22 species (63%) are found to have almost the same attributes. The accordance ratio is quite high as in the case of mammals. Regarding the difference between the same-name birds and the different-name birds, the ratio of attribute accordance is higher in the former than in the latter, but the difference does not seem to be significant (Table 7).

## DISCUSSION

### I. Plant and Animal Names and the “Authentic” Pygmy Language

It is generally maintained that African Pygmy groups living in the tropical rain forests of central Africa have lost their original language and borrowed their present languages from farmers with whom they have or once had closely associated. But, it is hasty to conclude that there are no original words left at all.

As mentioned earlier, Letouzey (1976) explored Bibaya (Baka) plant terminology and compared it extensively with other languages of farmers. Now, Bibaya Pygmies speak a language quite close to Ngbaka (an Ubangian language spoken in the southern part of the Republic of Central Africa). Letouzey found that at least 104 plant names of 108



**Table 8.** Accordance ratio of plant and animal names in Efe and Mbuti.

	species in common	same-name species
plants	146	31 (21%)
two-place plants	41	5
three-place plants	41	9
four-place plants	64	17
mammals	44	10 (23%)
birds	35	14 (40%)

botanical species have possibly originated from Pygmy language, since none of them are found in any plant name list of the neighboring farmers. He claimed that if some of those 104 words were found in other languages of Pygmy hunter-gatherers in the central Africa, it was strong evidence for the existence of an original Pygmy language. For the Ituri forest, of the 108 plant species mentioned by Letouzey, 29 species were found there. Unfortunately, no name listed by Letouzey was used by Ituri foragers. This would not deny the possibility of a proper Pygmy language, but perhaps means that there may have been variations throughout the African tropical rain forests.

It has become clear that not a few names of plants and animals are used in common both by the Efe and by the Mbuti. Of plants, 12% to 30% of plants recorded from both the Efe and the Mbuti have the same names, 23% of mammals, and 40% of birds have the same names (Table 8). Lese and Bira, now the mother tongue for the Efe and Mbuti belong to completely different language groups. One is a central Sudanic and the other is a Bantu. They have no common plant and animal vocabulary. So the accordance of plant and animal names in fairly high frequency is not a mere coincidence, but a matter of consideration for any two languages.

If no name had been imported, however improbable a postulation, the present names are all from Lese, Bira, or Pygmy language. There are various possibilities concerning the changes in plant names or animal names from the original to the present one (Table 9).

Three possibilities exist considering the names that are the same throughout the forest (the same-name type in Table 9).

*Hypothesis 1:* Original Pygmy terms survive until now.

*Hypothesis 2:* Original Pygmy terms were lost, and Lese terms prevail throughout the forest.

*Hypothesis 3:* Original Pygmy terms were lost, and Bira terms prevail throughout the forest.

Hypothesis 1 seems to be the simplest. Some of the original Pygmy language disappeared through close relationships with the farmers, while plant and animal names survived because the Pygmies were much more familiar with the forest than the farmers.

**Table 9.** Models of name change in the Ituri forest

	Lese Efe		Mbuti Bira		
<i>Before contact</i>	X	A	A	Y	
<i>After contact</i>					
same-name type		A	A		hypothesis 1
		X	X		hypothesis 2
		Y	Y		hypothesis 3
different-name type		X	Y		hypothesis 4
		A	Y		hypothesis 5
		X	A		hypothesis 6

Note: A=original Pygmy, X=Lese, Y=Bira

Hypothesis 2 and 3 have a slimmer chance for standing because it is very tortuous to consider that the Lese or the Bira to have adopted the other farmers' terms discarding their own. If either of the Lese or the Bira lacked some terms, they could have borrowed from each other.

There are also three hypothesis explaining why names differed by language groups (the different-name type).

*Hypothesis 4:* Original Pygmy terms were lost, replaced by Lese and Bira terms, respectively.

*Hypothesis 5:* Original Pygmy terms survive in Efe, and original Lese terms were lost. And in Mbuti and Bira, the original Pygmy terms were lost, and Bira terms were adopted.

*Hypothesis 6:* The reverse case of hypothesis 5. Original Lese terms remained in Efe and Lese, and the original Pygmy terms remained in Mbuti and Bira.

Hypothesis 4 seems to be the simplest explanation where names are different between language groups. In the process of language transition among the Ituri foragers, many plant and animal names could not be immune to change. It is possible that the foragers adopted a majority of plant and animal vocabulary from the farmers in place of their own.

Hypothesis 5 and 6 seem to be less likely but not impossible. When farmers lacked original terms for certain plants and animals, corresponding Pygmy terms might have been adopted.

There is also a possibility that some terms came from other languages. This would be represented by replacing one of "A," "X," or "Y" with "Z" in Table 9. For example, when a certain new plant was introduced to the Ituri forest with a name in a foreign language, that name would come to be used everywhere.

The scenario of combination of two hypotheses that the same names used in common by different-language groups were originally Pygmy (hypothesis 1), while the names used only in one group were from Bira or Lese (hypothesis 4), seems probable considering the

nature of socio-economic and cultural relationships among the foragers and the farmers in the Ituri forest. One can imagine an situation that Pygmy terms survived easily for the plants and animals not known by the farmers, but were replaced by the farmers' terms for the plants and animals that the farmers knew well. However, things may not be so simple, since many endemic species to the forest such as duikers and monkeys have different names. There could be more possibilities that may not be neglected. One is that there could have been more than one Pygmy language and terminology, local dialects, before the contact with the farmers.

Concerning the borrowing of Pygmy terms by the farmers, Letouzey (1976) questioned how the farmers could have adopted Pygmy terms and discarded their own at all, since he found that each plant had just one name among the Baka-bocanga (an Ubangian) and the Lissongo (a Bantu) farmers. Even if some Pygmy terms came to be used by the farmers, the farmers' original terms should not be lost necessarily, considering the farmers' high social status against the Pygmies. It is also difficult to assume that the farmers had no plant and animal name before contact with the Pygmies. In the Ituri forest, however, it seems less difficult to imagine the farmers knew few plants and animals there, since they all came from outside of the forest.

In the Ituri forest, I found that some plants and animals had two names in one local group, of which one was a name used by the same-language groups and the other was the name used by a different-language group. Such cases might indicate an intermediate situation where new terms coexist with the original terms.

## II. Names and Attributes of Plants and Animals

The Mbuti and the Efe use many common plants collected in both groups in a similar way no matter what the names, and for mammals and birds, the attributes accord much better than the names. If such plant use and animal attributes originated as proper Pygmy culture, they prove to be much more durable than the names. Or it might be that the farmers lacked such culture and observations before the contact with the Pygmies, and there was no obstacle for those culture and observations to survive. Today some of these attributions such as food restrictions are shared by the farmers.

There is no association in accordance of plant use or animal attributions between the species with the same or different names. This may also indicate that the names are not as important as the use or attributes in the transition of plant and animal culture among the Ituri foragers.

As mentioned earlier, the Ituri foragers, both the Efe and the Mbuti have very close relationships with their neighboring farmers in every aspect of life such as social relations based on fictive-kinship, economic exchanges based on generalized reciprocity, common performance of ritual ceremonies, cultural norms such as food restrictions. In some places intermarriage between Pygmy girls and farmers is very frequent (Terashima, 1987).

The relationships between the Ituri foragers and the farmers are very complicated, beyond such a simplest model of "masters and slaves." Usually farmers are thought to be in an advantageous position, but sometimes things are not so simple. Some farmers prefer to live together with the foragers than their relatives (Grinker, 1994; Terashima, 1998). Many things happen in such complicated situations. There are many possibilities and many unsolved questions about the relationships between the Pygmies and the farmers, and between the the Mbuti and the Efe, as well as the relationships between men and the

natural environment. More surveys of ethnobotany and ethnozoology would contribute to clarifying those topics.

ACKNOWLEDGMENTS I thank all Efe and Mbuti people who kindly collaborated with me in this study. Also thanks are due to useful comments from my colleagues and friends in the CHAGS9 meeting at Edinburgh. This study was financially supported in part by the Grant-in-Aid for Scientific Research (Project No. 14401013 headed by Dr. Daiji Kimura, Kyoto University).

#### NOTES

- (1) Similarity index =  $N(ab)/[N(a) + N(b) - N(ab)]$ , where  $N(a)$  and  $N(b)$  represent the number of species used in group  $a$  and  $b$ , and  $N(ab)$  the number of species used in both groups.
- (2) Bailey et al., (1989) claimed that the hunter-gatherers might not have been solely living in the tropical rain forest, because there is not sufficient nutritional material for hunter-gatherers in the forest. This idea is, however, not yet confirmed.
- (3) The Efe usually hunt with bows-and-arrows and dogs, and occasionally with spears. The Mbuti usually hunt with nets and occasionally with spears. The nets are thought to have been introduced by the farmers.
- (4) (the frequency of Pattern 1) divided by (the frequency of Pattern 1 + Pattern 2)
- (5) (the frequency of Pattern 3) divided by (the frequency of Pattern 3 + Pattern 4)

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## Appendix 1. Names and Use of Four-group Plants

usage category	species	Efe name	Mbuti name	main use*	other use*	
<b>1) Same-name plants</b>						
food	<i>Dioscorea mangelotiana</i>	toba/tumba	tumba	tuber		
	<i>Dioscoreophyllum cumminsii</i>	kisombi	kisombi	tuber, fruit		
	<i>Gambeya africana</i>	malinda	elinda	fruit		
	<i>Irvingia robur</i>	bute	ebute	nut		
	<i>I. wombulu</i>	toutou	tu (+tubi, eholo)	nut		
material culture	<i>Tieghemella africana</i>	ifou	fou	fruit		
	<i>Ficus exasperata</i>	awasa, masawa	masawa (+kawa)	abrasive		
	<i>Scaphopetalum thonneri</i>	mbaka	mbaka	wood	whip for initiation	
	<i>Vepris louisii</i>	munduluka	mutuluka	bow		
taboo	<i>Uvariopsis congolana</i>	akobishi	akobishi	whole tree		
narcotics	<i>Piper guineense</i>	beka	abeka	seed	ornament	
	<i>Solanum sp.</i>	ngbako	ngbako	fruit		
indirect use	<i>Barteria fistulosa</i>	tonjakpa, tunza	echunja	bait	tonic for men	
	<i>Bridelia micrantha</i>	munjaku	enjeku	caterpillar		
various	<i>Cola lateritia</i>	toko, ndoko	toko	caterpillar		
	<i>Olyra latifolia</i>	ngbere	bangbile	treating, enema-pipe		
	<i>Piper umbellatum</i>	kombukombu	budokomu	various		
<b>2) Different-name plants</b>						
medicine	<i>Citropsis articulata</i>	fekekpa (+adekindelindu)	amesalosal	treating	fruit	
food	<i>Aframomum sp.</i>	mbembe	ngemo	fruit		
	<i>Anonidium mannii</i>	taku	ebambu	fruit		
	<i>Antrocaryon nannanii</i>	kango	esenge	nut		
	<i>Canarium schweinfurthii</i>	opi	mbe	fruit	resin	
	<i>Chytranthus mortehanii</i>	surusuru	sesemu	seed		
	<i>Cola acuminata</i>	eme	liko/sombou (+moko)	seed		
	<i>Dioscorea bulbifera</i>	tee	konjo	tuber, bulb		
	<i>D. praehensilis</i>	kango	aduaka (+amengese)	tuber		
	<i>D. smilacifolia</i>	apa	etaba	tuber		
	<i>Irvingia gabonensis</i>	ambele	esele	nut		
	<i>Landolphia owariensis</i>	ndene	buma	fruit		
	<i>Myrianthus arboreus</i>	akawa, akawakawa	mbombo	fruit		
	<i>M. holstii</i>	akawafefe, kawakawa	bembekenye, mbwembwe	fruit		
	<i>Raphia sp.</i>	tifa	libondo	sap, various		
	<i>Tetracarpidium conophorum</i>	angetti	toby	nut		
	material culture	<i>Treculia africana</i>	nduku	pusia	seed	
		<i>Aidia micrantha</i>	karu	tiba	bow	
		<i>Ataenidia conferta</i>	gefe	bulu	wrapping	
		<i>Desplatsia dewevrei</i>	chombi (+okutaji)	esuli	brush	
<i>Eremospatha haullevilleana</i>		enji	mbopi	binding		
<i>Erlthrophleum guineense</i>		anjoafa	tafa	charcoal	arrow-poison	
<i>Manniophyton fulvum</i>		sudi	kusa	net		
<i>Maranthochloa congensis</i>		keru	toto	basketry		
<i>Megaphrynium macrostachyum</i>		ngilipi	ngongo	wrapping, thatching		
<i>Musanga cecropioides</i>		kele	kombo	wood		
ritual/magical	<i>Pancovia harmsiana</i>	alelau (+tama)	engango	axe-handle	fruit	
	<i>Polyalthia suaveolens</i>	ketu (+mulange)	eta (+emole)	torch		
	<i>Rothmannia whitfieldii</i>	tato	ebembe/ebimbele	dye		
	<i>Leptaspis cochleata</i>	nzanza	sanesane/sasane	various		
	poison	<i>Rauvolfia vomitoria</i>	kimakima (+kokukoku)	bakatiyabamiki/masis i (+kwetakweta)	arrow-poison	treating
indirect use	<i>Cynometra alexandri</i>	ato	tembu	honey nectar		
	<i>Julbernardia sereti</i>	rofo	eko	honey		
	<i>Celtis sp.</i>	arubese	kene	caterpillar		
others	<i>Alchornea floribundus</i>	popo	epese	various		

\* The uses mentioned were not necessarily found among all the local groups.

(continued)

**Appendix 1. (continued)**

usage category	species	Efe name	Mbuti name	main use*	other use*
<b>3) Intermediate-name plants</b>					
medicine	<i>Alstonia boonei</i>	mokpo (+ode, +akima)	ekimo	treating	
	<i>Croton haumanianus</i>	acutengitalu, sumbe/biloo	tengwe	treating	
	<i>Roureopsis obliquifoliolata</i>	aluman (+ndindina)	ndindimyo	treating	
material culture	<i>Antiaris welwitschii</i>	chonge (+sopa)	supa	barkcloth	
	<i>Calamus deerratus</i>	ekpekpe (+ndundukpe)	lekwe (+akpekpe)	binding	
	<i>Trichillia sp.</i>	gbombo	ehamba (+gbomgbo)	wood	
poison	<i>Parquetina nigrescense</i>	kolokuko (+mutalikuko)	mutali	arrow-poison	
	<i>Tephrosia vogelii</i>	ruru	bappi (+ruru)	fish-poison	
<b>4) No-common-name plants</b>					
medicine	<i>Spathodea campanulata</i>	alipa, akuaku	njolo	treating	
food	<i>Dictyophleba lucida</i>	mangocha'aei, gbado'aei	malondo	fruit	
material culture	<i>Ficus lepreuri</i>	ipisaki, ipikalikoko	tumbu, sebya	barkcloth	
others	<i>Costus afer</i>	mukakamukaka, andiauodiodi	mbimbitu, tutuku	various	

\* The uses mentioned were not necessarily found among all the local groups.

## Appendix 2. Names and Attributes of Mammals

Order	Latin name	English name	Efe name	Mbuti name	name*	attribute*
Insectivora	<i>Rhynchocyon cirnei</i>	Giant elephant shrew	abeke	amapepepe	x	same
Insectivora	<i>Potamogale velox</i>	Giant otter Shrew	akpebi	amepulu	x	x
Rodentia	<i>Anomalurus sp.</i>	Flying squirrel	alope	embulu	x	x
Rodentia	<i>Cricetomys emini</i>	Giant rat	apuru	apenbe	x	same
Rodentia	<i>Thryonomys sp.</i>	Cane rat	taru	sengi	x	same
Rodentia	<i>Atherurus africanus</i>	Brush-tailed porcupine	fele	njiko	x	x
Rodentia	<i>Hystrix sp.</i>	Crested porcupine	ikule	njingi	x	x
Pholidota	<i>Manis gigantea</i>	Giant ground pangolin	kate	tope	x	same
Pholidota	<i>Manis tricuspis</i>	Tree pangolin	oku	eboso	x	same
Primates	<i>Euoticus elegantulus</i>	Needle-clawed galago	gbanga	ekpanga	same	same
Primates	<i>Galagoideus demidovi</i>	Dwarf galago	gbenjikeke/besi	epinje	x	x
Primates	<i>Perodicticus potto</i>	Bosman's potto	abende	abaku	x	x
Primates	<i>Papio anubis</i>	Anubis baboon	meba	apula	x	same
Primates	<i>Cercocebus albigena</i>	Grey-cheeked mangabey	akputu	akputu	same	x
Primates	<i>Cercocebus galeritus</i>	Crested mangabey	angara	angala	same	same
Primates	<i>Cercopithecus ascanius</i>	Red-tailed monkey	tepe/gima	mbeke	x	x
Primates	<i>Cercopithecus mitis</i>	Blue monkey	asaba	saba	same	same
Primates	<i>Cercopithecus mona</i>	Mona monkey	cabira/mudurupu	mbengi	x	same
Primates	<i>Colobus abyssinicus</i>	Abyssinian B&W colobus	bururu/ngeru	mbolo	x	same
Primates	<i>Colobus angolensis</i>	Angolan B&W	muko	mbela	x	x
Primates	<i>Colobus rufomitratu</i>	Red colobus	aboi	masakpu	x	same
Primates	<i>Pan troglodytes</i>	Chimpanzee	andikobunde	siko	x	x
Carnivora	<i>Panthera pardus</i>	Leopard	kau	muli	x	x
Carnivora	<i>Mellivora capensis</i>	Ratel	kurukuru/abebeu	kunbukunbu	same	same
Carnivora	<i>Atilax paludinosus</i>	Marsh mongoose	andikao/taca'akputu	apakekeke	x	x
Carnivora	<i>Bdeogale nigripes</i>	Black-footed	esafu	ndeke	x	x
Carnivora	<i>Crossarchus alexandri</i>	Dark mongoose	kpolokpolo	kpolokpolo	same	x
Carnivora	<i>Viverra civetta</i>	African civet	camu	samo	same	x
Tubulidentata	<i>Orycteropus afer</i>	Aardvark	ingbo	ngibo	same	same
Hyracoidea	<i>Dendrohyrax dorsalis</i>	Tree hyrax	yama	shoka	x	same
Proboscidea	<i>Loxodonta africana</i>	Forest elephant	oku	mbongo	x	same
Artiodactyla	<i>Hylochoerus meinertzhageni</i>	Giant forest hog	balike	ekuma	x	same
Artiodactyla	<i>Potamochoerus porcus</i>	Bush pig	tiko	ngoya	x	x
Artiodactyla	<i>Hyemoschus aquaticus</i>	Water chevrotain	bbefe/ambaka	ahele	x	same
Artiodactyla	<i>Okapia johnstoni</i>	Okapi	okapi/bote/babbo	mboti	same	same
Artiodactyla	<i>Tragelaphus euryceros</i>	Bongo	sofi	syoli	same	same
Artiodactyla	<i>Cephalophus callipygus</i>	Peters's duiker	raka	apole	x	x
Artiodactyla	<i>Cephalophus dorsalis</i>	Bay duiker	iti	kuha	x	same
Artiodactyla	<i>Cephalophus leucogaster</i>	Gabon duiker	tau	seke	x	same
Artiodactyla	<i>Cephalophus monticola</i>	Blue duiker	medi	nbuku	x	x
Artiodactyla	<i>Cephalophus nigrifrons</i>	Black-fronted duiker	munju	nge	x	same
Artiodactyla	<i>Cephalophus sylvicultur</i>	Yellow-backed duiker	toci	moinbo	x	same
Artiodactyla	<i>Neotragus batesi</i>	Bates' pygmy antelope	apopo	anbilo	x	same
Artiodactyla	<i>Syncerus caffer</i>	Forest buffalo	tupi	njali	x	same

\* Accordance in names and attributes is indicated.



## Appendix 3. Common Birds Among the Efe and the Mbuti

family	species (Efe/Mbuti)*	common name	Efe name	Mbuti name	name**	attribute**	attribute(Efe)	attribute(Mbuti)
Accipitridae	<i>Gypohierax angolensis</i>	palmnut vulture	kaliisa	amakanbi	x	same	eke	kuweri
Accipitridae	<i>Kaupifalco monogrammicus</i>	lizard buzzard	sekpi	segbe	same	x	for olds	
Accipitridae	<i>Lophaetus occipitalis</i>	long-crested eagle	pelekesi	sombouko	x	x	for olds	nba
Phasianidae	<i>Agelastes niger</i>	black Guinea-fowl	gbegbegbe	gbengbegbe	same	x		for olds
Phasianidae	<i>Francolinus</i> sp.	a kind of francolin	aloko	ekombi	x	same	leopard	leopard, ekusa
Phasianidae	<i>Guttera pucherani/plumifera</i>	crested Guinea-fowl	kaliango	kanga	x	same	eke	kuweri
Rallidae	<i>Sarothrura pulchra</i>	white-spotted crane	yambombo	amabonbonbon	same	x	ritual	for olds
Musophagidae	<i>Corythaëola cristata</i>	great blue turaco	kalikoko	kulkoko	same	same	eke	kuweri
Cuculidae	<i>Centropus senegalensis</i>	Senegal coucal	ififi	fifi	same	same	bad	for olds
Strigidae	?	owls	aku	apamuku	x	same	bad	bad
Coliidae	<i>Colius striatus</i>	speckled mousebird	musude	manjoa	x	same		
Alcedinidae	<i>Ceyx picta</i>	African pygmy kingfisher	kouanjenje	mangamako	x	same	eke, elephant	eke, elephant
Bucerotidae	<i>Bycanistes</i> sp./albotibialis	a kind of hornbill	tawa	ngawa	same	x	eke	ritual
Capitonidae	?	barbet	engu	inguu	same	same		
Capitonidae	<i>Pogoniulus bilineatus</i>	lemon-rumped tinkerbird	kongbe	amapongotolo	x	x	bay-duiker	
Picidae	<i>Campethera nivosa</i>	buff-spotted woodpecker	andakuku	amanbere	x	x	bad	
Hirundinidae	<i>Psalidoprocne nitens</i>	square-tailed saw-wing	kuruba	byanbya	x	same	bad	bad
Motacillidae	<i>Motacilla aguimp</i>	African pied wagtail	godingodi	manbiase	x	same	village	village
Pycnonotidae	<i>Andropadus gracilirostris</i>	slender-billed bulbul	bisolo	esholo	same	same	eke, duiker	duiker
Pycnonotidae	<i>Andropadus virens</i>	little greenbul	ndetu	kietu	same	same	good	
Pycnonotidae	<i>Bleda syndactyla</i>	red-tailed bristle-bill	kpekpe	gbengbe	same	same	duiker, leader	duiker, kuweri
Pycnonotidae	<i>Criniger calurus</i>	red-tailed greenbul	pioi	mbilie	x	x		leader
Pycnonotidae	<i>Pycnotus barabatus</i>	yellow-vented bulbul	akpupole	kpukpele	same	same	eke, pangolin	pangolin
Turdidae	<i>Cossypha cyanocamptor</i>	blue-shouldered robin-chat	mutandi	alipandoi	x	same	bad	kuweri
Sylviidae	<i>Camaroptera brevicaudata/brachyura</i>	grey-backed camaroptera	sie	amabe	x	same		
Sylviidae	<i>Hylia prasina</i>	green hylia	gisimbikosa	amakisonbikisonbi	same	same	wild vegetable	wild vegetable
Muscicapidae	<i>Dyaphorophya castanea</i>	chestnut wattle-eye	uengbamundurukpa	amekpongo	x	x	eke	
Muscicapidae	<i>Schistolais leucopogon</i>	white-chinned prinia	chichiri	dede	x	same		
Muscicapidae	<i>Tepsiphon viridis</i>	African paradise flycatcher	chekiki	suekeke	same	same	bad	kuweri, nba
Nectariniidae	<i>Nectarinia olivacea</i>	olive sunbird	njeba	amatinebulu	x	x	eke	
Oriolidae	<i>Oriolus brachyrhynchus</i>	western black-headed oriole	bukangoi	amakokobuo	x	same		
Ploceidae	<i>Ploceus cuculatus</i>	village weaver	alei	siele	x	x	eke	
Ploceidae	<i>Ploceus nigerrimus</i>	Vieillot's black weaver	aleiesa	siele	x	x	eke	
Dicruridae	<i>Dicrurus</i> sp.	a kind of drongo	apasa	apasia	same	same		
Estrildidae	<i>Lonchura bicolor/fringilloides</i>	black-and-white mannikin	manakulele	njinji	x	x	eke	

\* Some birds have different identifications in the level of species between the Efe and the Mbuti, which are shown respectively.

\*\* Accordance of names and attributes between the Efe and the Mbuti is indicated.

————— Accepted *July 1, 2003*

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