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Research Article

Status of Lake Tana Commercial Fishery, Ethiopia

Abstract

The status of Lake Tana Fishery was evaluated from analysis of commercial catch data of number I fishers cooperative. The data collection has been carried out from September 2003 to September 2009. Results indicated that Nile tilapia (*Oreochromis niloticus*), African catfish (*Clarias gariepinus*) and species flock of endemic, large *Labeobarbus* spp. were the three main species groups targeted by commercial gillnet fishery of Lake Tana and form 65 %, 20 % and 15 % of the annual catch compositions of fish species during the study period respectively. There was significant variability among sampling years encompassing temporal aspects. Especially, commercial catch of *O. niloticus* were significantly booming up to 2007 and declining after wards. The most likely explanations for the declining catch of *O. niloticus* and others are the illegal use of undersized monofilament gillnet imported from Sudan town (Gelabat) and the harmful increase of the commercial gillnet fishery targeting the spawning aggregations of *L. barbus* spp. and *C. gariepinus* in the river mouths and littoral areas. The observed decline in the commercial catch of *O. niloticus* and others stress the need for the urgent development of a management plan focusing on controlling import of undersized monofilament gillnet, fishing effort and gear restrictions in the river mouths and major tributaries during the breeding seasons and implementing the regional fishery legislation.

Introduction

Ethiopia is endowed with significant area of inland water, including about 7,400 km^2 of lakes and reservoirs, and about 7,000 km of rivers. Estimates of maximum sustainable yields might allow a production growth between 30,000 to 40,000 tones per year, from the main lakes only. The rivers fishery potential is roughly estimated at about 5000t/yr. however, the estimated annual production in 1992/93 increased by about 30 % leading to an estimated fish harvest of 6,500 tones [1].

As a matter of fact, the incidence, depth and severity of food poverty are much more serious in Ethiopia. The national food security strategy has therefore, been formulated with an overall objective to raise the level of food self reliance nationally and ensure household food security strategy of the regions, much more comprehensive packages of interventions are needed to ensure food security in the regions. It can be stressed that the fisheries and aquaculture sub-sector of the livestock sector can play a significant role for the regions food security as far as resources of fishery is numerous.

Lake Tana, the source of the Blue Nile, is Ethiopia's largest lake; it probably was formed during late Pliocene or early Pleistocene times. It now covers an area of about 3150 km^2 and has an average depth of 8 m, with a maximum of 14 m. It is situated at an altitude of 1830 m and can be characterized as oligo-mesotrophic Lake [2] with a very truncated fish fauna [3] that is it is poor in species and families. There is only one representative of the family Cichlidae: *Oreochromis niloticus,* a very wide spread species in Africa. The three species of clarias (Family Claridae), that [4] describes for the lake (Including the endemic Clarias tsanensis [5], have recently been synonyms to *Clarias gariepinus*, the most common member of this genus [6].

The Largest family in the lake is the Cyprinid, which is represented by three genera: Varicorhionius, with one single species *V. beso* Garra, for which [4] describes two species in Lake Tana: *G. Quadrimaculata* and G.dembensis and the last well described genus of Cyprinidae fishes from Lake Tana Barbus, which has been revised several times as a result seventeen morphotypes of lake Tana Labeobarbus were identified. According to [7] to prevent extinction of the unique Barbus species flock, effort control restrictions near the river mouths during August-September (peak breeding period) have to be implemented immediately to protect the vulnerable spawning aggregations. Since its introduction in 1986, little has been documented about the development and characterstics of the commercial gillnet fisheries and development of the three targeted species groups, *L. Barbus*, *C. gariepinus*, and *O. niloticus*. This lack of knowledge about the natural resources and the impact of the commercial gillnet fishery is one of the main reasons why to date no management plan or fisheries regulations exist in L. Tana. However, in recent years fishers have noted a drastic reduction of their catches in L. Tana. This stresses the need for sound data on Lake Tana's fish and fisheries in order to provide a scientific base for advice on development of a management plan and fisheries regulations. Therefore the purpose of the study is to know the general trend of catch compositions and weight of Lake Tana commercial fishery and evaluate status of fishing activities in Lake Tana.

Objectives of the Study

General objectives

The major objective of the study was to generate baseline scientific information/ data about economically important and commonly found species for management and sustainable utilization

of the resources, and recommend ways and means of conserving the diversity and stock of the icthyofauna of L. Tana.

Specific objectives

To identify fish composition of annual catch

To evaluate the weight of annual catch

To examine the fishing activity at the landing and fishing sites

Materials and Methods

Study site was at the landing site of Bahir-Dar number one fishers' cooperative station. Data was collected by identifying fish species just after arrival of motorized boat to the station and taking their weight on daily bases using a sensitive balance. Data collection has been carried out from September 2003 to September 2009. Reconnaissance survey was conducted to overview the fishing site and fishing materials at different landing and fishing sites. Survey was conducted by collecting information from the beneficiaries and fishers from motorized and reed boat by interview while they are fishing. Fishing gears type and size were assessed at their landing and fishing sites. Data was analyzed using statistical software (SPSS version 16) and descriptive statistics.

Result and Discussion

Total catch composition and weight

The three main species groups targeted by commercial gillnet fishery of L. Tana during the study were found to be a species flock of endemic, large *Labeobarbus* spp., African catfish (*Clarias gariepinus*) and Nile tilapia (*Oreochromis niloticus*) (Figure 1). Total catch from Lake Tana by Bahir- Dar fishers' number one cooperative recorded during the study was *O. niloticus* 1689.1 tone, *C. gariepinus* 527.3 tone and *L. barbus* 383.8 tone. Annual catch shows that, compositions of fish species for seven respective years are mainly *O. niloticus* which constitutes 64.96 %, *C. gariepinus* 20.28 % and *L. barbus* 14.76 % of the total catch (Figure 2). Even though species diversity for *L. barbus* species is more divers, which enables Abay basin rich in fish diversity due to *L. barbus* endemisity exclusively in L. Tana. The previous two species are more abundant in total catch respectively, but *L. barbus* species is rare, the most possible explanation is due to inappropriate fishing burdens for several years on their spawning grounds with non applicable fishery legislations in the region that make *L. barbus* composition rare in commercial catch composition of fishers of Bahir-Dar number one fishers cooperative. Full time fishers and off time fishers of Lake Tana vicinity target *L. barbus* species at spawning grounds especially at all Lake Tana tributary river mouths and upstream rivers while fishes migrate for breeding purpose.

Fishing Activities

Lake Tana fisheries consist of mainly artisanal predominantly subsistence fishery conducted from papyrus reed boats (Tankwa), which resemble those of ancient Egypt. The fishermen, who are using mainly fish traps and small gill nets, are almost exclusively members of the reed boat fishers. Since 1986 a motorized commercial gillnet fishery developed by Amhara fishermen in cooperation with fishermen in Urk (Netherlands). As a result currently fishing with motorized boat becomes common; fore example Bahir-Dar number one fishers' cooperative has more than 70 motorized boats. Commercial catches of large barbs in Lake Tana over the last decade have sharply decreased, due to over fishing in river mouths during fish migration to their spawning rivers [8]. However, at the 4th Pan African Fisheries and Fish Association (PAFFA) conference held in September 2008 at Addis Ababa, habitat degradation at the breeding ground of fish (rivers, tributaries and wetlands) contributed more than over fishing for the sharp decline. The present study shows that almost all fishers both reed boat and motorized boat fishing pressure mainly concentrate on breeding season and spawning ground of each species. *O. niloticus* fishing is carried out at littoral regions,

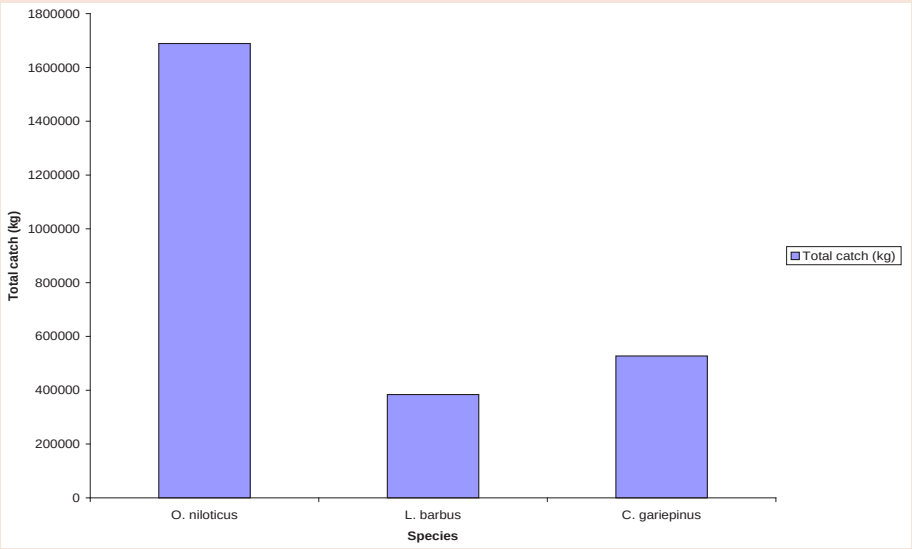

Figure 1: Total catch of commercial gillnet fishery of L. Tana by Bahir-Dar number one fishers cooperative from2003 to 2009.

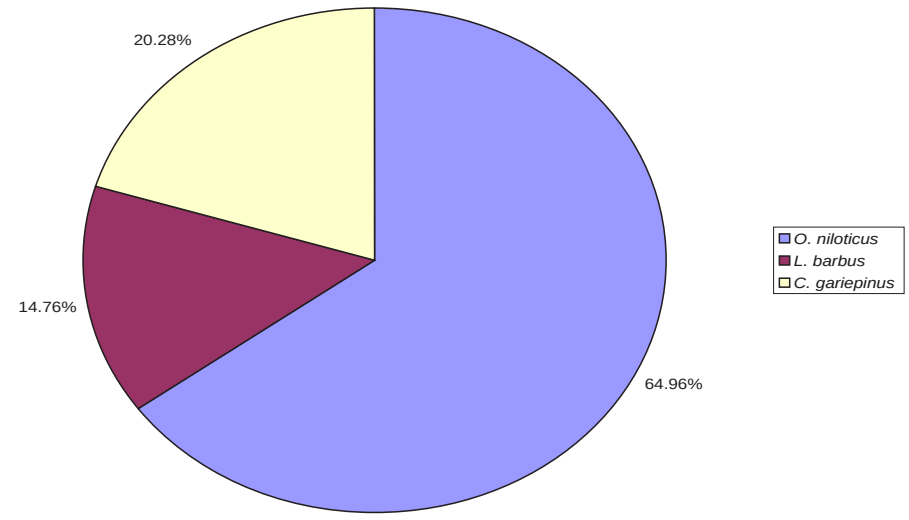

Figure 2: Total catch percentage of commercial gillnet fishery by Bahir-Dar number one fishers cooperative from 2003 to 2009.

Figure 3: Catch of commercial gillnet fishery from Enfranz River mouth tributary of Lake Tana during *L. barbusspawning* season.

C. gariepinus at flooded areas, littoral and river mouths. *L. barbus* mostly targeted at river mouths and a little distance towards upstream (Figure 3). The most surprising fishing activities that makes shock and lead to overall collapse of L. Tana fishery resource is using undersized monofilament gillnet imported from Sudan town (Gelabat) market starting from 2008 (personal communication with fishers). During peak spawning season at pre-rainy season, peak rainy season and post rainy season at all spawning grounds setting 5 cm up to 7 cm stretched mesh by all fishers become common practice (Figure 4).

Fishing by monofilament gillnet is performed mostly starting from early in the morning up to 10 am by disturbing spawning ground with strong stick to kick surface water for several times and several places until they caught enough catch. The demand of filleted fish by immediate fish traders who export L. Tana fish mainly to Addis Ababa and Sudan as well as different towns of the country trigger fishers to have catch from small sized fish population by using illegal small sized monofilament gillnets which have never been practiced any years before. The other fishing practice recently started by many of fishers is using small mesh sized cast net (usually <4 cm) used at the shore sides of L. Tana especially during *O. niloticus* spawning seasons (Figure 5).

During both the day time and night, monofilament gillnet is refuge somewhere in the vicinity of L. Tana covered by vegetations at littoral areas, what makes different from the previous activity is setting the appropriate gillnet for the whole night and they set off early in the morning and left their gillnet for the next day harvesting (Figure 6).

The commercial gillnet fisheries was monitored during 2003 to 2009. According to experimental trawling program of [9] commercial catch large specimens of African catfish (>50 cm) and Nile tilapia (>20 cm) decreased significantly over the last 10 years time, but recruitment of young fish to the adult populations was not negatively affected. During the same period the commercial catch of riverine spawning *Labeobarbus* spp. declined with 75 %. In the experimental fishery a similar decrease was observed and the populations of juvenile *L. barbus* in the littoral (Length range: 5-18

Figure 4: Monofilament gillnet introduced to *L. Tana* commercial gillnet fishery from Sudanese market (Gelabat).

Figure 5: Fishing with 4-5 cm stretched mesh size cast net at shore sides of *L. Tana*.

Figure 6: Monofilament gillnet during off time (day time) put at refuge at littoral region.

cm) decreased even by more than 85 % [9]. The major reason for the collapse of these fish species is due to destructive fishing during their spawning season and destruction of the river ecology that serves as a spawning ground. These species form aggregations in the river mouths in August-September, during which period they are targeted by the commercial gillnet fishery.

Annual catch distribution pattern

The present study shows that, *O. niloticus* show an increasing order starting from 2003 up to 2007, but after 2007 it become decline sharply year after year for consecutive two years. Of course *C. gariepinus* and *L. barbus* do not show significant change, year after year except *L. barbus* species show significant decline during 2007

($P<0.05$). From annual catch composition *O. niloticus* plays a leading catch by weight, this is because of targeting the spawning seasons and spawning aggregation grounds. The other two species had been targeted illegally for several years as a result at both spawning seasons and grounds there is no remarkable catches whatever fishing effort is applied. Overfishing of *L. barbus* near and in river mouths and upstream in the rivers on and near the spawning grounds by fishers for several years reduced their abundance to a very low level.

At every year of commercial gillnet catch of *O. niloticus* takes a leading dominant species by weight starting from 2003 to 2007 at an increasing order. The total amount commercial catch of *O. niloticus* during 2007 is 450 tone, but after a year of 2007 it starts to become decline. Of course total annual commercial catch declines during 2008 and 2009 at decreasing order respectively (Figure 8).

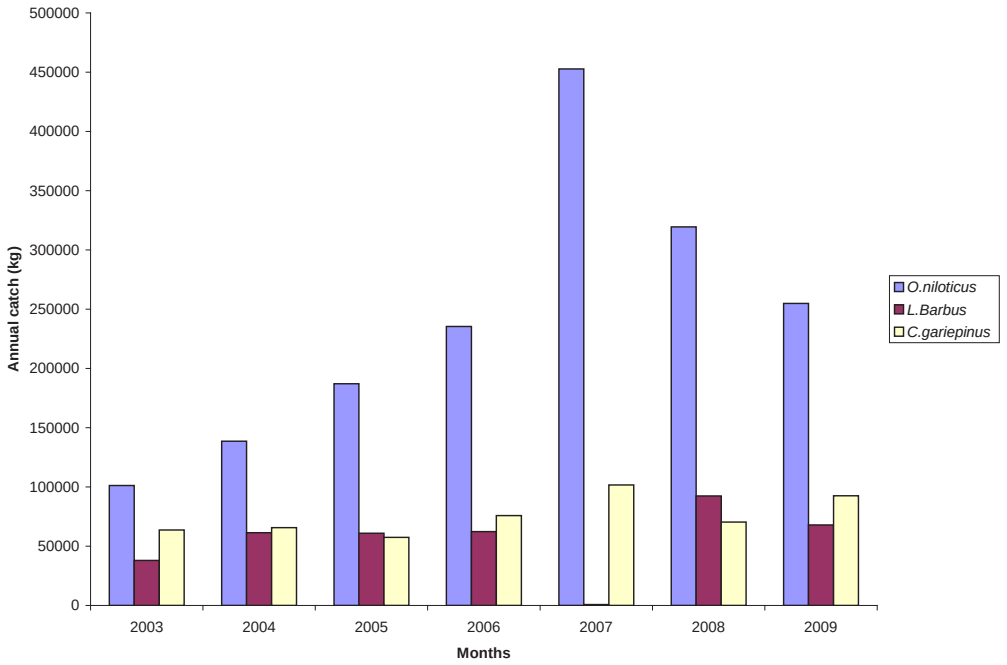

Figure 7: Annual catch pattern by weight from 2003 to 2009 by fishers of Bahir-Dar number One fishers cooperative.

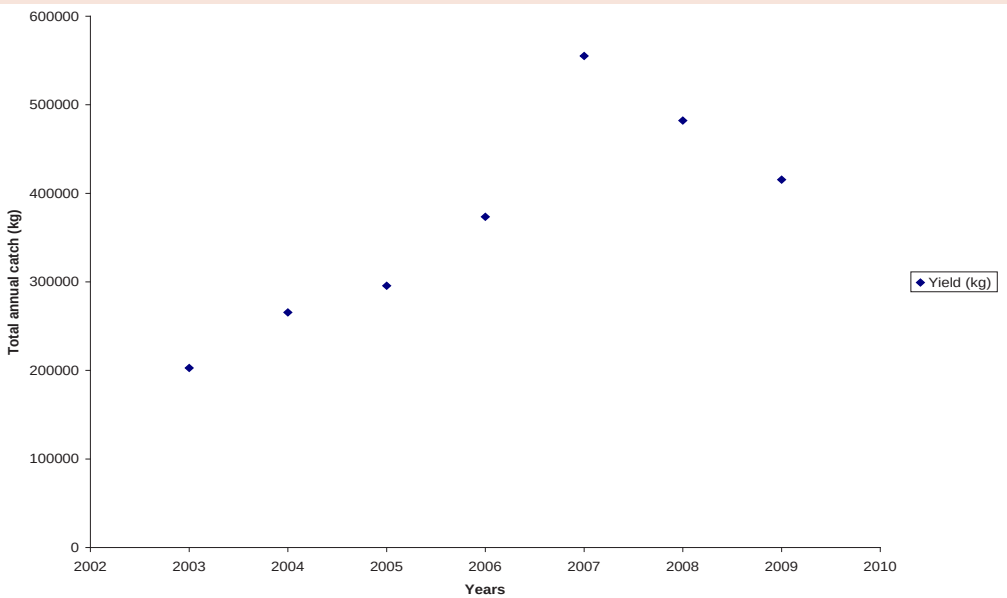

Figure 8: Total annual commercial gillnet fishery catch by Bahir-Dar number one fishers cooperative from 2003 to 2009.

Catch weight increment of *O. niloticus* from 2003 up to 2007 is due to fishing pressure at spawning grounds with illegal monofilament introduction, this is supported by the amount of catch recorded at a particular seasons, which are peak spawning seasons of *O. niloticus* (Feburary, March and April).

The highest catch of *O. niloticus* was recorded during 2007 which is 452.7 tone/year and least was recorded during 2003, 101.1 tone/year and the mean catch by weight is 241.3 tone/year. The highest catch of *C. gariepinus* was recorded during 2007 which is 101.6 tone/year and least was recorded during 2005, which is 57.5 tone/year and

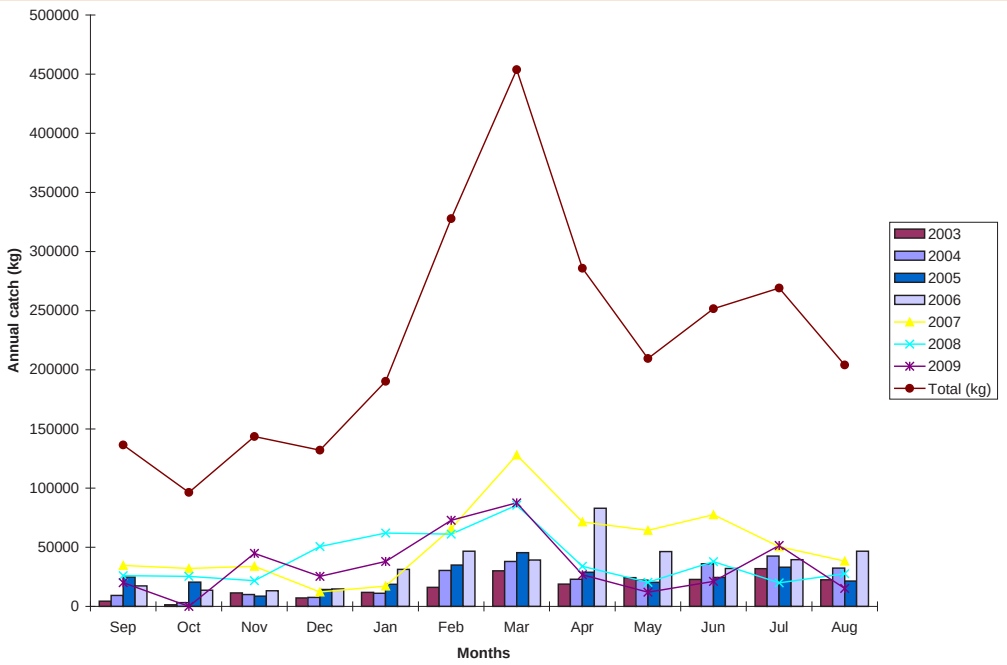

Figure 9: Total catch distribution on monthly bases from 2003 to 2009 from catches of Bahir-Dar number one fisherscooperative.

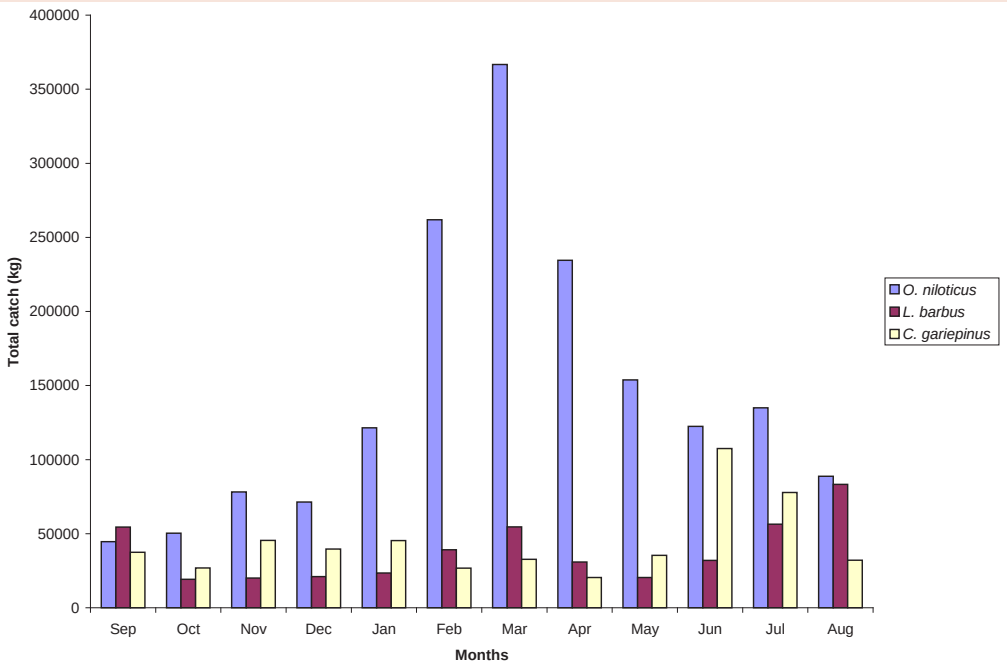

Figure 10: Total catch distribution of three species in monthly bases.

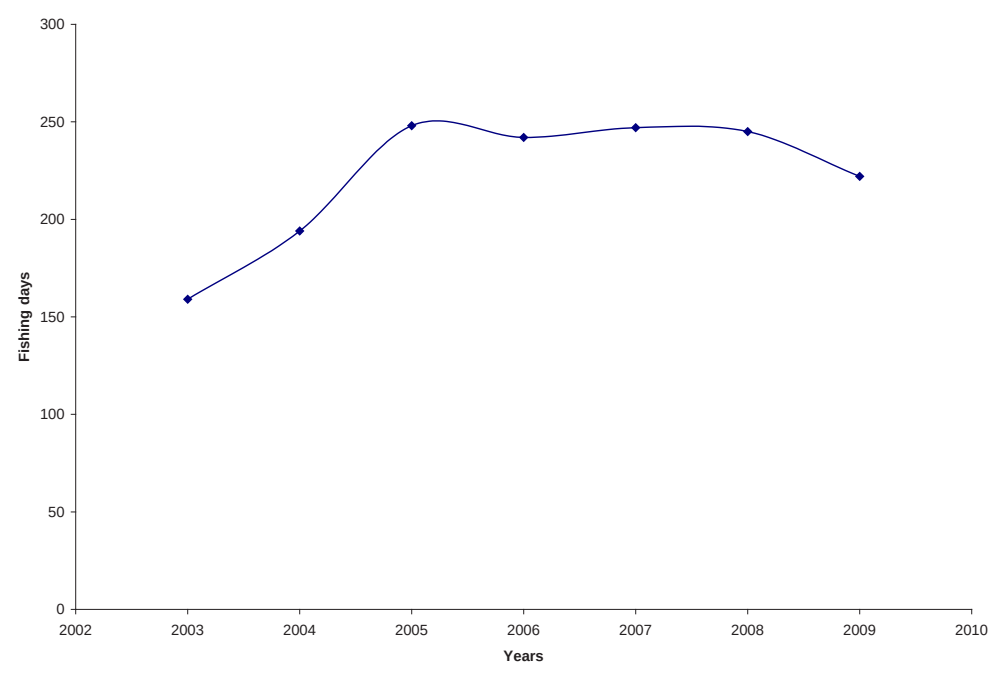

Figure 11: Effort by using trips/year.

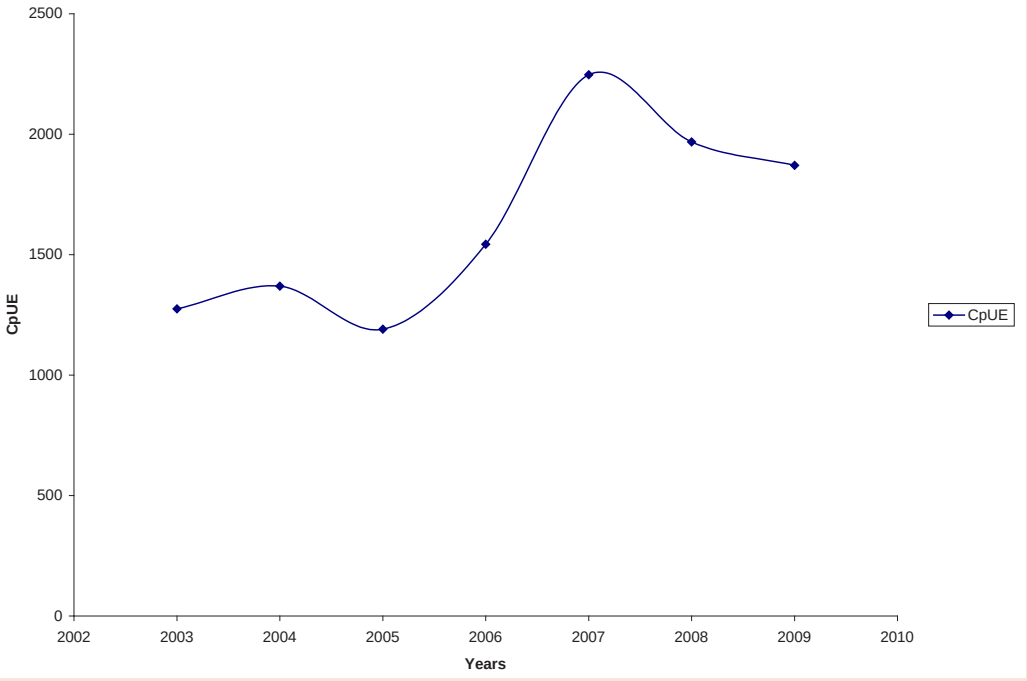

Figure 12: CpUE using kg/trip.

the mean catch by weight is 75.3 tone/year. The highest catch of *L. barbus* was recorded during 2008 which is 92.4 tone/year and least was recorded during 2007, which is 0.7 tone/year and the mean catch by weight is 54.8 tone/year (Figure 7).

Total catch distribution shows that, March exhibit the highest catch and it follows with February and April respectively. May, Jun, July and August exhibit the second category for better catch distribution. The least was recorded from September up to December

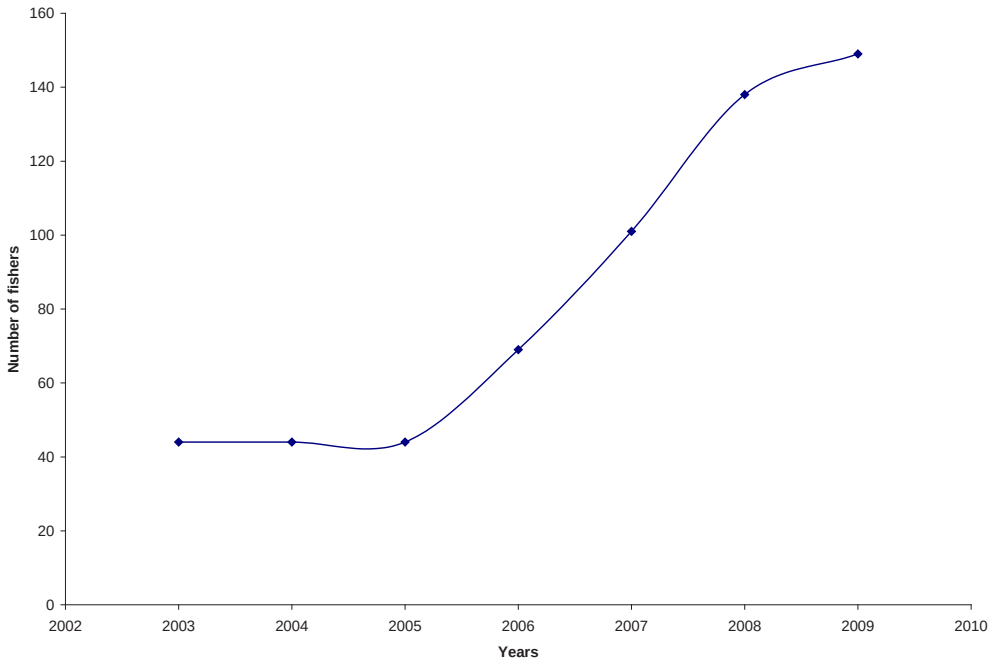

Figure 13: Number of fishers per year.

(Figure 9). Specifically *L. barbus* annual catch starts to increase during July, peak in August and it starts to decline in September. This is the peak spawning season for *L. barbus* species. The highest catch was recorded for *C. gariepinus* in Jun and it follows in July, which is the spawning season for *C. gariepinus*. The other seasons exhibit least production. The highest total catch for *O. niloticus* was recorded during March followed by February and April respectively (Figure 10).

Fisher's trip of fishing days per year was increased from 2003 to 2005. This shows that fishers was used an appropriate fishing material throughout the year. But during year 2006 fishing trips get declined and it remains constant until 2008. Trips per year during 2009 again start to declined. This indicates that fishing is carried out during the selected seasons, which is breeding seasons and at the same time breeding grounds of the most economically important fish species of Lake Tana (Figure 11).

CpUE using kg of their catch per trip shows that, during 2005 it has got declined and from 2005 onwards up to 2007 it was at increasing order and again after 2007 it became declined (Figure 12). The number of fishers from 2003 up to 2005 it was almost the same. But starting from 2005 up to 2009 it is on an increasing order (Figure 13), this implies that the number and length of fishing gears are at the same time gets an increment.

Conclusion and Recommendation

At every year of commercial gillnet catch of *O. niloticus* takes a leading dominant species by weight starting from 2003 to 2007 at an increasing order. The total amount commercial catch of *O. niloticus* during 2007 was 450 tone, but after a year of 2007 it starts to become decline. Of course total annual commercial catch declines during 2008 and 2009 at decreasing order respectively. Catch weight increment of *O. niloticus* from 2003 up to 2007 was due to fishing pressure at spawning grounds with illegal monofilament introduction, this is supported by the amount of catch recorded at a particular seasons, which are peak spawning seasons of *O. niloticus* (Feburary, March and April).

- Closed seasons and spawning grounds for different fish species have to be implemented
- Prohibit illegal fishing such as using small stretched mesh size gillnet, monofilament gillnet, beach seines during spawning aggregations, small mesh sized cast net at shore sides, which is major sites for breeding and nursery.
- Generally implementing the existing fishery legislation is a vital issue to alleviate the problems that Lake Tana fishery resource encountered.

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