A preliminary report on the diversity of forest landscape recognition among the Baka hunter-gatherers of Eastern Cameroon

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Abstract

Indigenous peoples living in tropical forest have developed their own traditional ecological knowledge base, which has enabled their sustainable exploitation of local natural resources. Whereas there are many studies on ethnobotany, ethnopharmacology, and cultural recognition of plants of Congo basin hunter-gatherers, less focus have been put on their recognition of forest landscape itself. Investigating folk classification of tropical forest landscapes can help us to more exhaustively assess habitat diversity, and to demonstrate its potential for the subsistence and well-being of forest-dependent local peoples, as well as provide meaningful information for establishing sustainable social forestry programs. We described 20 folk vegetation categories or habitats in the Baka forest nomenclature. Recognized habitats are defined based on their flooding regime and soil characteristics, indicator species, distance from the village, visibility in the understory, canopy structure, history of past land use, and forest hydrology. The Baka informants clearly distinguish and name relatively stable habitats featured by hydrological constraints, land form, and monodominance by specific species. We observed, however, considerable variations in their cognition of forest vegetations between individuals. Further study is needed to examine what factors of socioecological and/or socioeconomic conditions influence on their diverse ways of forest landscape recognition.

Keywords: landscape ethnoecology, African tropical rainforests, Congo basin hunter-gatherers, Cameroon

1. Introduction

Indigenous peoples living in tropical forest have developed their own traditional ecological knowledge base, which has enabled their sustainable exploitation of local natural resources. Also, such traditional knowledge have contributed to the development of scientific knowledge about tropical forest, as René Letouzey (1976) collected Baka lexicons related to forest botany as he owed much from Baka botanical knowledge during his fieldwork in Eastern and Southern Cameroon.

There are many studies on ethnobotany, ethnopharmacology, and cultutal recognition of plants among Congo basin hunter-gatherers (Motte-Florac 1980, Tanno 1981, Bahuchet 1985, Terashima *et al*.1988, Ichikawa and Terashima 1996, Betti 2004, Hattori 2006). Most studies, however, focused on plant knowledge at (ethno-)species level and less focus have been put on their recognition of forest landscape itself. Bahuchet (1985: 49-65) applied ethno-linguistics to describe and analyze the ecological processes as understood by the Aka hunter-gatherers of the Central African Republic. Bahuchet pointed out some similarities between traditional folk and modern biological descriptions of the dynamics of tropical rainforest. The Aka informants described natural forest habitats under specific conditions related to forest gap dynamics (Bahuchet 1985).

For forest-dwelling farmers, labeled habitats tend to be related to the agricultural activities. Mvae farmers who reside at village in Campo-Ma'an National Park recognizes village forest (slash-and-purn fields, fallows and cocoa agroforests), anthropogenic forest (secondary forest, abandoned settlements), and deep forest (Dounias 1996). Nguenang *et al.* (2010) reports that Bajoué in Dja biosphere reserve (South-East Cameroon) distinguish four main vegetation types: *Ebour* (young or old fallow aged 4 to 11 years dominated by weeds like *Chromolaena odorata* in early stage and by *Musanga cecropioides* in the old stage; *Kwalkomo* (corresponding to secondary forest with characteristic species like *Zanthoxylum gilletii*, *Pentaclerathra macrophylla*, *Terminalia superb*; *Ekomo* (corresponding to mature forest more or less disturbed with the shrub layer dominated by *Rinorea* and *Drypetes*; *Zam* (corresponding to swamp forest with dominance of *Raphia* species).

Whereas these previous studies give us glimpses on variation of forest recognition by forest dwellers of central Africa, the content and structure of folk knowledge about forest landscapes, especially those of complex secondary vegetations, has not been properly investigated as of yet. Investigating this type of folk classification system can help us more exhaustively assess habitat diversity (Abraao *et al.* 2008) and demonstrate its potential for the subsistence and well-being of forest-dependent local peoples, as well as provide meaningful information for establishing sustainable social forestry programs.

Form of local knowledge on forest diversity is not uniform among tropical forest dwellers in different regions and cultures despite of similarity in environment (Ellen 2010). Ethno-ecological tropical forest classification have been studied in Amazonia and then in southeast Asia. There are two patterns reported: detailed and relatively definitive fixed classification with many lexicalization of

specific vegetations (such as among the Matsigenka in Peru Amazon: Abraao *et al*. 2010, Shepard *et al*. 2001) and flexible, multidimensional, less or non-fixed classification with less lexicalization of specific vegetation (such as among the Nuaulu in Eastern Indonesia: Ellen 2010). To which extent local people share systematic categorization may depend on both of the pattern of forest diversity and each group's mode of forest recognition. In this paper, we try to describe the folk forest recognition among the Baka and its intracultural diversity in relation to their daily livelihoods.

2. Study area and people

This study has been conducted in southeastern Cameroon. The study site was Ndongo village located at 2°05′N 14°5′E near the Dja River, which is the international border between Cameroon and the Republic of Congo (Figure 1). The altitude is about 360 m above sea level. The vegetation of this region has been described as mixed forest, with a dominance of deciduous species (Letouzey 1985). Annual rainfall varies from 1300 to 1600 mm and annual average temperature is 25 °C (Sigha-Nkamdjou 1994). The area is subject to a Guinean equatorial climate with four seasons divided as follows: a long dry season from December to mid-March, a short rainy season from mid-March to June, a short dry season in July and August, and a long rainy season from August to November. The weather pattern is distinctive from the other parts of Congo basin because a clearly defined dry season exists, when semi-deciduous species.

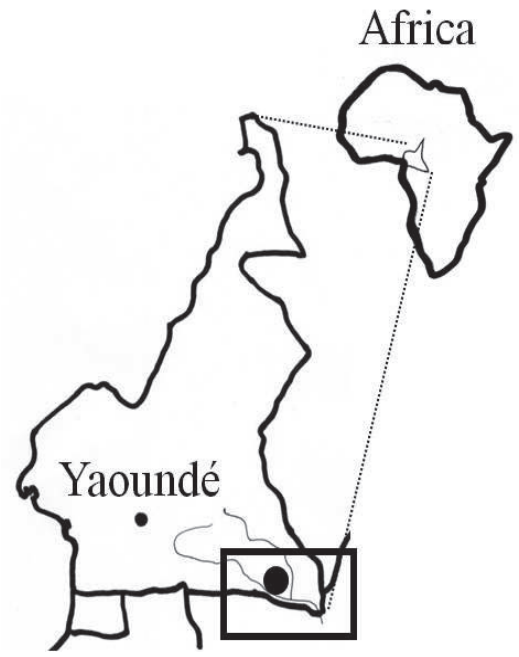

Figure 1. Research area

The Baka is one of the Pygmy hunter-gatherer groups who are assumed to be the first people of Congo Basin tropical forest, whose total population is estimated as 30,000 to 35,000 (Njounan Tegomo *et al*. 2012). Reflecting forest dependent life, the Baka are well known for their botanical knowledge

(Letouzey 1976). Since 1950s, Lifestyle of the Baka became sedentary and adoption of agriculture proceeded (Althabe 1965). Current subsistence activities of Baka consists of a combination of hunting and gathering, fishing, small-scale shifting cultivation, and cocoa farming (Oishi 2012).

Total population of local community of Ndongo is around 350.Whereas the inhabitants of research area are multi-ethnic with 15 ethnic groups resulting from operation of commercial logging operation in the past, major part of population are dominated in number by two indigenous groups of the Baka hunter-gatherers and Bakwele fisher-farmers (Oishi 2012). There were eight separate sedentary camps for the Baka, each of which has a population between 27 and 58 at the time of fieldwork.

3. Methodology

We conducted field research for two weeks in February 2009 and three weeks in July 2010. The visits were made in the middle of the major and minor dry seasons, respectively. Interviews were conducted in Baka and French languages throughout the research.

First we made a preliminary group discussion, which had been held with 27 Baka adults (15 men and 12 women) living in Ndongo village to explore terminologies of the different forest landscapes that are recognized by the Baka. The group interview was conducted as a free-form conversation among the participants with a minimum of intervention by the researchers. We asked informants simple questions such as '*What kinds of forest do you know?*'. There were often differences of opinion among participants.

Confusing and conflicting opinions were recorded and translated from Baka language with the help of research assistants. After some discussion, participants of the group disucussion reached a consensus on the major forest categories. The result of this discussion was repeatedly verified by cross-checking with different Baka informants throughout the field research in the forest.

4. Results

In total, 20 folk vegetation categories or habitats were preliminarily recorded in the Baka forest nomenclature. Table 1 characterizes the 20 habitats and the matching floristic forest types based on contemporary ecological classification systems (Photographs of each landscape were given in the appendix).

Table 1. Baka vegetation categories

No.	Baka vegetation category	Description
1	*bele*	generic term of "forest"
2	*bai*	wet savannah, the Baka don't recognize as forest
3	*njambo*	*Raphia* forest, the Baka don't recognize as forest
4	*wundo na gbie**	agricultural fallow, the Baka don't recognize as forest
5	*bele na bundja* or *saka**	periodically flooded forest
6	*tobele*	deep forest far from village, etymologically meaning is “the heart (centre) of the forest”
7	*bemba**	*Gilbertiodendron* monodominant forest
8	*liwala**	forest with understory dominated by *boboko* (*Marantochloa purpurea*) and where you can find many *bala bala* trees (*Milletia* sp.) with cacao like large leaves. Surface soil is blakish.
9	*buya**	forest with open canopy and more or less thick understory. Only few heliophyte trees emerge the canopy. Could be understood as young growing secondary forest.
10	*buka*	physically and physiognomically similar forest to *buya* . *Buka* is smaller forest patch than *buya.*
11	*bi**	forest with very thick understory where it is difficult to see at long distance.
12	*koko na bele**	forest gaps created by the falling down of trees.
13	*kpwoto**	heavily disturbed areas near wet savannah where elephants and the other large mammals use to come and feed.
14	*dobo*	swamp forest along streams, poorly drained.
15	*diko bala (na bele)**	forest regenerated after the abandoned temporary camps for hunting and gathering, fishing, and small-scale agriculture.
16	*diko ba (na bele)**	forest regenerated after the abandoned villages.
17	*bikolo**	mature forest with many big trees and more or less thick understory.
18	*mandja**	mature forest with very clear understory where you can see somebody at or something very far.
18a	*mandja na bi*	forest mosaic where one can find discontinuous patches of *mandja* and *bi* forests categories.
18b	*mandja na bikolo or bikolo na mandja*	forest mosaic where one can find discontinuous patches of *mandja* and *bikolo* forests categories.

Note: Photographs of the categories with * are provided in the Appendix.

The generic Baka term for forest is *bele*. *Bele* is thought to occupy the semiotically opposite position of *ba* (sedentary village). Wet savannah, *Raphia* forest, and agricultural fallow lands are not recognized as forest. Excluding generic and composite terms, the Baka lexicalize more on natural habitats (11 habitats) than on anthropogenic habitats (3 habitats). Baka categorization and recognition of forest reflects multiple frameworks, that include physical structure, flooding regime, dominant species, topography, distance from settlement (sedentary village), animal disturbance, and anthropogeneity (past human activities, human settlement history). Among these forest understory visibility and canopy openness were frequently cited as reasons to explain the differences between forest habitats.

As can be seen in the case of combined categories of *mandja na bikolo* and *mandja na bi* (categories 18a and 18b in Table 1), the Baka do not always set clear boundaries between different forest categories. The correspondence between the present forest and forest categories is not fixed and does not always have a one-to-one relationship. The Baka informants claimed complicated varieties of forest vegetation in various ways. This flexible and elastic characteristic mode of their forest recognition might be a practical to cope with constantly changing diverse situation of forest micro-environments (Ellen 2010).

Natural vegetation and anthropogenic vegetation appear to be similar in their physical structure. The Baka perceive a similarity between agricultural fallow and young forest vegetation undergoing the process of regeneration. *Wundo* is a term used for agricultural fallow, but sometimes the Baka also use this term for *buya*, large sized forest gaps. In such cases, the Baka distinguish *wundo na bele* (fallow of forest) from *wundo na gbie* (agricultural fallow) near the village.

The *tobele* category is unique from the other habitats in that it is defined only by the distance from sedentary villages or camps. Considering that it can also contain many of the other habitats of forest, it cannot be treated in the same way as the categories of vegetation type. In general, the distance appears to be far more than 15 km (in a straight line) from the current village, but it is impossible to clarify and quantify the boundary of *tobele* because the Baka recognize *tobele* in a continuum with other habitats, and more importantly, they "feel" it according to the informants.

We also observed a considerable intra-cultural variations about forest landscape recognitions among Baka informants. Whereas some informants stressed the importance of soil and land form, the others stressed the potential distribution of edible wild and semi-wild plant and animal species for gathering and hunting activities. In addition, gendered differences are evident in some forest habitat uses. For example, whereas female Baka tend to tell importance of secondary forests to fetch *Marantaceae* herb leaves that are indispensable for roofing traditional *mongulu* mobile huts, male Baka tend to tell importance of Primary and *Raphia* monodominant forests to fetch tree species and *Raphia* shoots for house construction at sedentarized camps. This may reflect modification of gendered roles among the Baka following continuous tendencies of sedentarization.

5. Discussion

In general, Baka forest habitats are defined based on their flooding regime and soil characteristics, indicator species, distance from the village, visibility in the understory, canopy structure, history of past land use, and forest hydrology. The Baka clearly distinguish and name relatively stable habitats featured by hydrological constraints, land form, and monodominance by specific species. Four of the Baka habitats (*bemba, njambo, liwala*, and *bai*) were specifically defined based on the presence of characteristic indicator species: *Gilbertiodendron dewevrei*, *Raphia* spp., *Milletia* sp., and savannahs grasses, respectively. *Gilbertiodendron* monodominant forest (also refer to as *limbali*) and *Raphia* forest types are also considered as modern ecological classifications (Aubrevile 1957), as well as in the Cameroon national forest classification of ONADEF (1992). Knowledge about these habitats were extensively shared among people. On the contrary, habitat like the *tobele*, which etymologically means "the heart [center] of the forest," cannot only be clearly defined but individual perception may also vary a lot depending on his/her cumulative experience in the forest.

The *bi, buka, buya, koko na bele, diko ba, diko bala*, and *wundo na gbie* respectively represent different conditions of secondary vegetation. Only three categories of *diko ba, diko bala,* and *wundo na*

gbie reflected human use history. Different from the previous studies on forest dwellers who principally rely on swidden agriculture (Dounias 1996, Nguenang *et al.* 2010), the Baka lexicalize more on natural habitats than on anthropogenic habitats. The *koko na bele* forest category reflects a natural disturbance (trees falling down) and same terminology is also reported in the forest nomenclature of Aka pygmies of the Central African Republic (Bahuchet 1985), as well as in ecological classifications. The *bi, buka*, and *buya* reflect the physiognomical aspect of the forest (understory density and canopy structure, respectively). *Dibo* and *saka* (or *bele na bundja*) are associated with forest hydrology and soil characteristics, and these characteristics are also reflected in modern ecological classification systems (Aubreville 1952, Letouzey 1985, ONADEF 1992). Similarly, the *kpwoto* category, which is 'a place where elephants gather and feed', is well known in the scientific literature as saline. Although *mandja* and *bikolo* both represent mature stages of forest growth, the Baka clearly distinguish them based on their understory structure. Frameworks in which the Baka recognize secondary forest are multidimensional, sometimes overlapping, and complementing each other to draw diverse and intermediate features of dynamic forest landscapes. This may allow the Baka to make ad hoc reference to a particular condition of forest, as their "pragmatic" response to the high complexity of environment (Ellen 2010).

Thus, our results are in line with previous studies that have argued that folk forest classification systems can provide novel ecological information for modern ecologists (Abraao *et al*. 2008, Sheil and Lawrence 2004, Halme and Bodmer 2007, Shepard *et al.* 2001). Whereas previous quantitative analysis on forest landscape recognition were mostly from Amazonia and Southeast Asia and absent from central Africa, the present research suggests that the traditional ecological knowledge of forest dwellers such as the Baka have enough potential to be used to identify major landscape units in southeast Cameroon rainforest areas.

The question arises whether the Baka have a similar type of ethnotheories or the perspectives to grasp the ecological relationships between their recognized habitats. When we asked how they observe vegetation changes in the long term, Baka informants told us about their understandings of vegetation changes, for example, from forest gaps to open canopy forest or very thick undergrowth forest, depending on the gap size (cf. Bahuchet 1985). Of course the Baka are also aware that fallow land will return to forest. Although their images of vegetation change may not be arranged systematically and there observed were considerable variation in their ways of expression, it is clear that the Baka view forest vegetation not as a static entity but as a dynamic one (Ellen 2010). Further study is needed to examine what factors of socioecological and/or socioeconomic conditions influence on their diverse ways of forest landscape recognition.

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Appendix. Photographs of observed forest landscapes.

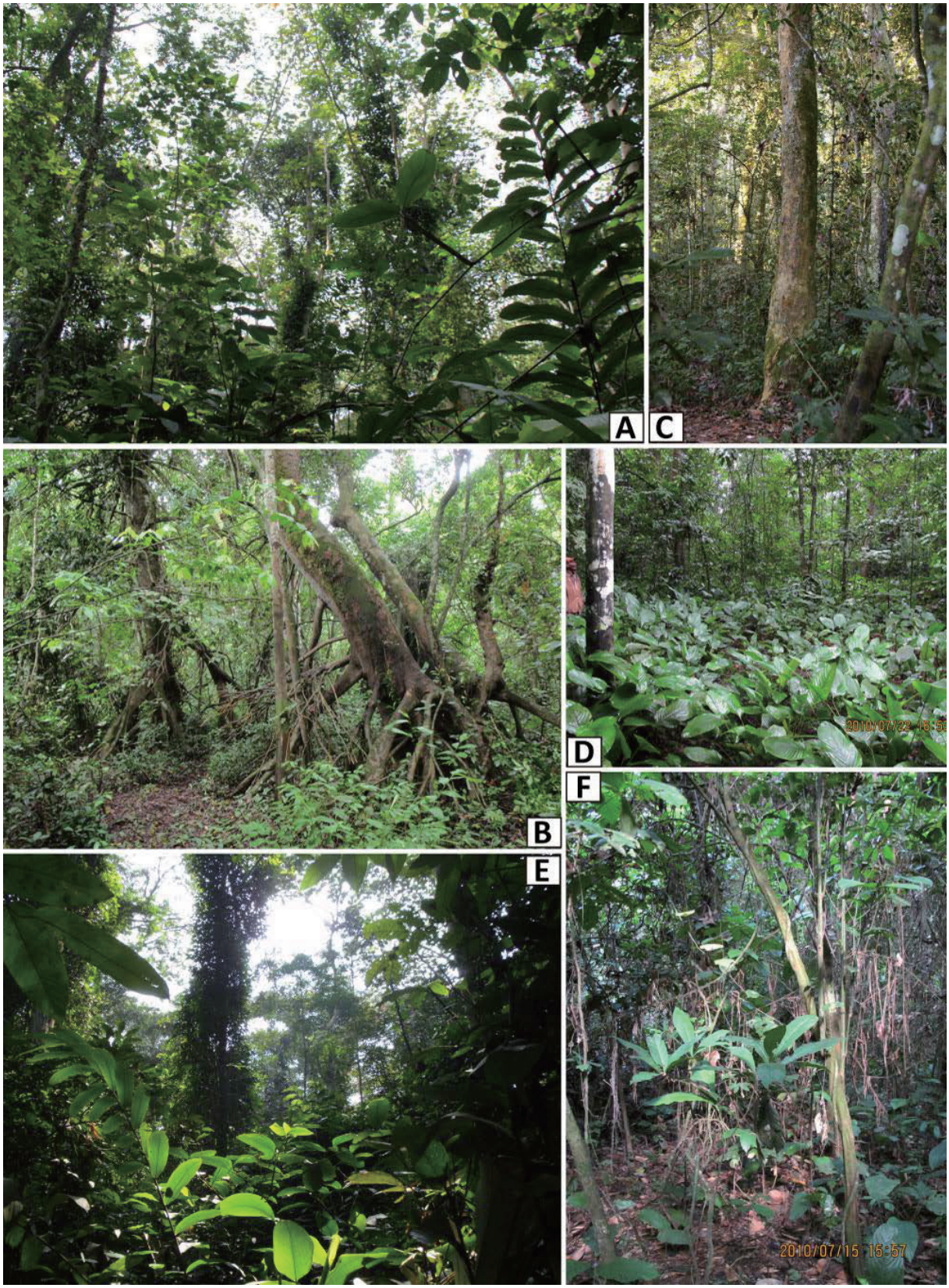
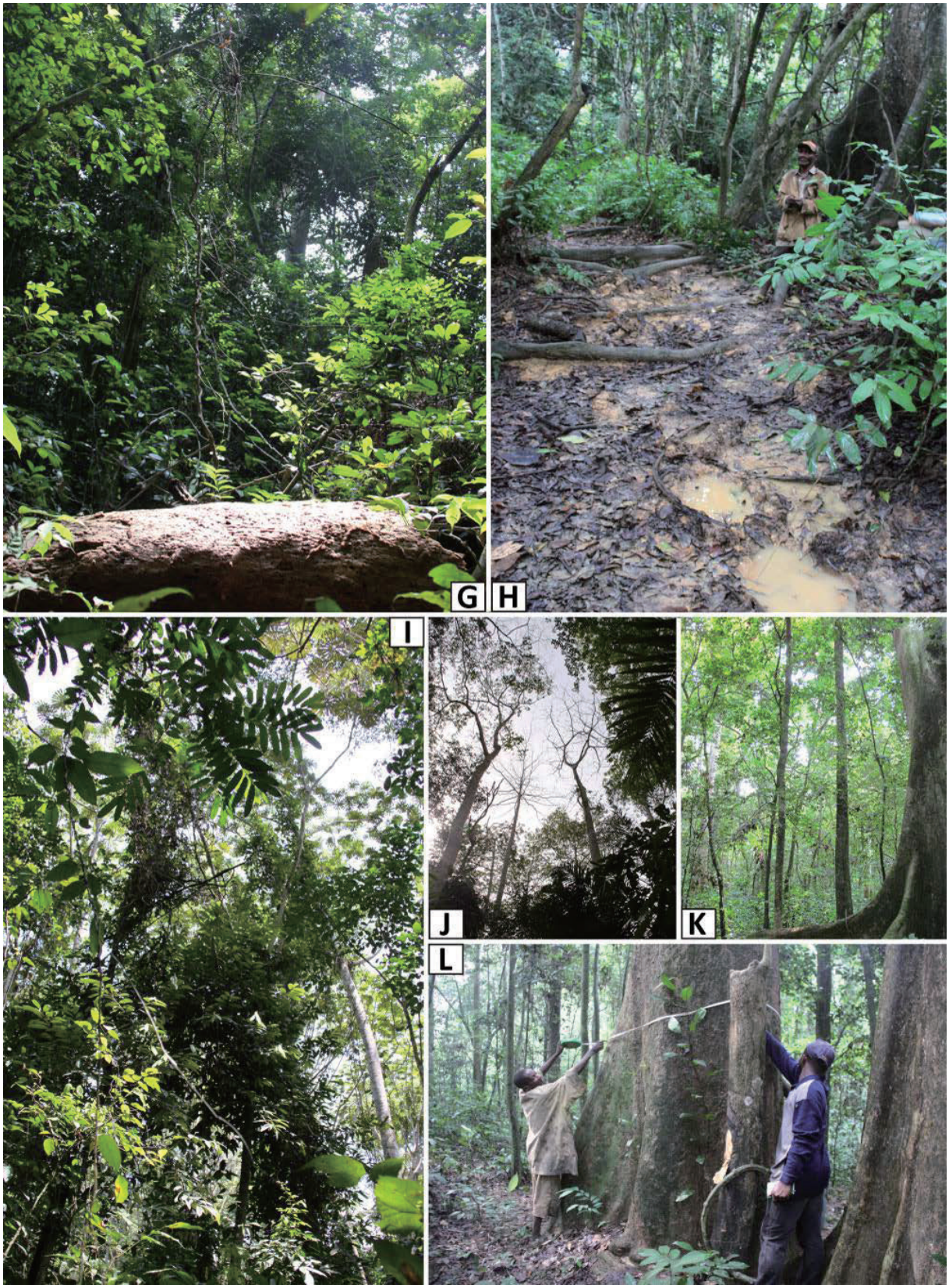


Figure 2. (A)*wundo na gbie*, (B)*bele na bundja*, (C)*bemba*, (D)*liwala*, (E)*buya*, (F)*bi*



(G)*koko na bele*, (H)*kpwoto*, (I)*diko bala*, (J)*diko ba*, (K)*bikolo*, (L)*mandja*