

HUNTING OF THE BOYELA, SLASH-AND-BURN AGRICULTURALISTS, IN THE CENTRAL ZAIRE FOREST

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ABSTRACT The hunting techniques and activities of the Boyela, slash-and-burn agriculturalists in the central Zaire Forest, are described and analyzed in this paper. The meat which the hunting provides is the primary protein source for the Boyela who depend on cassava tubers with a very low protein content for the bulk of their diet. Hunting, besides agriculture, is one of their major subsistence activities.

The Boyela hunters mainly hunt by drive and ambush methods, using bows and arrows, nets, and traps which are well adapted to the forest environment. However, they are characterized as trappers, having developed an elaborate trapping technology.

As the Boyela hunters are engaged in agricultural activities, they are restricted to part-time hunting within a small area around their settlements and fields; however, the people's demand for meat is not small. It is inferred that in order to resolve this problem, they have adopted trapping, which is the most efficient in terms of labour-input, as the principal hunting activity, have made many technological innovations, and have occasionally conducted hunting trips deep into the usual hunting range, leaving their home base.

INTRODUCTION

The Boyela as a tribe belong to the Mongo, a Bantu group, who are widely distributed through the vast tropical rain forest of the central Congo Basin (Murdock, 1959: 284-90). Their livelihood is based on slash-and-burn agriculture, but they also engage in supplementary hunting, fishing and gathering. They are closely tied to their natural environment, the tropical rain forest, and make their living from it.

The present author conducted field surveys on the Boyela since 1976 from the viewpoint of ecological anthropology, focussing on their subsistence ecology. Their basic subsistence activity, slash-and-burn agriculture, is described elsewhere (Sato, in press), and this paper will deal more with hunting, especially its ecological aspects.

Recently some ecological anthropological studies have been conducted on African hunter-gatherers, and detailed data on their hunting life are accumulating. However, there is still little data on the hunting life of agriculturalists, for hunting has not received much attention in most anthropological studies of agriculturalists. Where hunting was mentioned, most of these studies considered its social, cultural, and religious aspects, not its ecological aspects. It is certain, however, that most agriculturalists in the tropics throughout the world hunt as a subsistence activity. Such universality suggests that it should not be overlooked in study of the subsistence economy and ecology of agriculturalists.

This paper attempts to do two things. The first is to reveal the characteristics of hunting in a forest environment. The second is to reveal the characteristics on hunting by forest agriculturalists. With respect to the latter, some explanation may be required. In general, it can be considered that agriculture promotes sedentariness, and that hunting by agriculturalists is in contradiction to their sedentary life; heavy reliance on it precludes sedentariness (Carneiro, 1970; Gross 1975). Therefore, it can be expected that the hunting by agriculturalists differs from that of hunter-gatherers in various ways.

How do they adjust to such a contradictory relationship between hunting and agriculture and how do they hunt in a given natural environment? To understand the adaptive system of agriculturalists it is necessary to examine these problems. This may also provide clues as to the origin of agricultural society.

In this paper Boyela hunting techniques and activities will be described and analyzed, and discussed through a comparison with those of African hunter-gatherers. The significance of hunting in subsistence of the Boyela and world tropical agricultural societies will also be discussed.

METHOD AND PERIOD OF FIELD SURVEY

Two field surveys in the Zaire Forest were conducted from September 1976 to February 1977 and from October 1978 to February 1979. Both included an extensive short trip in the Boyela and the Ngandu territories and two intensive surveys at Yele, a village in the southeastern part of the Boyela territory. The first intensive survey was for five months (Oct.–Feb.) and the second for four months (Nov.–Feb.).

Although this report is based on material obtained from the two studies, description of the actual hunting activity is based mainly on the data obtained from the second survey.

The surveys were made by direct observation and inquiry, using Lingala language, the common language of the western and central part of the Republic of Zaire. In the present paper, however, Boyela language (Loyela) is used for native terms. If at any time the Lingala language is used, it is referred to hereafter as Lin.

STUDY AREA

A. Location

The Boyela are distributed in the area of the upper Tshuapa River, a tributary of the Zaire (Congo) River (Fig. 1). This area is administratively included in the Zone de Ikela, Région de

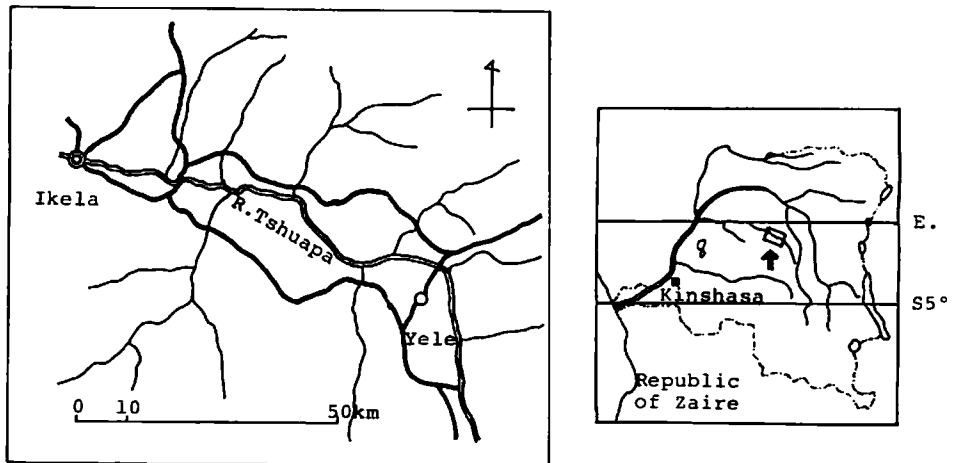


Fig. 1. Research area.

Équateur, République du Zaïre. People living around the Boyela are the Bambole to the east, the Batetela to the south, the Yasayama to the west, and the Laliangolu to the north, all of whom belong to the Mongo. Only a few people, the so-called pygmoid, called Batwa or Jôfe by the Boyela, still inhabit the Boyela territory. They were once hunter-gatherers although today their traditional culture has almost disappeared.

Yele village, in which the two intensive surveys were conducted, is about 120 km south-east of Ikela, the central town of the Zone de Ikela, on the left bank of the Tshuapa River.

B. Natural Environment

1) Climate

Figure 2 shows the rainfall and temperature for Ikela ($1^{\circ}10'S$, $23^{\circ}16'E$) (Vuanaza, 1975). Seasonal changes in the temperature are insignificant. The mean maximum and minimum temperature are approximately $30^{\circ}C$ and $20^{\circ}C$ respectively, and the mean temperature is $24^{\circ}C$ – $25^{\circ}C$. The average annual rainfall of three years (1952, 1953, 1958) was 1839 mm. Since

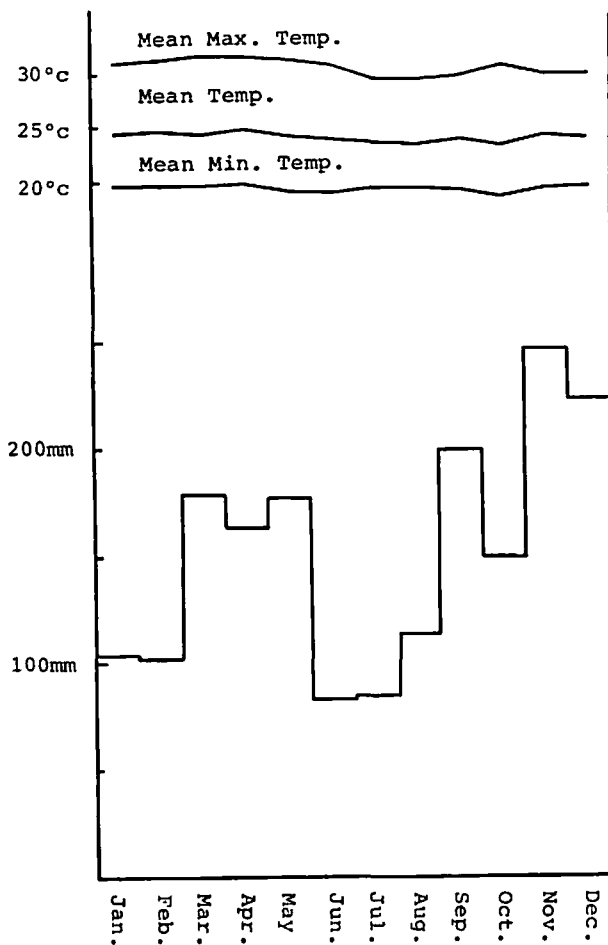


Fig. 2. Temperature and rainfall at Ikela (after Vuanza, 1975).

it rains relatively little from June until August and slightly more from September to November, dry and wet seasons, though not extreme, are distinguishable in this area.

According to Yele villagers, it is said that September to November is the season of "eula" (rain), and that January to March and June to August are the seasons of "bôa". The term "bôa" refers to a fishing trip or a fishing hut. "Bôa" seasons, when rivers or swamps are at a low water level, are most suitable for damming-and-draining fishing, the most prevalent fishing method in this area. Short fishing trips are conducted in these seasons. Further, "eula" or "bôa" seasons influence the activity cycle of agriculture and hunting as well as fishing.

The climate in this area, included within the tropical rain forest zone, has seasonal changes, to which the human activity system is closely linked.

2) Vegetation

The study area is 400–500 m above sea level. Although some river banks have steep slopes, the terrain is generally flat. The vegetation in the study area can be roughly divided into three types: secondary forest, dry primary forest, and swamp forest. In the south-eastern district of the Boyela territory, most villages have been established along a main road since the 1950's. Therefore, the artificial vegetation of cultivated lands and abandoned fields are distributed today along the road like a belt. As soon as a field, which has already been colonized by various plants or herbs and vines during a harvesting period is abandoned, it is rapidly covered with secondary growth; i.e., dense scrub, herbs and low to medium trees. A newly abandoned field in which usable food crops usually still remain, is called "lisako" and an old one is called "bololo". The secondary forest is one of the most attractive environments for animals because, firstly, there are many favourite foods such as the fruits of "bokuchi" (*Rauvolfia vomitoria*) and "liyonje" (*Alchornea cordifolia*) for birds, and field crops for terrestrial animals such as duikers, bush pigs and elephants, and secondly, its heavy thickets provide good cover. Such environmental conditions make the secondary forest an important trapping zone of the Yele people. The primary forest extends beyond the secondary forest zone. The dry primary forest called "bohama" is largely mixed forest. The mixed forest is composed of poor undergrowth, dense low trees and various high trees over 30–40 m. "Botuna" (*Cynometra hankei*) and "bofil" (*Scorodophloeus zenkeri*) are common tall trees. In the dry primary forest, there are local single-dominant forests of "bomongo" (*Gilbertiodendron dewevrei*), which have poor undergrowth and short trees. The mixed forest contains sporadic thicket vegetations, as will be described later, which are preferred by animals, especially duikers. According to the Yele people, it is said that the "bomongo" forest is rich in truffles which are the favourite food of many terrestrial animals. In such dry primary forests, the people of Yele conduct bow and arrow hunting and trapping, mainly directed at duikers. There are many small streams less than 4–5 m in width, distributed in the Yele forest, which are all tributaries of the Tshuapa River. These small streams are usually fringed by swamp forests called "luamba". Unlike the dry primary forest, the canopy is formed by medium trees. Common trees are "bokongo" (*Guibourtia demeusei*), "bosenge" (*Uapaca guineensis*), and "luembe" (*Bolighia welwitschii*). Such herbs as "lokokolo" (*Ataenidia conferta*) are common on the forest floor. This forest contains local thickets more densely than the dry primary forest, and moreover many hollows probably made by inundation. These natural conditions make this forest a major hunting and trapping zone, as they provide favourite hiding places for duikers or brush-tailed porcupines. In addition to these forests mentioned above, there is a forest called "nsenge". As this forest is always found near watercourses although it is not flooded, here it is treated as a variety of the swamp forest. Various medium trees form the canopy like the swamp forest, and "bokongo", "botendele" (*Roureopsis obliquifoliolata*) and so on are common trees. Visibility in this forest is relatively good, as there are few short trees. The tar-

gets are easily spotted in such a condition, and therefore, this forest provides a good hunting ground for collective bow and arrow hunting.

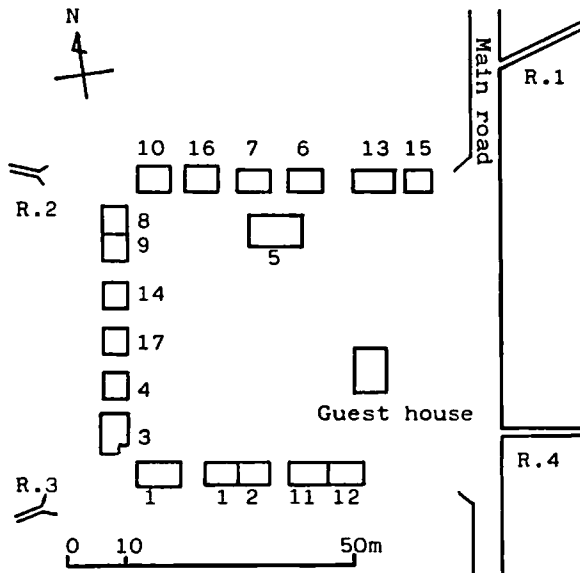
A local thicket in the dry primary and swamp forest, as mentioned above, is called "lisambo", which consists of dense low to medium trees, liana palms such as "likau" (*Ancistrophyllum secundiflorum*) and "lokoli" (*Eremospatha haullevilleana*) and herbs such as *Hau- mania* sp. and *Aframomum* sp.

As above, the vegetation of the study area is composed of a secondary forest belt along a road, a dry primary forest occupying the interfluvial area and swamp forest belts along water- courses. Such vegetation may be common in the central part of the Zaire Forest, as it is also seen in the Ngandu territory (Kano, 1980: 245).

C. Yele Villagers

Most of the inhabitants of Yele village belong to the Boyongo subtribe of the Boyela tribe which is grouped into fifteen subtribes. Although the total population of the Boyela is un- known, in the south-eastern region of the Boyela territory (an area of about 1000 km²) ap- proximately 2200 people belonging to the four subtribes, i.e., Boyongo, Eleku, Lokalo and Momayoshila, inhabited it at the time of the survey. Population density of the region is ap- proximately 2.2 persons per square kilometer.

Each subtribe commonly consists of more than one lineage. The Boyela society is patrilineal and polygamous, and the lineage is a unit for exogamy. The majority of the people in Yele village belonged to the Yele lineage and the rest belonged to the Lingomo lineage, which is one of seven lineages of the Boyongo subtribe like the Yele lineage. In 1979, the popu- lation of Yele village was 190 (Table 1).



N. shows 'House number'(see Table 2).

R.1, R.2, R.3 : Road to the swiddens and forest.

R.4 : Road to the watering place.

Fig. 3. Allocation of the houses at Efenjolumbu hamlet.

Table 1. Population composition in Yele village.

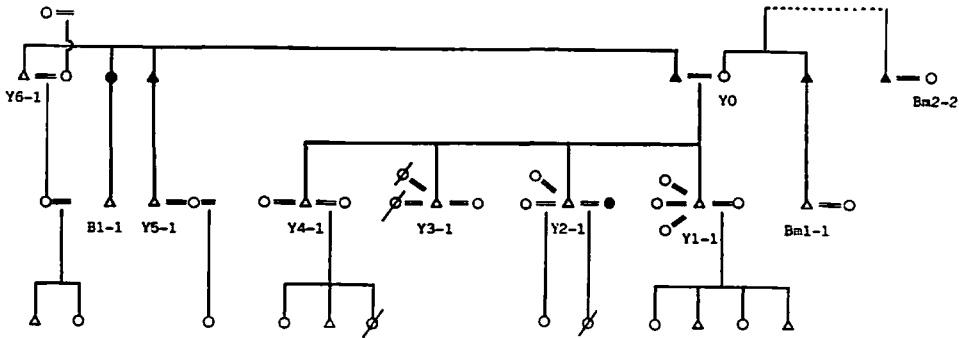
Age grade	Male	Female	Total
over 60	7	9	16
25-59	45	64	109
15-24	11	11	22
0-14	19	24	43
Total	82	108	190

The age of each person was identified according to that described on the identification cards which all adults had.

Table 2. Members of Efenjolumbu hamlet in Yele village.

House No.	Individual No.	Sex	Age (Jan. '79)	Relationship	Tribe
1	Y1-1	M	48	Husband	Boyela
	Y1-2	F	42	Wife	Bambole
	Y1-a	M	12	Child	Boyela
	Y1-b	F	10	Child	Boyela
	Y1-c	M	6	Child	Boyela
2	Y1-d	F	3	Child	Boyela
	Y1-3	F	55	Wife	Boyela
3	Y1-4	F	49	Wife	Bambole
4	Y1-5	F	30	Wife	Bambole
5	Y2-1	M	45	Husband	Boyela
6	Y2-2	F	46	Wife	Boyela
7	Y2-3	F	23	Wife	Boyela
	Y2-a	F	5	Child	Boyela
8	Y3-a*	F	11	Child	Boyela
	Y3-1	M	42	Husband	Boyela
	Y3-2*	F	38	Wife	Bambole
9	Y3-2*	F	37	Wife	Boyela
10	Y3-3	F	38	Wife	Bambole
11	Y4-1	M	33	Husband	Boyela
	Y4-2	F	35	Wife	Boyela
	Y4-a*	F	12	Child	Boyela
	Y4-b	M	6	Child	Boyela
	Y4-c	F	0	Child	Boyela
12	Y4-3	F	38	Wife	Boyela
13	Y5-1	M	52	Husband	Boyela
	Y5-2	F	26	Wife	Boyela
	Y5-a	F	7	Wife's child	Boyela
14	Y6-1	M	60	Husband	Boyela
	Y6-2	F	58	Wife	Boyela
	Y6-a	F	33	Child	Boyela
	Y6-b	F	9	Child's child	Boyela
	Y6-c	M	6	Child's child	Boyela
	Y6-0	F	over 70	Wife's mother	Boyela
15	B1-1	M	59		Boyela
16	Bm1-1	M	46	Husband	Bambole
	Bm1-2	F	48	Wife	Boyela
17	Y0	F	ca 70		Bambole
17	Bm2-2	F	50		Boyela

* They were almost or entirely absent during the study period.



∅ : almost or entirely absent from the hamlet during the study period.

Fig. 4. Genealogy of the inhabitants of Efenjolumbu hamlet.

Yele village consisted of six hamlets situated along a road for about 5 km. These hamlets varied in population from 10 to 50 and are located at intervals of 0.3–2.0 km. The people shift settlement sites every five to ten years, moving very short distances of less than several hundred meters. The author lived in one of these hamlets, Efenjolumbu and obtained most of the data on hunting activities there. Efenjolumbu is one of eight sublineages belonging to the Yele lineage. Hereafter this hamlet is referred to as E. hamlet. The population of E. hamlet was around 30 in 1979, including seven families, consisting of three nuclear families and four polygamous families, and two widows and one widower (Table 2). Figs. 3 and 4 show the allocation of houses and the genealogy respectively. There were eight adult men. Of these men,

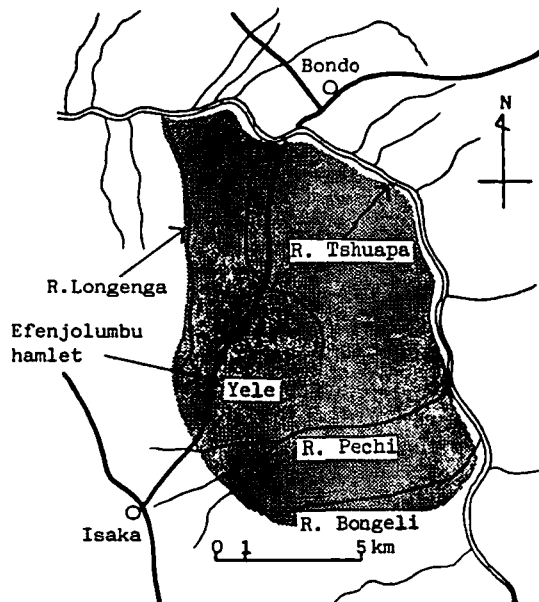


Fig. 5. Yele village and the home range of Yele villagers.

seven, except Y6-1, could hunt. In addition, two boys (Y1-a and Y4-b) usually hunted and trapped small birds near the hamlet, but did not participate very frequently in the hunting by adult men. Among the eight adult men, six (Y1-1, Y2-1, Y3-1, Y4-1, Y5-1 and Y6-1) belonged to the Efenjolumbu sublineage. Of the rest 2, B1-1, of the Bondo subtribe, a subtribe of the Boyela, was the father's sister's child of the brothers of Y1-1, Y2-1, Y3-1 and Y4-1, and the other, Bml-1, a Bambole, was their mother's brother's child. Thus, a dwelling group is usually composed of members belonging to a single lineage and sometimes includes their close relatives.

The people of Yele regard a range of about 110 km², bordered by the Tshuapa River to the north, the border of the Yele and the Eleku village to the south, the Bongeli River to the east and the Longenga River to the west, as their own forest (Fig. 5). However, there does not seem to be much regulation of the activities of other villagers within this range. According to the Yele villagers, anyone may make a field in their forest if the site is in virgin forest, and there is no problem in chasing animals in bow and arrow huntings even in the case of hunters from neighbouring villages trespassing upon their forest. "But", they continued, "none would do so, because the forest is too remote from their own villages".

D. Agriculture

Although several kinds of animals, goats, dogs, domestic fowl and ducks were raised at Yele, these domestic animals were normally used for bride prices or sacrifices in rituals with the exception of dogs for hunting, and were seldom used as a daily food source. Therefore, food getting activities consist of slash-and-burn agriculture by the males and females, hunting by the males, fishing in small streams, and collecting wild plants and small animals by the females. Of these, slash-and-burn agriculture is the most important and the field crops from it provide the bulk of the diet.

Here I will briefly summarize the system of their slash-and-burn agriculture.⁽¹⁾ Yele villagers said that they could make swidden fields whenever they liked, but in practice the process of slash-and-burn agriculture seemed to be arranged very much according to seasons. A census of the fields at E. hamlet (Sato, in press), in Jan.-Feb. 1979, indicate that September-October is the major season of planting, i.e., clearing and drying are finished by the dry season, June-August, and planting is done as the rainy season begins.

Usually, each family makes one or two new fields every year. In E. hamlet, an area of about 6 hectares of the swidden fields was cleared in 1978. This corresponds to about 1800 m² per person (Sato, *ibid*). The people of Yele, like neighbouring peoples, tend to make their fields close to their own hamlets. For example, it took only fifteen minutes to walk to the most distant field of E. hamlet. Mostly secondary forest is cleared. Old secondary forest is especially preferred. Because it is difficult to clear the primary forest, although large yields can be expected, and only small yields can be expected in young secondary forest, although it is easier to clear it. The first person who cleared the virgin forest has a right to the subsequent secondary forest, and its ownership is normally passed down from father to son.

In general, the basic labour unit of slash-and-burn agriculture is the married couple in a nuclear family, and the husband and his wives in a polygamous family. The process of cultivation consists of selecting the field site, clearing shrubs and herbs, felling big trees, drying (including cutting off twigs), burning, planting, weeding and harvesting. All of these jobs are done by the wife except selection of the site and felling of big trees. Fences are occasionally erected by the husband mainly to protect the site against domestic goats. It is very difficult to determine the exact annual labour input in slash-and-burn agriculture since it varies from season to season. The following three situations, however, seem to indicate that the women are the major work force in cultivation: (1) one woman alone has cleared the field site of a

Table 3. Time spent in daily activity at E. hamlet.

	Male		Female	
	Average time spent per day (minutes)	(%)	Average time spent per day (minutes)	(%)
Hunting	39	21.9	—	—
Gathering	—	—	5	1.7
Fishing	—	—	23	8.8
Agriculture	62	34.8	153	57.5
Watering	3	1.7	51	19.0
Others	74	41.6	38	13.1
Total	178	100.0	267	100.1

This survey was done from 24–30 Jan. 1977 at E. hamlet. The objects observed included 8 adult males and 12 adult females. As most males participated in public service on 26, 27 and 29 Jan. and they had not sufficient time to do other activities, the data on time spent by males on these days were excluded.

young secondary forest without her husband's help, (2) the women's tasks require continuous labours throughout the year, (3) the results of a time study conducted at E. hamlet from January 24–30, 1977, though brief, showed that the women spent more hours in agricultural activity than the men (Table 3).

Various crops (29 species) were planted in the Yele village. The principal crop is cassava. Cassava is interplanted in the same field together with additional crops; maize, yam, plantain banana, sugar cane, red pepper, pineapple, and so on. Cassava tubers can be harvested in eight to twelve months since planting and harvesting is done little by little as the food is required. Usually the field is abandoned after a harvesting period of about 1 year, despite the availability of cassava tubers. This is because the harvesting at the old field, by then covered with secondary growth, becomes more and more difficult, whereas the cassava of the new field becomes available and is easier to harvest.

The people of Yele depend on cassava for the bulk of their caloric intake (about 76%). Estimating from my data of food consumption, the average annual yield of cassava is about 3.5 metric tons per hectare (Sato, *ibid*). However, since some cassava tubers are usually left unharvested as mentioned above, the potential yield is considerably higher and was estimated to be 9 metric tons per hectare.

GAME ANIMALS

In Table 4, all the medium- and large-sized mammals in the survey area and the several small-sized mammals which are important as hunting objects are listed. In addition to these mammals, many vernacular names of small mammals such as rodents and insectivores, some of which are also hunted, were collected. Of those listed, a few species of arboreal primates, bushbucks, bush pigs, and elephants are frequently observed in the Yele forest. These mammals are the major hunted prey of the Yele people, except the elephants are rarely hunted. The mammals which are scarcely visible, on the other hand, include hippopotamus, buffalo, chimpanzee, and bongo (a larger antelope). The fauna of the survey area is generally similar to that of the Ituri Forest (about 600 km to the northeast) although the number of species of the study area is slightly less (Harako, 1976: 48–50).

Besides mammals, many birds such as guinea-fowl, hornbill, sunbird—the last which are hunted mainly by boys as with other small birds—and so on, are also hunted. In addition, though not directly hunted, many reptiles, such as pythons, vipers, cobras and tortoises, etc. are captured as they are found in the forest.

Table 4. Mammals of research area.

Scientific Name	English Name	Vernacular Name
Order Primates		
<i>Pan paniscus</i>	Pygmy chimpanzee	Eliya
<i>Colobus angolensis</i>	Angolan colobus	Lula
<i>C. badius</i>	Red colobus	Liemba
<i>Cercocebus aterrimus</i>	Black mangabey	Limu
<i>Cercopithecus ascanius</i>	Red-tailed monkey	Nsoii
<i>C. mona</i>	Mona monkey	Ngele
<i>C. mitis</i>	Blue monkey	Bokoma
<i>C. neglectus</i>	Brazza's monkey	Mpunga
<i>Galago demidoui</i>	Demidoff's galago	Lisile
<i>Perodicticus potto</i>	Potto	Ifombe
Order Pholidota		
<i>Manis gigantea</i>	Giant pangolin	Ikanga
<i>M. tricuspis</i>	Tree pangolin	Kolomoyo
Order Tubulidentata		
<i>Orycteropus afer</i>	Aardvark	Lifenge
Order Hyracoidea		
<i>Dendrohyrax arboreus</i>	Tree hyrax	Elela
Order Proboscidea		
<i>Loxodonta africana cyclotis</i>	African forest elephant	Njoku
Order Artiodactyla		
<i>Hippopotamus amphibius</i>	Hippopotamus	Nguo
<i>Syncerus caffer</i>	African buffalo	Mbolo
<i>Potamochoerus porcus porcus</i>	Bush pig	Nsombo
<i>Hyemoschus aquaticus</i>	Water chevrotain	Etambe
<i>Boocercus euryceros</i>	Bongo	Nkala
<i>Cephalophus monticola</i>	Blue duiker	Boloko
<i>C. callipygus</i>	Peter's duiker	Bokomboli
<i>C. nigrifrons</i>	Black-fronted duiker	Mpambi
<i>C. dorsalis</i>	Bay duiker	Nkinda
<i>C. sylvicultor</i>	Yellow-backed duiker	Lisoko
<i>Tragelaphus spekei</i>	Sitatunga	Mbuli
<i>Tragelaphus scriptus</i>	Bushbuck	Mbuli
Order Carnivora		
<i>Panthera pardus</i>	Leopard	Nkoi
<i>Felis aurata</i>	Golden cat	Loaondo
<i>Viverra civetta</i>	African civet	Njouwo
<i>Mellivora capensis</i>	Ratel	Esisi
<i>Poiana richardsoni</i>	African linsang	Iyeni
<i>Nandinia binotata</i>	Two-spotted palm civet	Mbeo
<i>Genetta spp.</i>	(Genet	Bokondo
	Genet	Bomanga
<i>Herpentes sanguineus</i>	Slender mongoose	Jeleli
<i>Crossarchus obscurus</i>	Dark mongoose	Efanja
<i>Atilax paludinosus</i>	Marsh mongoose	Boliya
Order Rodentia		
<i>Atherus africanus</i>	Brush-tailed porcupine	Iko
<i>Cricetomys emini</i>	Giant rat	Botomba
<i>Anomalurus derbianus</i>	Fraser's flying squirrel	Lokiyo
	(Squirrel	Ahle
	Squirrel	Liyoko
Order Insectivora		
<i>Rhynchocyon cirnei</i>	Chequered elephant-shrew	Litoko

HUNTING TOOLS AND TRAPS

Today bows and arrows and various traps are the principal hunting tools in the survey area.

Net hunting, once prevalent, has been on the wane. Spears are used for elephant traps, but spear-throw hunting is not done.⁽²⁾

A. Bow and Arrow

Bow: There are two types of bows. Adult males use two bow types. One type is the “bota” (Fig. 6a) made of the hard and straight trunk of young “bokendu” (*Aidia micrantha*) tree. This bow is 100–120 cm in length, with a radius at the central part of about 1.0 cm. A ringed stopper (“efoke”) for the bowstring is fixed to each end of the bow. The other type is “lifino” (Fig. 6b) made of the trunk of the liana palm, “lifino” (*Eremospatha haullevilleana*). This bow is 75–95 cm in length, and the radius of the central part is about 1.5 cm. Unlike the “bota”, a hole and a groove are made at each end of the bow to fix the bowstring. The “bota” is larger and quite a lot stronger than the “lifino”. The first bow that a father makes for their sons aged 6–7 is the “lifino” type. The “lifino” takes all types of arrows while the “bota” is too strong to shoot some of the lightest types of arrows. Bowstring called “bolemo” are made from the bark of the trunk of the liana palm, “likau” (*Ancistrophyllum secundiflorum*). Besides this, “lokoli” (*Eremospatha haullevilleana*) is used for the bows of boys, but adult hunters do not use it. As bowstrings made of “likau” are not so durable, they occasionally snap in the midst of shooting. Therefore a hunter usually makes a spare before hunting. However, even if he carries no spare, “likau” is so abundant in the forest that he can easily fashion a new bowstring.

Arrow: Arrows for hunting are divided into two groups: (1) an iron-tipped arrow, (2) an arrow with the arrowhead made from plant material.

The former includes the “likula” (Fig. 7a) with a non-poisonous arrowhead and the “lokate” with a poisoned arrowhead. Both arrows are quite similar in shape. These are about 70 cm in length with a radius at the centre of about 0.4 cm. The shaft (“bolanga”) is normally made from the straight stem of “bokendu” and the arrow feather (“nsala”) from the feather of a guinea-fowl. The “likula” is used to hunt small- and medium-sized terrestrial animals and the “lokate” for large-sized animals such as bush pigs. Usually both these arrows are retrieved after use if possible.

The second type of arrow includes the “bofito” (Fig. 7b) and the “ikele” with a non-poisonous arrowhead, and the “imbenga” (Fig. 7c) and the “bolele” (Fig. 7d) with a poi-

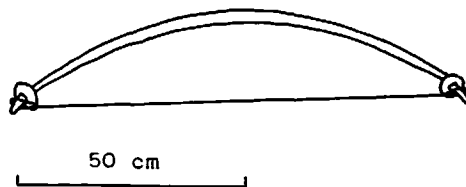


Fig. 6a. A type of bow, “bota”.

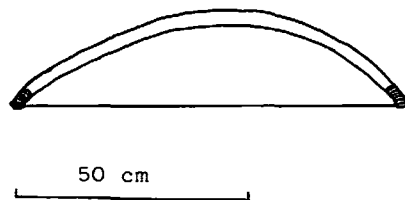


Fig. 6b. A type of bow, “lifino”.

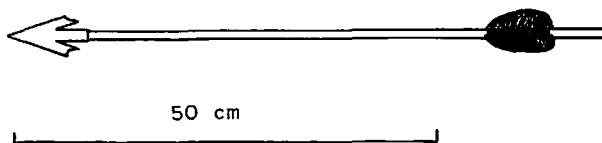


Fig. 7a. A type of arrow, "likula".

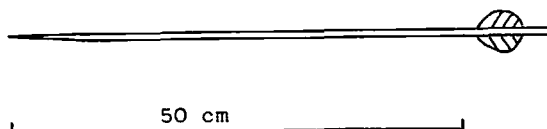


Fig. 7b. A type of arrow, "bofito".

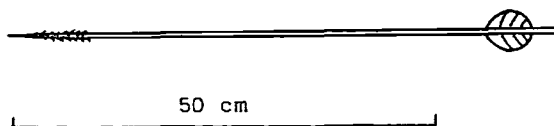


Fig. 7c. A type of arrow, "imbenga".

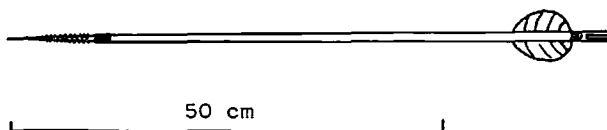


Fig. 7d. A type of arrow, "bolele".

soned arrowhead. The "bofito" is made from the sharpened main nerve of a cultivated oil palm. "litoko" (*Elaeis guineensis*) and the "ikele" is made from the young main nerve of a cultivated raffia palm, "lifeke" (*Raphia sese*). The full length of these arrows is 50–70 cm, with a radius at the centre of about 0.3 cm. These arrows are mainly used by boys for hunting small rodents or birds, but they are rarely carried by adult hunters. Usually these arrows are abandoned after being shot. The "imbenga" made of the main nerve of an oil palm is 60–70 cm in length with a radius of the centre of 0.3 cm. The sharpened arrowhead is incised and poisoned. The "bolele" consists of a shaft made of the main nerve of a wild liana palm, (*Ancistrophyllum secundiflorum*), and the incised arrowhead ("bakeka") made of the sharpened main nerve of an oil palm or a raffia palm. The arrowhead ("bakeka") which has been inserted into the shaft and fixed is poisoned. The full length of the "bolele" is about 70 cm with a central radius of about 0.4 cm. Both the "imbenga" and "bolele" are exclusively used for arboreal animals, especially monkeys. After shooting, hunters usually try to withdraw these arrows, but rarely succeed. Of these arrows used for similar targets, the "imbenga" is relatively popular, as it is easy to make. The "imbenga", however, is so light as to be unsuitable for the "bota" type of bows. The arrow feathers ("nomba") of these four kinds of arrows are made from the leaves of the tree species, "botendajôfe" (*Pancovia harmsiana*), "botende" (*Pancovia laurentii*) or "mpoa" (*Comarus griffonianus*). A poisoned arrow is always protected with a cover ("efofa") made from the leaves of the "lokumbo" tree, (*Penianthus longifolius*), except at the time of shooting.

As a rule, each hunter collects different materials with the exception of the iron arrowheads and makes arrows for himself.

According to old villagers, the quiver ("kofo") made of the bark of "manga" (*Brachystegia laurentii*), "boulu" (*Oxystigma oxyphyllum*) or "wango" (*Julbernardia* sp.) was used until the last generation, but today this is no longer seen.

Poison: The arrow poison is obtained from the root of a kind of wood liana. "lokoliyolengo" (*Parquetia nigrescens*). This material is first shaved with an iron knife ("ifaka"), and afterwards the shavings are put in a mesh squeezer ("yama") made of the bark of *Ancistrophyllum secundiflorum* to squeeze out the liquid. The liquid is then smeared on the arrowhead and dried over a fire. This is repeated until the liquid spread becomes black like tar. Besides this, the bark of the "bokuchi" (*Rauvolfia vomitoria*) and the "lokolola" (*Strophantus sarmenosus*) are used. These three materials are often mixed and the poison liquid squeezed from them.

B. Net

A net ("botai") is made from the twisted fibers of the vine of "lokosa" (*Manniophyton fulvum*). The net is about 1.3 m in height, and a unit of net is 10–30 m in length. At the time of the second survey there were only about 10 units of net in the whole of Yele. Old nets are seldom superseded by new ones as net hunting has been decreasing.

C. Dog

A dog ("libwa") plays a very significant role in the several methods of bow and arrow hunting. It finds and drives out game and tracks injured game that has been shot with an arrow. It is not rare to catch game only by a dog's attack. Further, even when patrolling traps without a dog, hunters often call a dog and make it track an animal that has broken loose unless a long time has elapsed since it escaped. Around two heads of adult dog are raised in a hamlet.

A wooden bell ("elefo" Fig. 8) is fastened around the neck of the dog, so that the dog can be readily located. A globular "elefo" is made either of the tree species, "bosio" (*Pterocarpus soyauxii*) or "loungwamba" (*Drypetes* sp.), which is hollowed out. A small iron ball or a pebble is put into the hollow and the "elefo" makes a sound of "kolokolokolo....".

D. Machete and Knife

Hunters always carry either a machete ("bopanga") or a knife ("ifaka"), but especially a machete which is used for various purposes: i.e., cutting away a bush, cutting down and trim-

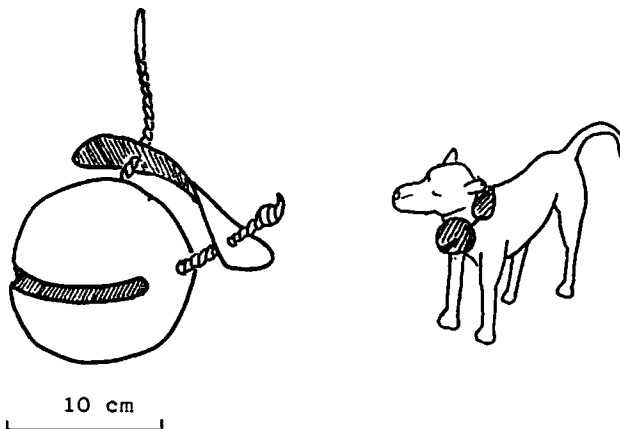


Fig. 8. A wooden bell, "elefo".

ming the materials of different hunting gear and weapons against animals. It is the most essential hunting tool. Hunters wear it on their waist while hunting unless they need to use it.

In addition, some other tools are used occasionally. One is a hollow horn ("ifungi") of "mbuli" (*Tragelaphus scriptus*), which is blown to recruit the participants of a collective hunt-

Table 5. Variety of trap.

	Objects	Setting place	Remarks
Spring Trap			
1.	Jeki M.L.	G	Wire*
2.	Itelebeye M.	G	Wire*
3.	Nilo S.M.	G	Synthetic fibre*
4.	Lokinga M.L.	G	Fibre from raffia palm*
5.	Bokulu S.M.	G	Fibre from "lokosa"**
6.	Bongomba S.M.	G	Liana palm*
7.	Bokingo M.L.	G	Liana palm*
8.	Logongo S.	G	Liana palm*
9.	Bökoitoko S.	G	Liana palm*, "bokombe"**
10.	Ifanola S.	G	Liana palm*
11.	Ikinga Squirrel	T	Liana palm*
12.	Bosanjo Monkey	G	Liana palm*
13.	Bofenda S.	Felling tree across the river	Liana palm*
14.	Nleko (pl.) Giant rat	G	"Bokombe"**, Fruit of <i>Ongokea gore**</i>
15.	Wätangila (pl.) Giant rat	G	"Bokombe"**, Fruit of <i>Antho- notha fragrans**</i>
16.	Botaka Giant rat	G	"Bokombe"**, Fruit of <i>Strom- bosia grandifolia**</i>
17.	Simbäkilo S.M.	G	Liana palm*, Truffle**
18.	Bönjo Giant rat	G	"Bokombe"**, Fruit of <i>Pentades- ma butyracea**</i>
19.	Bokombelo Elephant-shrew	G	Liana palm*, Fruit of <i>Berlinia sp.**</i>
20.	Ikalamba Yellow-backed duiker	G	Liana palm*, Giant rat***
21.	Icholombo Guinea fowl	G	Liana palm*, Fruit of <i>Elaeis guineensis**</i>
22.	Boulu Small bird	G	Liana palm*, Maize**
23.	Ifasa Small bird	T	Liana palm*, Fruit of <i>Rauvolfia vomitoria</i> etc.**
24.	Ifasindaiyoko Squirrel	T	"Bokombe"**, Animal's bone**
25.	Ikombeliya "embo" (a fresh-water turtle)	River	Liana palm*, Cassava tuber**
Spear Trap			
26.	Elongo African forest elephant	T	Spear and log
27.	Bafoku S.M.L.	G	Pit fall and spear
Gravity Trap			
28.	Lika L.	G, River	Construction of logs
29.	Ikule M.	G	Construction of logs
Tightening Snare			
30.	Itai Guinea fowl	G	Fibre from "lokosa"
31.	Bokoma medium-sized bird	T	Liana palm*
Miscellaneous Trap			
32.	Iteko Squirrel	T	Small net (Fibre from "lokosa")
33.	Libanga Squirrel	T	Small net (Fibre from "lokosa")
34.	Boleka S.	G (Felling tree)	Basket trap of Liana palm
35.	Bolembo Small-bird	River	Birdlime made of sap

S: small-sized animal; M: medium-sized animal; L: large-sized animal; G: on the ground; T: on the tree.

*Material of loop; **Kind of bait.

ing party before hunting, or to communicate among the members in a forest. But the principal means of recruiting participants is a large tom-tom ("bongu") made of the tree, "bosio", and the means of communication within a forest is usually a whistle called "iyototoli". Another is a bundle of sprays called "bombo", with which a beater of collective hunting beats the trunks or the plank buttresses of the trees in order to drive out animals. This tool, however, is rarely used, as the dog serves as a beater.

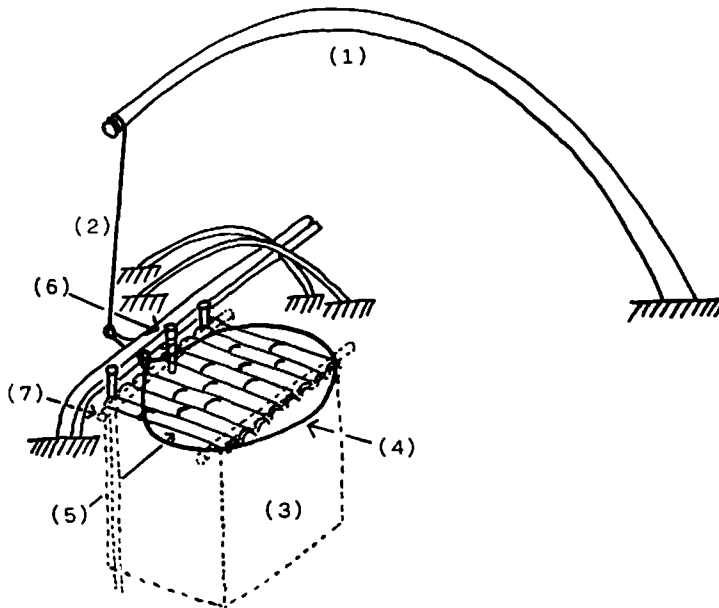
E. Traps

There were 35 varieties of traps which could be identified by observation and inquiry (Table 5). These are classified into five types: spring traps, spear traps, gravity traps, tightening traps, and miscellaneous types.

1) Spring Traps

The principle of spring traps is that as soon as an animal passes, a stopper comes off and the repelling power of a bent tree makes a loop connected with it tighten around the neck or leg of the game.

The spring trap type includes 25 varieties. Among them, "nilo" whose loop is made of synthetic fibres, and "itelebeye" and "jeki" whose loops are both made of wires, are the most

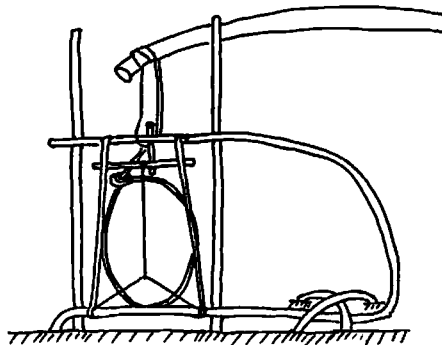


- (1) : A spring pole, "sumbe"
- (2) : A connecting string, "bolofa"
- (3) : A pitfall, "lifoku"
- (4) : A loop, "lilus"
- (5) : A pitfall cover, "lokala"
- (6) : A stopper, "lofoka"
- (7) : A bar supporting "lokala", "nde"

Fig. 9. A kind of spring trap, "jeki".

important traps for the Yele trappers. These have a nearly similar formation. The "jeki" is shown in Fig. 9. A small pitfall is dug prior to setting the trap, and as soon as a passing animal walks through the small pitfall, the stopper comes off. Wires became available in the 1950's and synthetic fibres in the 1960's. Until then, a fibre ("lokinga") obtained from a raffia palm and a twisted fibre ("bokulu") made of a vine, *Manniophyton fulvum*, had been used for the loop of "jeki" type and "nilo" type respectively. These traps have the same name as the fibres used. Today, trappers prefer the synthetic fibres and wires which can be used semi-permanently to the traditional fibres. "bokulu" or "lokinga". However, when wires are left as they are set for a long time, over one month, they become brittle. Therefore, trappers must take care to withdraw them before that time limit. The "nilo" and "itelebeye" are used principally for brush-tailed porcupines or small-sized duikers (including the blue duiker) and the "jeki" for bush pigs, medium-sized duikers (including the black-fronted duiker, peter's duiker and bay duiker) or large-sized duikers (including the yellow-backed duiker). "Bongomba" and "bokingo", whose loops are made from the bark of the trunk of a liana palm, *Ancistrophyllum secundiflorum*, *Eremospatha haullevileana*, are still extensively used intraps. As shown in Fig. 10, the loop is fixed in a vertical position to the ground, and as soon as an animal passes through the loop, the stopper comes off. The "bokingo" is used for medium- and large-sized duikers, whereas the "bongomba" for small-sized animals such as brush-tailed porcupines and blue duikers. "Logongo", "bokoitoko" and "ifanola" which are set for small rodents on the ground, "bofenda" which is set on the felling tree across a river, and "ikinga" and "bosanjo" which are set for small rodents or monkeys on the branches of trees, are nearly of the same type as "bokingo" and "bongomba". These traps are generally called "tosai". There are 12 varieties of baited spring traps. With the exception of the "ikalamba" which is aimed at yellow-backed duikers, all of these are set for relatively small animals such as the giant rat, "botomba" (*Cricetomys emini*), the chequered elephant-shrew, "litoko", (*Rhynchocyon cirnei*), and various birds. The "ikombeliya", aimed at a fresh-water turtle called "embo", is the only spring trap that is set in a river.

Trappers don't give particular attention to the kind of tree used for the spring pole, but avoid a nonelastic tree such as "botyumbe" (*Musanga cecropioides*), "bokolombe" (*Staudtia stipitata*), "bokolola" (*Coelocaryon botryoides*) and so on. Several wild and cultivated plants



20 cm

Fig. 10. A kind of spring trap, "bongomba".

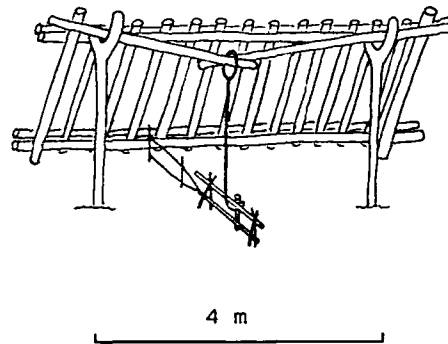


Fig. 11. A gravity trap, "lika".

as mentioned above, with the exception of synthetic fibres and wires, are used for the materials of a loop. Wild vines such as "lokaka" (*Roureopsis obliquifoliolate*), "iyongo" (*Landolphia violacea*) and so on are used for the materials of the connective string between a loop and a spring pole of the "jeki", "itelebeye", and "lokinga".

2) Spear Traps

This type of trap includes "elongo" and "lifoku". The principle of the "elongo" trap is that the log, with an iron spear of 20–30 cm by 10 cm fixed to one end, is kept hanging high above the ground, and as soon as an elephant passes, the stopper comes off and the log with the spear falls on the game. The "lifoku" trap is an arrangement of many wooden spears stood on the bottom of a large pit called "lifoku". Today these are seldom set, as they are dangerous for people too.

3) Gravity Traps

This type of trap includes the "lika" (Fig. 11) and "likule", which work in much the same way. As shown in Fig. 11, it is constructed of many logs in the shape of a roof and two cords attached to the stopper are stretched under its construction. As soon as an animal passes under it, the stopper comes off and it is squeezed between the logs. The larger-scale "lika" is set at the river side or over the small stream for bush pig, and the small-scale "ikule" is set at the river side for small- and medium-sized duiker.

4) Tightening Snare

There are two varieties of this snare called "itai" and "bokoma". Both varieties need not use a spring pole. The principle of "itai" is that a long line of "bokulu", on which about ten loops are set, is concealed in a thicket, and the loop tightens around the neck of a small animal, such as a guinea fowl or a blue duiker, which happens to pass through. The "bokoma", as shown in Fig. 12, needs a watcher. Bait is set on the branch of a tree above and the watcher pulls down on a long line made of a liana palm with a loop at one end to tighten around the neck of a bird which comes to eat the bait.

5) Miscellaneous Traps

The "iteko" and "libanga" (which is larger) are both small-sized nets set at the gateway of a hollow for small rodents. The basket trap called "boleka" made from the bark of *Haumania leonardii* or *Ancistrophyllum secundiflorum* is set at the gateway of the hollow shaped in a fallen tree for a brush-tailed porcupine. This is also used as a fishing trap. These three traps need a watcher. In addition, the birdlime called "bolembo" made of liquid from the seeds of "boate" (*Omphalocarpum lecomteanum*) and the sap of "bosenja" (*Canthium rufivillosum*) and "bôle" (*Landolphia* sp.) is set in the river for small birds.

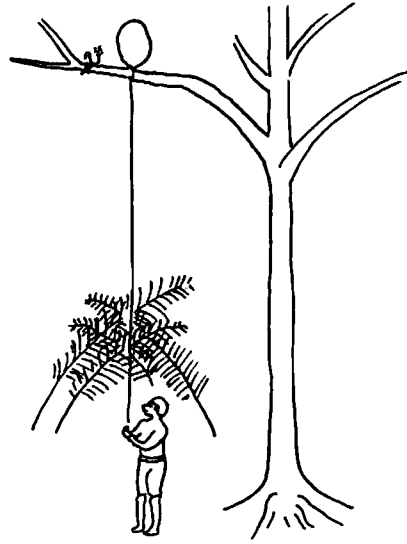


Fig. 12. A tightening snare, "bokoma".

HUNTING ACTIVITY

In Table 6 all cases of hunting in which the adult men of E. hamlet were engaged for a total of 104 days from October 28, 1978 to February 4, 1979 (excepting January 30 to February 4, 1979) are shown according to each hunting method. Here I will describe in detail some aspects of the "menza" and "luemba" styles of bow and arrow hunting and trapping, which are the most important in terms of subsistence economy, and briefly summarize the other hunting methods.

A. Bow and Arrow Hunting

1) "Menza"

As shown in Table 6a, 16 hunting trips in the "menza" style, 12 of which the author accompanied, took place during the study period.

a) Method: The "menza" style is a small-scale collective hunt based on drive strategy, which is, generally speaking, capturing animals which have been driven out by beaters consisting of men and/or dogs, with bows and arrows or nets. In the "menza" style, one or two dogs are always used. Among members, one archer called "osengelyambwa" takes charge of setting the dogs on the hunt. Although the combination of a "osengelyambwa" and a dog is sufficient for a "menza" in principle, in practice, several archers called "banamenza" usually join it. Table 6-a indicates that in many cases, a party of "menza" consisted of 3 to 5 archers (Av. 3.9 person) and one dog. All archers carry a set of arrows of two or three "likula" and one or two "lokate". Main targets are small-sized duikers and brush-tailed porcupines. The major hunting area is the forest and thicket along the rivers.

The dog, often playing the role of hunter, tracker and beater, is particularly important in "menza". "Osengelyambwa" beats his breast or shouts ("iyâ", "iyâ") to stimulate the dogs, but once the dogs start to chase an animal, he, like the other archers, keeps silent and waits for an opportunity to shoot an arrow. He sometimes utters a quiet falsetto ("hiyâ") in order

Table 6a. Hunting record ("menza").
Hunting method "menza" (Cases from 1 to 12 were observed.)

Case No.	Date	No. of Hunters (E. ham-let)	Working Hours			Hunting Hours		Animals Caught	Means of Catch	Note	Animals fled	
			Departure	Arrival	Average	Beginning	Ending					
1.	29 Oct. 1978	5* (2)	10:50	15:20	4.30	11:20	14:35	3.15	GF1	arrow	Two dogs.	BTP6, BLD1
2.	2 Nov.	11* (5)	8:33	13:50	5.17	9:31	12:55	3.24	0		Rain at 13:00.	BTP1, BLD3
3.	14 Nov.	5 (2)	((14:35))	17:24	((2.49))	14:47	17:08	2.21	0		Hunt in the vicinity of the fields.	BTP3, BLD2
4.	29 Nov.	4 (1)	8:02	16:30	8.28	8:28	15:20	6.52	0			BLD2, PD1, BP3, Ot1
5.	30 Nov.	3 (2)	9:02	14:00	4.58	10:07	10:48	((0.41))	BP1, BLD1	arrow+ dog	A dead bush pig found.	?
6.	6 Dec.	4 (2)	8:07	13:10	5.03	9:05	12:05	3.00	BLD1	dog	Rain at 12:00.	BTP1, PD1
7.	17 Dec.	4 (3)	10:50	18:00	6.10	11:28	17:10	5.42	BLD1	arrow+ dog	A good catch ritual.	BLD1, Ot1
8.	18 Dec.	5 (3)	11:57	17:23	5.26	12:15	16:42	4.27	BTP1	machete	Two dogs.	BTP1, BO1
9.	29 Dec.	2*(1)	8:35	14:35	6.00	9:40	12:38	3.58	0		Two dogs.	BTP1
10.	5 Jan. 1979	5*(2)	9:45	16:00	6.15	10:20	14:55	4.35	0		A dog injured.	BTP4, BLD1
11.	8 Jan.	2*(1)	5:55	((15:00))	((9.05))	9:35	10:35	((1.00))	0		Rain at 10:00. Rest at a hut.	BTP2
12.	23 Jan.	6*(3)	10:35	18:00	7.25	11:05	16:40	5.35	BTP1	arrow	Three dogs.	BTP2, PD1, BLD1
13.	25 Jan.	4 (3)	11:13	16:18	5.05	?	?	?	0			?
14.	6 Feb.	4 (3)	6:50	16:08	9.18	?	?	?	BTP1	?		?
15.	10 Feb.	3 (1)	9:30	17:50	8.20	?	?	?	BTP1	?		?
16.	12 Feb.	3 (2)	11:40	16:00	4.20	?	?	?	BTP1	?		?
		Av. 3.9 (Case 2 excluded)	Av. 9:35	Av. 16:01	Av. 6.10	Av. 10:38	Av. 14:17	Av. 4.37				BTP (48.9%), BLD (31.1%), PD (6.7%), BP (6.7%), Ot (6.7%)

BTP: Brush-tailed porcupine; BLD: Blue duiker; PD: Peter's duiker; BP: Bush pig; BO: Marsh mongoose; GF: Guinea fowl; Ot: Others.

(()): Excluded on calculation of average value.

* Boys participated.

to let the dog know his position without disturbing the game. The reason for this is to keep the dog driving the game in front of him. Such a way of operating dogs can commonly be seen in all the hunting methods that use dogs. A dog owner usually acts as an "osengelyambwa".

Unlike "luemba", which will be described later, there is no arranged hunting formation in "menza" and each archer moves relatively freely. But, as in "luemba", once the dogs start to drive an animal, all the archers locate themselves so as to encircle the prey.

"Menza" is mostly done in the riverside environment, especially the swamp forest, as there are many hunting spots for brush-tailed porcupines. This hunting spot is called "lisumbu", which refers to a place where a hollow called "litoka" is shaped under the roots of a standing tree. A "lisumbu" is a favourite hiding place for brush-tailed porcupines. The hunt proceeds as follows: archers encircle a "lisumbu" where the prey has taken refuge from the beating of a dog, and instantly all escape routes except one or two are blocked. The archers watch in front of these. A stick is poked into the "lisumbu" to drive out the game, and the archers kill it with a machete or bow and arrow. "Menza", conducted by a few hunters, is suited to such brush-tailed porcupine hunting. When dogs drive the game, the river acts as a barrier blocking its escape. Thus, even a few hunters can closely encircle a game at the riverside. This is another reason why "menza" hunting is mostly done in the riverside environment.

b) Daily activity: As shown in Table 6a, no party consisted of the hunters of E. hamlet alone, but included 25 to 70 percent visitors or inhabitants from neighbouring hamlets.

"Menza" is a day-time hunt. Usually all members leave the hamlet together in the morning. The average time required to reach the first hunting site was about 40 minutes (min. 5 minutes to max. 2 hours). Before beginning to hunt, they would usually discuss a general route and pray for their safety and a large catch at the first hunting site. With interruptions, sometimes for rest or discussion, they hunted for 3-6 hours (4 hours and 37 minutes on the average).

They stop hunting by dusk (5:00 p.m.) and start for the village together. A heavy rain often makes them end the hunt early. In general, the hunters of Yele dislike to hunt in the rain, and they do not go hunting even in a light rain. Furthermore, they may stop hunting as soon as they have obtained enough to satisfy themselves. A typical instance can be seen in the case of No. 5, where the hunt ended only 40 minutes after it began, after a dead bush pig was found. When there is any catch, they butcher and share it in the forest near the hamlet on their way home. They arrive at the hamlet by 6:00 p.m. at the latest.

Including approximately 2 hours spent in travelling, butchering and so on, the time spent in hunting each day was 6 hours and 10 minutes on average.

c) Hunting area: Fig. 13 shows all the routes of the 12 hunting cases observed. Except in case 11, in which it took about 2 hours to go from the hamlet to the hunting ground, all "menza" hunting was done within an hour's walking distance from the hamlet.

Major hunting areas included the Longenga basin to the west and the Pechi basin to the east. In "menza" hunting in such a basin the party progresses along and across the river as Fig. 13 shows.

Case 3 was conducted away from the watercourses, which is exceptional in "menza". The hunting ground was secondary bush, where the men of E. hamlet had seen many clear spoors of blue duikers and brush-tailed porcupines when they had come to make a preliminary inspection to clear the area.

d) Catch: The animals caught by "menza" in the 16 days included one guinea fowl, one bush pig, three blue duikers, and five brush-tailed porcupines. It is clear that the principal targets of "menza" are small-sized animals, especially brush-tailed porcupines.

The total weight of the game taken was about 88.0 kg according to standard weight per

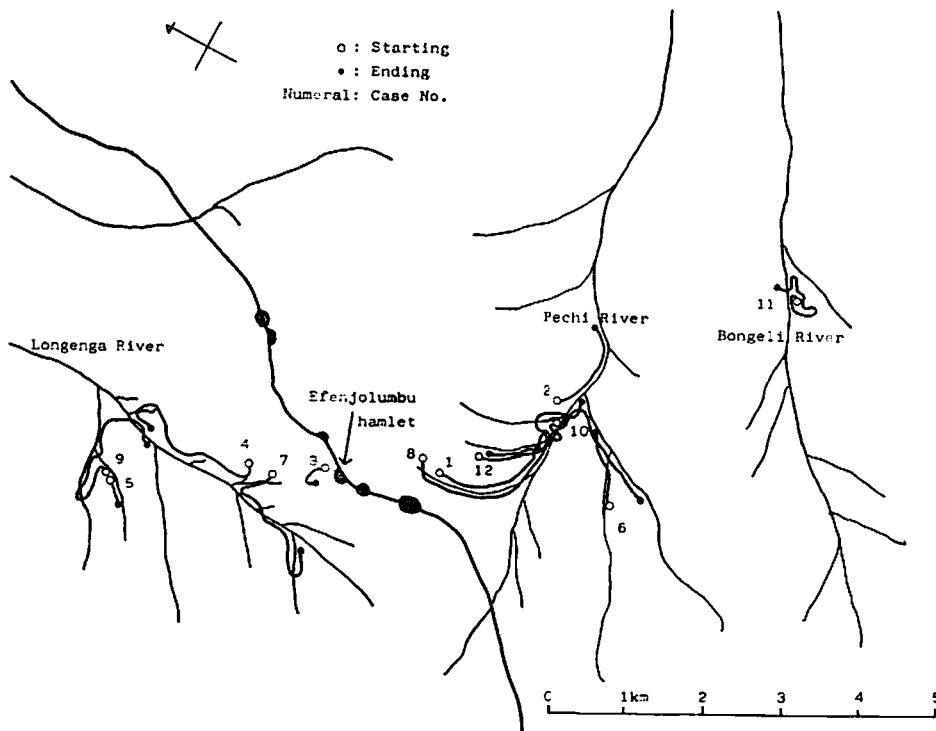


Fig. 13. Hunting route during "menza".

head of each animal (guinea fowl = 2.0 kg, bush pig = 60 kg, blue duiker = 4.5 kg and brush-tailed porcupine = 2.5 kg). Thus the hunters obtained an average of 5.5 kg per day of meat, which is equivalent to an average of 1.3 kg per person per day. Inclusion of the bush pig, however, which is seldom caught, seems to give an artificially high average for the usual "menza". If the bush pig is not taken into account, an average of 1.8 kg per day or 0.4 kg of meat per person per day is obtained.

2) "Luemba"

Three cases of "luemba", all of which the author accompanied, took place during the study period (Table 6b).

a) Method: "Luemba", based on a driving strategy like "menza", is an organized collective hunt. A hunting party consists of over 7 or 8 archers and/or a few dogs. The equipment of archers is the same as for the "menza". Although owing to a large number of members and their systematic cooperation, dogs are not indispensable in "luemba", they always follow all the "luemba" hunting forays in the Yele village.

The "luemba" proceeds as follows: each member locates at intervals of 10 to 15 meters from one another so as to make a semicircle facing forward and the party advances in this formation (Fig. 14). One or two beaters called "ikongi", followed by the dogs, drive the animal out. When the prey runs back, two "ichyundo", situated at both ends of the mouth of the semicircle, move so as to close the mouth and other members also move to encircle the animal. After the attack, the party soon reforms the semicircle and advances whether or not they have caught the animal. Two archers called "liya" bring up the rear of the formation and determine their own direction and speed.

Table 6b. Hunting record ("luemba", "lofoma", tracking).
 "luemba" (All cases were observed.)

Case No.	Date	No. of Hunters (E. hamlet)	Working Hours			Hunting Hours			Animals Caught	Means of Catch	Note	Animals fled
			Departure	Arrival		Beginning	Ending					
1.	31 Oct. 1978	10*(4)	9:20	14:10	4.50	10:50	13:20	2.30	BTP1 BLD1	arrow	Rain at 13:00	?
2.	16 Dec.	7 (5)	8:20	17:10	8.50	8:45	16:20	7.35	BLD1	arrow+dog		BTP2, BLD1, PD3, BP2
3.	17 Jan. 1979	9 (5)	8:45	17:05	8.20	9:30	15:40	6.10	PD1	arrow+dog	Hunting ritual	BTP5, BLD3, Bokondo 1 BTP (36.8%), BLD (26.3%), PD (21.1%), BP (10.3%), Other (5.3%)
			Av. 8:48	Av. 16:08	Av. 7.20	Av. 9:42	Av. 15:07	Av. 5.25				
"lofoma" (No case was observed.)												
1.	28 Oct. 1978	3	12:30	14:00	1.30	—	—	—	0			
2.	16 Jan. 1979	3	9:40	12:00 (ca)	2.00 (ca)	—	—	—	0			
Tracking (No case was observed.)												
1.	6 Nov. 1978	10*	16:20	17:40	1.20	—	—	—	0			
2.	13 Jan. 1979	2	15:35	17:26	1.51	—	—	—	BLD1	trap+dog		
3.	19 Jan.	7*	13:45	15:55	2.10	—	—	—	0			
4.	9 Feb.	3	14:00	16:00	2.00	—	—	—	0			

BTP: Brush-tailed porcupine; BLD: Blue duiker; PD: Peter's duiker; BP: Bush pig; Bokondo: Genet; *: Boys participated.

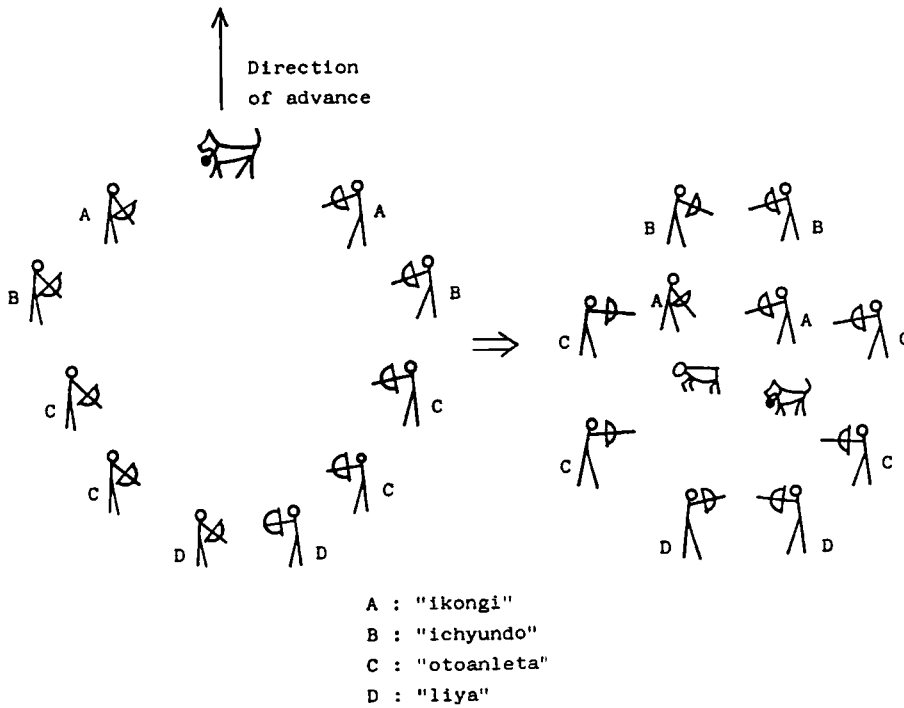


Fig. 14. "Luemba" formation.

Usually there is a hunting leader called "bokololuemba" in "luemba". But this term does not mean a conductor in practising "luemba". He is an advocator who suggests to have a "luemba", and does not always participate in it. Anyone can become a "bokololuemba" except women.

b) Daily activity: In the early morning, the leader or another inhabitant of the same hamlet normally calls for participation in the luemba using a tom-tom. Such a call was done in cases 1 and 3. In case 2, the hunters had at first intended to have a "menza", but due to the large number of participants, organized a "luemba" instead. The three hunting parties included visitors to or neighbours of E. hamlet at 28.6 to 60 percent.

"Luemba" is also a day-time hunt. After the hunters have gathered at the leader's hamlet, they depart together in the morning. Some members of the party may gather directly at the assembly place in the forest. While the departure time of the "menza" which tends to be done at random varies to quite an extent, the practice of "luemba" usually is prearranged the previous day and the call to participate is done in the early morning so that the party can leave by 9:30 a.m. Before the commencement of the hunt, discussion and prayers are held as for the "menza". One round of driving game from the time of organizing the formation to its break up by rest or discussion is 1 to 2 hours, and about 4 or 5 rounds a day are done. Unless it rains, the gross working hours between departure and return may be 8 to 9 hours, including about 2 hours spent in travelling, butchering, and so on. The party arrives at the hamlet before dark. To understand the daily activity in more detail, a description of case 2 is given below: Case 2. Dec. 16, 1978.

8:20 Seven hunters and one dog start for the forest.

8:35 They reach the assembly place and decide to practise "luemba" instead of "menza" as planned.

- 8:45 The hunting begins with one beater and three archers in both wings. They enter a dense thicket in which an archer had failed to capture a bush pig two days before.
- 8:55 An animal is driven out. No chance to shoot. Shortly after that, owing to extremely dense bush, it became difficult for the author to follow.
- 10:10 As soon as the beater, Y3-1, shot the blue duiker, the dog bit it. An old archer (a visitor) carries it.
- 10:30 They take their position a second time.
- 10:50 Two bush pigs flee.
- 11:20 They move to another place.
- 11:35 During the move, an archer blows a whistle ("iyototoli") meaning a peter's duiker has been spotted and soon Bm1-1 shoots at it, but it gets away.
- 11:47 They take their positions again on the right bank of the Longenga River.
- 12:25 Two brush-tailed porcupines flee. No chance to shoot. Move to the upper Longenga.
- 12:30 Cross the river.
- 11:47 They take their positions again on the right bank of the Longenga River.
- 12:25 Two brush-tailed porcupines flee. No chance to shoot. Move to the upper Longenga.
- 12:30 Cross the river.
- 13:50 Peter's duiker flees. No chance to shoot.
- 14:20 Brush-tailed porcupine flees. Y2-1 fails to hit it.
- 14:50 Blue duiker flees. No chance to shoot.
- 15:10 Y1-1 hits a peter's duiker from a distance of about 5 m. Soon after, an archer shoots a second arrow, but misses. The duiker lost quite a lot of blood from the first arrow, however, in the end the chase fails. One of the reasons is that the dog became trapped in a "jeki" on the way.
- 16:20 Chase finishes. Start for home.
- 16:35 They butcher and share the blue duiker on the way home.
- 16:55 Start for home again.
- 17:10 Arrive at the hamlet.

c) Hunting area: In Fig. 15, the routes of the three hunts are shown. Although the hunting grounds of the "luemba" which are aimed mainly at duikers need not, like the "menza", be concentrated in the riverine environment, nevertheless the hunting routes were for the most part along the watercourses, partly including the interfluvial areas. It is understood that the hunters of Yele willingly do the "luemba" in the forests close to the river or stream.

d) Catch: It is difficult to know exactly how many animals escaped from the encirclement of hunters in "menza" and "luemba". Tables 6a and 6b show the estimated number of escaped animals according to my observation and the hunters' information in both hunting methods. The actual number is probably more. Although the proportion of peter's duiker in "menza" and brush-tailed porcupine in "luemba" is low respectively, both hunting methods show a similar species composition of escaped animals; i.e., brush-tailed porcupine, blue duiker, peter's duiker, and bush pig in that order. Adding the game caught, it can be surmised that brush-tailed porcupines and small- and medium-sized duikers are the most numerous game in this area, especially in the riverine zone. However, the number of brush-tailed porcupine caught in the "luemba" is relatively few, i.e., one brush-tailed porcupine, two blue duikers and one peter's duiker. The reason seems to be that unlike in "menza", once the brush-tailed porcupine is driven into a burrow, it is usually no longer attacked in "luemba". Therefore, small- and medium-sized duikers are the principal targets of "luemba".

The total weight of the game taken was about 26.5 kg according to standard weight per head of each animal (peter's duiker = 15 kg, the others, as stated before). This value is equiva-

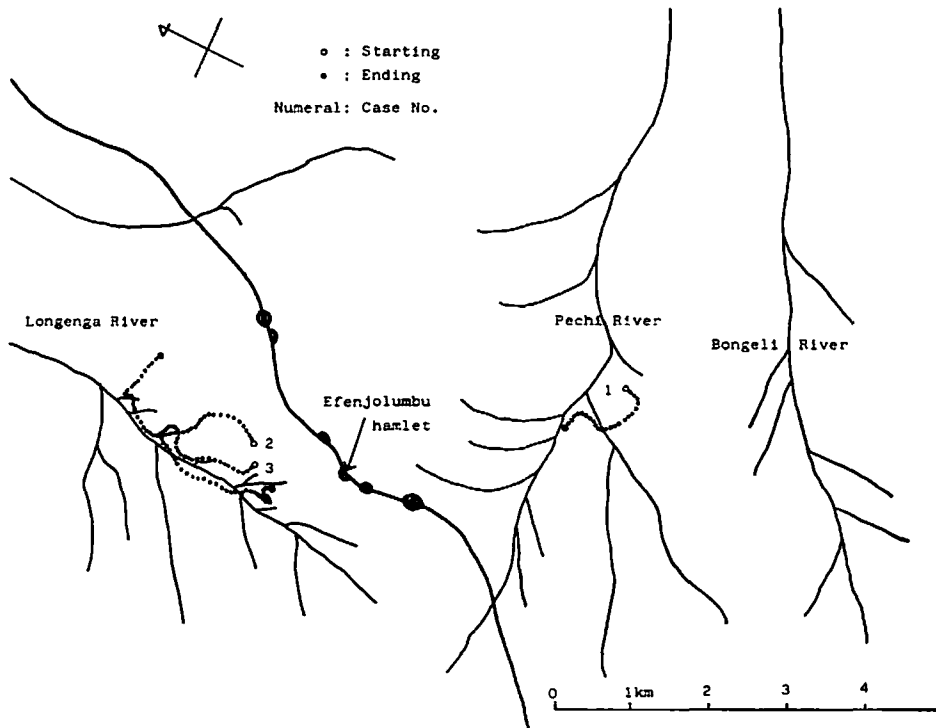


Fig. 15. Hunting route during "luemba".

lent to the average 8.8 kg of meat per day and 1.0 kg per person per day. There was something caught in every "luemba" hunt. Furthermore, game was caught in the two cases of "luemba", conducted in Feb. 1977 and 1979 except during this study period. These facts seem to indicate that "luemba" is a more successful hunting method than "menza".

At the moment of capture, the dog played an important role as shown in Tables 6a and 6b. Apart from the smallest-sized animal such as a brush-tailed porcupine, game is not usually killed by one arrow. Therefore, the sequence of chasing the wounded game is important in the process of bow and arrow hunting such as "luemba" and "menza". When visibility is not good and spoor unclear on the leaf covered forest floor, it is quite impossible for hunters alone to chase the game. This is the main reason why all "luemba" hunting parties were accompanied by dogs although they are not always needed.

3) "Iyongi"

This is a method of hunting in which a man with a full set of bow and arrows conducts a hunt by means of ambush, luring and stalking methods, as he rambles about the forest. Although this is occasionally done by a party of a few hunters, it is usually done individually while patrolling traps. According to Yele hunters, this is one of the most difficult kinds of hunting and they must walk cautiously in the forest, straining their senses to find the game. When aiming at terrestrial animals, especially duikers, a hunter hides in ambush or sounds a decoy in the path where the animal left its fresh footprints or evidence of digging out truffles. It is said that this decoy call called "iyai" lures not only duikers, but also predators and scavengers such as leopards, mongooses, rapacious birds, tortoises and so forth. It is doubtful, however, that there is a practical result from this ambush and decoy call, for the catch from

"iyongi" is limited to arboreal monkeys. In the dense forest, visibility is better in the trees as the view on the ground is obstructed by trees and undergrowth. Furthermore, the sound of the monkeys trooping together makes it relatively easy for a hunter to locate them. When he finds his prey, the hunter stalks and shoots a poisoned arrow at it. Therefore, in the case of "iyongi" a hunter always carries "imbenga" and/or "bolele" for monkey as well as "likula" and "lo-kate". According to Yele hunters, it is difficult to shoot a monkey from a high tree even with those arrows, and the early morning and evening when monkeys descend closer to the ground to feed are more suitable hunting times. Indeed, many cases of "iyongi", which did not include patrolling traps, were conducted for 1 to 2 hours in the evening (Table 6c). During the study period one *Cercopithecus mona* ("ngele") was caught by "iyongi" hunting.

4) "Lofoma"

This is small-scale collective hunting based on the driving method, which aims at arboreal monkeys, especially *Cercopithecus* spp. Some archers hidden in a tree above shoot arrows at a troop of monkeys driven out by a beater on the ground. The main hunting ground is the secondary forest around the hamlets, where troops of monkeys, including *Cercopithecus ascanius* called "nsoli" and *Cercopithecus mona*, can be seen frequently. There were no catches in the two "lofoma" hunts (Table 6b).

5) "Lokima"

This hunting is conducted in combination with dogs. One or a few archers and one or two dogs drive out game and afterwards run it down. Thus, this is based on a drive and running down method. The main prey are small- and medium-sized duikers. This method is seldom employed as it is strenuous.

6) Tracking by Dog

This hunting which has no native name is used on the spur of the moment. When a trapper patrolling traps finds that game has just broken loose from the trap, he returns to call a dog and other hunters, and together they chase the wounded game. In addition, Yele hunters occasionally have dogs chase bushbuck, which is often seen near the village. In prin-

Table 6c. Hunting record ("iyongi").
(No case was observed.)

Case No.	Individual					
	No.	Date	Departure	Arrival	Working Hours	Catch
1	Y4-1	28 Oct. 1978	14:00	ca 18:00	ca 4.00	0
2	Y4-1	29 Oct.	7:28	?	?	0
3	Y4-1	1 Nov.	13:55	ca 17:00	ca 3.05	MM1
4	Y4-1	14 Nov.	? (sunset)	?	?	0
5	Y4-1	15 Nov.	16:40	ca 18:00	ca 1.20	0
6	B1-1	15 Nov.	16:40	ca 18:00	ca 1.20	0
7	Y4-1	21 Nov.	?	?	?	0
8	Y3-1	1 Dec.	? (sunset)	?	?	0
9	Y3-1	2 Dec.	ca 15:00	16:55	ca 1.55	0
10	Y3-1	15 Dec.	ca 12:30	18:05	ca 5.35	0
11	Y4-1	15 Dec.	15:10	16:50	1.40	0
12	Y4-1	18 Dec.	8:50	ca 11:00	ca 2.10	0
13	Y3-1	22 Dec.	16:12	18:15	2.03	0
14	Y4-1	5 Jan. 1979	7:00	ca 9:00	ca 2.00	0
15	Y4-1	13 Jan.	16:20	ca 18:00	ca 1.40	0
16	Y3-1	16 Jan.	?	?	?	0
17	Y4-1	16 Jan.	16:47	ca 18:00	ca 1.13	0
18	Y4-1	22 Jan.	17:20	ca 18:30	ca 1.10	0
19	Y2-1	11 Feb.	14:30	15:30	ca 1.00	0

MM: Mona monkey.

principle, this hunting is similar to "lokima". In 4 instances of tracking one wounded blue duiker was caught (Table 6b).

B. Net Hunting

1) "Botai"

As this hunting is no longer conducted, the description below is based on information from the Yele people. Based on a driving strategy, "botai" is large-scale collective hunting. A party consists of over 20 members including 5 to 10 net owners called "bokolobotai" and more than 10 beaters called "ndufi". Women participate in this hunting as beaters and transporters (called "botoli") of the game that is caught. The major hunting ground is dry primary forest. "Botai" proceeds as follows:⁽³⁾ net owners set the nets in a semicircle so as to encircle a local thicket ("lisambo") in the dry primary forest. Beaters, then drive the game out and the net owner, hidden inside the net circle, gives the game caught in his net a finishing blow. The main preys are duikers.

2) "Botafe"

This hunting is based on an ambush strategy and the target is arboreal monkeys. At first, one or two net owners set the nets in a circle under the tree through which monkeys, especially *Cercopithecus* spp. often pass, and fasten a string of *Eremospatha haullevilleana* on a branch. This branch is a monkey path called "ikoka".

As soon as a monkey passes through "ikoka", a man or woman who ambushes from below pulls a string so that it falls into the net encirclement and the other member gives it a finishing blow with a weapon such as a machete. This type of hunting can include 2 or 3 members and it is still conducted, though none was witnessed during the study period.

3) "Liyemba"

This is a hunting based on a besetting strategy and aimed at arboreal monkeys and mongooses. In the case of monkey hunting, over 10 men lay siege to trees, on which a troop of monkeys are feeding or resting, and set up a circle of nets. They then fell the trees around the nets to prevent the prey from escaping, and shoot with arrows or capture them with the nets. Mongoose hunting, however, can be accomplished with a few participants. According to the Yele hunters, it is said that a troop of "efanja" (*Crossarchus obscurus*) have their night nests in the trees, often in oil palms. When hunters find their nests in the evening, they return to the tree before sunrise to lay siege to it, capturing the prey as it descends in the early morning by bow and arrow or net.

In either case, the net is not necessarily used, but, if used, they are likely to catch the prey. This hunting was not conducted during the study period, but one case of monkey and mongoose hunting each was done during the first survey.

C. Trapping

1) Trapping Activity

The procedure of trapping is as follows: (1) the selection of the trapping site, (2) the setting of traps, (3) the patrolling of traps (including the withdrawal of the game trapped and the restoration of traps), (4) the removal or abandonment of traps. Whenever trappers walk about the forest, they search for a good trapping site so as to be able to shift to it or newly set a trap at any time. The factors concerned in the selection of the trapping site are firstly, evidence of animals such as spoor, and secondly, whether traps have been set by other trappers or not, for the first comer has priority over others to set traps at the same site. Furthermore, the distance between the hamlet and the site must be considered. Although the number of traps set by one trapper varies from season to season and from trapper to trapper, it is around 50 on average.

Table 6d. Hunting record (Trapping).
(Case 4, 11, 36 and 50 were observed.)

Case No.	Individual No.	Date	Departure	Arrival	Working Hours	Catch
1	Y5-1	28 Oct. 1978	10:37	12:30	1.53	0
2	Y2-1	28 Oct.	10:37	12:30	1.53	0
3	Y5-1	28 Oct.	14:30	ca 17:00	ca 2.30	0
4	Y2-1	30 Oct.	8:57	16:45	7.48	0
5	Y4-1	1 Nov.	?	?	?	0
6	Y5-1	1 Nov.	?	?	?	BTP1 by "nilo"
7	Y5-1	3 Nov.	?	?	?	BTP1 by "bongomba"
8	Y2-1	3 Nov.	?	?	?	0
9	Y4-1	6 Nov.	?	?	?	0
10	Y4-1	7 Nov.	?	?	?	BD1 by "jeki"
11	Y4-1	7 Nov.	14:30	17:00	2.30	0
12	Bm1-1	8 Nov.	?	?	?	0
13	Y2-1	8 Nov.	8:15	ca 11:15	ca 3.00	WC1 by "itelebeye"
14	Y5-1	9 Nov.	?	?	?	BFD1 by "jeki"
15	Y4-1	9 Nov.	ca 8:30	10:45	ca 2.15	0
16	Y4-1	11 Nov.	?	?	?	0
17	Y4-1	12 Nov.	8:50	ca 11:00	ca 2.10	0
18	Y4-1	12 Nov.	14:00	ca 16:00	ca 2.00	0
19	Y4-1	13 Nov.	ca 7:30	12:20	ca 4.50	MM1* by bow and arrow
20	Y5-1	13 Nov.	ca 9:00	11:30	ca 2.30	0
21	Y5-1	13 Nov.	12:03	ca 14:30	ca 2.27	0
22	Y2-1	13 Nov.	12:03	ca 14:30	ca 2.27	0
23	Y4-1	14 Nov.	12:30	ca 15:30	ca 3.00	0
24	Y4-1	15 Nov.	ca 10:00	13:00	ca 3.00	0
25	Y4-1	15 Nov.	16:40	ca 18:10	ca 1.30	0
26	Y2-1	16 Nov.	?	?	?	WC1 by "itelebeye"
27	Y4-1	16 Nov.	?	?	?	withdrawing traps
28	Y4-1	17 Nov.	?	?	?	0
29	Y5-1	18 Nov.	ca 13:00	16:55	ca 3.55	0
30	Y2-1	21 Nov.	?	?	?	WC1 by "itelebeye"
31	Y2-1	26 Nov.	8:00	12:10	4.10	0
32	Y5-1	27 Nov.	13:00	15:20	3.20	0
33	Y3-1	27 Nov.	?	?	?	0 setting a trap ("lika")
34	Y3-1	28 Nov.	?	?	?	0 setting a trap ("lika")
35	Y3-1	3 Dec.	in the morning	19:00	?	0 setting a trap ("lika")
36	Y3-1	4 Dec.	9:42	17:10	7.28	0 setting a trap ("lika")
37	Y3-1	5 Dec.	?	?	?	0 setting a trap ("lika")
38	Y5-1	7 Dec.	?	?	?	0
39	Y3-1	8 Dec.	?	?	?	0
40	Y2-1	9 Dec.	ca 9:00	14:55	ca 5.55	0 withdrawing traps
41	Y4-1	13 Dec.	9:00	16:45	7.45	0
42	Y4-1	16 Dec.	6:50	ca 14:00	ca 7.10	0
43	Y5-1	18 Dec.	7:20	10:40	3.20	0
44	Y4-1	19 Dec.	6:00	14:20	8.20	0
45	Y3-1	19 Dec.	?	?	?	0
46	Y3-1	20 Dec.	10:30	19:00	8.30	0
47	Y3-1	21 Dec.	?	?	?	0 killed a green mamba ("lokonga")
48	Y4-1	22 Dec.	6:55	17:10	10.15	0
49	Y3-1	23 Dec.	10:28	ca 17:30	ca 7.02	0

Table 6d. (continued)

Case No.	Individual No.	Date	Departure	Arrival	Working Hours	Catch
50	Y5-1	23 Dec.	10:58	14:20	3.22	0
51	Y2-1	24 Dec.	14:20	16:30	2.10	0
52	Y3-1	25 Dec.	ca 7:00	10:30	ca 3.30	0
53	Y5-1	25 Dec.	12:31	17:46	5.15	0
54	Y4-1	26 Dec.	8:00	14:55	6.55	BLD1, BTP1
55	Y5-1	26 Dec.	12:25	ca 15:30	ca 3.05	0
56	Y4-1	29 Dec.	7:00	ca 14:00	ca 7:00	WC1
57	Y5-1	29 Dec.	7:28	ca 11:30	ca 4.02	0
58	Y5-1	2 Jan. 1979	11:05	15:30	4.25	0
59	Y4-1	3 Jan.	6:43	14:55	8.12	0
						killed a adder ("ityufa")
60	Y5-1	4 Jan.	ca 12:30	17:35	ca 5.05	0
61	Y4-1	7 Jan.	7:00			0
62	Y5-1	8 Jan.	14:50	16:30	1.40	0
63	Y4-1	9 Jan.	?	?	?	BTP1
64	Y5-1	11 Jan.	ca 12:30	14:20	ca 1.50	0
65	Y5-1	12 Jan.	?	?	?	0
66	Y3-1	12 Jan.	ca 11:00	ca 18:00	ca 7.00	0
67	Y5-1	13 Jan.	?	?	?	0
68	Y4-1	14 Jan.	7:00	14:00	7.00	0
69	Y2-1	15 Jan.	13:55	ca 17:00	ca 3.05	0
70	Y4-1	18 Jan.	7:00	13:00	6.00	PD1
71	Y5-1	21 Jan.	ca 9:30	13:30	ca 4.00	0
72	Y4-1	23 Jan.	7:22	ca 14:30	ca 7.08	0
73	Y3-1	26 Jan.	?	?	?	BP1
74	Y4-1	28 Jan.	7:00	14:50	7.50	0
						by "jeki" killed a adder ("ityufa")
75	Y4-1	9 Feb.	ca 15:00	17:04	ca 2.04	0
76	Y5-1	9 Feb.	ca 12:30	15:25	ca 2.55	0
77	Y5-1	11 Feb.	ca 13:00	16:19	ca 3.19	0
78	Y4-1	13 Feb.	?	?	?	BFD1

A boy's trapping

Individual No.	Date	Departure	Arrival	Working Hours	Catch
Y1-a	13 Dec. 1978	ca 9:00	16:45	7.45	0
Y1-a	16 Dec.	6:50	ca 14:00	ca 7.10	WC1
Y1-a	26 Dec.	8:00	14:55	6.55	0

BTP: Brush-tailed porcupine; BD: Bay duiker; WC: Water chevrotain; BFD: Black-fronted duiker; PD: Peter's duiker; BP: Bush pig; BLD: Blue duiker; MM: Mona monkey.

Most of the traps set are spring traps such as "nilo", "jeki" and "tosai". As it takes about 30 minutes to set one spring trap, a maximum of ten to fifteen traps can be set in a day. Among the various trapping activities, most hours are spent on patrolling the traps. The hunters of E. hamlet went trapping a total of 78 times and 73 man-days during the study period (Table 6d). Among these, 71 times and 66 man-days were spent in patrolling the traps. This work required on average 4 and a half hours each time (min. 1 hr. 40 min; max. 10 hrs. 15 min.). According to Y4-1 and Y5-1 who both engaged in trapping throughout the study period, as the former patrolled his traps 26 days in 85 days (excluding 19 days of a hunting trip) and the latter 22 days in 104 days, the frequency of patrolling of traps was 2.7 days per 10 days per person on the average, that is, one day of patrolling for every 3 to 4 days per person. There are often traps which have sprung up without trapping the game, therefore, patrolling of

traps is conducted not only to withdraw the game but to restore the traps. Where game is seldom trapped, trappers shift the trapping site. For this, the synthetic fibres and wires used for the loops of traps are withdrawn and the rest of the trap is abandoned.

2) Trapping Area

The usual place for setting traps is on an animal path. This includes that of small-sized animals such as brush-tailed porcupine and giant rat, called "bôkowiko", that of larger-sized animals such as duiker and bush pig, called "lihoto" and that of the elephant, called "bôngo". The principal spring traps are set at the former two, and "elongo", one of the spear traps, at the last, for the elephant. "Lihoto" on which fresh footprints are left, is called "liyoko", and arouses the greatest trappers' interest. Besides this, places for setting traps include a mud bath called "esafa", a felled tree across a river called "bofenda" and a branch of a tree for arboreal animal path called "ikoka" (including also an artificial branch).

Fig. 16 shows roughly the location of the trapping sites of four trappers, Y2-1, Y3-1, Y4-1 and Y5-1. The trapping area extends over all types of forest. Among these, the riverine forest and the secondary forest near to the fields are more important, for there are many paths of animals who have come to search for water, food, or hiding places. In these forests, trappers often make a long fence 50 cm to 100 cm in height, using branches between many traps so as to prevent game from passing through gaps other than the trapping spot. The longest fence I observed was over 300 m and had 35 traps along it. This set of traps and a fence is called "lokombo".

In the case of E. hamlet, it took about five minutes to walk from the hamlet to the nearest

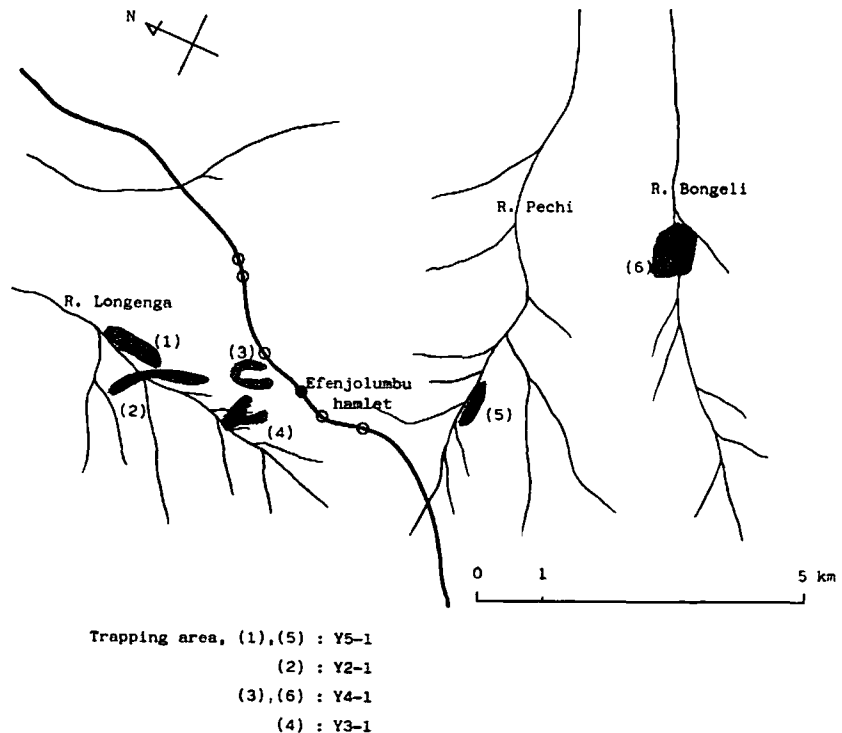


Fig. 16. Trapping area of the four hunters of Efenjolumbu hamlet.

trapping area and about two hours to the farthest. The latter is the Bongeli basin, in which Y4-1 conducted a hunting trip leaving the village, and after return he continued to patrol some of the traps which had been set on that trip.

3) Catch

If one peter's duiker (which a man of another hamlet took from a trap of Y4-1), one water chevrotain (which was captured by a boy, Y1-a), and three snakes (which were killed in the midst of patrolling traps) are added to the catches in Table 6d, the total game taken in trapping, consisted of one blue duiker, 6 medium-sized duikers, 5 water chevrotains, 4 brush-tailed porcupines, one bush pig and three snakes. The total weight of the game taken was about 208.5 kg according to the standard weight per head of each animal (black-fronted duiker = 14.0 kg, bay duiker = 17.0 kg, water chevrotain = 8.0 kg, green manba = 1.0 kg, rhinoceros viper = 2.0 kg and the others, as before). Among all the catches, duikers accounted for 7 heads (35.0%) or 93.5 kg (44.8%). These appear to be a principal target for trapping. Water chevrotain and brush-tailed porcupine also show a relatively high frequency of capture. The high rate of capture of water chevrotain, which leads a semi-aquatic life, shows that the riverine environment is a major trapping zone. Although the frequency of trapping bush pig is low, due to its large size it makes a sizable contribution to the meat supply of the villagers. When asked about their hunting success of the bush pig, most of the hunters of E. hamlet replied that they had caught innumerable bush pigs (it seems to be over 10 heads) by trapping in contrast to bow and arrow hunting by which most of the hunters had ever caught one or two. It should be emphasized that the frequency of capture is low in general, but trappers set their traps for the bush pig with some confidence of success.

If a hamlet has a long period of unsuccessful hunting not only in collective hunting, but also in trapping, the hunters may become convinced that they have fallen into a slump. This is called "bolingi". It is believed that "bolingi" is caused by the violation of some cultural prohibition or regulation or by malice and so on. When no game is secured in collective hunting, the members always discuss to determine the cause of the failure. They usually discover a trifling infringement and blame the person who brought about the problem. Such accusations, however, are not so serious and a ritual may not follow. On the other hand, in the case of "bolingi", the hunters usually visit a witch doctor ("nkanga") to get him to divine the source of the problem and after that, a ritual may be performed to drive away the evil. In E. hamlet, such a ritual occurred on Jan. 15, 1979.

D. Boy's Hunting

Since the hunting activity of boys has not been described, it is summarized here. The boys hunt mainly in the secondary forest around their hamlet. This hunting is partly for pleasure. They capture small birds and rodents, using bow ("lifino") and arrow ("bofito") and small-sized spring traps such as "boulu" and "ifasa". Although their hunting is in part play, it seems to be of training value for use in future hunts; that is, the bow and arrow hunting of birds and rodents by stalking is useful training for that of monkeys in "iyongi", the collective bow and arrow hunting of squirrels through drive strategy for "menza" and "luemba", and the setting of small-sized traps for preparation of larger-sized traps such as "nilo", "jeki" and so forth.

The boys sometimes participate in "menza" and "luemba", even if they have no "likula". Boys participated in these types of hunts eight man-days among a total of 70 man-days (for all the members). These include 2 man-days of Y1-a and Y4-b, and 6 man-days of the visitors and the inhabitants of other hamlets. Except for Y4-b, most of the boys were 13 or 14 years old at that time. In addition, when Y4-1 conducted a hunting trip in the Bongeli basin,

Y1-a followed him and set a small number of the "nilo". Thus, the boys at this age learn to do adult hunting. According to the uncles of Y1-a, he may soon be able to deal with "likula". When a boy is recognized as a grown-up hunter, "likula", an iron-tripped arrow, is given to him by his father or uncles.

HUNTING TRIP

The people of Yele usually conduct one-day hunting trips in the forest relatively close to their hamlets. However, they occasionally make a hunting trip to a faraway forest, leaving their hamlets. This is called "ifomo", which is also the name of the temporary hut used during a hunting trip.

This hunting trip party consists of one to several families' members. The men hunt and the women fish and collect wild plants and small animals. The main hunting method on "ifomo" is trapping, but also includes individual bow and arrow hunting. A collective bow and arrow hunt is done when there is a party of several families.

The dry season, especially June to August, is regarded as the best time for "ifomo". Reasons are, firstly that the water level of the streams lowers during the dry season and this facilitates fishing, and secondly, from June to August a variety of wild foods, lepidopterous larvae, fruit and honey can be collected. Furthermore they have more time to spare for hunting during the dry season which is normally a period of drying felled trees. Indeed among 7 hunters of E. hamlet, two (Y2-1, Y5-1) conducted hunting trips in August 1978 and four (Y1-1, Y3-1, Y4-1, Bm1-1) in Feb. -Mar. 1978. The time of "ifomo", however, is not limited exclusively to the dry season. For example, Y4-1 went on "ifomo" in November 1978, and Y3-1 and Bm1-1 made a long-term hunting trip in Oct. 1976-Jan. 1977. The time for "ifomo" is determined by each family's need for meat, schedule of cultivation and season.

A "ifomo" lasts from a few weeks to 3 months. Cassava tubers brought from the village serve as the main food during this period, and foods which are hunted, fished and collected are prepared as sidedishes. The cassava tubers are preserved and detoxicated by soaking in a stream. The information about "ifomo" below was obtained from Y4-1 who conducted a hunting trip for 19 days in November 1978. He set 10 to 15 traps each day, seeking good places for the traps, and finished setting them in a week. He then repeated the daily hunting routine, "iyongi" from 8:00 a.m. to 10:00 a.m. and patrolled the traps in the daytime. He set 94 traps

Table 7. An example of the catch in a hunting trip ("ifomo").

Animal	Number	Weight
Duiker	9	63.5 kg
blue duiker	(7)	(31.5)
peter's duiker	(1)	(15.0)
bay duiker	(1)	(17.0)
Water chevrotain	1	8.0
Brush-tailed porcupine	5	12.5
Red-tailed monkey	1	4.0
Mona monkey	1	4.0
Angolan colobus	1	15.0
Black mangabey	1	6.0
Giant rat	1	1.0
Squirrel	1	0.5
Total	21	114.5

This hunting trip was conducted by Y4-1 from 21 Nov. to 9 Dec. 1978.

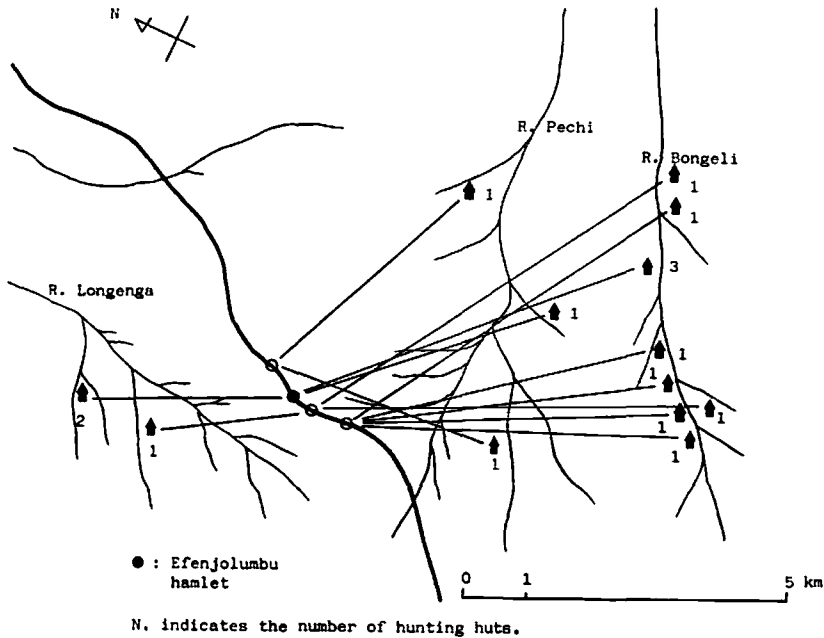


Fig. 17. The location of the hunting huts used by hunters of Efenjolumbu and the other three neighbouring hamlets in 1978.

in all: 29 "jeki", 58 "nilo" and 7 other types, and obtained 115 kg of game, details of which are shown in Table 7. It appears that blue duikers and brush-tailed porcupines are also the principal game in "ifomo".

A "ifomo" is usually conducted within the territory of the hunters' village. Fig. 17 shows the location of the hunting huts which the inhabitants of Efenjolumbu and neighbouring hamlets used in 1978. Sixteen huts were built in the Bongeli basin, around 2 hours' walking distance from each hamlet, and three in the Longenga basin and Pechi basin, respectively, about one hour's walk from the hamlets.

Part of the game captured in "ifomo" is used as food during the trip, and the remains are immediately dried over a fire to preserve them for use as daily food in village life, for rites or to sell.

HUNTING RANGE

As mentioned earlier, the people of Yele regard an area of about 110 km² their own forest. Their subsistence activities are indeed carried out within this range except at the permanently flooded zone close to the Tschuapa River, and hunting, also, is within the range. Even a long-term hunting trip is seldom conducted beyond the territory. This does not, however, mean that each hunter of the Yele village uses the whole of the territory for his hunting ground. Indeed, the hunters do hunt and set traps in the forest as near to their own hamlet as they make their fields. In addition, several hamlets are relatively close to each other along a road. Therefore, the hunting range of each hamlet extends on both sides of a road in a long narrow strip, overlapping a part of it. Figure 18 shows the range covered with the hunting ac-

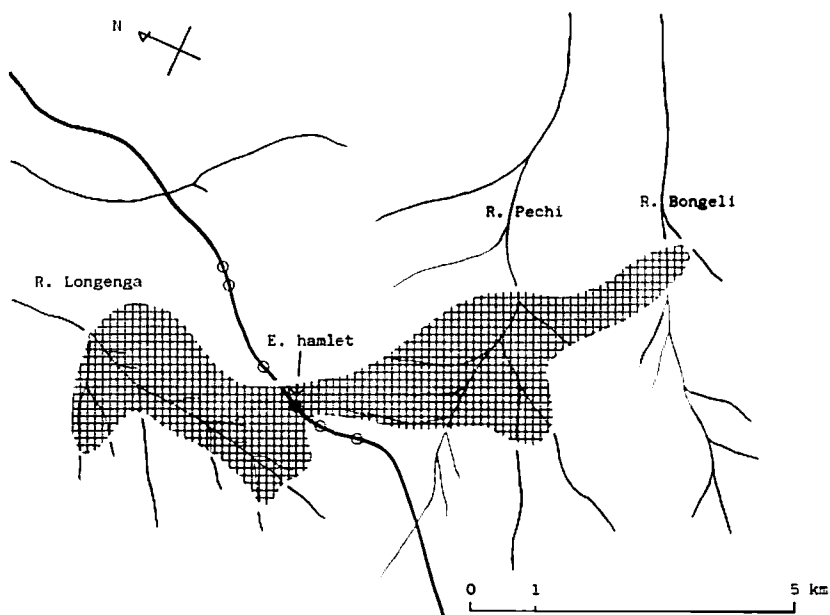


Fig. 18. Hunting range used by the hunters of Efenjolumbu hamlet during the study period.

tivities which were conducted by the hunters of E. hamlet during the study period except for the "ifomo".

The Bongeli basin is the most distant part of E. hamlet's range and takes about 2 hours to reach. In this area Y4-1 conducted 19 days' "ifomo" and after that, he continued still to patrol the traps he had been set during his "ifomo". However, this place seems to be somewhat too far from the village for the usual one-day hunting for the following reasons: first, working hours from departure to arrival are too much; for example, 7 to 10 hours a day in Y4-1's case, and, when Y4-1 went there to patrol his traps, he was often accompanied by his wife who carried food (normally such a woman's participation in usual hunting occurs rarely) and made preparations for lodging in his hunting hut in time of need; second, "menza" was only conducted once there during the study period. Thus, probably for one-day hunting a hunting ground must be within 2 hours' walking distance one way.

The hunting range area is about 13 km² according to calculations from the map. Even if the study period extends more, this value is unlikely to increase as neighbouring hamlets are sedentary. Assuming the area of the annual hunting range to be 15 km², the hunting area per capita is 0.4 km² (assuming an average population of 34). This is a very small area, compared to that of a hunter-gatherer, as will be discussed later.

HUNTING EFFORTS AND RETURNS

Below is discussed labour input and return in hunting. Table 8 shows the man-days spent hunting and by hunting methods regarding seven men who are able to hunt in E. hamlet. In this table, a column under "Days Hunting", labeled "Other", was not explained previously.

Table 8. Days spent hunting by each hunter of Efenjolumbu hamlet. (28 Oct. 1978-14 Feb. 1979, except for 30 Jan.-4 Feb. 1979)

Hunter	Age (Jan. '79)	Days Study Period (SD)	Days* Available (AD)	Days Hunting							Total Number of Hunt- ing Days (T)	Hunting Days per 10 Days	
				Bow and Arrow Hunting					Trap setting & patrolling	Other		T/SD × 10	T/AD × 10
				"iyongi"	"menza"	"lucmba"	"lofoma"	tracking					
Y4-1	36	85**	85	12	3	2	2	2	26	—	39	4.6	4.6
Y3-1	42	104	44	5	7	2	1	1	13	—	29	2.8	6.6
Y2-1	45	104	97	1	14	2	1	2	11	—	30	2.9	3.1
Bm1-1	46	104	78	—	1	3	—	2	1	—	7	0.7	0.9
Y1-1	48	104	58	—	—	2	—	1	—	1	4	0.4	0.7
Y5-1	52	104	83	—	7	3	—	1	22	—	32	3.1	3.9
B1-1	59	104	45	1	1	—	—	1	—	—	3	0.3	0.7
	Total	709	490	19	33	14	4	10	73	1	144	2.0 (av.)	2.9 (av.)

* The length of each hunter's visit to some other village is excluded.

** Nineteen days during which Y4-1 conducted a hunting trip, leaving his hamlet, are excluded.

"Other" refers to a case when Y1-1 heard the shriek of an animal (yellow-backed duiker) at night which had been caught in a trap set by someone of the neighbouring hamlet. He went out and killed the trapped duiker. The data for Y4-1's 19 days hunting trip are excluded.

Altogether 144 man-days were spent in hunting among a total of 709 man-days. This corresponds to about 2 days of every 10 days spent hunting per person. Among all the hunting methods, the greatest number of man-days were spent in trapping; i.e., trapping (73 man-days), "menza" (33 man-days), "iyongi" (19 man-days) and "luemba" (14 man-days).

Man-days spent hunting vary from hunter to hunter. In general, the men of Yele may use any hunting method. However, in hunting they are characterized as trappers, as so far as circumstances permit, they continuously set traps and watch them periodically, only conducting bow and arrow and net hunting occasionally. In E. hamlet only two hunters, Y4-1 and Y5-1, kept this hunting pattern throughout the study period. The other five hunters set traps only periodically or not at all during the study period for various reasons. These are described below.

The case of Y3-1: He often made journeys during the study period, especially during the first half, and thus he did not set traps then, though he did in the latter half of the period. By nature he is one of the most active hunters as is shown by the fact that he went hunting at the high rate of 6.6 days per 10 days of the available days to hunt.

The case of Y2-1: He is a local officer engaged in local government administrative work in the village. During the first half of the survey period, he was busy trapping, but gradually removed the traps as he became busier with arrangements for the villagers' labor service to restore a road and a bridge in the latter half of the period.

The case of Bm1-1: He had been engaged in building a house ("bokwele") which was unusual and considerably bigger than normal house ("bole") ever since the beginning of the survey. He stopped trapping through the study period.

The case of Y1-1: Clearing the fields of this four wives left him no time to do any trapping.

The case of B1-1: In the early period of the survey, he was involved in lawsuit, and had no time to go hunting ever since. The last three named people rarely did bow and arrow hunting either.

Such affairs as described above are not so uncommon in the villagers' daily life except for the case of B1-1 and therefore it would be rather rare for anyone to maintain the hunting activity pattern mentioned before over a long period of time. Of two hunters who could maintain such a hunting activity pattern during the study period, Y4-1 was a particularly active hunter. The frequency of his hunting days per 10 days (4.6) would probably be the maximum a hunter of Yele could do over a long-term.

It could not be determined from the present study whether hunting frequency is correlated with age.

Table 9 shows the total length of time spent in each hunting method by the 7 hunters of E. hamlet. The time covers from departure to return. In any case where the time spent hunting was uncertain, it was estimated as the average time spent per trip for that hunting method. The total time spent was 724 man-hours. It corresponds to 1 hour 12 minutes per day per person on the average. Most man-hours were spent in trapping out of the hunting methods (49.2%). Following that, 27.3% in "menza" and 14.5% in "luemba". The bulk of man-hours was spent in these three hunting methods. This indicates that so far as labor input is concerned, these are the principal hunting methods.

Table 10 shows the total weight of catch obtained by the 7 hunters and a boy of E. hamlet according to each hunting method. In this table the estimated weight of catch which was shared by those other than the inhabitants of E. hamlet is subtracted from the total weight of

Table 9. Time spent in hunting* by method.

	Bow and Arrow Hunting				tracking	Trap setting & patrolling	Other	Total
	"iyongi"	"menza"	"luemba"	"lofoma"				
Total Number of Man-hours (%)	41 (5.7)	198 (27.3)	105 (14.5)	6 (0.8)	7 (2.3)	356 (49.2)	1 (0.1)	724 (99.9)

*Objects includes 7 adult hunters.

Hours spent in hunting per person per day

= [Total number of man-hours spent hunting (724)]/[Total number of man-days observed (709)]

= One hour 12 minutes per person per day

Hours spent in hunting imply working hours between departure and arrival. In the case that working hours could not be known, the average working hours per time of the same method are substituted for it.

Table 10. Hunting return in Efenjolumbu hamlet.

	Bow and Arrow Hunting* ¹				Trap* ³	Other	Total
	"iyongi"	"menza"	"luemba"	tracking			
	kg	kg	kg	kg	kg	kg	kg (%)
Small-sized duiker	—	8.7	5.5	4.5	4.5	—	23.2 (8.2)
Medium-sized duiker	—	—	9.0	—	89.0	—	98.0 (34.5)
Large-sized duiker	—	—	—	—	—	25.0	25.0 (8.8)
Water chevrotain	—	—	—	—	40.0* ⁴	—	40.0 (14.1)
Brush-tailed porcupine	—	7.2	1.0	—	10.0	—	18.2 (6.4)
Bush pig * ²	—	25.0	—	—	40.0	—	65.0 (22.9)
Monkey	8.0	—	—	—	—	—	8.0 (2.8)
Other small animals	—	1.8	—	—	5.0	—	6.8 (2.4)
Total	8.0 (2.8)	42.7 (15.0)	15.5 (5.5)	4.5 (1.6)	188.5 (66.3)	25.0 (8.8)	284.2 (100.0)

Small sized duiker: Blue duiker; Medium-sized duiker: Black fronted duiker, Peter's duiker, and Bay duiker; Large-sized duiker: Yellow-backed duiker.

*1: In group hunting, the amounts of shares to the members except the hunters of Efenjolumbu hamlet, are subtracted on the supposition that catch is shared evenly.

*2: The estimated amounts of the shares which were distributed to elder men according to a strict rule applied to bush pig are subtracted.

*3: Here small birds captured by boys are excluded.

*4: The weight of one head captured by a boy are included.

the catch. This includes: (1) the distribution among the members in collective hunting; although there are some rules pertaining to this distribution, in practice, the catch is shared evenly among all members, (2) the distribution of bush pig to the elder men according to a strict rule (which will be mentioned later).

The total weight of the catch was estimated at 284.2 kg. It corresponds to 0.08 kg (= 284.2 kg/104 days × 34 persons) of catch per day per capita, as the average population of E. hamlet is 34. Among all varieties of game, five species of duikers provided 51.5% (146.2 kg) of the total weight of catch obtained. This indicated that they are the most important source of meat. Although only two bush pigs were captured, they supplied a great amount of meat: 65 kg (22.0 per cent). The bush pig is the most preferred game of the Yele people and causes excitement because of the large amount of fatty meat it provides. In contrast to the bush pig, the brush-tailed porcupine supplied only 6.4 per cent of the total weight of catch obtained, but it showed a high frequency of capture in the "menza" and in trapping. Although the brush-tailed-porcupine provides a small amount of meat, it is an important animal with re-

spect to its contribution to the stable meat supply. This is similarly so in the case of the blue duiker.

The table indicates the high significance of trapping. The catch from trapping provides 66.3% of the total weight of catch obtained; if the catch obtained by tracking (a blue duiker was captured again after escaping from the trap) and by killing the yellow backed duiker caught in the neighbour's trap at midnight is included, the proportion reaches 77%. The amount of meat provided by the "menza" and "luemba", except in the case of the yellow backed duiker stated above, follows trapping in that order. The total number of man-hours spent in these two bow and arrow hunting styles are nearly equal to those in trapping, however the contribution to the meat supply is significantly less.

We can determine the labour efficiency of hunting in terms of the weight of catch obtained per unit time spent hunting. In sum the value is 0.37 kg per man-hour. To calculate this, the 22 man-hours spent in trapping by a boy (Y1-a) and 12 man-hours on "menza" by two boys (Y1-a, Y4-b) were added to the total number of man-hours spent by 7 adult hunters. The value in each hunting style is as follows: trapping: 0.50 kg per man-hour; "menza": 0.20 kg per man-hour; "luemba": 0.15 kg per man-hour; "iyongi": 0.20 kg per man-hour; tracking: 0.64 kg per man-hour; other: 25.0 kg per man-hour. Apart from the last two, these values indicate that the bow and arrow hunt is less profitable in relation to labour input, whereas trapping yields more for less labour input.

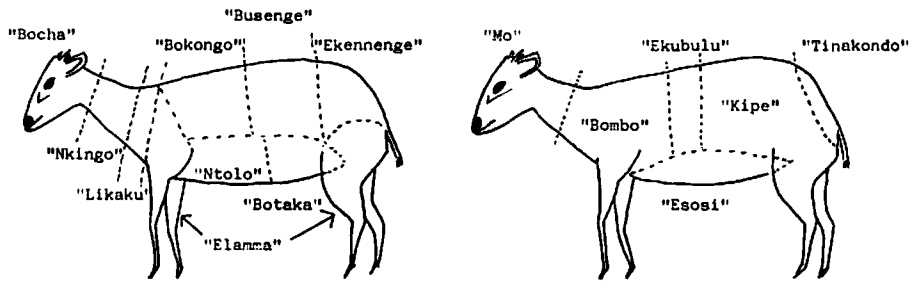
TRANSPORTATION, BUTCHERY AND DISTRIBUTION OF CATCH

A. Transportation of Catch

Individual hunting: Game obtained by individual hunting such as trapping or "iyongi" is dismembered in the village. The hunter transports his catch from the hunting place to the village. Occasionally, however, the hunter's wife accompanies him with a basket in which to carry the catch. When the hunter goes hunting alone, he does not take any special transporting implement and if he makes a catch, he crosses and binds its four limbs together with a wild vine and carries it by hand or, if it is heavy, on his shoulder with a carrying stick. When the catch is large, such as a yellow-backed duiker, the animal is usually dismembered on the spot and women come from the village to carry meat back in baskets on the back. If a large animal is to be dismembered in the village, two transporters will be sent for to carry the catch with a carrying pole on their shoulder to the village.

Group hunting: In large-scale net hunting, "botai", women used to join the hunting party as beaters and transporters of the catch. On the other hand, in collective bow and arrow hunting in which women do not participate, one member acts as transporter. He is called "botoli", and is entitled to the base of the neck of the catch at the time of sharing. If there are too many animals for one man to carry, there may be more than two transporters. There is no definitive rule to determine who acts as transporter. However, the fact that Y5-1 aged 52 often became "botoli" and so also the boys aged 10 to 15 many of times when they joined the hunting party, suggests that men with less hunting ability tend to be "botoli". "Botoli" carries the catch, its four limbs with a vine until the dissection is carried out on the way home. When the catch is as big as medium-sized duikers, one of the following is sometimes done instead of carrying it; it is kept in the stream, on a tree 1.5 meter high, or in the earth until it is withdrawn at the end of the hunting. When a large-sized game is captured, the hunting stops and the dissection begins immediately.

After butchering and sharing, the hunters take home their own share themselves, wrapping



The manner of the Boyela.

The manner of the Bambuti in the
Ituri Forest (after Tanno, 1976).

Fig. 19. The dissecting of the middle-sized duiker.

it in leaves of the herbs such as *Ataenidia conferta*. When a share is too big to be wrapped up in leaves, they carry it home with a carrying pole or in an instant basket ("elombo") made of liana palm.

B. Butchering of Catch

The catch, except for very small animals which are often butchered by women, is commonly butchered by a man with a machete and a knife. Although the divided parts vary slightly according to the type of animal and the number of people sharing it, the catch, except a very small or large animal, is usually butchered as follows: (1) the four limbs ("elamma") are cut off, hind legs ("elammenakolo") first, and forelegs ("elammaenal") next. (2) the ribs are chopped along both sides with a machete and the skin cut from the neck to the lower abdomen with a knife, and the abdominal region is cut off. The abdomen consists of two parts: the lower abdomen ("botaka") and the chest ("ntolo") which are usually separated at the time of distribution. (3) the viscera are removed including the stomach ("likundu"), intestines ("basofo"), liver ("mpiko"), heart ("boloko"), lungs ("bafoko"), kidneys ("genge") and so on; these are all consumed except the contents of the digestive tract. (4) the remains of the head and trunk are cut into small parts; the head ("bocha"), neck ("nkingo"), base of the neck ("likaku"), upper part of the trunk ("bokongo"), middle part of the trunk ("busenge"), and the loins ("ekennenge"), from which the inguinal region ("botataki") is occasionally separated. Besides these, if there are many people to share, some pieces of meat called generally "bohumba" are cut off. A typical instance of butchering according to the above procedure is done with small- and medium-sized duikers.

As shown in Fig. 19, the game is divided into more parts than is done in the butchery of the Bambuti. It is possible that such a fine dissection by the Yele people is related to the small amount of meat they have to share.

C. Distribution of Catch

Basically any catch belongs to the hunter who captures it. The catch is distributed to others according to some rules. There is a first distribution or primary distribution and a later or secondary distribution.

1) The Primary Distribution

a) Animal for the ancestors ("nyama ya bankoko", Lin.): Some animals are regarded as being for the ancestors and when they are caught, the hunter must present some parts or all

of it to the senior villagers. For instance, when a bush pig is caught, its head ("bocha") and part of its chest ("ntolo") is presented to them, and the remains belong to the hunter. In addition to bush pig, aardvark ("lifenge"), giant pangolin ("ikanga"), African civet ("njo"), black mangabey ("limu") and python ("nkoma") are included in the category of such animals. Of these animals, African civet and black mangabey are games of which the whole is presented. Apart from these animals, there are a few animals such as bush buck and yellow-backed duiker, a part of which is obligatory to present first to village officers. Even if any meat is left after the obligatory presentation, it can never be sold to other persons. This is because if sold, the seller would probably be suspected to have more of the same and to have cheated (i.e., given less than he should).

b) Catch in individual hunting: Except for the animals just mentioned, any catch made entirely by the hunter himself does not come under the primary distribution obligation. However, if he has received help from any others in making the catch, part is given to the helpers. For instance, "bokongo", the upper part of game's trunk, will be given to one who (1) informed to the trapper that the game had been trapped, (2) brought to the trapper the game which had been trapped, (3) gave the game the killing blow when he found the trapped game alive, or (4) tracked and caught the game which had been trapped or injured by the arrow shot in individual strolling hunting. In second instance, the base of the animal's neck, "likaku", is added to the share. According to the Yele hunters, "bokongo" is a central part of the body of animal and represents the capture of game, and therefore it is given to the one who helped to catch it.

c) Catch in collective hunting: In bow and arrow hunting the ownership of the catch belongs to the first shooter or to the owner of the dog, or the net owner in net hunting. In bow and arrow hunting using dogs, "menza" or "lokima", the first shooter is given one foreleg, one hind leg, the head, "bokongo" and viscera, and the remainder is given to the owner of the dogs. If the first shooter fails to kill the game and the second shooter or the dog succeeds in killing it, "bokongo" is given to him or the dog owner. When the game is killed by the dogs alone, it all belongs to the dog owner.

In "luemba" there is usually a hunting leader called "bokololuemba" as mentioned before. He can receive some share whether he participates in "luemba" hunting or not. His share of the catch is one foreleg, one hind leg, the head, neck, middle part of the trunk, lower part of the trunk, and part of the chest, and the remainder goes to the first shooter; that is one foreleg, one hind leg, "bokongo" and viscera. The "bokololuemba" gives from his share either the foreleg or the head and neck to the "ikongi" (beater), and part of the chest to other members of the hunt. When dogs join the "luemba" and they alone capture the game, the dog owner takes the shares of the first shooter listed above. When the second shooter or the dog makes the final catch, the sharing is the same as in "menza".

In any bow and arrow hunting, the base of the neck is given to the transporter of the catch, if there is one.

In net hunting, "botai", there is a hunting leader also called "bokololuemba". From the kill the net owner takes one foreleg, one hind leg, the head in the case of a female catch, neck, middle part or trunk, inguinal part and viscera, and the "bokololuemba" takes the remains except the "bokongo". "Bokongo" is given to whoever first reached the net besides the net owner in which the game was caught.

In practice, it was not observed that the primary distribution of the catch from collective hunting occurred in accordance with these rules. If the rule of primary distribution in collective hunting is strictly followed, some participants would not receive a share. That being so, they or their wives would be jealous of the owner of the catch. The hunters of Yele are extremely

afraid of such jealousy because it is believed that it causes "bolingi", or failure to the hunt as mentioned before. Therefore, they prefer to share the meat with all participants as evenly as possible, although they adhere to the rules that the shooter or the dog owner who kills the game takes the "bokongo" and viscera, and the transporter ("botoli") the "likaku". The catch from collective hunting is usually shared with all participants in this way.

2) The Secondary Distribution

In contrast to primary distribution which is done according to set rules, the secondary distribution depends on the sharer's will alone. If, however, a sharer obtains sufficient meat to redistribute, the secondary distribution occurs usually.

In individual hunting, the bulk or whole of a catch except "nyama ya bankoko" belongs to the owner. Therefore, the catch is not only consumed by the owner's family, but in general shared with other families in a hamlet. Although the distribution of a small animal such as brush-tailed porcupine is limited to a few families at most or to the owner's family, that of a medium-sized duiker may extend to all the families in a hamlet as large as E. hamlet. The reason why such redistribution occurs in a hamlet is that a hamlet is usually composed of members belonging to a single lineage and in other words it is an extended family.

As mentioned before, the catch from collective hunting is shared with all participants. As the principal game in collective hunting is a small animal such as brush-tailed porcupine or blue duiker, the share to each participant is not usually redistributed to people other than his family's members. However, the actual primary distribution in collective hunting where a catch is almost evenly shared with all participants, represents functionally secondary distribution; from the owner of a catch to other participants.

Thus the rules or customs of sharing a catch make its meat go not only to the owner or his family's members, but also to the other people who have not its ownership or can not hunt.

In general, the success of the hunt is uncertain and furthermore, in village life as seen in the case of E. hamlet, all hunters are not always engaged in hunting. Therefore such a distribution pattern is indispensable for maintaining stable level of meat consumption in the village.

Since the people of Yele do not regard the catch from collective hunting as an article of commerce, and also the share to each participant is usually too little to sell, meat sold is limited to that gained from individual hunting.

PREPARATION AND PRESERVATION OF CATCH

A. Preparation

Preparation of the catch like other foods, is the women's task. There are two cooking methods: boiling and roasting. The eating of raw or grilled meat was not seen. The two cooking methods are as follows:

1) Boiling ("ikacha")

Three kinds of meat are cooked: the first is fresh meat called "botena", the second is meat dried for only 2 to 3 days, called "bosisateya", and the third is dried meat called "aoma". The "bosisateya" meat, which remains tender, is processed in the same way as fresh meat.

For fresh meat and "bosisateya" the hairs on the skin are burned off, and a lump of meat is carved and put into a metallic pot of boiling water. A short time after boiling, salt, red pepper, and palm oil are added, and the meat is boiled again until only a little water remains. Some leaves of either "bofilii" (*Scorodophloeus zenkeri*), "bokumbo" (*Leonardoxa romii*), or some young ferns or some fungi are occasionally added.

For dried meat the meat is first boiled slightly after burning the hairs of the skin. Next the

bone is smashed and the meat is carved and boiled again with salt, red pepper, and palm oil. It is much more popular to mix meat with such wild plants as described above. A soup of cassava leaves with a small amount of dried meat is also a popular dish.

2) Roasting

This includes two cooking methods called "bolanga" and "botumo" respectively.

a) "Bolanga": For fresh meat, the hairs on the skin are burned off after the bones have been well smashed. After that the pieces of carved meat are put on a wrapper of 3 to 4 large leaves of "lokongo" (*Megaphrynium macrostachyum*) or plantain banana and wrapped, adding the wild vegetables as before, salt, red pepper, palm oil and a little water. A little water is also poured between the leaves of the wrapper. The bundle of meat is kept over the fire for at least one day, avoiding the direct flame. It is said that meat roasted for 2 or 3 days is tastiest. The "bolanga" method cannot be used to prepare dried meat.

b) "Botumo": Although "botumo" is very similar to "bolanga", it takes less time to cook the meat as the bundle of meat is put directly in the fire in "botumo". It is used for fresh meat only. Dried meat is not usually cooked by this method except that it is sometimes roasted with cassava leaves.

3) Preparation of Rotten Meat

It is not uncommon that the meat with a considerably foul smell is consumed without discard. Game, that has been dead more than 3 days and in which worms have bred, may be considered edible if when the hunter beats the body he hears dry and clear sounds.

Cooking of rotten meat begins with boiling it in water. After boiling, dead worms are removed and the meat is washed with water. The washed meat is cooked according to the procedure for boiling fresh meat. It is common to cook such meat with plenty of vegetables such as cassava leaves, tomatoes and so forth.

B. Preservation

The only method of preserving meat in the study area is by drying. Too little meat is obtained in the usual hunting of village life to be preserved and it is usually consumed within a couple of days. On the other hand, in the "ifomo" which provides a large amount of meat in a comparatively short period, large quantities of meat are processed for preservation. It is as follows: the meat is first boiled over a fire, and then placed on a grid called "boliko", supported with four stakes about one meter high, and then smoked. The hairs are usually not removed except those of some animals such as brush-tailed porcupines, tree pangolins, mongooses, tree hyraxes and birds. The people believe that the removal of the hairs might cause the meat to become too tough. In two or three days the meat begins to dry and toughen, and from then flies are unable to lay eggs in it. It is thoroughly smoked in about one week. In case water is not readily available, the meat is smoked on a grid as it is and a strong fire is kept burning under the the grid.

Game that is smaller than a blue duiker is smoked after only being gutted, whereas bigger game is cut into pieces and smoked. In the latter case, the head part is usually consumed immediately, as it would become hard like a skull once smoked. Viscera are also consumed instantly, but any leftovers are smoked.

DISCUSSION AND CONCLUSION

So far I have described and analyzed the techniques, activities and some other aspects of Boyela hunting. On the basis of the results the following topics are discussed.

- (1) Significance of hunting in agricultural societies in terms of protein consumption.
- (2) Relationship between hunting strategy and natural environment.
- (3) Comparison of hunting activities: The Boyela and African hunter-gatherers.
- (4) Relationship between hunting and settlement pattern.

This discussion may provide answers to questions of the relationship of hunting as a subsistence activity to a living environment and the agriculture-based subsistence, and may be a help to understand the Boyela adaptive system.

A. Significance of Hunting in Agricultural Societies

1) The Place of Hunting in the Subsistence Economy of the Yele People

I conducted research on the food intake of three households consisting of 7 adult persons and 3 children less than 15 years of age from Feb. 6–11, 1979 at E. hamlet. The results have been analyzed in another report (Sato, in press). Here I will briefly summarize the results again to examine the significance of hunting in their diet.

Table 11 shows that cultivated crops are a very significant part of the diet. They provide 92% of the total weight of food intake and 96% of the total caloric intake. However, though cultivated crops supply a large amount of energy, they provide little protein. The daily protein intake per adult person from cultivated crops is only about 20 g and that proportion accounts for only 58% of the total protein intake. This is due to the very low protein content of the cassava tubers which provide about 75% of the total food crops taken, and the scarcity of a high protein source, like pulse, in the food crops of the Yele people.⁽⁴⁾ There is not great seasonal change in such a dietary pattern; the bulk of the food supply depends on the cultivated crops, especially cassava tubers, and therefore it is possible that the daily protein intake from cultivated crops is kept around 20 g per adult person throughout the year.

According to the recently published WHO/FAO daily requirements (FAO and WHO, 1973: 74), the safe level of protein intake in terms of egg or milk protein for adult men and women are 0.57 g and 0.52 g per kg in weight per day, respectively. From the data of adult Yele villagers' body weight;⁽⁵⁾ 51.3 kg for men and 46.7 kg for women on the average. the safe level of protein intake for adult Yele villagers are calculated at 29.2 g per person per day for men and 24.3 g for women. Supposing the protein from cultivated crops has protein quality of 60% relative to eggs or milk (ibid: 61–66), the daily protein intake of 20 g per person from the cultivated crops in the Yele village corresponds to only 12 g egg or milk protein. It appears that the cultivated crops in the Yele villagers' diet cannot possibly supply the whole of their protein requirements. Therefore, it is indispensable for the Yele people to take protein from food sources other than crops. Unless the people can meet their protein requirements from other sources, there is a risk of protein deficiency. Indeed in Zaire, which is a major area of cassava production, kwashiorkor is the most prevalent nutritional disease (May, 1965: 85–137). This is related to a diet of low protein staple foods and the recent immigration of a large population into the bigger central towns. However, symptoms of protein deficiency such as discoloured hair were not seen in the study area, although no clinical assessments were made. Food from hunting, fishing, and gathering probably contributes importantly to protein intake.

As shown in Table 11, among these food getting activities, hunting may be the most significant activity. Although various insects can be regarded as a significant protein source (Ruddle, 1973), the major collecting season is limited to June until August. Furthermore, fishing by the Yele people in small streams provides a stable but poor supply of food. On the other hand, hunting can be conducted throughout the year and provides an unstable but a larger amount of food than fishing.

The value of daily meat intake shown in the table seems to be slightly underestimated from

Table 11. Food intake per adult person* per day by food getting activity (Feb. 6-11, 1979).

Method	Weight (kg)	Protein (g)	Energy (kcal)
Agriculture	1.92 (91.9%)	19 (57.6%)	2167 (96.4%)
Gathering	0.11 (5.3)	2 (6.1)	16 (0.7)
Hunting	0.05 (2.4)	10 (30.3)	49 (2.2)
Fishing	0.01 (0.5)	2 (6.1)	14 (0.6)
Animal husbandry	0.00 (0.0)	0 (0.0)	2 (0.1)
Total	2.09 (100.1%)	33 (100.1%)	2248 (100.0%)

*A child less than 15 years of age is adjusted to a half of an adult on calculation.

The data is based on the records of the food intake in 3 families including 7 adult persons and 3 children at Efenjolumbu hamlet.

the long-term viewpoint. As stated in the chapter on "Hunting Efforts and Returns", the inhabitants of E. hamlet obtained a total of 284.2 kg of catch during the study period. Taking into account the proportion abandoned (30% of catch by estimation), the daily meat consumption per person is 0.06 kg on average. It should, however, be considered that this value does not include the meat from temporary hunting trips ("ifomo"). Although it is difficult to know how much meat such hunting trips supply, a rough estimate is made below.

A hunting trip of 19 days was done by Y4-1 during the study period, and resulted in a total catch of about 115 kg of meat. According to Y4-1, the result was comparatively good for the time spent. In 1978, six hunters of E. hamlet conducted 7 hunting trips of less than one month. Accordingly, if it suppose that 100 kg is gained each trip and 30% of this is abandoned, the amount of meat from the hunting trips is calculated at 490 kg a year. As meat obtained during a hunting trip is used partly for sale and partly for gifts, estimating this ratio at about 20%, the hunting trips of the people of E. hamlet are considered to supply the total of approximately 400 kg of meat a year for self-consumption. This corresponds to 0.03 kg of meat intake per day per person. Therefore, the amount of the daily meat consumption per person may reach 0.09 kg (0.06+0.03) on average. Adjusting the number of population through age (adult: 1, child under 15 years old: 0.5), that per adult person is 0.11 kg. Since the meat weight of 0.11 kg contains approximately 20 g of protein, it is likely that the meat from hunting provides more protein than the crops from agriculture, considering that higher protein value. Thus, the meat from hunting can be regarded as a primary protein source for the Yele people.

The manner of exploiting protein sources by the people of the Zaire Forest, who generally depend on low protein staple foods such as cassava and banana, varies from tribe to tribe according to the natural and socio-economic environment. According to Chinn (1945: 137-147), four predominant types of diets could be recognized among the various tribes living in Coquilhatville Province⁽⁶⁾: (1) a diet of fish supplemented by caterpillars eaten by the majority of tribes along the Tshuapa River, the Monia on the banks of the Ngiri River and the Libinza, etc. on the banks of the Zaire River, (2) a mixed diet based on barter exchange of meat and fish utilized by the Akula, the Ngwandi, the Ngombe, etc., (3) a diet of meat of the Ngandu, the Yokote, the Mbole, etc., (4) a diet of mushrooms and caterpillars of the Bolenda. In addition to these dietary customs, the economic symbiosis between the Babila and the Bambuti pygmy in the Ituri Forest, must be mentioned. Generally speaking, in the vast interfluvial area of the Zaire Forest, the people can not expect to obtain a large amount of fish from big rivers, and therefore, it is suggested that in the interfluvial area, diet such as that of the Yele people and the third type in Chinn's classification is prevalent.

Although the hunting in Yele contributes little in terms of food supply, nutritionally speaking, it is a very significant element in the subsistence activities. It should be noted, however, that the Yele people hunt game, not because they are conscious of the nutritional problem in

their dietary life, but that they regard the meat as the tastiest and favourite food. When fresh meat is served for a meal, there is no room for vegetable foods as the side dish. On the other hand, having only vegetables for more than a few days, often causes them to complain about their food, saying "njala": Lin, (I'm hungry), or "nakufi na njala": Lin, (I nearly die of hunger).

2) The General Significance of Hunting in the World Agricultural Society

Table 12 shows the degree of dependence on hunting in the world tropical agricultural societies, based on Murdock's Ethnographic Atlas (Murdock, 1967). The selected agricultural societies are all within the range of the tropic of Cancer and Capricorn, and indicate the dependence of over 46% on agriculture. The total number of the selected agricultural societies is 373, consisting of 235 in Africa, 90 in south-east Asia and insular Pacific, and 48 in America. According to this table, nearly 70% of all societies depend on hunting at a rate of over 6% on their subsistence economy. In each region, apart from the societies in south-east Asia and insular Pacific, the societies of nearly 70% in Africa and 90% in America respectively, depend on hunting at a rate of over 6%. Considering separately the societies that do slash-and-burn agriculture or extensive cultivation, principally of roots or tubers, these values increase, especially in Africa: 80% of a total of 40 societies in Africa and 91% of 22 societies in America. Furthermore, the proportion of societies dependent on hunting to a greater degree also increases in both Africa and America. Such a tendency must be related to the usually low protein content in root and tuber crops (Table 13). It may be suggested that in agricultural societies, the greater the dependence on low protein staple foods such as roots or tu-

Table 12. Dependence on hunting of tropic agricultural society*1 (After Murdock, 1967).

Region	Type of Agriculture	Dependence on hunting			Total
		0-5%	6-15%	over 16%	
Africa	Er*2	8	24	8	40
	Others*3	65	114	16	195
	Total	73	138	24	235
South-east Asia and Insular Pacific	Er	2	4	—	6
	Others	39	30	15	84
	Total	41	34	15	90
America	Er	2	3	17	22
	Others	3	19	4	26
	Total	5	22	21	48

*1: The total 373 societies, which depend on agriculture at a rate of over 46 per cent according to Murdock's definition, are selected from among all the societies within the tropics of Capricorn and Cancer.

*2: Extensive or shifting cultivation with the principal crops of roots or tubers.

*3: Other type of agriculture and the principal crops except the above.

Table 13. Composition of various tuber crops (after Onwueme, 1978).

	Yam <i>Dioscorea alata</i>	Cassava <i>Manihot</i> sp.	Sweet potato <i>Ipomoea</i> sp.	Taro <i>Colocasia</i> sp.
Moisture (%)	70	62	50-81	63-85
Starch (%)	28	35	8-29	13-29
Sugars (%)	0.5		0.5 -2.5	
Fat (%)	0.1-0.3	0.3	1.8 -6.4	0.16-0.36
Crude protein (%)	1.1-2.8	1-2	0.95-2.4	1.4 -3.0
Crude fibre (%)	0.6-1.4	1-2	0.5 -7.5	0.60-1.18
Ash (%)	0.7-2.1	1	0.88-1.38	0.60-1.3

bers, bananas, and sago, the greater the dependence on hunting (or fishing), unless there is livestock or high protein vegetable foods.

It is clear that although hunting usually supplies a small, but not negligible amount of food, it is an universal subsistence activity in world tropical agricultural societies.

B. Relationship between Hunting Strategy and Natural Environment

1) Objects

Table 14 shows the number and weight of catches obtained by trapping and bow and arrow hunting recorded at E. hamlet.

The people of Yele regard almost all mammals as potential prey. Of all game, duikers were the most numerous catch in both trapping and bow and arrow hunting. Harako (1976: 80) pointed out that both hunting groups of the Bambuti net hunters engaging exclusively in net hunting and the Bambuti archers hunting without nets were characterized as duiker hunters, using appropriate methods to hunt duikers. Harako also noted that the Bambuti's concentration on duikers as the main game, was mostly determined by the fact that all 6 species of duikers have very similar habits and they are evenly distributed overall the forest in large numbers (ibid). The same factor can be applied to my survey area, because this area is not considerably different from the Ituri Forest in fauna and vegetation.

In addition to duikers, the other important game in Yele hunting is brush-tailed porcupines and water chevrotains. Taken together, the total catch of these species was similar to the duiker total. This is considerably different from the case of the Bambuti. According to Harako's survey records, among 52 catches in 17 days' net huntings by net hunters there were no porcupines or chevrotains and among 17 catches in 20 days' bow and arrow huntings by archers there was one porcupine (Harako, 1976: 60-61, 64). One possible reason for this difference is that it may be difficult to capture water chevrotains by net hunting and bow and arrow hunting, as they were only caught by trapping even in Yele. Dorst (1970: 182) describes the water chevrotain as: "Leading a semi-aquatic life, and swimming very easily and taking refuge in the water. ...they are very elusive difficult to observe". They could not be effectively hunted even with nets and dogs. Another possible reason for the difference in catches between the Yele and Bambuti is that trapping and "menza", the principal hunting methods of the Yele people, are more suitable to a riverine environment. Besides water chevrotains, porcupines, which "are nocturnal, sheltering in daylight in burrows...." (Dorst, ibid: 34), also occur in large num-

Table 14. Catch by trapping and bow and arrow hunting.

	Trap*				Bow and Arrow**			
	Head	%	Weight (kg)	%	Head	%	Weight (kg)	%
Small-sized duiker	2	9.5	9.0	4.2	5	29.4	22.5	18.2
Medium-sized duiker	6	28.6	89.0	41.8	1	5.9	15.0	12.1
Large-sized duiker	—	—	—	—	—	—	—	—
Water chevrotain	5	23.8	40.0	18.8	—	—	—	—
Brush-tailed porcupine	4	19.0	10.0	4.7	6	35.3	15.0	12.1
Bush pig	1	4.8	60.0	28.2	1	5.9	60.0	48.6
Monkey	—	—	—	—	2	11.8	8.0	6.5
Other small animal	3	14.3	5.0	2.3	2	11.8	3.0	2.4
Total	21	100.0	213.0	100.0	17	100.1	123.5	99.9

Small-sized duiker: blue duiker.

Medium-sized duiker: black-fronted duiker, peter's duiker and bay duiker.

Large-sized duiker: yellow backed duiker.

*includes the animals, which had escaped from trap, captured by tracking.

**includes the animals captured by how and arrow hunting in the midst of trap patrolling.

bers in the riverine forest which is full of burrows. Furthermore, in the riverine forest the animal paths of these species and duikers are frequently found. Thus in the riverine environment there is a high chance to encounter game relative to the restricted space. Such an environment is considered to be advantageous for trapping where success depends on the frequency of encountering game and for small-scale collective bow and arrow hunting. The small-sized brush-tailed porcupine contributes little to the meat supply by weight. However, the Yele people never regard it as a marginal game, but as one of the important targets. This suggests that the Yele people like to do such hunting as they are assured of some kind of catch though the amount of meat is not so much.

While the Bambuti hunt all over the forest, primarily for duikers, the Yele people concentrate their hunting activity in the riverine area not only for duiker, but for the other animals.

2) Hunting Strategy

Table 15 shows the hunting strategies employed in each of the hunting styles in Yele. There are five basic hunting strategies: drive, ambush, stalking, luring and besetting.

a) Drive: Drive strategy is employed in one of three net hunting styles and in five of six bow and arrow hunting styles. As "menza" and "luemba" (which, besides trapping, contribute significantly to the meat supply) are included in these, drive is one of the most important hunting strategies used by the Yele people.

Drive strategy is not restricted to the forest. For example, it is the main strategy in the hunting of the Bambote, hunter-gatherers in the wooded savanna on the west coast of Lake Tanganyika (Terashima, 1980), and in New Guinea it is more commonly used in open country than in the forest (Bulmer, 1968). According to some ethnographical reports, however, drive strategy predominates in the Zaire Forest region (Maes, 1924; Takeda, in press; Harako, 1976; Tanno, 1976). This is probably because drive strategy is suitable for duiker hunting, taking advantage of duikers' habits. Most species of duikers are nocturnal, hiding in the bush during the day and when startled, taking refuge in the deep bush, running under the thick brush with their heads down (Harako, 1976: 80). In Yele, furthermore, a drive strategy is also one of the most suitable for brush-tailed porcupine hunting.

b) Ambush: The principal hunting method of the people of Yele is trapping. In principle, it employs ambush strategy or modified ambush strategy. Ambush strategy can also be found in strolling bow and arrow hunting, "iyongi". In the latter case it can be adapted to duiker hunting, but the hunter of Yele would not use it so much, as the main target of "iyongi" is monkeys rather than duikers. Indeed, the "iyongi" catch was limited to monkeys. On the

Table 15. Hunting method and strategy.

Name of Hunting	Hunting Strategy	Dog	Target
Bow & Arrow Hunting			
"iyongi"	ambush, luring, stalking	—	arboreal monkey
"menza"	drive	+	brush-tailed porcupine
"luemba"	drive	=	duiker
"lokima"	drive-run down	+	duiker
"lofoma"	drive-ambush	—	arboreal monkey
tracking by dog	drive (chasing)	±	wounded animal, bush buck
Net Hunting			
"botai"	drive	--	duiker
"botafe"	ambush	—	arboreal monkey
"liyemba"	besetting	--	arboreal monkey, mongoose
Trapping			
"tolonga"	trapping (ambush)	—	various animals

other hand, the Bambuti have an effective ambush method for hunting duikers. This is called "ebaka", in which a hunter waits at the ambush point in a tree 2 to 3 meters above the ground and shoots at any duiker coming to feeding (Harako, *ibid*: 55). According to Harako, "ebaka" is as important as the drive method for the archer group of the Bambuti. In Yele, a hunting method like "ebaka" did not develop. This is not unrelated to the fact that the people of Yele have elaborated their trapping methods.

The ambush strategy is also used in net hunting for arboreal monkeys.

The drive and ambush methods are the most important strategies in the hunting of the Yele. Both of these have a common feature in that they enable hunters to develop hunting styles in which the hunters themselves do not have to hunt game from a great distance. There is no doubt that such hunting styles are more favourable for hunting duikers or brush-tailed porcupines, whose habits make them difficult to find. Furthermore, not only in ambush hunting, but in many styles of drive hunting which often include the ambush process (hunters hide themselves to wait for driven game), obstructions such as trees which usually restrict their view, become advantageous for hunters.

Both hunting strategies are not restricted to hunting in the forest, but it is suggested that they are best adapted to the fauna and the natural environment of the Zaire Forest.

c) Stalking: This is very different from both the above strategies. Typical examples of stalking are seen in the hunting of the Bushman (Tanaka, 1971) and the Hadza (Woodburn, 1968) in the open land of south and east Africa, respectively. Their bow and arrow hunting (for antelopes) proceeds as follows: (1) catching sight of the game, (2) approaching the game by stalking, (3) shooting an arrow and (4) chasing or tracking the game. Steps (1) and (4) need the unobstructed view of the savanna. Stalking is not impossible in the forest; for example, it can be seen in the spear hunting of the Bambuti, but it is not efficient enough to be used as the main hunting method of the forest people. However, hunting arboreal monkeys is an exception as they can be caught on sight comparatively more easily in the forest, and in Yele bow and arrow hunting by stalking strategy is practised only for these monkeys.

d) Luring: Luring of terrestrial animals using a decoy call is employed in individual bow and arrow hunting. Also with luring, as with ambush and drive, it is not always necessary to spot the game from afar off. According to the data of the Yele hunting, however, it is questionable whether luring is successful in catching game.

e) Besetting: This is a strategy used in "liyemba", a form of net hunting, to capture gregarious animals such as arboreal monkeys.

The features of the hunting strategies in Yele mentioned above have a considerable similarity to those of the Bambuti inhabiting a similar natural environment, as shown clearly in Table 16. In this table by Terashima (1980: 265), the hunting methods of 3 groups of African

Table 16. Comparison of hunting methods (after Terashima, 1980: 265).

Method	Boyela	Bambuti	Bambote	Bushman
Netting	+ (S)	+ (S)	+(S)	—
Bow-and-arrow				
ambushing	+ (S)	+ (S)	—	—
beating	+ (S-M)	+ (S)	+ (S-M)	—
stalking	+ (S)	+ (S-M)	+ (S-M-L)	+ (S-M-L)
spearing	—	+ (M-L)	—	(+)
Chasing (by dog)	+ (S-M)	+ (S)	+ (S)	+ (S)
Chasing (by men)	—	—	+ (M-L)	+ (L)
Trapping	+ (S-M-L)	—	+ (S-M-L)	+ (S-M)

Note: S, M, and L indicate that the objects of the hunting are small, medium, and large-sized animals, respectively.

hunter-gatherers, the Bambuti in the forest, the Bushman in the driest savanna, and the Bambote in the wooded savanna, are compared with each other. It can be seen that each group has developed its own hunting strategies suited to the characteristics of its own natural environment.

C. Comparison of Hunting Activities: The Boyela and African Hunter-gatherers

1) Tools

The hunting tools used by the Yele people include bows and arrows, nets, and traps. Additionally, spears may be listed. The spear is used only for the trap set for elephants and the hand-operated spear hunting is not practised in Yele. According to my information, however, the people of neighbouring subtribes do carry on hand-operated spear hunting. Therefore, it is possible that the Yele people used this hunting technique before. Moreover, some ethnographic reports (Weeks, 1909; 123–124, Takeda, in press; Maes, 1924: 61–84), suggest that bows and arrows, nets, spears, and traps are, or were, an usual set of hunting tools in one agriculturalist group of the central Zaire Forest. Guns have not yet become common.

On the other hand, the sets of hunting tools of each of three African hunter-gatherer groups (the Bambuti, the Bambote, and the Bushman) have only the bow and arrow in common and each group lacks either one or the other of nets, spears, or traps (Harako, 1976; Terashima, 1980; Tanaka, 1971). The archer group of the Bambuti uses only the bow and arrow and the spear. Thus, the number of kinds of hunting tools provided by one agriculturalist group of the central Zaire Forest, is in excess of that of any African hunter-gatherer group.

In addition to this, the number of varieties of the same kind of the hunting tool is considerably different between agriculturalists and hunter-gatherers. For example, with regard to arrows, the Bambuti have an iron-tipped arrow called "api", a non-tipped arrow called "sua" made from the main nerve of wild palms, and a poisoned arrow, i.e., a "sua" on which poisonous liquid is spread (Harako, *ibid*: 51–52), whereas the people of Yele have not only all of these, but also one kind of poisoned arrow with a wooden arrowhead. In the case of nets, although the Yele people use only one kind of net, the Ngandu (Takeda, in press) have four kinds differing according to mesh size, while the Bambuti have only one kind. It is the agriculturalist that are in striking contrast to those of the hunter-gatherer. Trapping is not practised by the Bambuti, but is by the Bambote and the Bushman. According to Terashima (*ibid*: 253), however, the Bambote do not practise trapping as a rule. Only a few trap, perhaps imitating the neighbouring agriculturalist trappers, and the Bambote themselves have only one type of basket trap. The Bushman uses only two types of traps: a spring trap and a steel trap (Tanaka, *ibid*: 54–55). On the other hand the people of the Boyela and Ngandu (Takeda, *ibid*) have a knowledge of more than 30 kinds of traps, although they are not all in use today. Among the Tongwe, an agriculturalist group in the wooded savanna of the east coast of Lake Tanganyika, 17 kinds of traps were recorded (Kakeya, 1976: 177). It is possible that such an elaboration of traps is a general feature of agriculturalist-hunters. It is anyway a fact that agriculturalist groups of the central Zaire Forest such as the Yele people and the Ngandu have more kinds of hunting tools, and, moreover, a greater variety of each kind of hunting tool than any African hunter-gatherer group.

2) Hunting Range and Pattern of Use

The people of Yele exploit 'their own forest' that is regarded as their own territory, sharing it with each hamlet. A hunter of E. hamlet stated as follows; "the people in the north of the Yele village use the lower stream of rivers (flowing into the Tshuapa River), the people in the south, the upper, and we in the middle, the middle respectively".

I estimated the area of the hunting range used by the hunters of E. hamlet throughout a year to be 15 square kilometers. As this hunting range is considered adequate to maintain the

annual meat supply for the average population of 34 of E. hamlet, the hunting range per person is calculated at 0.4 km²/person.

The Bambuti (net hunters) use the entire hunting territory of their own band during a hunting season, from December to July, moving their 4 to 6 hunting camps one after another. Harako (1977: 210), Tanno (1976: 123–124), and Ichikawa (1978: 55) estimated the average area of the hunting territory of a net hunter band to be 100 km², 120–150 km², and 150–300 km² (including the area shared by neighbouring bands), respectively. Ichikawa's value including the shared area may be a closer approximation to the actual hunting range used. A net hunter band is thought to have about 60 persons on average (Ichikawa, 1978: 13; Harako, 1977: 209). Accordingly, the average area of the forest used for the annual meat supply per person is estimated at 2.5–5.0 km²/person, or 6–12 times that of the Yele people. The Bambuti have a relatively high population density compared with other hunter-gatherers (Harako, 1979) but nevertheless, with regard to the annual hunting range per capita, even that of the Bambuti is much larger than that of the Yele people.

This difference is caused by differences in the residential pattern between the Bambuti and the Yele people; i.e., the former leads a nomadic life and the latter, a sedentary one. However, it should be noted that the Yele people adopt a temporary nomadic life style on their occasional hunting trips away from their village but within the village territory. According to my observations, the many hunting huts used for bases in such hunting trips were established in marginal areas of the usual hunting range, to which it took about two hours to walk from the hamlets. Perhaps such an area is too distant to be regularly hunted but is relatively rich in game resources. The people of Yele may exploit their limited hunting range to the best advantage by adopting a temporal nomadic life style.

3) Hunting Efforts and Returns

Table 17 compares hunting efforts and returns among these three hunting groups: a net hunter band of the Bambuti surveyed by Ichikawa (1976, 1978), the Bushman surveyed by Tanaka (1971, 1974), and the hunters of E. hamlet.

As previously mentioned, the men of Yele spent their time felling trees for fields, building houses, travelling and so on, and, therefore, can be called only part-time hunters. Indeed, in terms of time spent hunting the quantity of labour input by the Yele hunters is very little,

Table 17. Comparison of hunting efforts and returns.

	Time spent hunting			Return		
	Days per person per 10 days	Hours per person per day	(No. of objects)	Meat obtained per person per day	Meat* ¹ consumed per person per day on the average	(No. of objects)
Boyela	2	1 hr. 12 min.	7 hunters	0.08 kg	0.13* ² kg	(34 persons)
Bambuti (Ichikawa, 1976: 29; 1978: 45)	5.8	4 hrs. 28 min.	28 effectives (men 13) (women 15)	0.88 (0.51)* ³	0.34* ⁴	(45 persons)
Bushman (Tanaka, 1971: 29; 1974: 82)	7.6	6 hrs. 19 min.	8 hunters	0.30* ⁵	0.30	(50 persons)

*1: The quantity of meat abandoned is not taken into consideration.

*2: The quantity of meat obtained in hunting trips is taken into consideration.

*3: The quantity of meat, exchanged for food crops, is deducted from 0.88 kg of meat obtained.

*4: Calculated on the supposition that there is no meat during the rainy season from August to November, when they stop hunting.

*5: Based on the yearly catch estimated.

compared to that of the hunter-gatherers. The frequency of hunting per hunter (or effective⁽⁷⁾) in the Bushman and the Bambuti are on average 7.6 days and 5.8 days per 10 days per person respectively, whereas that of the Yele people is 2 days per 10 days per person on average. The Bushman and Bambuti spent 6 hours 19 minutes/day/person and 4 hours 28 minutes/day/person in hunting on average, or about 4–5 times that of the Yele people.

The hunting returns of each group are examined next. The hunting of the Bambuti during the study period of 23 consecutive days, yielded an average catch of 0.88 kg per day per capita. According to the annual amounts of the catch estimated by Tanaka (1974: 82), the Bushman obtained 0.3 kg of meat per day per capita on average, about one third of that of the Bambuti. The Bambuti, however, exchange some meat for food crops of the agriculturalists and stop hunting during the rainy season from August to November so that their estimated daily intake of meat is 0.34 kg per capita (Ichikawa, 1976: 32–33). Thus, although the weight of the daily catch per person of the Bambuti is considerably more than that of the Bushman, (probably because the Bambuti's net hunting provides a stable and efficient serve of meat), their daily consumption of meat is nearly equal to that of the Bushman. Excluding game acquired on the occasional hunting trip, the average weight of catch by the people of E. hamlet is 0.08 kg per day per capita, less than about one tenth for that of the Bambuti and about one quarter that of the Bushman. Even daily meat consumption per capita including catches from the hunting trips, is approximately 0.13 kg/day/capita, or about one third to one half of that of the two hunter-gatherer groups.

However, in terms of the catch weight per man-hour spent hunting, the hunting of the Yele people shows higher efficiency than those of these two hunter-gatherer groups. Seven hunters and two boys of E. hamlet spent 758 man-hours in hunting during the study period, and got about 284 kg. Therefore, they obtained a catch weight of 0.37 kg per man-hour. According to Takaka's data (1971: 36, 81–81), the population of the central Bushman includes the effective people for subsistence at a rate of about 50%; they consist of 40% men and 60% women. Their one camp, which has an average number of population of 50 persons, is considered to include about ten active hunters. They spent about 6 hours a day per person in hunting and gained a total catch weight of 5606 kg a year; a catch weight of 0.26 kg per man-hour. The Bambuti spent the total of 2878 man-hours in net hunting for 23 days, and gained a total catch weight of about 805 kg, or a catch weight of 0.28 kg per man-hour. Thus, the quantity of catch per unit time spent is not very different between the Bambuti and the Bushman, but that of the Yele people is relatively in excess of those of both the hunter-gatherers. This difference is caused by the high efficiency of trapping; the catch weight of 0.50 kg per man-hour was obtained by the trapping of the hunters of E. hamlet. The Bambuti net hunters almost make a speciality of net hunting and though the Bushman use trapping, they mainly do bow and arrow hunting.

Although the net hunting, as shown in the case of the Bambuti, can get continuously a good catch, it requires a large number of participants, including women as well as men. Once, such net hunting was one of the repertoires of the Yele people, however, perhaps they could not very frequently conduct it, because they (not only women, but also men) had to spend their many hours in agriculture and miscellaneous activities. Accordingly, it can be hardly considered that the Yele people, like the Bambuti, relied upon net hunting as the source of their daily meat supply. It is the same in the case of large-scale collective bow and arrow hunting which also is one of the most suitable for the hunting of forest duikers. This is assured by the fact that the frequency of practising the "luemba" in E. hamlet was only about once a month.

On the other hand, it is possible for the Yele people to conduct frequently the individual and small-scale collective bow and arrow hunting such as the "iyongi" and "menza". But

these methods of hunting cannot supply enough meat for the part time hunters of Yele to depend wholly on it, and give small returns for time spent.

In contrast to such hunting styles, trapping is done individually and sets returns without a large amount of labour input so that it may be the most appropriate style for part time hunters.

The above discussions are summarized as the following statement. Both the area of the hunting range and the hours spent hunting by the Yele people are much smaller than those of the hunter-gatherers. These differences are closely related to the fact that the Yele subsistence base is agriculture. The existence of the fields around each sedentary hamlet does not permit the cultivators to go hunting in the faraway forest for a long time, nor to be full-time hunters, because of the men's share in the agricultural work. In other words, agriculture has succeeded in providing for a relatively large population on a small land area, whereas it has limited their exploitable land and time for hunting to a small extent. In the forest where game resources are evenly distributed, a limited land area may be directly related to the limited quantity of available game resources. Furthermore, the subsistence role claimed for hunting is still important. Such conditions as the relatively high population density, the limited available game resources and man-hour, and the important role of hunting, may be the most important factors deciding the agriculturalists of the Zaire Forest to develop various hunting styles using various tools and a large variety of traps. They cannot move to different hunting bases as the Bambuti do, even if the catches in a hunting area have become poor. Therefore, they may be in need of persistent technological innovations, which has resulted in their various hunting styles and variegated traps.

There is, however, the possibility that such technological innovation can further decrease the limited game resources, and eventually lead to their depletion as indicated by the following. Many hunters of Yele deplored the recent decrease in the game population, especially brush-tailed porcupines, and the large-scale net hunting ("botai") has been on the wane. Even if there is no such risk, the meat supply from the usual hunting conducted in the vicinity of the hamlet alone is doubtlessly insufficient to meet the villagers' demands. These things suggest that it is necessary for the Yele villagers to occasionally go on hunting trips to the faraway forest where there is little possibility of over-hunting game, and so, a good catch can be expected.

D. Relationship between Hunting and Settlement Pattern

Occasional hunting trip to the faraway forest, like "ifomo" in the Boyela, is also seen in the neighbouring tribes such as the Ngandu and Bambole. From their similar natural environment and mode of life to those of the Boyela, it is likely that such a hunting trip in the Ngandu and Bambole is as an important component of their subsistence system as the "ifomo" in the Boyela. Perhaps such significance of hunting trips may be the same in most agriculturalists in the interfluvial area of the Zaire Forest.

Carneiro (1970) revealed the correlation between the dependence on hunting and gathering, and the nomadism in American tropical agriculturalist groups. Gross (1975) also noted similar view. Whether such correlation can be applied to African agricultural societies can not be decided without detailed studies on the population, the area of land, the biomass, the historical condition and so on. However, it may admitted that hunting and gathering are restraining factors for sedentariness, whereas agriculture is a promoting or compatible factor (Carneiro, 1956). The village site of the Boyela or the neighbouring tribes is almost sedentary though that moves a very short distance every 5 to 10 years (usually owing to an important person's death or superannuation of houses). However, occasional but indispensable hunting trips, which

imply that these agriculturalists shift temporarily their home base from village to forest, prevent their settlement pattern from being defined as complete sedentariness. Thus the settlement pattern of agriculturalists in the Zaire Forest manifests that hunting acts as a restraining factor of sedentariness.

As discussed before, the primary role of the hunting on the Boyela subsistence economy is a contribution to protein supply. Furthermore, the significance of hunting is relatively great owing to poor protein supply from other subsistence activities. Therefore exploiting protein sources other than meat from hunting would effect the lower degree of dependence on hunting and provide a possibility of leading completely sedentary life. This assumption may suggest that maintaining reliable sources of protein supply without heavy dependence on hunting (or gathering) is a requisite condition for the complete sedentariness in tropical agriculturalists' settlement pattern. Although settlement pattern is not determined only by a nutritional or ecological factor, the relationship between protein and settlement pattern should be examined in Africa or the other tropical zone in the future.

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NOTES

- (1) See Ankei's report, in which the agricultural system of the Songola people in Zaire Forest is described in detail (Ankei, 1981).
- (2) I obtained the information on the spear-throw hunting at the neighbouring village Lokalo, and at the several villages on the right bank of the Tshuapa River.
- (3) In principle, this is similar to the net hunting of the Bambuti (Harako, 1976, Tanno, 1976). Harako and Tanno describe this hunting activity in detail.
- (4) Although cassava leaves, a common food stuff of the Yele people, have a relatively high protein content, a large amount of vegetable leaves cannot be eaten to provide the bulk of the protein supply.
- (5) The stature and weight of the Yele people were measured Jan. 1979. Means and standard errors of the measurements of the adults from 20 to 59 of ages were 165.3 ± 0.9 cm in height and 51.3 ± 1.0 kg in weight for men ($N = 41$), and 157.2 ± 0.9 cm and 46.7 ± 1.0 kg for women ($N = 49$).
- (6) Coquilhatville Province is called Région de l'Équateur at present.
- (7) Effectives are referred to as people capable of participating in hunting. The women of the Bambuti participate consistently in the net hunting, and therefore, the effectives include the women and men.

REFERENCES

- Ankei, Y., 1981. Agricultural livelihood and economic activities of the Songola—Slash-and-burn agriculturalists in the tropical rain forest, central Africa (in Japanese). *Kikan Jinruigaku*, 12(1): 96–178.
- Bulmer, R., 1968. The strategies of hunting in New Guinea. *Oceania*, 38: 302–318.
- Carneiro, R. L., 1956. Slash-and-burn agriculture: A closer look at its implications for settlements pattern. *International Congress of Anthropological and Ethnological Sciences (Selected Papers)*, 5: 229–234.
- , 1970. The transition from hunting to horticulture in the Amazon Basin. *International Congress of Anthropological and Ethnological Sciences*, 8(3): 243–251.
- Chinn, M., 1945. Sur l'alimentation des indigènes de la Province de Coquilhatville. *Annales de la Société Belge de Médecine Tropicale*, 25(2): 57–149.
- Dorst, J. and P. Dandelot, 1972. *A Field Guide to Larger Mammals of Africa* (2nd ed.), Collins, London.
- FAO and WHO, 1973. Energy and protein requirements. *World Health Organization Technical Report Series* 522.
- Gross, D., 1975. Protein capture and cultural development in the Amazon Basin. *American Anthropologist*, 77(3): 526–549.
- Harako, R., 1976. The Mbuti as hunters—A study of ecological anthropology of the Mbuti pygmies (1)—. *Kyoto University African Studies*, 10: 37–99.
- , 1977. Ecology and society of the Mbuti pygmies (in Japanese). In (H. Watanabe, et al., eds.) *Anthropology* 12, *Ecology*, pp. 185–214, Yuzankaku, Tokyo.
- , 1979. Environment and population density of hunter-gatherers (in Japanese). *Meiji Daigaku Kyoyoronshu*, 120: 51–68.
- Ichikawa, M., 1976. Hunting life of the Mbuti pygmies (in Japanese). *Shi-zen*, 31(4): 26–35.
- , 1978. The residential groups of the Mbuti pygmies (in Japanese). *Kikan Jinruigaku*, 9(1): 3–79.
- Kakeya, M., 1976. Subsistence ecology of the Tongwe, Tanzania. *Kyoto University African Studies*, 10: 143–212.
- Kano, T., 1980. Social behavior of wild pygmy chimpanzees (*Pan paniscus*) of Wamba: A preliminary report. *Journal of Human Evolution*, 9: 243–260.
- Maes, J., 1924. Notes sur les populations des bassins du Kasai, de la Lukenie et du Lac Léopold II. *Annales du Musée du Congo Belge, New Series, Miscellanea*, 1(1).
- May, J. M., 1965. *The Ecology of Malnutrition in Middle Africa; Studies in Medical Geography*, 5. Hafner, New York.
- Murdock, G. P., 1959. *Africa—Its Peoples and Their Culture History*. McGraw-hill, New York.
- , 1967. *Ethnographic Atlas*. University of Pittsburgh Press.
- Onwueme, I. C., 1978. *The Tropical Tuber Crops—Yams, Cassava, Sweet Potato, Cocoyams*. John Wiley, New York.
- Ruddle, K., 1973. The human use of insects: Example from the Yukpa. *Biotropical*, 5(2): 94–101.
- Sato, H., in press. Subsistence economy of the Boyela (in Japanese).
- Takeda, J., in press. Notes on hunting and sharing game among the Ngandu, a tropical rain forest tribe of central Zaire (in Japanese).
- Tanaka, J., 1971. *The Bushman* (in Japanese), Shisakusha, Tokyo.
- , 1974. Ecology of the Bushman (in Japanese). In (R. Otsuka, et al., eds.) *Ecology* 14; *Human Ecology*, pp. 61–91, Kyoritsu Shuppan, Tokyo.
- Tanno, T., 1976. The Mbuti net-hunters in the Ituri Forest, eastern Zaire—Their hunting activities and band composition. *Kyoto University African Studies*, 10: 101–135.
- Terashima, H., 1980. Hunting life of the Bambote—An anthropological study of hunter-gatherers in a wooded savanna. *Senri Ethnological Studies*, 6: 223–268.
- Vuanza, P. N. et al., 1975. *Les Régimes Moyens et Extrêmes des Climats Principaux du Zaïre*. Centre Meteorologique, Kinshasa.
- Weeks, J. H., 1909. Anthropological notes on the Bangala of the upper Congo Basin. *Journal of Royal Anthropological Institute*, 39: 97–136.
- Woodburn, J., 1968. An introduction to Hadza ecology. In (R. B. Lee, and I. DeVore, eds.) *Man the Hunter*, pp. 45–55, Aldine, Chicago.