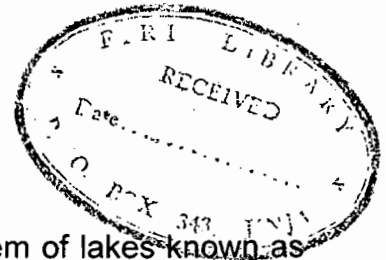


The fisheries diversity of Lake Mburo with reference to Lake Kachera and some other Ankole minor lakes.

A paper presented at a meeting for co-ordinating and harmonising fisheries activities on L. Mburo at Lake View Hotel, Mbarara 29/8/2002.

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Introduction

Lakes Mburo and Kachera are part of the complex system of lakes known as the Koki lakes. These lakes form part of the Victoria satellite lakes. The Koki lakes are separated by extended swamps. The fisheries of these lakes are important as they contribute to government efforts of increasing food security, poverty reduction and conservation of natural resource base.

These lakes are important biodiversity areas because some of these lakes have been found to contain the native tilapiine *Oreochromis esculentus* (Ngege), absent or threatened with extinction in the main lakes Victoria and Kyoga. It's also important to note that this species is only unique to the Victoria and Kyoga lake basins (Graham, 1929, Worthington, 1929). The values of some of these lake fisheries are however, threatened by human activities such as over exploitation, introduction of exotics especially water hyacinth which is already present in River Ruizi, habitat degradation among others.

Geographical setting of the lakes

Lake Mburo

Lake Mburo is located in Mbarara district in lake Mburo National park - LMNP (created in 1982). The lake is about 230 km west of Kampala city. It has a maximum length of about 6km, width of 3km, depth of 3m and total surface area of 10.4km². The size and shape however, vary from time to time due to movement of the floating islands. Papyrus swamps surround the lake and

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through the swamps, River Ruizi empties its waters into this lake (Fig.1). In 1983, the lake was gazetted as a national park and there after, fishing was restricted to a single landing site presently situated at Rubale camp. This camp is however, viewed as a temporary fishing assemblage established in order to monitor and control fishing activities.

Despite the size of the lake, about 100 or so people reside in the camp (Emerton, 1999) and about 50% of these derive their livelihood from fish and other fish related activities.

The lake supports a commercial fishery, which is controlled and regulated by the park authorities. There is some degree of liaison between the people of the fishing camp and the park authorities and this creates law and order as regards fishing activities. The fishers seem to be aware that they are exploiting a resource, which belongs to the park and know that any form of mismanagement would result in their eviction.

In 1994, 51 canoes operated on this lake from Rwonyo camp and used, on average 6 nets per canoe in active fishing and about 13 nets per canoe in passive fishing (Kamanyi, 1996). Gill nets were of mainly 76.2mm mesh size targeting the *Tilapia spp.* and 25.4mm mesh size for haplochromines. Long line fishery used hook sizes of 8 or 9 and on average 250 hooks per canoe. There was some basket trap fishing. The major fishing tribes in order of importance were the Banyankole, Baganda and Bakiga. In 1997, there were 32 canoes operating at Rubale landing site and generated a catch of about 300 tonnes equivalent to Uganda shilling 108 million compared to 50.8 million in 1994 (Hulme 1997) or an average of nearly 3.5million per canoe (Emerton, 1999). The *Tilapia spp.*, *Protopterus aethiopicus*, *Clarias gariepinus* and *Haplochromines* contributed i.e. 52%, 19%, 13% and 15% of the total value respectively for the total catch of 1997. However, the fish landing population also generates revenue for the LMNP authorities through various fees and levies paid by fishers, boat owners and fish processors.

Lake Kachera

The lake has a total surface area of 36.3km² and a maximum depth of 4.1m. It has a maximum length of 20km and width of 3.5km. Due to presence of small floating islands, the size and shape of the lake varies from time to time. The shoreline is fringed with papyrus, forest, Phragmites and scattered banana plantations. Unlike Lake Mbuho, Lake Kachera is shared by Mbarara and Rakai districts and borders Lake Mbuho national park (Fig. 1)

The human population surrounding the lake are either cattle keepers or cultivators or both. The fishery was exploited using 76.2 to 101.6mm mesh size of nets and 38.1mm (Kamanyi 1996). The larger mesh sizes targeted the *tilapiines* and smaller mesh sizes targeted the haplochromines (Nkejje). Hooks (average of 300 per boat) of size 9 targeted *P. aethiopicus* and *C.gariepinus*.

In 2001, an arrangement was reached between the two districts to reduce the fishing boats on the lake and shared 300 boats between the six landings (3 landings for each district).

The other Ankole minor lakes

Ankole, before it was divided consisted of present Mbarara, Ntungamo, Bushenyi and possibly part of Kamwenge districts. Of these districts, Bushenyi has numerous minor lakes scattered within Bunyaruguru the number of which is not well known. However, a survey carried out between 1992 and 1994 on impact of fishing gears and methods and socio-economics of fishing communities on Lakes Nyabihoko (Ntungamo district), Rwijongo, Mafuro and Kibwera in Bushenyi district (Kamanyi, 1996) will be briefly presented.

Lake Nyabihoko

The lake is about 2.5m deep, had 30 fishing canoes operating from one landing (Kasinga) with an average of 4 gillnets of 3.5-4.0 inch mesh size

targeting *Tilapia* and *Clarias sp.* Hooks of size 9 (average, 40 per canoe) and basket traps targeted *Clarias spp.* The common carp and *O. niloticus* were introduced in the 1950s, but the carp failed to survive. Other unexploited fish species included the haplochromines, *Barbus sp* and *Mastacembelus sp.*

Lakes Rwijongo, Mafuro and Kibwera

Lakes Rwijongo and Mafuro are crater lakes found in Bunyaruguru (Bushenyi district). The fisheries were mainly for subsistence though small size fish caught are on high demand. On L. Mafuro rafts made out of banana stems were being used. L. Kibwera is yet another crater Lake within the game reserve adjacent to Queen Elizabeth National Park (Rwenzori park) and was being managed by Zwillig safaris. On L. Rwijongo the major fishery was *O. niloticus*, on L. Mafuro was *O. niloticus*, *O. leucostictus* and Haplochromines while on L. Kibwera was *O. niloticus* and *C. gariepinus*.

Fish species composition (% fresh weight) recorded from lakes Mbuho and Kachera (2001/2002)

Five fish species were recorded in commercial catches excluding the haplochromines (Table 1). In experimental catches, 10 species (L. Mbuho) and 9 species (L. Kachera) were recorded (Table 2). Four and three species of the haplochromines were identified on lakes Mbuho and Kachera respectively. It's always not easy to identify juveniles haplochromines. The small haplochromines in the tables 1 and 2 are likely to be the young of either *A. aneocolor* and *H. squamipinus*.

Table 1. Percentage composition (fresh weight) of fishes recorded in commercial catches from lakes Mbuoro and Kachera 2001/2002

Fish species	Mbuoro	Kachera
<i>Clarias gariepinus</i>	4.97	14.69
<i>Oreochromis esculentus</i>	82.81	26.39
<i>Oreochromis leucostictus</i>	3.70	6.55
<i>Oreochromis niloticus</i>	1.83	19.35
<i>Protopterus aethiopicus</i>	6.66	31.84
Haplochromines	0.40	1.18

Table 2. Percentage catch composition (fresh weight) of fishes recorded in experimental gillnet catches from lakes Mbuoro and Kachera 2001 and 2002.

Fish species	Mbuoro	Kachera
<i>Astatoreochromis alluaudii</i>	1.19	0.22
<i>Astatotilapia aneocolor</i>	3.52	3.52
<i>Astatotilapia nubila</i>	0.02	
<i>Harpagochromis squamipinus</i>	11.34	3.87
Small haplochromines (unidentified)	3.64	5.04
<i>Clarias gariepinus</i>	20.84	26.67
<i>Clarias liocephalus</i>	0.01	1.14
<i>Oreochromis esculentus</i>	12.50	3.46
<i>Oreochromis leucostictus</i>	1.05	10.31
<i>Oreochromis niloticus</i>	7.91	8.26
<i>Protopterus aethiopicus</i>	37.96	37.45

Impact of human exploitation on fish species diversity

From Tables 1 and 2 above, it's clear that almost all the fish species present in these lakes are exploited and this calls for sustainable utilization of the resources to avoid depletion of the stocks. In commercial catches five major

fish species were recorded dominated by (% total fresh weight) *O. esculentus* (82%) on Lake Mburo and *P. aethiopicus* (31.8%) on Lake Kachera. The sixth group composed of the smaller fishes, the haplochromines on both lakes. From experimental catches, *Protopterus aethiopicus* and *Clarias gariepinus* dominated (% total fresh weight) on both Lakes (Table 2). While *O. esculentus* had a higher percentage of 12.5% on L. Mburo, on L. Kachera it was *O. leucostictus* that dominated (10.3%) among the tilapiines.

Lakes Mburo, Kachera, Kijanebalola and Nakivali form a more or less continuous system containing similar species and same mechanism of exploitation. Observation showed that all lakes contain *O. esculentus*, *O. niloticus*, *Protopterus aethiopicus*, *Clarias gariepinus* and haplochromines as the major commercial fisheries. During the survey of 1992-1994, 66% of the major haplochromines (*H. squamipinus* and *A. aneocolor*) on Kachera and Mburo caught by the 1.2" (30.5mm) mesh size of gill nets were mature. The 76.2mm (3") harvested 95% of mature *O. esculentus* on both lakes (Fig. 2). However, basket traps targeted young *C. gariepinus* and hook fishing was seasonal but more active in rainy seasons targeting *C. gariepinus* and *P. aethiopicus*.

The other minor lakes

On L. Nyabihoko, the gill net mesh sizes of 88.9mm (3.5") harvested 94% of mature specimens of *O. niloticus* and all *C. gariepinus* were mature above 36cm total length (Fig. 3) with an average weight of 200g (mean total length 21.5cm) and 600g (mean total length 43.3cm) respectively. The haplochromines and *Barbus sp.* could not be harvested by the commercial mesh size in use then, as the fish are generally very small.

On L. Rwijongo gill net mesh size of 63.5mm(2.5") to 76.2mm (3") were fished passively using, on average, 10 nets per canoe. The *O. niloticus* harvest from the 63.5mm mesh size of gill nets were all above 14cm total length (size at first maturity) and all the fish were mature at 17cm total length (Fig. 4) with a mean weight of 80g and mean total length of 15.5cm. The

50.8mm mesh size of nets cropped about 80% of the *O. niloticus* below size at first maturity (Fig. 4.)

On L. Mafuro, *O. niloticus*, *O. leucostictus* and haplochromines were generally not fished. Attempts to fish, gill nets of 63.5 and 76.2mm were used. Some few fishers targeted *C. carsoni* (Nsonzi). Simple angling using hooks of size 12 caught *O. niloticus*. The common carp introduced in 1970 never survived. Annual fish kills were reported due to high temperatures. The production from the lake is below subsistence level.

On L. Kibwera, in theory the lake was not commercially exploited except by the zwilling safari guests or staff. Only one canoe was seen on the lake. It was reported that if there was fishing, then the 114.3mm mesh size targeted *O. niloticus* and hook size number 9 targeted *C. gariepinus*. *O. niloticus* and *C. gariepinus* of 600g and 3000g respectively were reported as being harvested then. This could be a lake with important fishery.

Recommendations

- Hook fishing (size 9) for *P. aethiopicus* and *C. gariepinus* should be encouraged on lakes Mbuho, Kachera and Kibwera.
- Haplochromine exploitation using gill net mesh size of 1.5" (38.1 mm), set passively, at a distance not less than 100 m from the shoreline should be encouraged.
- The gill net mesh size of nets set passively targeting the *tilapiines* should not be allowed to go below 3.5" (88.9 mm) on lakes Mbuho, Kachera and Nyabihoko. Use of gill net mesh size of not less than 3" (76.2 mm) and 4.5" (114.3 mm) on lakes Rwijongo and Kibwera respectively should be encouraged.
- The swamps surrounding some of these lakes should be left intact to prevent entry of exotics and conserve fish species absent or threatened with extinction in the main lakes.
- More detailed studies are required in the over 160 minor lakes in Uganda to understand the status of fish species diversity.

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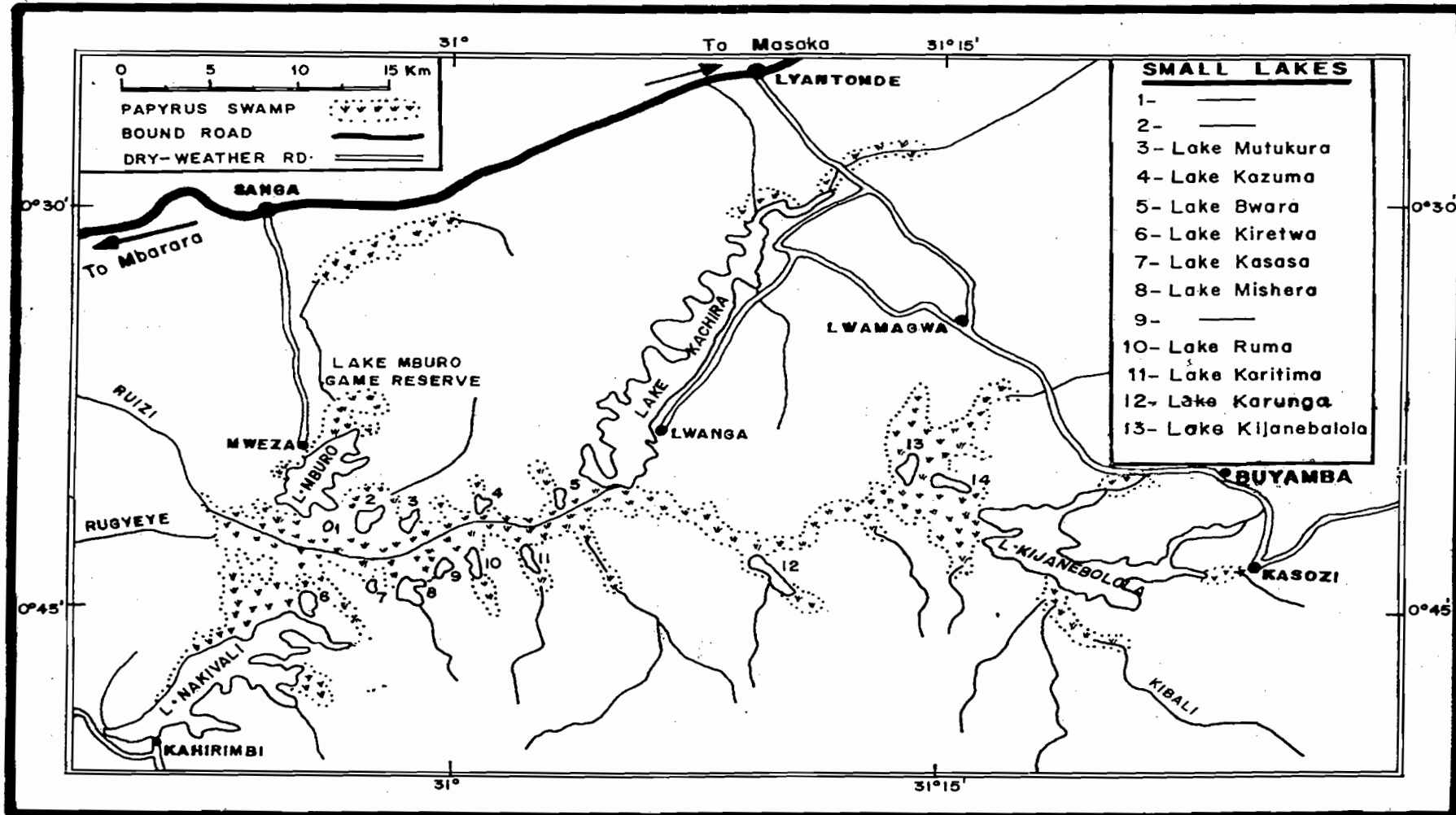


Fig 1 A Map showing lakes Mbuoro, Kachera and other associated Koki lakes

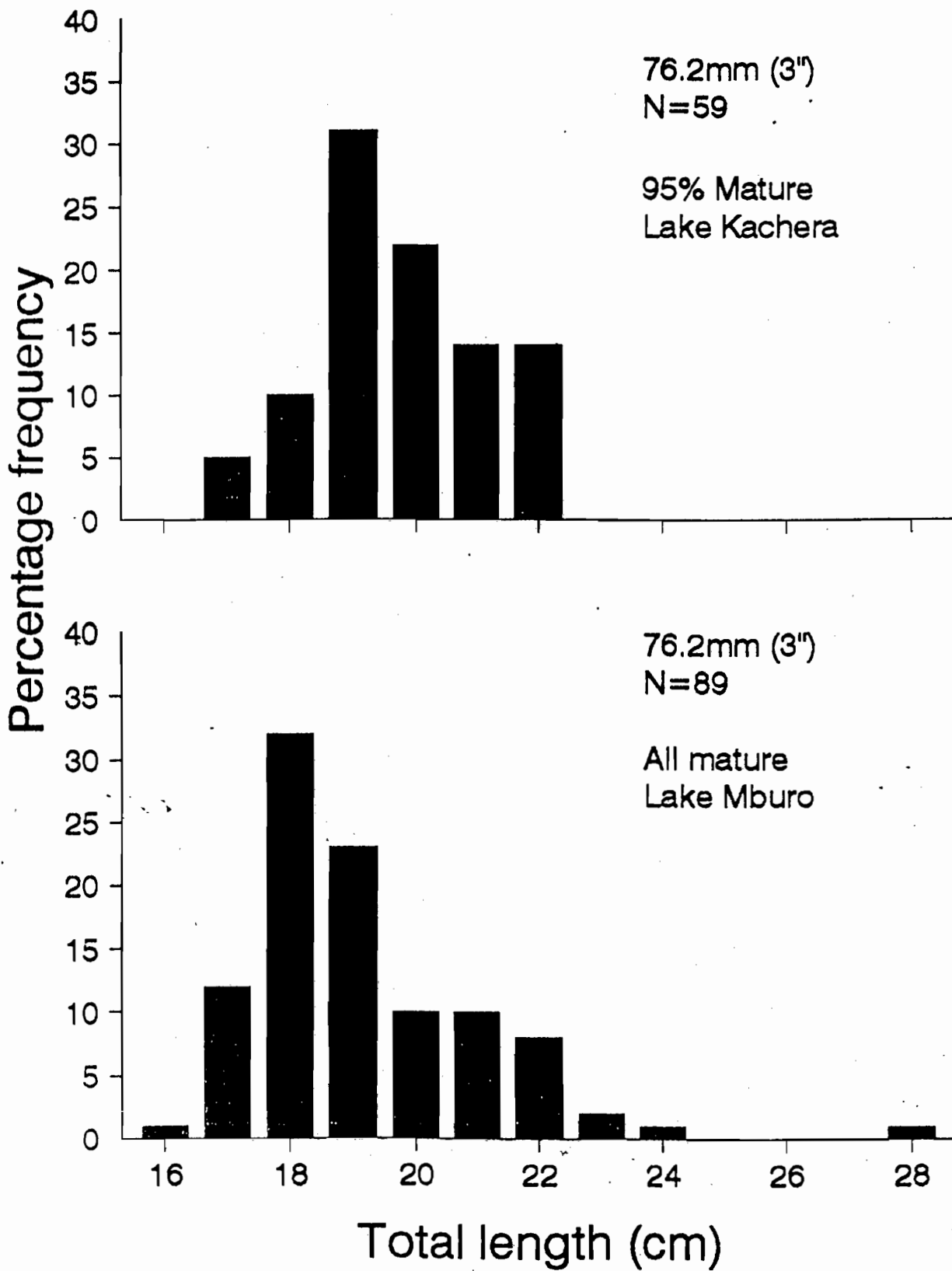


Fig.2 Size distribution of *Oreochromis esculentus* caught by the 70.2 mm mesh size gillnets on Lakes Kachera and Mburo (sexes combined).

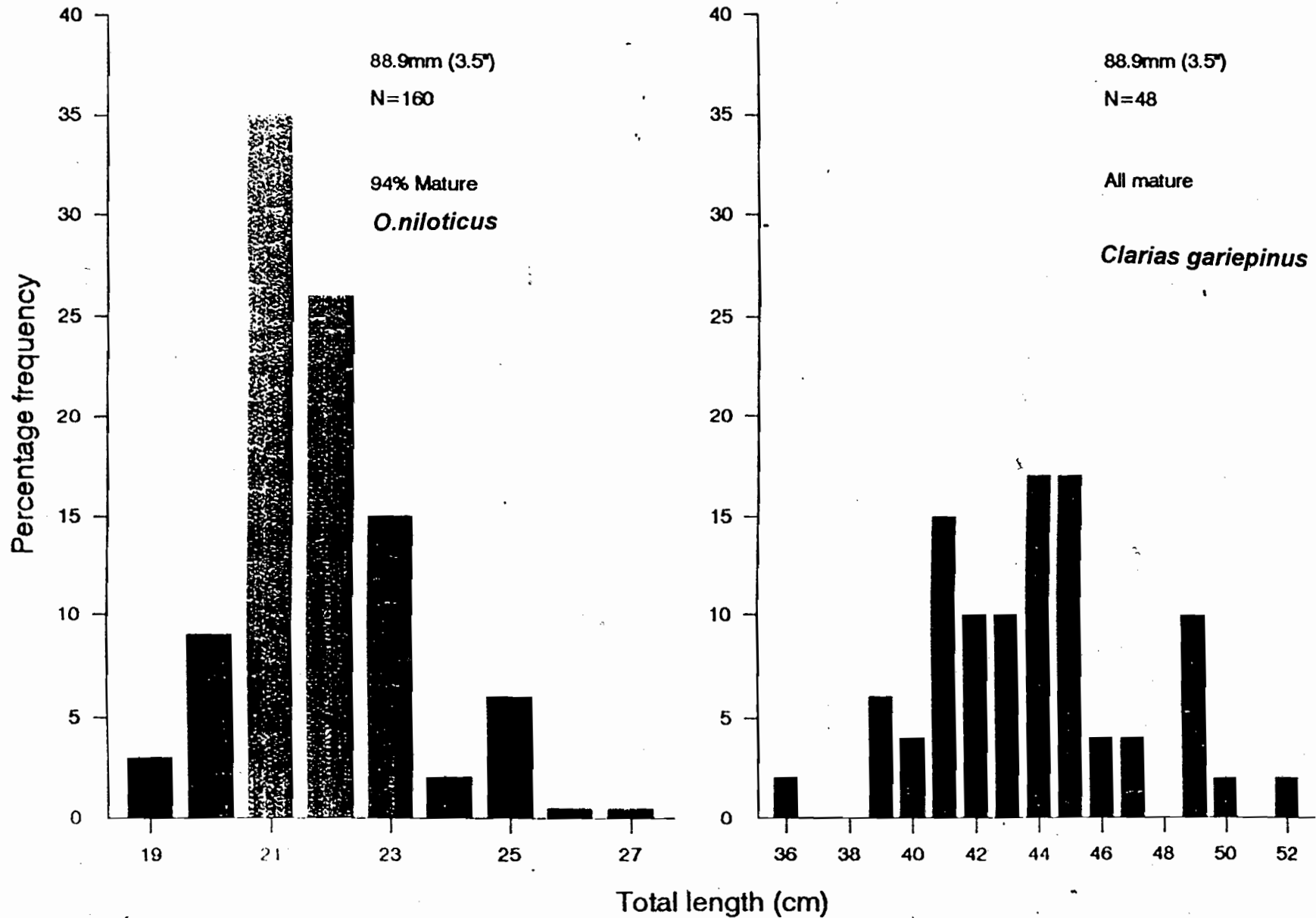


Fig.3 The size distribution of *Oreochromis niloticus* and *Clarias gariepinus* caught in the 88.9 mm gillnet mesh sizes fished passively on Lake Nyabihoko (sexes combined).

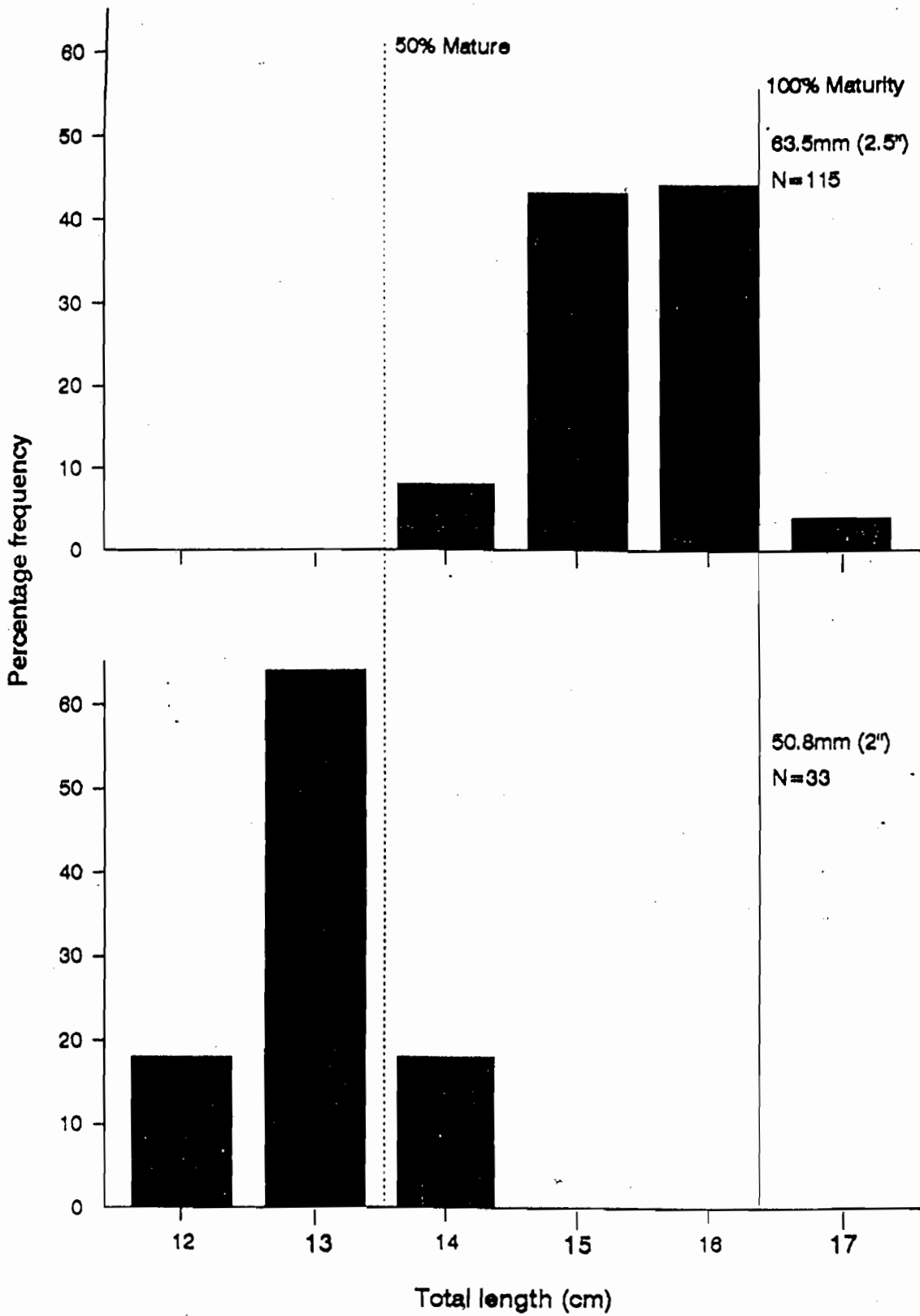


Fig.4 Length frequency distribution of *Oreochromis niloticus* from two different gillnet mesh sizes fished passively on Lake Rwijongo (sexes combined).