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SUSTAINABILITY OF FISHING IN THE BANGWEULU SWAMPS, ZAMBIA

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ABSTRACT This paper explores the ecological and economic dimensions of sustainable resource use in the Bangweulu Swamps, Zambia, based on analysis of data accumulated over a ten year period. Analysis focuses on the four main commercial fishing methods, and reveals a transition of fish species and catch amount varied between 1983 and 1993 for each fishing method. The localized fish trading system has also changed over the decade. Due to the economic degradation of the nation, barter system has become more dominant than cash trade among the fishermen and the fish traders in the swamps. The author fears that a WWF-promoted project begun in 1990 has disregarded the indigenous management of the resources, and advocates taking into account the indigenous way of use.

Key Words: Resource management; Indigenous use; Market economy; Fish trade; Wetlands project.

INTRODUCTION

In recent years, numerous regional development plans have been carried out on the basis of exchange, such as providing development assistance in exchange for nature conservation and resource management in an aid-recipient country. Several authors report that the destruction of the environment has resulted in cutting off the link between nature and men, and pollution of the environment threatens human life in many areas in the world (Ishi, 1988). Nagamine (1985) argued that the pursuit of material development in third world countries would be better based on a new idea of development than to retrace the path that has been pursued by industrialized and affluent countries. However, the political leaders and the nations tend to entertain an ideal in which their people will live in industrial affluence. The administrations of donor countries also take it for granted that the aid-receiving areas will be able to develop economically when the market economy is given more priority than the traditional culture.

Else Skjonsberg (1992), in investigations of several fisheries of Africa, such as Mweru-Wa-Ntipa in northern Zambia and Lake Tanganyika in central Africa, concluded that virtually every regional development project in the third world failed to realize its original expectations. This is because they have been designed to introduce new techniques while taking little notice of the everyday life of the inhabitants of the area. She emphasized the necessity for grasping the sociological aspects of the life of inhabitants as a part of the natural environment and adopting non-intervention approaches, such as distributing machinery, before undertaking and imple-

menting interventions.

Ichikawa and I have carried out field research on the fishing activity in the Bangweulu Swamps, Zambia since 1983. Although fish caught from the Bangweulu Swamps have been a commodity in the Copperbelt markets since the colonial era (Brelsford,1946), little literature exists about the activity of fishing in the swamps except Brelsford (1946) and Tait (1965) prior to the studies of Ichikawa (1985) and Imai (1985), and there are only two research reports promoted by the Department of Fisheries: Inoue (1971) and Evans (1983). Both reports were based on basic surveys designed to qualitatively and quantitatively describe the fish resources in the Bangweulu region. However, scarcely any study has been conducted about the life of the fishermen or local inhabitants.

Our research of 1983 revealed that most of the swamp fishermen, composed of several ethnic groups, were in fact, part-time fishermen who also engage in cultivation (Imai,1985). We also found that each production unit chose a specific fishing method to catch a particular group of fish, for example, the Mormyridae or Cichlidae, in high demand in the markets.

We also found that the types of fishing activity among the fishermen were divided into three classes on the basis of fishing seasons, fishing grounds and methods, and furthermore, that the swamp area was actually utilized by the several ethnic groups from different areas (Imai, 1986, 1987). Such utilization of the swamps can be regarded as active segregation among the fishermen, who are skillfully involved in fish consumer's market. Accordingly, conditions of resource shortage or environmental destruction have been avoided through this indigenous pattern of management without any legal or administrative controls.

I have pointed out that the fishermen in the Bangweulu Swamps have developed independent trading strategies, such as a fixed price for fish regardless of fish species, while they adapted to market economy (Imai 1991, 1995).

Ichikawa (1994) explained that such activity represented a buffer between the indigenous system and the market economy. In this way, sustainable use is put to practice in the Bangweulu Swamps. He also argued that in trying to promote sustainable use of a natural environment, rather than simply applying the system planned in advanced nations currently, the indigenous use of the natural environment should be re-evaluated (Ichikawa, 1995). It is clear that the above indigenous fishing methods have long supported sustainable use in the Bangweulu Swamps.

In my research conducted in 1990 and 1993, I found that the demand for fish in the city market has increased, and that a more commercial fishing system has penetrated the Bangweulu area. Is it possible to sustain the fish resources exploited by both the indigenous system and market economy?

In this article I first describe the contents and the amount of catch by main commercial fishing methods, based on the 1993 research, and compare these with 1983 data. Secondly, I describe and analyse the activity patterns of the fishermen and the traders in response to the trends of the fish market. Lastly, I examine a contemporary conservation and management development project in the Bangweulu Swamps from the perspective of indigenous use of resources.

TRANSITION OF LOCAL FISHING

During research, from September 1 to October 4, 1993 at Ma. fishing camp (Fig. 1, 2), I obtained background information about fishing activity from fishermen, such as ethnic group affiliation, native village, number of fishermen in the production unit, fishing gear and methods used.

From October 15 to November 1, I conducted the same investigation at Mu. fishing camp (Fig. 2), the camp where Ichikawa carried out research in 1983. In addition to simplifying the work of weighing fish, I confirmed fish species and weighed total catch of the day.

In this section, I will describe the nature of the commercial fishing methods which I observed in 1993, analyse the composition and weight of catch, and compare these results with those I collected in 1983. The activity patterns of the various fishing methods have previously been described by Imai (1985, 1986, 1987).

I. *Mukombo* Fishing

In Zambia, *mukombo* is a common method of fishing in which fishermen drive the fish into nets by thumping the water with poles (Mortimer, 1965). Medium-sized Cichlidae is the main target fish of *mukombo* due to the high demand for Cichlidae in the market, so the fish traders are eager to purchase them in the swamps. In *mukombo*, the fisherman usually does not need multiple nets, nor is the net fitted with sinkers. Thus the gear for *mukombo* is neither heavy nor bulky. Fishermen

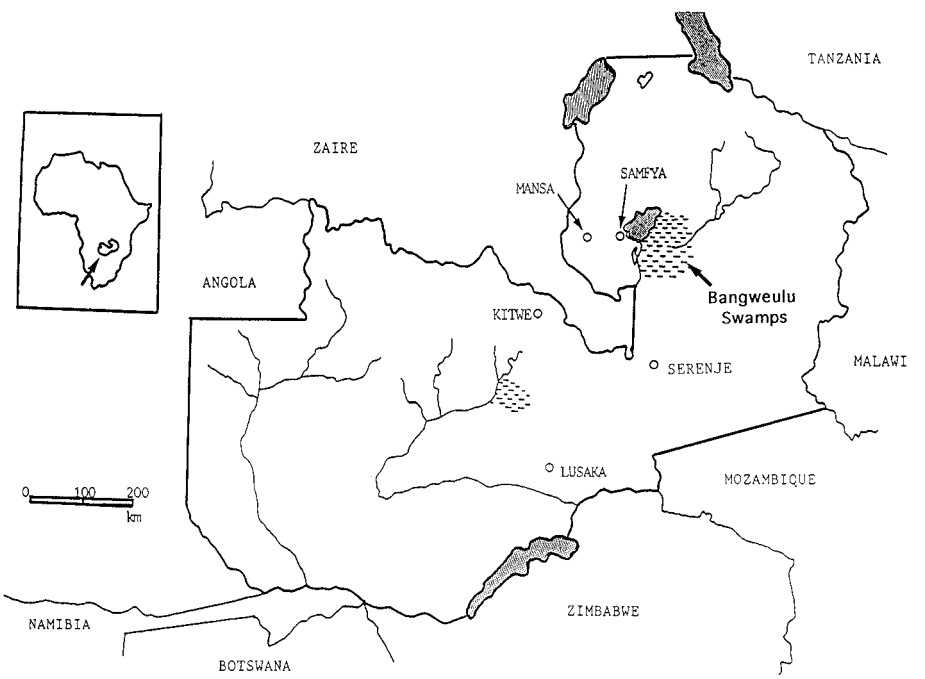

Fig. 1. Map of Zambia.

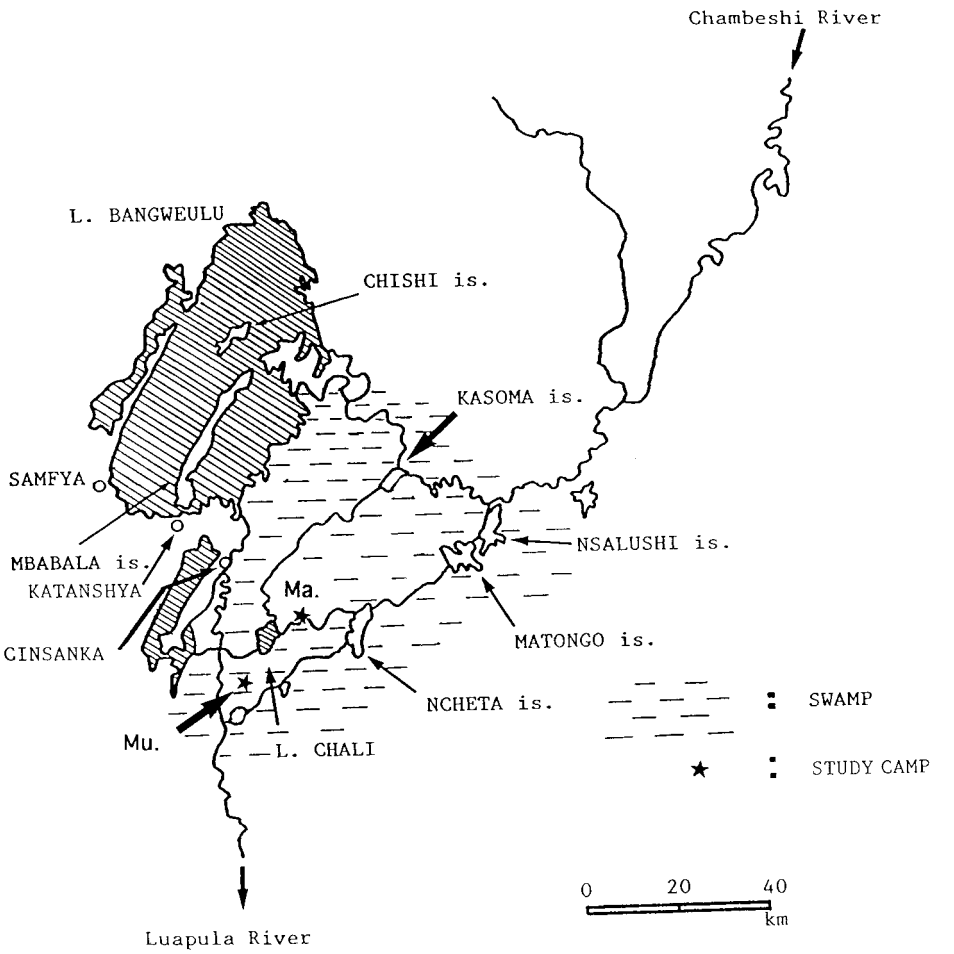

Fig. 2. The Bangweulu Swamps.

whose home village areas are in the north of the Lake Bangweulu, such as the N'gumbo, usually rely on the *mukombo* method (Imai, 1985). Many of them carry out *mukombo* from June to early November to catch a lot of Cichlidae fish (Table 1) (1985).

However, in 1993 when I re-visited the camp, I found only two fish production units in which the fishermen engaged in *mukombo* fishing, due to the change in the ethnic composition of the fishermen in Camp Ma. The Kabende fishermen had become the majority of Camp Ma. fisherman in 1993, and they were staying there from as early as May to engage in stationary gillnet fishing or seine net fishing (Table 2). As shown in Table 2, only one production unit of the N'gumbo fishermen could be found in the camp. The fishermen in the camp said that the N'gumbo fishermen had moved to continue *mukombo* fishing in other areas.

As the spawning of fish is blocked by *mukombo* fishing and many fry are caught together with adult fish (Hayward, 1985), *mukombo* fishing is prohibited throughout

Table 1. Fishing Unit and Period in Study Camp Ma. (1983)

Ethnic group	fishing unit	number of persons	fishing method	fishing period
N'gumbo				
	1. Mwa.	3	B3	Apr. − Oct.
	2. Rob.	1	B3	Mar. − Sep.
	3. Abi.	2	B3	Apr. − Sep.
	4. Eli.	2	B3	Apr. − Oct.
	5. Emm.	1	B3	Mar. − Oct.
	6. Seb.	1	B3	Apr. − Oct.
	7. Nel.	1	B3	May. − Oct.
	8. Mpu.	3	B3	Apr. − Oct.
	9. Bej.	3	B3	Apr. − Oct.
	10. Cha.	1	B3	Mar. − Dec.
	11. Bet.	3	B3	Apr. − Oct.
	12. Dom.	2	B3	Apr. − Oct.
	13. Mus.	1	B3	Apr. − Nov.
	14. Fel.	1	B3	Apr. − Nov.
Unga	1. Bai.	3	B3	Apr. − Oct.
	2. Obi.	5	B1a, b	Mar. − Jan.
	3. Sam.	5	B1b, B2	Apr. − Dec.
	4. P.K.	1	B1a, B3	Oct. − Jan.
	5. Yob.	2	B1a, b	Oct. − Jan.
	6. Kal.	2	B1a, b	Oct. − Jan.
	7. F.P.	2	B1a, b	Oct. − Jan.
	8. Lev.	4	B1a, b	Mar. − Jun., Oct. − Jan.
	9. Alf.	3	B1a, b	Oct. − Dec.
	10. Mwe.	3	B1a	Dec. − Jan.
	11. Cho.	1	B1a	Dec. − Jan.
Kabende	1. Tal.	3	B1a, b	Dec. − Jan.
	2. Fra.	2	B1a, b	Dec. − Jan.
	3. Hab.	1	B1a	Apr. − Sep.
	4. Sec.	2	B1a	May. − Jan.

Note B1a: *Malalikishya* ; B1b: *Ukusebeshya* ; B2: *Mukwao* ; B3: *Mukombo.*

Table 2. Fishing Unit and Period in Study Camp Ma. (1993)

Ethnic group	fishing unit	number of persons	fishing method	fishing period
Kabende				
	1. Ch.H.	3	B1a	May − Dec.
	2. Fr.	2	B1a	Aug. − Nov.
	3. Ch.M.	5	B2	Jun. − Nov.
	4. Mwe.	3	B2	?
	5. Sh.	1	B1a	Jun. − Nov.
	6. Mam.	5	B2	May − Nov.
	7. Kal.	2	B1a	May − Nov.
	8. Kos.	3	B1a	?
	9. Chi.	2	B1a	Jun. − Nov.
Unga				
	1. Mup.	3	B1a, b	Aug. − Nov.
Bisa				
	1. Mal.	1	B1a	Jul. − Nov.
N'gumbo				
	1. Amo.	1	B1a, B3	May − Nov.

Note : B1a: *Malalikishya* ; B1b: *Ukusebeshya* ; B2: *Mukwao*; B3: *Mukombo*.

Zambia (Fisheries Act, 1974). Although *mukombo* fishing had not been strictly controlled in 1983 when I began to carry out the field study, control has been increasingly strengthened by the Bangweulu Fishery since the 1990's. As a policy of natural resources conservation was adopted by the government, the regional administration imposed controls on *mukombo* fishermen. According to a staff of the Bangweulu Fishery, several fishermen who violated the prohibition were punished with a fine or confiscation of their fishing gear.

Accordingly, the total number of *mukombo* fishermen decreased sharply in the swamp area by 1993. Several fishermen denied having engaged in *mukombo* fishing and refused to have their catch weighed. They asserted, "No, these fishes were not caught by *mukombo* fishing." Consequently, as shown in Table 3, relatively little catch with *mukombo* fishing could be weighed in 1993. Ichikawa (1985) observed 18 *mukombo* units out of 19 in Camp Mu. in 1983 (Table 4a). However, by 1993, I could confirm only 1 *mukombo* production unit out of 20 (Table 4b).

As shown in Table 3, the catch by *mukombo* fishing in 1983 and 1985 were medium-sized fish species of Cichlidae, such as *Tilapia rendalli, Sarotherodon macrochir.* In 1993, Cichlidae fishes accounted for just 38.6% of the total catch by *mukombo* fishing, while the percentage of Mormyridae and Claridae species were higher. Thus, while direct comparison between the two records is not possible, it seems clear that the standing crop of medium-sized Cichlidae fishes decreased due to intensive *mukombo* fishing in the area. Accordingly, the number of N'gumbo fishermen at the research camp who exclusively engaged in *mukombo* also decreased (Table 1, 2).

It cannot be readily concluded whether the decrease in number of the *mukombo* fishermen was the result of strict control or the decrease in the number of the target fish (medium-sized Cichlidae fishes).

As shown in Table 3, the difference in the average amount of daily catches by a *mukombo* fisherman in 1983 (11.8 kg) and 1993 (11.1 kg) is slight. Bangweulu fishermen sold their fish to traders at a fixed price per kilogram regardless of fish

Table 3. Comparison of Catches from *Mukombo* fishing. (1983, 1985, 1993) kg(%)

	1983	1985	1993
Mormyridae	0.4 (0)	0 (0)	4.5 (10.1)
Cichlidae	2,280.1 (97.9)	69.5 (100.0)	17.2 (38.6)
Claridae	40.5 (1.7)	0 (0)	15.6 (35.0)
others	7.5 (0)	0 (0)	7.3 (16.4)
total	2,328.5	69.5	44.6
kg/person・day	11.82	6.95	11.14

Table 4a. Number of fishing units by Fishing Method at Mu. Camp in 1983. (from Ichikawa, 1985)

fishing method	number of units
mukombo	18
malalikishya	15
ukusebeshya	3
mukwao	4
unit (total)	19

Table 4b. Fishing Unit and Period in Study Camp Mu. (1993)

Ethnic group	fishing unit	number of persons	fishing method	fishing period
Kabende				
	1. Ch.Al.	4	B2	Mar. − Nov.
	2. Kab.	4	B2	Jul. − Nov.
	3. Max.	4	B2	Aug. − Nov.
	4. Top.	4	B2	Jul. − Nov.
	5. Sak.	3	B2	Sep. − Nov.
	6. Kaf.	2	B1a	Oct. − Nov.
	7. Chib.	2	B1a	Aug. − Nov.
	8. Fid.	4	B2	Jun. − Nov
	9. Bra.	2	B1a	Aug. − Nov.
	10. Kom.	2	B1a, b	Sep. − Nov.
	11. A.Mas.	4	B2	Jun. − Nov.
	12. Kri.	3	B2, B3	Aug. − Nov.
	13. Mos.	2	B1a	Sep. − Nov.
	14. Lub.	3	B1a	Aug. − Nov.
	15. Mul.	1	B1a	Aug. − Nov.
	16. Mab.	?	B2	?
	17. Kan.	2	B1a	Sep. − Nov.
	18. Al.Mw.	2	B1a, b	Aug. − Nov.
	19. Mwe.	2	B1a	Sep. − Nov.
Unga				
	1. Kap.	2	B1a	Oct. − Nov.

Note B1a: *Malalikishya*; B1b: *Ukusebeshya*; B2: *Mukwao*; B3: *Mukombo*.

species (Imai, 1985). This system for selling fish was still observed in 1993, so the profit per head has not differed between these years.

II. *Malalikishya* Fishing

In *malalikishya* fishing, nets are set in water in the evening and gathered the next morning. As shown in Table 5a, when nets of more than 1.5 inches mesh size (about 3.8 cm) are used, the percentage of medium-sized Cichlidae fishes (i.e. *Serranochromis angusticeps*, *Haplochromis mellandi*) decreased from 67.7% in 1983 to 53.5% in 1993. At the same time, the percentage of the Mormyridae catch decreased from 16.8% in 1983 to 0% in 1993 (Table 5a). The weight of catch per net (about 100 yards: 91 meters long) increased by 460 grams in 1993 (Table 5a).

Table 5a. Comparison of Catches from *Malalikishya* Fishing. (1983, 1993)

(mesh size: >1.5 inches) kg(%)

	1983	1993
Mormyridae	12.8 (16.8)	0 (0)
Cichlidae	51.5 (67.7)	71.15 (53.5)
Claridae	7.6 (10.0)	55.8 (42.0)
others	4.2 (5.5)	5.95 (4.5)
total	76.1	132.9
number of net (100 yards/net)	43	59.5
kg/net	1.77	2.23

When nets of 1.5 inches mesh size were used, the percentage of Cichlidae species caught increased (+12.6%), while that of Mormyridae fish decreased (−11.5%) (Table 5b). The percentage of other species, such as *Clarias*, for the most part, did not change. The weight of catch per net (about 2.60 kg) using the *Malalikishya* fishing method showed little change between 1983 and 1993.

III. *Ukusebeshya* Fishing

In this fishing, nets of 1.5 inches mesh size are set out at night for three to four hours, requiring the fishermen to tend the nets during this period. Nets are usually set in two sessions, in the evening from around 4:00 p.m. to 8:00 p.m. and later at night from around 1:00 a.m. to 5:00 a.m. (Imai, 1985).

Tables 6a and 6b show that 58.1% of catch in the evening session and 79.1% of catch in the morning session in 1983 were Mormyridae fishes, mainly *Marcusenius macrolepidotus* (*mintesa*). *Mintesa* fish is not only in high demand among consumers, but also is sold at a higher price in the market (Imai, 1986). Although many small-sized Cichlidae fishes such as *Tilapia sparmanii* (*matuku*) are caught, the demand for them is not so high.

The composition of catch by *ukusebeshya* fishing in 1993 differed from that in 1983. In both evening and morning sessions, the percentage of Mormyridae fishes caught decreased remarkably (evening session, − 25.2%; early morning session, − 22.8%), whereas, the percentage of Cichlidae fishes, mainly *Tilapia sparmanii*, increased. As for other species, the percentages for 1983 and 1993 are similar.

The amount of fish per net increased in both sessions (the evening session, +820 grams; the early morning session, +300 grams), a total of about 1.1 kg more than in 1983. The average fish production unit engaged in *ukusebeshya* fishing usually went out fishing twice a night (the evening and the early morning sessions).

As shown in Table 1, eight units out of 14 adopted the stationary gillnet fishing method of *ukusebeshya* in 1983. However in 1993, only one unit out of 9 engaged in *ukusebeshya* fishing (Table 2). Likewise, in camp Mu., just two units out of 11 engaged in *ukusebeshya* fishing (Table 4b).

Why has the number of *ukusebeshya* fishermen decreased since 1983, relative to the number of *malalikishya* fishermen? As pointed out by Imai (1986), the swamp fishermen have realized that 1.5 inches mesh sized net is the most suitable for fishing of the Mormyridae species (especially *Marcusenius macrolepidotus: mintesa*), and this is why fishermen were willing to use *ukusebeshya* fishing method and to

Table 5b. Comparison of Catches from *Malalikishya* Fishing. (1983, 1985, 1993)

(mesh size: 1.5 inches) kg(%)

	1983	1985	1993
Mormyridae	267.7 (49.6)	78.8 (49.1)	126.4 (38.1)
Cichlidae	221.6 (41.1)	64.7 (40.3)	178.0 (53.7)
Claridae	42.4 (7.9)	10.3 (6.4)	24.1 (7.3)
others	8 (1.5)	6.6 (4.1)	3.05 (1.0)
total	539.7	160.4	331.55
number of net (100 yards/net)	214	56	123.5
kg/net	2.52	2.86	2.68

Table 6a. Comparison of Catches from *Ukusebeshya Icungulo* (Evening) Fishing (1983, 1993) kg(%)

	1983	1993
Mormyridae	675.1 (58.1)	111.8 (32.9)
Cichlidae	458.9 (39.5)	216.9 (63.8)
Claridae	2.1 (0.2)	0 (0)
others	25.0 (2.2)	11.2 (3.3)
total	1,161.1	339.9
number of net (100 yard/net)	577	120
kg/net	2.01	2.83

Table 6b. Comparison of Catches from *Ukusebeshya Kumaca* (Early Morning) Fishing (1983, 1993) kg(%)

	1983	1993
Mormyridae	673.1 (79.1)	172.8 (56.3)
Cichlidae	143.1 (16.8)	112.3 (36.6)
Claridae	1.3 (0.2)	4.2 (1.4)
others	33.5 (3.9)	17.7 (5.8)
total	851.0	307.0
number of net (100 yards/net)	375	120
kg/net	2.26	2.56

catch *mintesa* fish intensively.

The *ukusebeshya* fishing requires continuous tending by the fishermen at night and it may be related to the decrease in the number of *ukusebeshya* fishermen over the ten year period. But the percentage of the Mormyridae fishes decreased in 1993. Another reason for the decline may be that these fishermen fear being attacked by crocodiles or hippopotamuses as they tend their nets. In 1993, I observed that many *ukusebeshya* fishermen returned to the camp immediately after setting their nets because of such danger, to collect their nets several hours later. This makes the *ukusebeshya* fishing is in-fact similar to *malalikishya* fishing using nets of 1.5 inches mesh size.

IV. *Mukwao* Fishing

There were only one *mukwao* fishing unit in Camp Ma. in 1983 (Table 1). While the number of production units engaging in *mukwao* fishing has not increased much by 1993 in Camp Ma (Table 1 and 2), a slight increase was observed in Camp Mu., where there were four production units out of 19 (about 21%) in 1983 (Table 4a: Ichikawa, 1985), but nine units out of 20 (45%) in 1993 (Table 4a and 4b).

Whereas the catch of Cichlidae fishes increased by 1993 (Table 7), the catch of Mormyridae fishes which accounted for more than 90% in both sessions of the

evening and the early morning fishing, decreased greatly by 1993. Although the catch of Claridae fishes differed little, that of others increased by more than 15%.

As for the total catch per day, a single unit using *mukwao* fishing, conducted twice a night, took in more than 40 kg per day, of which the average fish catches of each session (evening and early morning) was more than 20 kg. However, both production units (Nsanga A and B) took in less than 26 kg in 1993 (Table 7), half of that of 1983 (Imai, 1987). The same pattern was found in Camp Mu..

According to both interviews and observation in Camp Mu., the fishermen did not distinguish between the evening and the early morning session in a strict sense. This manner was in contrast to that of the *mukwao* fishermen whom I met in the Camp Ma. in 1983. As mentioned, while the number of the *mukwao* fishermen has increased in the study camps, the weight of catch per day has decreased greatly because the concentration of fishing fell off.

V. Summary

The characteristics of change between 1983 and 1993 can be summarized as follows:

1. *Mukombo* fishing
   (i) The number of *mukombo* fishermen decreased as a result of strict administrative control.
   (ii) The catch of Mormyridae and Claridae fishes increased.
   (iii) The amount of catch per person day varied little since 1983.

2. *Malalikishya* fishing
   (i) The ratio of Claridae fish catch increased when nets of more than 1.5 ins. mesh size were used.
   (ii) The ratio of Mormyridae fish catch decreased slightly when nets of 1.5 ins. mesh size were used, whereas that of the smaller Cichlidae fishes increased slightly.
   (iii) The amount of fish per net increased by 460 g.

3. *Ukusebeshya* fishing
   (i) The ratio of Mormyridae fishes decreased greatly in both evening and early

Table 7. Comparison of Catches from *Mukwao* Fishing. (1983, 1993) kg(%)

	1983		1993	
	icungulo	*kumaca*	*nsanga* A	*nsanga* B
Mormyridae	1,092.7 (93.6)	620.6 (90.6)	6.5 (2.1)	46.55 (15.0)
Cichlidae	57.6 (4.9)	49.4 (7.2)	254.8 (82.6)	197.15 (63.5)
Claridae	1.2 (0)	6.2 (1.0)	0 (0)	4.6 (1.5)
others	14.5 (1.2)	8.5 (1.2)	47.3 (15.3)	62.1 (20.0)
total	1,167.0	684.7	308.6	310.4
fishing days	52	33	14	12
kg/day	22.4	20.7	22.0	25.9

Note *icungulo*: evening fishing; *kumaca*: early morning fishing *nsanga*; fishing unit.

morning fishing sessions.
(ii) The amount of fish per net increased by more than 1 kg.
(iii) The number of *ukusebeshya* fishermen decreased in the swamps.

4. *Mukwao* fishing
(i) The ratio of Mormyridae fish catch decreased greatly in night fishing.
(ii) The efforts of fishing per day decreased and the average amount decreased by one-half.
(iii) The number of the *mukwao* fishermen increased.

CHANGE IN FISH TRADE

I. General Conditions

In the 1993 field research, I found several different systems of fish trade from that in the swamps in 1983. After comparing the trading situation in 1983 with that in 1993, I will discuss how the fishermen and traders interact in the market economy. The fish trading system confirmed in 1985 can be summarized as follows (Imai, 1985):

(1) Traders from the Copperbelt Province visited the fishing camps to buy fish with cash, which they then transported to the fish market in the Copperbelt cities.
(2) Traders who come from the villages on the lake shore or the river bank went around the fishing camps in the swamps carrying daily necessities with which to barter for fish. They then sold the fish to the traders from the Copperbelt cities in the local markets such as Samfya, Katanshya or Cinsanka.
(3) There were some fishermen who transport and sell fish directly at the market in Cinsanka or in Copperbelt.

Cash transactions could be observed frequently in the swamps in both 1983 and 1985. As reported in, Cooperatives in the area fixed the price for fish per kilogram (3 Zambian Kwacha), and people observed the price in their economic transactions (Imai, 1985). Thus even the less organized fishermen in the swamps were protected to a certain degree from the pressure of supply-and-demand based economic circulation (Imai, 1986).

However, fish in the swamps fluctuate with the annual rise and fall of water level, distribution of foods and the condition of breeding habitats (Brelsford, 1946.). Therefore, species and amount of fish catch fluctuate seasonally. Although traders come to purchase highly marketable fishes, ultimately they also purchase other kinds of fish at the fixed price when the target fish is scarce. In essence, fishermen were able to sell any species of fish at a fixed price regardless of the price in the market. Moreover, the fishermen did not need to target a particular fish for catch, thus reducing competition among fishermen. As a result of those conditions, the fish resources in the swamps were well-allocated to multiple fishing units (Imai, 1991).

Since the mid 1980's, inflation has continued in Zambia, and the price of fish per kg has risen. The cooperative society had purchased fish for 50 to 60 Zambian Kwacha per kg (Imai, 1995), but the fishermen refused to sell fish at this fixed price and the price increased. The rate of inflation was so rapid that the fixed price was unsuitable for maintaining people's livelihood.

The inflation has continued. In 1993, the fishermen's cooperative society no longer was able to fix the price per kg, and most of the fish trading in the swamps used barter. A chairman of a cooperative society in Samfya said people traded fish individually, so that fish prices had diversified.

In 1993, a bag of dried fish (about 25 kg) was sold at 8,000 Zambian Kwacha at Camp Ma., which means that fish price per kilogram was about 320 Zambian Kwacha (about $0.8; at US$1.00＝400ZK.). The fish price had declined 32% over the ten-year period. (The fish price per kilogram was $1.50 in 1990, whereas it was $2.50 in 1983 (Imai, 1995).)

The 1983 exchange rate of between the two currencies may not have been set properly, or the inflation may have been too rapid to catch up, so that the price of fish might be kept at the lower level. In the following section, I describe the barter trade adopted in the Bangweulu Swamps based on observations and interviews at Camps Ma. and Mu.

II. Barter Trade System

As shown in Table 8, there were more female traders than male traders in the swamps. Many of the female traders were housewives or widows who resided in the cities in the Copperbelt Province. Their husbands, brothers or fathers worked at companies, public offices or retail stores in the city. However, there were also several female traders who were living in the local towns or villages, such as Mansa, Samfya and so on. Their ages varied widely, from 20's to 50's. I met several women who made trading rounds in the swamps with small babies or infants.

These traders first collect commodity goods in the Copperbelt cities or nearby towns to trade for fish, transport them to the relay villages located along the western shore of the swamps, such as Cinsanka, Katanshya, Mukuku or Yongolo.

These female traders rent a boat, generally called *banana boat*, employed one or two paddlers, and made trading rounds to the fishing camps in the swamps (Imai, 1985).

According to my survey, several owners of banana boats anchor at ports in the relay villages to specifically serve these fish traders. However, I have never confirmed the exact number of trading boats in the swamp area. A photograph of a female trader whom I met at a study camp is shown in Figure 3. The rental fee for a boat is K10,000 and a paddler usually gets a salary of about K10,000. The fare for the swamps is higher than that from the swamps generally, although it varies slightly according to the load.

Fish are usually sold on credit in the swamps. Traders first go around to the fishing camps for about a week by boat, loaded with the exchange goods. When a trader arrives at a camp, she or he begins to negotiate with the fishermen for purchasing fish. After they agree to the amount of fish, the trader leaves the agreed upon goods

Table 8. Number of Fish Traders confirmed in Camp Mu. (1993)

	date	male	female	type of trade
1	Oct. 6	1	0	barter
2		0	2	barter
3	17	0	1	barter > cash
4		0	2	cash > barter
5		2	0	?
6	19	1	0	?
7	21	1	0	barter
8	22	1	1	barter
9		?	?	barter
10		0	2	barter > cash
11	23	0	1	barter
12		2	0	barter > cash
13		2	0	barter > cash
14	24	0	2	?
15	26	0	1	barter
16		2	0	barter
17	27	0	2	barter
18	28	1	1	barter
19		1	0	barter
20		0	1	barter
21	29	2	0	barter > cash
22		0	1	barter
23	30	1	0	barter > cash
24		0	1	barter
25		1	1	barter
26		0	1	barter > cash
27		0	2	?
total		18	22	

with the fishermen, and leaves the camp to visit the next camp.

Frequently, I saw several traders who took notes of the name of the fisherman with whom they traded, the name of the fishing camp and the amount of fish the trader would receive. Traders usually used the hut of a fisherman for the night, but, some put up mosquito netting and sleep outside. Traders return to the fishing camps after 10 to 14 days and receive fish from their counterparts. The respective list of items traded for fish differs from trader to trader. Table 9 lists the diverse items I observed in 1993. I saw some female traders knit a wool sweater or a cap for children on boat during their journey through the swamps. Interestinglty, even the *kapenta* fish (*Microthrissa stappersii*) from the Lake Tanganyika or *cisense* fish (*Poecilothrissa moeruensis*) from the Lake Mweru are brought to the swamps for exchange with other fishes.

The popular commodities among the fishermen for trade are necessities, and also unavailable in the region. Therefore, the fishermen always expect the traders to provide these items. The traders can get fish at lower prices in the swamps than in the other areas, and so they readily meet the demands of the fishermen. The fishermen save labour by not having to go shopping to the relay villages, and they do not need cash.

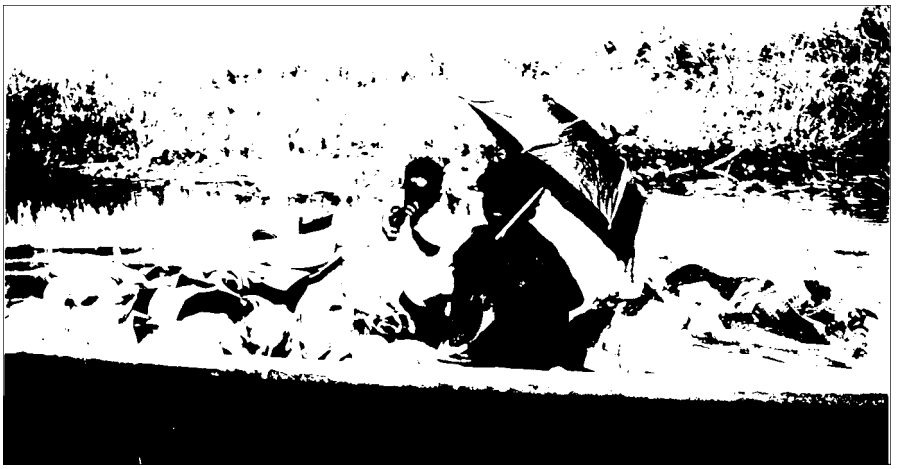

Fig. 3. Female Trader.

DISCUSSION

Mulongo (1991) and Gould (1989) have analysed the historical and economic stagnation in the Bangweulu region. Details of a WWF-Denmark development project have been examined with respect to the outlines identified in field research by Ichikawa (1985, 1994, 1995) and Imai (1985, 1986, 1987, 1991, 1995). I will discuss how the behaviour of the fishermen and natural resources in the area will be affected by such a regional development project.

Mulongo (1991) pointed out that the natural resources of the region were substantially depleted by the late 1950's. This economic decline was caused by unrestricted exploitation and increasing human population concentration. He argued that the introduction of wage labour and over-use of natural resources resulted in over-population in this area, due to the influence of colonial rule and western capitalism which has penetrated since the 1880's. Therefore, the roots of rural impoverishment was traced to the onset of colonial rule.

Gould (1989), in his classic work on Luapula, examined the foundation of the rural Zambian economy in the 1990's. He described how the Luapula area, includ-

Table 9. List of Articles Used for Barter. (1993)

foods	cassava, maize powder, sweet potato, biscuit, salt, canned beer, *cisense* (dried small fish)
secondhand cloths	trousers, shirt, blouse, under wear
daily necessities	soup, pot, enameled dish, cloth bag, padlock, mosquito net, match box, running shoes, radio cassette tape recorder
fishing utensils	fishing net, hook, needle, oar
others	firewood, paraffin oil, cigarette

ing the Bangweulu, changed to provide manpower to the Copperbelt area from the colonial era and remained an "under-development" area even after the independence of Zambia. Although a gradual decrease in fish catch was noted in the Bangweulu swamps during the period from 1950 to 1970, it has shown no further decline during the 1980's. Gould said that the harvest levels corresponded to those of the 1960's and early 1970's, but that there was no review of the impact of intensive infrustructure the fishery developments on the ecology nor the economy of the area. From catch records of fish provided by the Bangweulu Fishery Bureau in Samfya, no notable difference was seen between the 1970's and 1980's (Imai, 1985, 1995).

As described in the previous pages, the amount of fish per fishing effort increased, as based on the catch records of 1983 and 1993. In addition, the number of *mukombo* fishermen has decreased sharply due to the strict regulation of *mukombo* fishing, and the fishing effort per day has been cut by half in the *mukwao* fishing at night. Therefore, it seems that the amount of overall catch has been maintained during the period from the 1980's to the early 1990's as a result of a simultaneous increase and decrease of catch in the Bangweulu region.

The Zambian government promulgated a fish resource preservation policy in 1988. (Imai, 1995). All fishing and fish purchasing activities are prohibited each year from December 1st to February 28th. Although I have not confirmed this at the Bangweulu Research Unit in Samfya, the amount of dried fish passing through the Katanshya check post has decreased by one-half since 1990, according to records kept by the fisheries office of Chilanga in 1994 (Fig. 4). While I highly regard the fishing ban for preserving the fish resources in the area, the ultimate outcome of the policy has not yet been properly confirmed. It is necessary to examine how the fishing ban has affected fishing activity and fish catch in the area.

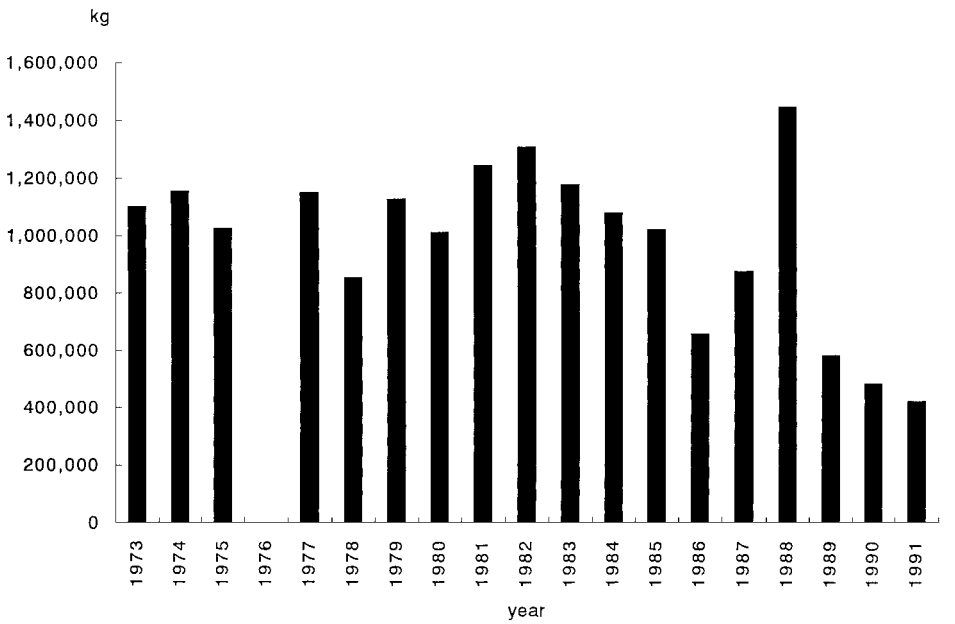

Fig. 4. Amount of dry fish transported through Katanshya check post (1976: no data)

As Mulongo (1991) and Gould (1989) pointed out, although the Mweru-Luapula region is rich in fisheries resources, it has been left behind from economic, political and administrative development introduced through modern production systems in other areas for example, Lusaka and the Copperbelt cities, since the colonial era. In contrast to other areas, Mweru-Luapula is reconciled to be a politico-economic peripheral area in Zambia.

In Zambia, an unique project has been established by WWF-Denmark, to conserve the wetlands in Zambia through protection of and cooperation with local communities. The project is known as the "wetlands project," entailing conservation and management of the Kafue Flats and the Bangweulu Basins. The fundamental approach of the project is as follows:

> The natural environment of the wetlands must be conserved to the degree that it deserves biological praise, that is to say, with an abundance of species, and which forms the basis of the people's livelihood. The project has been established to achieve sustainable use of the Bangweulu Swamps together with community development. According to the project proposal (1991), the pilot phase (duration 2.5 years) attempts to establish the basis for longer term activities. The pilot phase intends to intensify the local people's power of decision and traffic systems in the swamps (WWF-Denmark, 1991).

Although I agree with the basic idea of the project regarding conservation of natural resources, from my research experience in this area, I cannot help but express doubts regarding its recognition of the present situation of nature and the fishermen's life.

First of all, the proposal asserts that the people in the area, especially the Unga, are poor by any standards, so that poverty and the lack of external support has led to bad resource management in the swamps. Although the swamps are utilized by a large number of migrant fishermen, such as the N'gumbo, the Mukulu and the Bisa, who live around the periphery of the swamps and the adjacent lakes, the primary target groups of the project are restricted to the permanent inhabitants of the Unga and some people of the Kabende.

I doubt whether the authors of the proposal have really grasped the situation in the area. Fishermen of the Bangweulu Swamps have played their part in the fish circulation of the Copperbelt market since the colonial era, in cash economy and barter (Brelsford, 1946). I have confirmed that the fishermen are in good health and the people blessed with a wealthier life style than other rural villagers in Zambia who do not engage in fishing (Imai, 1985, 1987). A sophisticated system of economic and ecological co-existence has been maintained among the several ethnic groups in the swamps (Imai, 1985; Ichikawa, 1985). It is difficult to say that any administrative organ can carry out a plan of wildlife conservation and improvement of living conditions if they neglect the reality of the natural environment and the people's living situation.

The poverty and lack of external support have not led to bad resource management in the Bangweulu Swamps. The fishermen have skillfully produced a unique system through which the fish resources can be sustainably used (Imai, 1995). As Ichikawa (1995) asserted, we should carefully re-evaluate the system of indigenous

resource use for conservation of the swamps. If an administrative organ or committee preaches the use of natural resources without any knowledge of traditional use, it cannot succeed. It would be better to learn the indigenous way of using natural resources from the inhabitants themselves, those who fully understand the environment and have wisely used the resources. The purpose of the wetlands project will become fully embraced only when all the people who have a stake in the Bangweulu Swamps participate, such as the fishermen of various ethnic groups, fish traders and administrative organs.

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