

MOTA AND OTHER HUNTING ACTIVITIES OF THE MBUTI ARCHERS:

A Socio-ecological Study of Subsistence Technology

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ABSTRACT Several methods of bow-and-arrow hunting of the Mbuti archers in the Ituri Forest are described and analyzed in this paper. My observation and the literature indicate that one type of collective bow-and-arrow hunting, *mota*, which uses a beat-technique and aims for duikers or a chevrotain occupies the principal position among the various hunting activities of archers. Bow-and-arrow hunting has been so far considered far less effective than net hunting, but a comparison revealed that the *mota* hunting or *mota*-like bow-and-arrow hunting is not always inferior to net hunting in efficiency. We should keep this point in mind when we compare the subsistence ecology of archers and that of net-hunters.

INTRODUCTION

The Mbuti hunter-gatherers in the Ituri Forest have been investigated intensively from ecological and sociological points of view. The investigations revealed many features which characterize their subsistence ecology and social organization (Turnbull, 1965b; Harako, 1976, 1977; Tanno, 1976, 1980; Ichikawa, 1976, 1978; Hart, 1978). But as almost all the investigations concentrated their attention on net hunters, our knowledge of archers is still very limited. The study of Mbuti archers is important since their hunting styles seem to represent the original ones which had been adopted by the whole Mbuti before the introduction of net hunting. The net hunting is said to have started after the invasion of the Bantu agriculturalists into the forest (Harako, 1976: 84-86). Also we can deepen our understanding of net hunters as well as that of archers by comparing the two types of hunters in subsistence ecology, social organization, and some other contexts.

From September 1978 to February 1979 I conducted socio-ecological research into some bands of Mbuti archers. The research, although it was a preliminary one, revealed some interesting characteristics of the hunting activities and social organization of the archers. In this paper I shall concentrate my attention mainly on the description and analysis of bow-and-arrow hunting of the archers, depending chiefly on the data that I gathered among the archers who live in Andiri Locality. Especially the method, result, and economic significance of the collective bow-and-arrow hunting called *mota* are to be examined in detail. The *mota* is a principal hunting style among Andiri archers. It seems to have close connection with a pattern of band organization. After the examination of the *mota*, I shall make some comparisons between the net hunting and the *mota* hunting in method, result, and efficiency. This will show some facts that suggest bow-and-arrow hunting is not a means of subsistence inferior to the net hunting.

RESEARCH AREA AND THE MBUTI RESEARCHED

A half-day walk in the forest from Nduye, which is one of the administrative centers of the Lese people, takes us to Andiri village which is located about 15 km northeast of Nduye

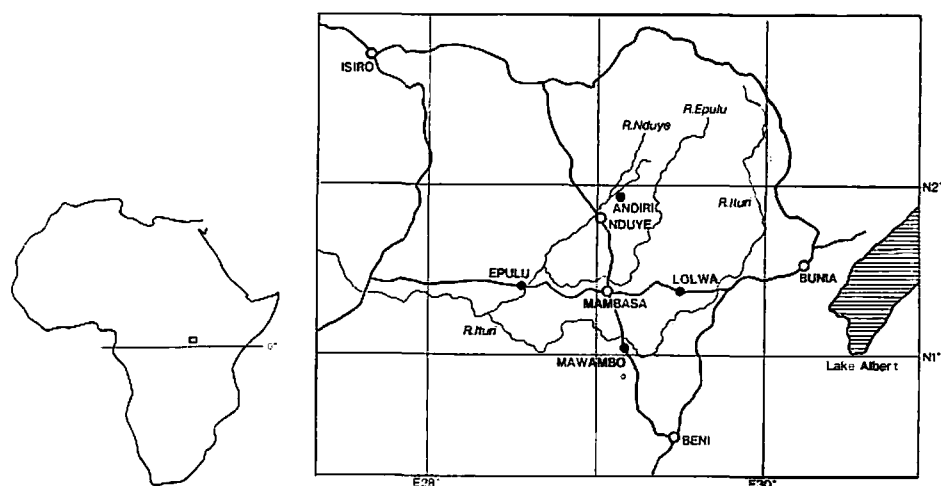


Fig. 1. The Ituri Forest.

(Fig. 1), Andiri is a small village of the Lese with a population of about 200. The path from Nduye, passing Andiri, goes through the forest and leads to a savanna which is said to be the homeland of Andiri villagers. In the forest there remain vestiges of deserted villages from place to place, telling us the history of the migration of the Lese people. Today there is no village in the forest beyond Andiri.

Five archer-bands were found around Andiri. I designated each of them Band AF, Band AG, Band AI, Band AJ, and Band AK. There were totally 38 households, or 125 people in those five bands, not counting the temporal visitors. Table 1 shows the membership composition of each band.

Every band except Band AG comprised a dominant patrilineal group and called by its name. For example, Band AF was composed of ten families, eight of which belonged to the patrilineal group called Andanji. So this band was simply called Andanji. Band AG was composed of two bands formerly separated; so this band contained two main patrilineal groups. This type of band composition, designated "dyadic band" by Ichikawa (1978: 151), is widely found among net hunters, too. As a general rule, the Mbuti observe patrilineal group exogamy and patrilocal post-marital residence; thus a band becomes ideally patrilocal one composed of patrilineally related males and their families. This is fairly applicable to the Andiri archers, but it is also true, as Ichikawa (1978: 149) has rightly pointed out,

Table 1. Membership composition of the Andiri archer bands.

Band	Population			Household*		
	Male	Female	Total	Full	Half	Total
AF	24	19	41	9	1	10
AG	16	15	31	10	2	12
AI	12	13	25	4	2	6
AJ	11	8	19	4	2	6
AK	5	4	9	3	1	4
Total	68	57	125	30	8	38

*A full household includes a man and his wife.

A half household is the one other than the full household.

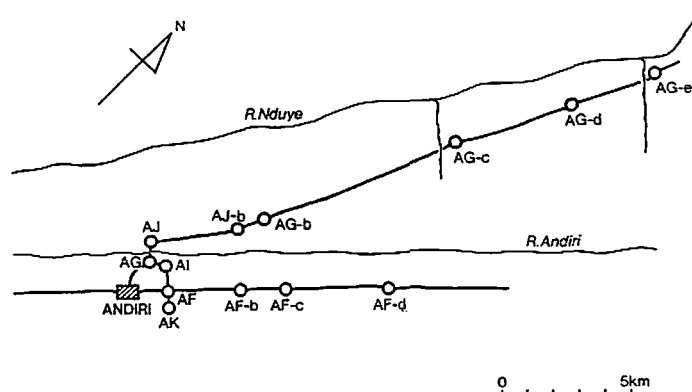


Fig. 2. Locations of base camps and hunting camps.

that the actual composition of a band usually shows some deviation from the ideal model. I will deal with the structure of archer bands in another paper, and here I just point out that Andiri archer bands are in no way territorial as Turnbull (1965b) affirms. He insists repeatedly that Mbuti bands, both the net hunters and the archers, lack interest in kinship relationship and that they can be defined only through territory; but what he insists is definitely unapplicable to Andiri archers.

From September to December the Mbuti stayed most of the time at the base camps which were situated around Andiri village. There they spent more time in activities concerned with village matters than in foraging for natural food. They frequently helped Andiri villagers in agricultural and other domestic activities in exchange for food. At the end of January they moved to the hunting camps deep in the forest and engaged in hunting actively. Figure 2 roughly shows the locations of the base camps and the hunting camps that I visited.

HUNTING ACTIVITIES

1. Spear Hunting

Andiri archers did two kinds of hunting: bow-and-arrow hunting and spear hunting. Spear hunting aims at large animals such as elephants and buffaloes. Some parties of hunters went on a spear hunting excursion a couple of times during my study period, and one of the parties was reported to have killed two elephants. The yield by spear hunting will be great if it succeeds; but, as Harako (1976: 56-57) says, spear hunting involves such great risk that it cannot be an ordinary hunting method but just an occasional one. Spear hunting is usually done in a group.

2. Individual Bow-and-arrow Hunting

Bow-and-arrow hunting can be classified into two types: one type is done singly and the other is done in a group. A hunter sometimes goes strolling in the forest with a bow and arrows, usually without any particular purpose, and hunts whenever the opportunity presents itself. Iron-tipped arrows are used for most terrestrial animals, and arrows without iron tips are for arboreal species such as monkeys and squirrels. Non-iron-tipped arrows used for monkeys are usually spreaded with poison. Iron-tipped arrows are collected after hunting, but non-iron-tipped arrows are not.

They do not use iron-tipped arrows for arboreal species, not because, as Turnbull (1965b)

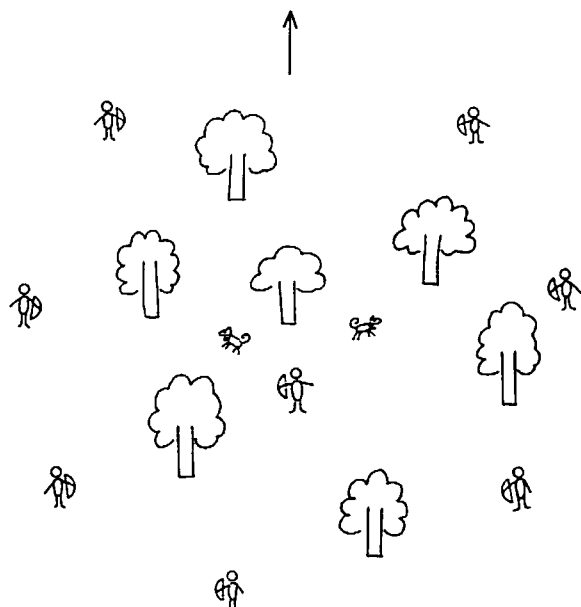


Fig. 3. *Mota* hunting.

suggests, they think poisoned arrows are more efficacious than iron-tipped arrows, but because, as Putnam (1948: 330) says, they fear to lose them. Turnbull (1965b: 153) writes: "With a poisoned arrow even a light graze will bring down the quarry, whereas with the metal-tipped arrow direct impact on a vital spot is essential." In order to maintain that the Mbuti could live without depending on such village products as metalworks he offered this opinion, but he apparently ignores the reality. It is quite doubtful that "even a light graze" of poisoned arrow can entail death to the animal. Harako explicitly doubts the widespread idea of the virulent effect of the Mbuti's poison and comments: "it is very rare that the animals shot by poisoned arrows die instantly. I made experiments on rats with some poisonous specimens I brought home, and no rat died quickly" (Harako, 1976: 63). I got the same impression, too. At any rate, the fact that the Mbuti, using only iron-tipped arrows, do not use poisoned ones for such terrestrial animals as duikers, which are very important species in their subsistence, evidently shows their actual idea on the effect of the poison.

The individual bow-and-arrow hunting is the basic pattern of the Mbuti hunting activity (Harako, 1976), but it does not seem economically important among Mbuti archers. Although some net hunters are reported to have done monkey-shooting by poisoned arrows actively, archers are not active in this type of hunting; they depend more on such group hunting as *mota* hunting (*ibid.*). Andiri archers did this type of hunt very rarely.

3. *Mota* Hunting

Mota is a collective bow-and-arrow hunting using beat-method. A hunt party usually consists of more than six or seven hunters and must be accompanied by a few dogs that scour the woods for game. A wooden bell is tied around the neck of each dog, the sounds of which drive out animals and inform hunters of the movement of the dogs. At a hunting ground, hunters spread out in the woods making a loose enclosure formation (Fig. 3). Then dogs,

Table 2. *Mota* hunting among Andiri archers, from October 1978 through February 1979.

	Date	Band (Camp)	Band Population	Number of Participants	Hours Hunting (from—to)	Hunting site	Catches	Notes
1*	11/10/78	AF (AF-a)	30	7	2h00m (11:00–13:00)	near village	porcupine	hunted in a secondary forest
2	16/12/78	AG (AG-a)	23	8	3h00m (12:00–15:00)	near village	chevrotain	
3	17/12/78	AG (AG-a)	23	3	8h30m (08:10–16:40)	far from village	0	
4*	20/12/78	AG (AG-a)	23	8	5h15m (10:00–15:15)	near village	0	
5*	30/01/79	AF (AF-b)	40	11	3h20m (11:20–14:40)	near camp AF-b	elephant shrew	porcupine trucking was done in a secondary forest
6*	1/02/79	AF (AF-b)	40	10	6h10m (10:40–16:50)	near camp AF-d	chevrotain, bay duiker	moving camp in the morning
7*	7/02/79	AG (AG-b)	18	7	5h30m (12:00–17:30)	near camp AG-b	potto	
8*	8/02/79	AG (AG-b)	18	9	8h50m (08:10–17:00)	far from camp AF-b	3 chevrotains	
9	9/02/79	AG (AG-c)	19	9	2h30m (13:30–16:00)	near camp AG-c	chevrotain	moving camp in the morning
10	10/02/79	AG (AG-d)	25	10	4h00m (12:00–16:00)	near camp AG-d	chevrotain, bay duiker	moving camp in the morning
11	11/02/79	AG (AG-e)	25	10	4h00m (12:00–16:00)	near camp AG-e	2 chevrotains	moving camp in the morning
12*	12/02/79	AG (AG-e)	25	10	8h40m (09:20–18:00)	near camp AG-e	chevrotain, dark mongoose porcupine, Guinea-fowl	honey collected en route

Note: The cases marked by * indicate that the author participated in the hunt, although he is not counted in the number of participants.

running to and fro in the woods, being encouraged by the shouts of a beater who takes up his position inside of the formation, drive out game that are hiding there. When they are accompanied by many dogs, more than one hunter take the part of the beater. Keeping the formation, the hunters advance through the woods in accord with the movement of the dogs and beater. The hunters sometimes stop to listen for the sound of a quarry and ambush it. When the dogs drive out a quarry, the hunters move rapidly and stealthily to enclose it, and shoot it when it comes sufficiently close to them. Hunters take freely many actions such as ambushing and tracking to meet the situation. When the quarry is killed, the hunters gather at the spot and butcher it. After the butchering, they distribute the meat according to certain rules. Each hunter, wrapping his portion of meat in big Marantaceae plants, carries it to the camp. Duikers and chevrotains are the main objects of this hunt. Smaller animals such as porcupines and mongooses are also hunted.

Table 2 shows the data concerning the *mota* hunting obtained during my survey period. More hunts were done besides those listed up in the table, but they are omitted because their data are incomplete. A hunting party was composed of hunter who belonged to the same band, but it often involved visitors from other bands. Especially when they lived at base camps, hunters frequently dropped in neighboring camps and joined freely in *mota* hunting of other bands. The minimal number of participants in hunting was only three in Case 3, but usually seven to ten people including junior hunters of the age between ten and fifteen participated; the mean number of participants was 8.4. Two hours were spent in hunting in the shortest case, and nearly nine hours in the longest case. It seems that the result of the *mota* hunting largely depends on the density of the game in the hunting area. That is, the yield was low when they hunted in the woods that was located near the village, while it was relatively high when they hunted far away from the village. The average weight of the meat they got by a hunt was about 4.5 kg⁽¹⁾ in the former cases (Cases 1, 2, and 4), and it was about 17 kg⁽¹⁾ in the later cases (Cases 3, and 5-12). Chevrotains were the most numerous game hunted, probably due to the fact that the river-side places where chevrotains frequent were often chosen as a hunting site.

4. *Musilo* Hunting

Musilo is a variation of the *mota* hunting. The method and formation of *musilo* are almost the same as those of *mota*. The differences lie in the following points: 1) The organization of *musilo* hunting involves all the neighboring bands, and consequently the number of the hunters who take part in it is far larger than in *mota* hunting. 2) A few women must participate in *musilo* hunting for symbolical tasks.

During my stay Andiri archers did *musilo* hunting three times in December. I observed two of them. The data collected then are shown in Table 3. From the table we can easily see the cooperativeness of the *musilo* hunting. The number of participants amounted to thirty or more. It is remarkable that even several villagers joined in the hunt.

The part women played in the hunt was symbolic and ritual rather than practical. Before setting out for the hunt, a pre-hunt ritual was performed by some women of the host band of the hunt. In this ritual they set fire to certain herbs and other materials which have symbolic meaning of a good hunt. In the forest they made a hunting fire at the root of a certain tree before the hunt started. During the hunt they sometimes cut a vine into about one-meter-long piece and shook it strongly several times, sprinkling the forest with the water contained in that vine. The women progressed in accord with the male hunt team, often occupying the rear part of the formation. They sang songs or shouted something occasionally, but most of the time continued their march in silence. They never took the lead in beating game, which was

Table 3. *Musilo* Hunting.

Date	14 Dec. '78	19 Dec. '78	21 Dec. '78
Host Band	Band AG	Band AF	Band AG
Hunting Hours	10 hours		9 hours
from	8:00 a.m.		8:30 a.m.
to	18:00		17:30
Hunting Site	near R. Ndyue	near AF-d	near R. Ndyue
Catches	Bay duiker Gabon duiker Chevrotain	Blue duiker Pygmy antelope	Bay duiker Blue duiker
Number of Participants	30		33
Composition of the Member	males: 7 from AF 11 from AG 3 from AI 1 from AJ females: 3 from AG children*: 2 villagers: 3		males: 7 from AF 11 from AG 3 from AI 4 from AJ females: 2 from AG children*: 2 villagers: 4

* under 10-year-old.

the business of the men and dogs. Considering the small number of the women-participants, evidently they were not expected to be practical hunters.

As I have already stated, most Mbuti stayed at the base camps in December. This was the time of the year when the contacts either between the Mbuti bands or between the Mbuti and villagers became most active and close. The *musilo* hunting took place in a festive atmosphere rather than in need of subsistence. The Mbuti said that they did the *musilo* hunting in order to get meat for the celebration of the new year. Besides this apparent purpose, however, there seems to be another implicit purpose, that is, to strengthen the cooperative and friendly social relationship between the neighboring bands. And the participation of the villagers in this hunt indicated the close socio-economical relationship between the Mbuti and the Lese people. I cannot make sufficient references to their relationship in this paper, but I do not think that Turnbull's view on their relationship (Turnbull, 1965b), which seems to be discussed too simply and one-sidedly, is applicable to the inter-ethnic situation in Andiri.

5. *Mota* and *Musilo* in Literature on Anthropology

Although descriptions of the hunting activities of the Mbuti archers in literature are very limited, some of them can be very usefully compared with what I observed and greatly helpful for gaining a better understanding of the characteristics of the Mbuti archer's subsistence technology.

We can find the description of *mota* hunting by Schebesta (cited in Turnbull, 1965a) and Harako (1976). Schebesta's observation of the *mota* hunting corresponds with my observation except a few points. I quote here its digest offered by Turnbull (*ibid.*): "The daily hunt, however, is the track hunt (...*mota*) in which the male members of the local group take part. Five or six men go out when the sun is high...accompanied by hunting dogs. Schebesta mentions a hunt leader...who gives the signal for departure and follows the dog, guided by the sound of its wooden bell. He shouts encouragement to the dog, and the other trackers, guided by these sounds, spread out on either side of the hunt leader. When the dog puts up game, the hunters all stand rigid, bows flexing, ready to shoot if the animal passes their way.... The rewards of this type of hunt are varied. A group of five or six hunters may be able to bring back an antelope each day, or may fail completely for days on end." Although the result of the *mota*

hunting is only vaguely shown, we can infer its economic significance from the fact that the *mota* hunting was a "daily hunt" conducted by the active male members of the local group. "The older man no longer able to track game successfully" (*ibid.*) use another method such as ambushing which will be described in the next subsection.

Harako's description on the *mota* hunting conducted by the archers who lived near Lolwa village fairly corresponds with what I observed and also with Schebesta's observation. He writes: "'Motá' is collective hunting usually done by more than ten archers.... Archers take their positions encircling a section of the forest. A dog with a wooden bell...sometimes aided by its owner and several boys, runs about in the encircled area and drives the game out of the bush. Archers shoot the game as it rushes out" (Harako, 1976: 54), and "occasionally only five or six archers attempt the 'motá' hunting method, but since the encircling formation is incomplete, archers must be prepared not only to ambush the game, but to take any added measure [tracking and so on] needed" (*ibid.*). And yet, his statement that "in a comparison with net hunting, we could say that the archers and bows and arrows correspond to the catchers and nets, while dogs correspond to beaters" (*ibid.*) seems misleading. Although it may be right figuratively, there are big practical differences between the net hunting and the *mota* hunting. For example, the *mota* hunting is a dynamic hunting where hunters are always in movement alternating tracking and ambushing, advancing and awaiting; while the net hunting is a static hunting where hunters only act in the encirclement made of nets. The differences between the *mota* hunting and the net hunting will be further discussed in the next section.

The *mota* hunting is a major hunting activity in Lolwa archers together with the *ebaka* hunting, which I will describe in the next subsection. They did the *ebaka* hunting early in the morning or during the evening, and the *mota* hunting during the daytime (Harako, 1976). They are basically duiker hunters depending on *mota* and *ebaka*, although they conduct spear hunting actively aiming for big game (*ibid.*).

Besides the Mbuti, we can find other people who conduct *mota*-like hunting in forest habitat: the Babali negroes (Schebesta, 1936) and the Boyela (Sato, 1980), for instance. Although the Boyela are primarily shifting agriculturalists living in the midst of the Congo Basin, they actively do various hunting. The hunting method used by the Boyela have many similarities with those used by the Mbuti. Especially one type of bow-and-arrow hunting called *luemba* is very similar in structure to *mota*, showing clearly the dynamic structure which characterizes *mota*. Let me cite it from Sato (1980):

More than seven or eight hunters participate in *luemba*.... Hunters once gather at a certain spot in the forest and there they arrange the route they will take, and assign work to each hunter. After performing a ritual for good luck they set out for a hunt. Hunters, spacing about ten to fifteen meters from each other, move ahead in a bag-like formation, the front part of which is widely open. Dogs and beaters (*ikongi*) that takes up their positions at the both sides of the opening of the formation drive out animals. And if an animal is driven out and goes inside the formation, the man who first saw the animal tells the others the kind of it by a whistle. Then the people called *ichundu*, who walk just behind the beaters, take a swift move to close the opening of the formation, and all the others also move to enclose the game tightly. Then they shoot *likulu* (iron-tipped arrows) or *lokate* (iron-tipped arrows spreaded with poison). Enclosed animals are not always caught; they escape from the enclosure more often.... Whether they hit an animal or not, they swiftly build up a formation again, and resume the march. At that time the men called *liya*, who take up their positions at the rear part of the formation, give hunters instructions on how to reconstruct the formation, on the direction they will take, and on the pace they must keep.... Small and middle-sized duikers such as blue duiker and Peter's duiker are the main objects of *luemba*. [Translation is mine.]

Although some details may be different, it is clear that the principal patterns of *luemba* and *mota* are the same. Particularly the flexible formation and the dynamic movement pattern characterize *luemba* as well as *mota*, giving them greater mobility that is not provided in net

hunting and allowing them to cover far larger areas in a day's hunt than net hunting does. The fact that the *mota*-like hunting method is widely adopted by forest people suggests the effectiveness of this type of hunting.

I was unable to find the name of *musilo* in the literature, but *begbe* described by Schebesta (cited in Turnbull, 1965a), Turnbull (1965b), and Harako (1976) seems to correspond to *musilo*. Most of their descriptions of the *begbe* hunting agree with *musilo* on the following points: 1) The *begbe* hunting is a large cooperative bow-and-arrow hunting using beat-technique: usually people from more than one band participate. 2) Women must participate. 3) The season when *begbe* is practiced is limited. 4) The *begbe* hunting seems to be more important in sociological context than in economic context. Besides these points, Schebesta gives a description on the pre-hunt ritual performed by the hunting leaders, and Harako notes the festive atmosphere in the hunt.

One difference between *begbe* and *musilo* is as follows: while in *musilo* women do only a symbolic work, in *begbe* they are said to do practical work just like in net hunting. Harako and Turnbull write: "...[in *begbe*] women and children attend as beaters, taking the same formation as in net hunting" (Harako, 1976: 54); "The *begbe* is remarkably like the net-hunt in technique and in social function. The major difference is the absence of net..." (Turnbull, 1965b: 162). This difference may be related to the difference of the number of the women who participate in hunting, but I cannot suggest this idea with certainty since Turnbull and Harako supply no specific figures of *begbe* hunting. Both Turnbull and Harako do not seem to have made firsthand observation on the *begbe* hunting for themselves. For Turnbull (1965b: 105) writes that he has never seen any archers in *begbe* beat-hunting camp, and Harako's survey period of Lolwa archers did not include the season when the *begbe* hunting takes place (Harako, 1976: 38). Although I do not mean to deny their description, there seems to be some possibility that they offered such description of *begbe* because they thought too much of the similarity between net hunting and the *begbe* hunting (Turnbull, 1965b: 162; Harako, 1976: 54). At any rate, we cannot elaborate the comparison until we get more data of the *begbe* hunting as well as of the *musilo* hunting.

It is strange that Turnbull has made no references to the *mota* hunting while mentioning the *begbe* hunting reiteratively. It is not certain whether it is because the *mota* hunting was not known to the archers he visited, or simply because he missed it. I think the latter is more likely, since it seems unlikely that the hunters who customarily practices the *begbe* hunting do not know the *mota* hunting at all.

6. Other Types of Bow-and-arrow Hunting in Literature

1) Small game tracking with a dog: Harako (1976) describes that when the numbers of hunters are not enough to do *mota*, they often resort to running after the game with a dog in the lead. Animals aimed for in this hunting are small ones such as mongooses, porcupines, and Guinea fowls, which dogs can track to some extent by themselves. Turnbull (1965b) and Hart (1978) mention this type of hunting briefly. Andiri archers sometimes did this type of hunting during the *mota* hunting when they found porcupines en route. Although this type of hunting is common among Mbuti archers, the result is limited since the objects of this hunting are usually small.

2) Ambushing: Two types of ambush hunting in Mbuti archers have been reported. One is the *ebaka* hunting I mentioned earlier. According to Harako (1976), *ebaka* is a foothold built upon a branch of a tree: it is set on a place where an animal trail passes by and where trees bearing fruit that lures duikers are found near by. A hunter waits for duikers passing below on the tree. This hunting method takes advantage of the feeding behavior of the duikers, and oc-

Table 4. Yield, labor input and efficiency of net hunting and *mota*.

Hunting Method	Place	Observation Period	No. of Hunts	Yield of meat (kg) ^{a)}		Hunt Hours	Hunting Group			Labor Input (man-hour)			Efficiency	Sources
				Total	per Hunt		Male	Female	Total	Male	Female	Total		
Net Hunt I.	Lolwa	Dec. 1972-Mar. 1973	16 ^{b)}	341	21.3	7:57	9.4	10.5	19.9	1207	1357	2564	0.13	Harako (1976, Table 4)
Net Hunt II.	Mawambo	Oct. 1973-Feb. 1974	13 ^{c)}	790	60.8	7:28	12.2			1180			(0.36) ^{c)}	Tanno (1976, Table 3)
Net Hunt III.	Mawambo	Jan. 1975	22	805	36.6	6:59	9.9	6.6	16.5	1740	1139	2879	0.28	Ichikawa (1976, Table 2)
Net Hunt IV.	Southern Ituri	Feb. 1974-Mar. 1974	22	498 ^{d)}	22.6									Hart (1978)
Mota Hunt	Andiri	Dec. 1978-Feb. 1979	12	167	13.9	5:08	8.5	0	8.5	511	0	511	0.33	Terashima

a) Weight of unbutchered meat; b) Case 8 is excluded; c) Cases 1 and 7 are excluded; d) The equivalent of 398.3 kg of butchered meat;

e) See the text.

cupies an important position together with the *mota* hunting among the hunting activities of Lolwa archers. Turnbull (1965b: 163) has made brief references to this type of hunting, although he does not mention the term *ebaka*. Among Andiri archers I did not observe this hunting. Another type of ambushing uses mimic calls of animals. Schebesta (cited in Turnbull, 1965a), Turnbull (1965b) and Harako (1976) describe this hunting method. Sometimes this method is combined with *ebaka* method (Turnbull, 1965b: 163). The effect of this hunting is quite doubtful, although this method seems to have spreaded widely in the forest. Harako (1976: 55) comments that "I believe successful cases are extremely few" and Schebesta (in Turnbull, 1965a: 169) notes that "this method of hunting is used by the older men no longer able to track game successfully." Sato (1980) also reported this mimic-call-hunting of the Boyela, but he doubts its effects as well. Among Andiri archers this type of hunting did not take place during my survey period.

EFFICIENCY OF THE *MOTA* HUNTING IN COMPARISON WITH NET HUNTING

Here I make some quantitative comparisons between the *mota* hunting and the net hunting, and reconsider their economic characteristics. Table 4 shows the yield and the labor input of net hunting and *mota* hunting. The figures are taken from the data on the net hunting of four net-hunter bands, and from the data on the *mota* hunting of Bands AF and AG. As is shown in Table 4, the yield of the *mota* hunting is smaller than that of the net hunting, if compared in a day's yield of meat. But the labor input of net hunting is greater than that of *mota*, since net hunting requires more number of hunters and spends more time. So we should compare the efficiency of the hunting methods taking the difference of labor into account. Here I take the yield of meat per man-hour as an index of the efficiency of the hunting methods. According to the calculation in Table 2, Bands AF and AG expended 511.0 man-hours of labor in the 12-day *mota* hunting, and got 10 chevrotains, 2 bay duikers, and 6 small game, the total yield of the game amounting to 167 kg.⁽¹⁾ Thus the efficiency index of the *mota* hunting is 0.33 kg/man-hour. As for net hunting, calculating in the same way, we get the following figures: 0.13 kg/man-hour by Lolwa net hunters, and 0.28 kg/man-hour by Mawambo net hunters studied by Ichikawa. Another data on Mawambo net hunters were offered by Tanno (1976), who studied them one year before the survey of Ichikawa. Tanno's data show the best result in terms of a day's yield among the data of four researchers of net hunters. Although he gives no figures of the female participants, I try to make some calculation. In the 13-day net hunting, they got 51 blue duikers, 33 middle-sized duikers, and 21 small game; the total weight of the game amounting to about 790 kg.⁽²⁾ On the other hand, men expended 1,180 man-hours in the 13-day hunting; and if we calculate the women's labor input at 1,000 man-hours, which is equivalent to 10 or 11 female participants per hunt, since Tanno (1976: 114) reported that "the number of beaters was always somewhat less than the number of men," the total amount of labor input comes to 2,180 man-hours. So the efficiency index is 0.36 kg/man-hour; this figure is nearly equal to the efficiency index of *mota* hunting. Thus compared even with the most excellent cases of net hunting, the *mota* hunting is not so inferior to the net hunting in efficiency.

Here it becomes clear that we cannot say that the net hunting is far more efficient than bow-and-arrow hunting. The generalization is difficult since the data on the *mota* hunting are limited; but we should alter the idea that bow-and-arrow hunting is less effective than the net hunting, which has been supposed true uncritically by some writers (Turnbull, 1965a, 1965b; Harako, 1976; Tanno, 1980).

Here I draw another example from the Mbote hunter-gatherers who live in a wooded sa-

vanna in the west of Lake Tanganyika to show that the efficiency of *mota*-like bow-and-arrow hunting is not inferior to that of net hunting. The Mbote conduct both net hunting and the *lukokolo* hunting (The same people do both). The latter is a collective bow-and-arrow hunting using beat-technique, and very similar to *mota* hunting (Terashima, 1980). Among the 16-day net hunting listed in Table 5 of Terashima (1980), I choose 11 cases (Cases 1-4, 6-8, 10, 13-15) for calculation since their data are complete. The total labor input of the 11-day net hunting was 1,368 man-hours, and the catches were 15 bush duikers, a klipspringer, and a green monkey; the total weight of the game amounting to about 250 kg.⁽³⁾ The average yield of meat is 22.7 kg a day, and the efficiency index is 0.18 kg/man-hour. On the other hand, by the 5-day *lukokolo* hunting (Terashima, 1980: Table 7), they expended 273 man-hour labor, and got 2 bush duikers, 2 cane rats, 2 pythons, a white-tailed mongoose, and a blue monkey; the total weight of the game amounting to about 65 kg.⁽³⁾ The average yield of meat is 13 kg a day, and the efficiency index is 0.24 kg/man-hour. Although the data of *lukokolo* are also limited, we can find here the same situation among the Mbuti. The net hunting surpasses the *lukokolo* in the average yield of a hunt, but on the contrary, the *lukokolo* surpasses the net hunting in the yield per unit labor.

By the comparison made so far, the economic characteristics of net hunting become clear. It is evident that net hunting is a very effective method for getting meat. If conducted adequately it can yield a great deal of meat; this potentiality evidently attracts commercial meat-traders to the net-hunter bands (Hart, 1978). Much greater labor, however is devoted to net hunting than to *mota* or *lukokolo*. Owing to the technological structure, the net hunting requires far larger labor input than the *mota* hunting requires. Usually, ten or so nets are necessary in net hunting, and the number of male hunters who manage the nets often exceeds ten (Turnbull, 1965b; Harako, 1976; Tanno, 1976; Ichikawa, 1976). Besides male hunters, the number of women who work as beaters must be large enough, too; their labor is critical to the success of net hunting and it is desirable that the equal number of men and women participate in net hunting (Tanno, 1976: 114). Thus net hunting structurally includes a large number of both men and women. Abruzzi (1979: 186-187) adequately notes: "Thus, while the net-hunters have achieved a more abundant and stable hunting return than have the archers (Harako, 1976: 84), they have done so only at the cost of a considerable increase in the total amount of labor expending in hunting activities." We should not forget this point when comparing the efficiency of net hunting and that of *mota* hunting.

The misunderstanding that net hunting is apparently more efficient than the *mota* hunting seems to arise from the uncritical comparison that assume the structural identity of net hunting and *mota* hunting. For example, Harako (1976: 85) writes: "It has already been made clear that 'motá' and 'begbe' in bow hunting are correlative to net hunting.... The net fills the space between the archers in 'motá', increasing the efficiency." If the whole structure of net hunting is the same as that of *mota* hunting, the efficiency of the former would increase. But as I have already mentioned, it is not the case. Although both net hunting and *mota* depend on the beat-technique, the practical formation and procedure are quite different. The *mota* is a dynamic hunting where hunters incessantly stroll in the forest keeping a loose enclosing formation. On the other hand, net hunting is a static hunting where hunters are allowed to move only within the tight enclosure of nets. In net hunting, the efficiency to get game once enclosed with nets may be fairly high, but the area hunted is far limited than the area hunted by *mota* hunting. Thus while net hunting may be more efficient than *mota* hunting in the area where the population density of the game is very high, its efficiency seems to decrease rapidly in the area where the density is low. In net hunting, it is very difficult to increase the number of game enclosed by extending the hunting area primarily due to its static structure.

In addition, net hunting requires such operations as setting up and folding up nets for each round of hunting, and travelling between netting sites suspending the hunting for a while, which increase labor input and inevitably lower the efficiency of hunting.

CONCLUSION AND DISCUSSION

1) The archers use various methods of hunting aiming for various animal species compared with the net hunters who adopt only a single hunting method. But all methods used by the archers do not have the same economic value. Although it is difficult to draw a definite conclusion here, since the data on the hunting activities of the archers are very limited, I would like to emphasize the importance of the *mota* hunting among the archer's hunting activities. Duikers and chevrotains, being the main objects of the *mota* hunting as well as of the net hunting, are most numerous game inhabiting the Ituri Forest (Harako, 1976; Ichikawa, 1978; Hart, 1978). The habit of the animals—they hide themselves in the bush in the daytime—and the environmental condition of the forest—there are many obstacles in the forest which limit the visibility and facilitate ambush—make it suitable to adopt the beat-technique, while they make it very difficult to use other methods like stalking method (Harako, 1976; Terashima, 1980). Thus it is very reasonable that archers regard the *mota* hunting as the principal hunting. That the *mota* hunting is a well adapted hunting in the forest environment, as I have mentioned above, is inferable from the fact that the same type of hunting is adopted by some forest people other than the Mbuti. Some other hunting techniques such as *ebaka* and ambushing with mimic calls also aim at duikers, but they do not seem to produce better results than the *mota* hunting (cf. Harako, 1976: Table 6).

2) If we recognize that the *mota* hunting is a principal hunting of the archers, one of the socio-ecological features of their band composition will become understandable. Here I consider the size of the archer band. Most of the archer bands (or camps) consist of five to twelve families except in some cases (Schebesta—cited in Turnbull, 1965a: 167; Turnbull, 1965b: 99; Harako, 1976: 48, 1977: 210; Ichikawa, 1978: 138–139). The bands of Andiri archers consisted of four to twelve families or 7.6 families on the average, their size falling within the range mentioned above excluding the minimal band. Thus usually the archer band keeps the number of families that is sufficient to do *mota* hunting which requires at least five or six hunters to be performed effectively. For net hunters the band size is asserted to be closely connected with the technical features of net hunting. In order to do net hunting effectively an adequate number of families must participate in it. If the band size decreases to six or seven families, it becomes impossible to do net hunting effectively; on the contrary, if the band size increases too large, close cooperation and smooth operations in the hunt will suffer (Turnbull, 1965b, 1968; Tanno, 1976; Harako 1977; Ichikawa, 1978). Harako (1977: 210) deduced from the data mentioned in the literature that the desirable size of the net-hunter band is 10 to 16 families; this range of band size fairly accords with the actual band-size range. As for archers, the relationship between the band size and the technical features of *mota* hunting is not so clear, since the *mota* hunting permits a wider range of the number of attendants. But it seems that a band tends to gather ten or so families. Within this range the *mota* hunting can be performed effectively, and at the same time, reciprocal food distribution among the families, which secures the band life, takes place smoothly (Ichikawa, 1978: 139).

This view given above is distinctively different from Turnbull's view that emphasizes the fission of the archer band into small segment. Turnbull (1968: 135) writes: "The reality is that whereas the net-hunting band is of necessity united throughout the bulk of the year, the archer band is splintered into tiny segments, sometimes only two or three families, each independent

of others." He asserts this view based on the idea that "the ideal number of archers for either tracking or ambushing game is three; five would already be felt as unwieldy" (*ibid.*). The fact that he did not take the *mota* hunting into account may explain why he offered such a view; it is quite unlikely that such tiny segments of bands have ever subsisted except in occasional cases. Even in Turnbull's own data (Turnbull, 1965b: 99) we cannot find the bands so small as he affirms. The following figures are given as the number of the huts he counted in seven archer bands where he is most certain of the genealogies (*ibid.*): 25 huts in Camp 4g; 11 huts in Camp 4h; 10 huts in Camps 4i and 4j; 9 huts in Camp 4l; 5 huts in Camp 4m. The number of huts usually represents the number of families in the band.

I do not find any reasons for asserting that the archer band should be splitted into such small segment as Turnbull says. On the contrary, when the band size becomes too small to do the *mota* hunting or other collective activities satisfactorily, the fusion of bands, one of the mechanisms to restore the band size, may take place. For instance, Band AK of Andiri, consisting of only four families, joined with Band AF in moving to the forest camp. At any rate, so far as the *mota* hunting is one of the most effective hunting methods of the archers, we should not ignore it in considering the band composition and the economy of the archers.

3) By the comparison of net hunting and *mota* hunting, the following points have become clear. First, although the *mota* hunting uses the same beat-technique as net hunting, they are definitely different in practical formation and procedure. So the idea is in no way supportable that regards them as having the same technical structure. Second, in a day's hunt the *mota* hunting yields less meat than the net hunting, but the yield of meat per unit labor in the former is not less than that in the latter according to the data reported so far. Thus the view that regards net hunting as far more effective than the bow-and-arrow hunting simply because the former yields more meat than the latter is merely superficial. These points should be taken into account when one makes a sociological or ecological comparison between the archer's life and the net-hunter's life. They may help to solve some problems: the separation problem of the Mbuti people into archers and net-hunters, for example. It has been so far a puzzling question why the net hunting did not spread among the archers, if net hunting is truly more effective than the bow-and-arrow hunting (Abruzzi, 1979; Tanno, 1980). But if we recognize that bow-and-arrow hunting is not a means of subsistence inferior to net hunting, it is quite natural that bow-and-arrow hunting have not been replaced by net hunting. Other problems concerning the subsistence ecology of archers and net-hunters should be reconsidered from this view point.

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NOTE

(1) Calculations are made using the following figures as the mean weight of game: chevrotain, 11.5 kg; bay duiker, 20 kg; other small animals, 2 kg. (Hart, 1978: Table 2)

(2) Blue duiker, 4.3 kg; middle-sized duiker, 16 kg; small animals, 2 kg. (Tanno, 1976: Table 4)

(3) Bush duiker, 15 kg; klipspringer, 15 kg; green monkey, 10 kg; cane rat, 5 kg; python, 5 kg; white-tailed mongoose, 5 kg.

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