FISH EXPLOITATION AND CHANGES IN THE FISH COMMUNITY OF LAKE GEORGE- UGANDA

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ABSTRACT

Unlike Lake Victoria, the fisheries of Lake George have undergone gradual changes in the size and proportion of the major commercial fish species, the Nile tilapia (Oreochromis niloticus: cichlidae) in the last 40 years (1950-1989). The size decreased from an average weight of 900g in 1950 to 430g in 1989 while percentage contribution in commercial catches during the same period declined from 92% to 36%. The over all annual commercial catches though showed a steady increase from the period 1950 when the fishery was opened to intensive and controlled exploitation, consistently high catches were observed in the 1960s and 1970s followed by a general decline in the early 1980s to amore or less stable fishery in the late 1980s.

These changes are attributed to increased fishing pressure especially on the nil tilapia and to increased use of smaller gill net mesh sizes lower than the recommended 127mm mesh. The changes in gill net mesh have brought O. leucostictus, acichlid, into commercial catches confirming that the 88.9mm mesh size nets are used by the commercial fishermen to harvest smaller fish species.

The commercial catches are presently dominated by the piscivorous fishes, (over 60%) whose contribution was less than 10% during initial exploitation of the virgin fishery in 1950.The piscivorous fish are mainly caught using hooks and lines .The entire fishery is believed to be exploited close to the maximum. The above trends serve to show the impact of exploitation on fish species diversity. Quantitive and qualitative changes of the major fish species on l. George are due to exploitation pressure unlike Lake Victoria where it is a combination of both exploitations and impact of fish introductions. There has been no fish introduction in Lake George.

INTRODUCTION

Lake George (fig. 1) is a shallow (mean depth 2.5m), small (250 km2), but highly productive tropical lake situated in western Uganda at an altitude of 914m. It is a component of the lakes that lie in the western limb of the African rift valley. The major outflow is the 30km long kazinga channel which flow into Lake Edward. Several rivers draining from the Rwenzori Mountains and adjacent areas also empty their waters into the lakes or adjacent swamps. The lake bottom is mainly muddy and papyrus swampy areas surround most of the lake. The water has a high density of phytoplankton dominated by the blue-green algae of genus microcystis which form the major food component of the herbivorous fish. The fishery is dominated by the cichlid species, twenty one so far have been reported (Gwahaba 1973. Of these, the most commercially important species is the Nile tilapia (oreochromis nilotics, cichlidae) and the related. (O. leucostictus, cichlidae) is just of secondary importance.

Unlike Lake Victoria, there is no tilapia zilli and O. esculentus (cichlidae). The nkejje (Haplochromis species complex, cichlidae) dominate in number and species but are not fished except when needed for bait by hook and line fisherman. The major non cichlid species include the cat fishes (bagrus docmac: bagridae) and male mudfish (clarias lazera: claridae), the lungfish (protopterus aethiopicus:lepidosirenidae), Elephant snout fish – kasulubana (mormyrus kannume:mormyridae) and the rare ningu (labeo forskalii: cyprinidae). The fishery has been observed during experimental studies using various gears, gear sizes, fishing practices and analysis of commercial catches on the lake.

FISHERY EXPLOITATION

Although the numbers of canoes, fishermen and gear quantity were not exactly known, very few fishermen operated on the lake from tiny canoes in the early 1930s. The fishery was exclusively for subsistence and fishing was carried out using locally constructed gears which included hand-baskets, non-return trap and very few gill nets (Dunn 1989).By 1950, The Uganda fish marketing African corporation (TUFMAC) was established on the lake. The lake was then opened to intensive gill net and hook and line exploitation but under controlled fishing regulations. the gillnet mesh sizes were restricted fishing to 127mm stretched mesh and 10 gillnet nets per small canoe, hooks to no.7 and 100 hooks per canoe. Only licenced canoes were allowed to fish. However, no detailed statistics of the effort are known, but few fishermen operated on the lake and their target was toward old and large fish of the population, especially the Nile tilapia.

Presently, the fishery is exploited from yet small, planked and non –moorized canoes using modern synthetic gill nets ranging from 101.6 mm to 127,0mm stretched mesh, papyrus stalks act as floats, and stones as sinkers. The fishermen's target is on the nil tilapia, catfishes and lungfish. Poachers however, use mesh sizes lower than 101.6mm. Hooks in use range from no.7 to no.9 and harvest large sized lungfish and catfishes. Occasionally, basket traps are used. Fishing activity is both day and night and since the lake is very shallow, fleets of nets are effectively set top to make 52 meshes. Many fishermen fish actively by setting 3 nets mostly the 101.6mm and 114.3mm stretched mesh in an arc and beating the water to drive the fish into stationary nets. This is the most popular method as the catches are higher from the few nets. It is an illegal technique as catches include immature Nile tilapia.

EFFORT

The lake has numerous poachers and it is difficult to establish the exact effort. The official licenced canoes operating on the lake do not reflect a true picture and neither the numbers of gears and sizes the fishermen come with at the landing. The fact

however, remains that since the fishery was opened to intensive exploitation in 1950, when few canoes with at least 10 gillnets or 100 hooks per canoe operated on the lake, the trend has been changing. Fry and kimsey (1960) estimated the rise in gill nets set per night from 50 to 1400 between 1950 and 1969. The minimum aerial canoe count carried out during 1968and 1969 revealed 130 and 136 canoes respectively (Dunn 1972), these excluded those hidden in papyrus swamps or sunk by the poachers. Yet, 495 canoes were counted in March 1989 (Dunn 1989) and out of the count, only 144 were supposed to be licenced, leaving 71% as the poaching or inactive canoes. The average number of gill nets and hooks per canoe as estimated between 1988 and 1989 (personal observation), FAO/UNDP 1989 (unpublished reports) range from 13to 30 for gillnets and 550 for hooks.

Presently, the observed mean catch from the 114.3mm and 127mm combined meshes is 60 kg per canoe per night and 3.3kg per net night. But when meshes were considered separately, slightly higher catches were observed in the lower mesh size gill nets. The Present average hook catches are higher than gill net catches (90 kg per canoe per night and 0.2 kg hook per night). Dunn 1972,reported an average catch of 96.8 kg per canoe per night for the year 1969 from a mixture of 101.6mm and 114.3mm stretched mesh size gill nets fished actively.

QUANTITATIVE AND QUALITATIVE CHANGES IN THE FISHERY

QUANTITATIVE CHANGES

The establishments of **TUFMAC** on Lake George in 1950 as the only monopoly for the processing of the fish from the lake made it possible for the Uganda Fisheries Department (UFD) to collect regular fish catch statistics for several years. Some of this data has been used in this paper. The landing records in the first ten year s from 1950-1959 were less constant (Fig. 2).

Sudden increases in the 1960s and 1970s were in the average of 3450mt to 451mt and were consistently high especially in the early 1960s when annual catches were between 4000mt to 50000mt However, during the same period, the average size of the then major commercial fish specie, the Nile tilapia was on the decline. In the early1980s there was steady decline in the quantities of fish landed to a minimum of 1989mt in 1985 (Table1). This period coincided with the closure of TUFMAC in 1985 and a war situation lasting from about 1979 to 1985. A steady increase was however registered between 1985 and 1989. The annual total fresh weight of fish landed between 1987 and 1989 were low though relatively constant at an average of 2650mt.

QUALITATIVE CHANGES

Two major Qualitative changes have occurred in the lake fish community namely; the Nile tilapia average size and proportion in commercial catches and the increase in proportion of the other commercial species in the catches.

Nile tilapia average size cover a period of 10 years declined from 900g in 195 0 to 6000g in 1959 after which the size remained fairly constant at an average of 700g as the period constituted a stable fishery between 1960 and 1965.

From 1965 the size continued to decline. In 1989 the average size of Nile tilapia was 430g (fig.3) based on commercial fish specimens analyzed from the 114.3mm mesh size nets.

At the time the fishery was opened to intensive exploitation in 1950, Nile tilapia constituted 92% by weight of the annual commercial landings. By 1954 the proportion was 84%.However, in the subsequent 15 years, the contribution of Nile tilapia was fairly constant ranging from 68% to 79%. The average contribution in 1988 and 1889 was 32%.

The gradual decline of Nile tilapia average proportion in commercial catches at five years intervals over a period of 40 years is indicated in fig.4.

The other species that contributed to the bulk of the fresh commercial catches by 1988 and 1989 were in order of magnitude, lung fish (p. aethiopicus) 39%, catfish and mud fishes together (Bagrus domac and clarias lazera) 29%on average (fig.5).They are mainly caught using hooks and lines and some from gill net mesh sizes of 114.3mm, 127mm and 152mm.Use of hooks is targeted at mainly large non cichlid species. The “other” species in the figure are Mormyus kannume, Barbus altianalis and Labeo forskalii. Their high contribution in 1971 was due to high catches of Mormyrus kannume which have declined since then.

Discussion

The changes in fish community of L.George are attributed to increased fishing pressure especially on Nile tilapia coupled with reduction of gillnet mesh sizes in use and to some extent prediction by piscivorous fish. Due to reduced catches and size of Nile tilapia together with high fish demand, the fishermen shifted to using gillnet mesh sizes lower than the recommended 127mm in addition to other active fishing practices like forcing fish into stationary nets by water beating to be able to harvest large Quantities of fish. This practice, with time, the resulted into harvest of larger proportions of smaller Nile tilapia, the major commercial species in the lake. Gradually, the species recruitment into the fishable size stocks declined inducing the fishermen to continuously shift to the destructive smaller mesh size gillnets which presently also harvest O. Leucustictus as well.

It becomes uneconomical economical to fish for large Nile tilapia using 127mm mesh size nets. O.Leucustictus is not harvested by large gillnet mesh above101.6mm due to its small size. In the 88.9mm mesh size nets all the O.Leucustictus have been observed to be mature at (230g average weight and 22.7cm average total length. Gwahaba (1973) showed that the length of the smallest mature female Nile tilapia on lake George was 18cm TL and the length at which50% were mature was 20.5cmTL while at 24cmTL,all females were mature. Presently, the smallest observed mature female Nile tilapia was 17cm TL and 50% of the fish were mature at 17-18cm TL

.At 24cm TL all was mature. Lowe McConnell (1958) reported the growth rate of adult Nile tilapia as 0.8cm/month while Gwahaba (1973) obtained the growth rate of 1.2cm/month for very young fish between 2cm and 10cm TL. Fry and kimsey(1960) observed that Nile tilapia spawns at 3 months intervals.Tht use 76.2mm and 88.9mm gillnet mesh size nets harvest Nile tilapia of 20.5cm and 24.3cm average total length respectively indicates that about 50% in the 76.2mm mesh size gillnets the fish are immature although in the 88.9mm gillnets they would all be mature. However, about 50% in the 88.9mm mesh size gill nets the fish would have spawned two times. Therefore use of small mesh size net reduces the first breeding stocks and recruitment intensified .In the 101.6cm and 114.3cm mesh size nets the average total length is 26cm and the three times. As the catches of Nile tilapia on L.George continued to decline, some fishermen intensified use of hooks and lines for catching piscivorous fish (the catfishes, mud fishes and lung fish) the latter being a very popular dish among the people living in the adjacent Ruwenzori Mountains.

There is now intensified use of hooks and lines on lake than in the early and late 1960s. The fish caught by hooks feed mainly 6 of the cichlid species. Increased use of hooks and mesh size control to 127mm would therefore provide a buffer to any additional fishing pressure on Nile tilapia, as a management measure.

The low commercial catches in the 1050s compared to 1960s are attributed to the fishery being virgin and fishermen operating with few inefficient gears. The sudden increase in the 1960s and 1970s was due to use of improved effective gears, increased fishing activities due to high fish demand at **TUFMAC** factory and easy access to urban market centers during the period.

The general decline of commercial catches in the early 1980s was due to the reduced size of Nile tilapia.it was during this period (1985) that **TUFMAC** ceased to operate. Among other factors the closure was due to reduced commercial fish supply to the factory and decreased size of the then major commercial fish the Nile tilapia.

The period 1985 to 1989 reflect some recovery as the fishery was being rehabilitated. Fishermen acquired more nets through government loans. However, the relatively constant fresh weight of commercial catches landed between 1987- 1989 could be an indication that the rate of recruitment into fishable stocks was ideally close to the rate of exploitation or the effort was relatively constant. The size of Nile tilapia during the period however, remained more or less constant as the major mesh size nets used (101.6mm and 114.3mm) were not changed except in poaching fishing activities. It was theoretically estimated ((Dunn 1989, that the potential maximum sustainable yield (MSY) for L.George was in the region of 300mt + 1093. The commercial catch data for 1989 was 2788mt which excludes the catches by poachers. The 1950-1989 average annual catches was 3180mt. Based on estimates of Dunn (1989) it is likely that more increase in effort may not being exploited close to the maximum.

The present trends therefore indicate that exploitation intensity can bring about qualitative or quantitative changes in a fishery.

It is therefore recommended that hook and line fishing be encouraged to enable the recovery of the Nile tilapia as the gear catches non-cichlid species which feed on the Nile tilapia. The minimum mesh size of gill nets should be restricted to 127 mm as the Nile tilapia from such gillnets are composed (average total length 31.6cm) and very mature fish that have spawn several times. The effort should be reduced by decreasing the number of illegal fishing activities.

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