Fish Resource Potential, and Some Biological aspects of Fishes in Lake Golbo, South Wollo, Ethiopia

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Introduction

Ethiopia could be a water tower of northeastern Africa where most of its part is arid. The inlands water body of Ethiopia is estimated at 7400 km2 of the lake's area and about 7000 km2 a total length of rivers (Wood and Talling 1998).

Ethiopian freshwater systems are classifying into seven drainage basins. These are the Abay, Awash, BaroAkobo, Omo-Gibe, Rift Lakes, Tekeze and Wabishebele-Genale basins.

The Number of fish species record from the seven drainage basins of Ethiopian has; Baro (87), Abay (36), Rift Valley Lakes (32), Wabe-Shebla (26), Omo (26), Awash (15), and Tekeze (10) (Abebe, 2007).

The purpose of this study was to collect information about the fish's resource potential, species composition, abundance, many biological aspects of the fish species of the present, and the Physico-chemical characteristics of the surface water.

Methodology

In the study lake, three sampling sites have selected. Purposively:

Site one (S1), outlet, site two (S2); this site has high vegetation covers and site three (S3); open water

pH, conductivity and temperature were measure in-situ using a portable Wagtech meter;

Transparency has evaluated using a standard 20 cm diameter Secchi disc.

Fishing simultaneously with multifilament gillnets of 6, 8, 10, 12 cm stretched mesh sizes

from stage IV females fish, the gonads were collected and preserved in Gilson's fluid to estimate fecundity

Morpho-edaphic index (MEI) has been applied to estimate annual fishes yield

by dividing the mean conductivity by the mean depth (Ryder et al. 1974)

Table 1. Empirical models used to estimate potential yield

Authors	**Equations**	**Yield**
Henderson and welcome 1974	$Y=14.3136MEI^{(0.4681)}$	Kg/ha/year
Ryder et al. 1974	$Y=23.281MEI^{(0.447)}$	Kg/ha/year

The relationships between total length and the total weight fish species have calculated using ;

the power function (Bagenal and Tesch 1978) $TW = aXTL^b$

The Relative condition factor (Kn) has used to determined using; $Kn = \frac{TW}{aTl^b}$

The sex ratio has determined by;

the total number of captured females divided by the total number of captured males.

Size at first maturity (TL50) was described by the logistic regression equation,

based on Gunderson et al. (1980). $P_X = \frac{1}{(1+exp(bx+a))}$

TL50% was get derived from the relationship of "a" and "b" $TL = -\frac{a}{b}$ (Sparre and Venema 1998

The fecundity of each ripe fishes had determined by the gravimetric method.

Samples of 3 g of eggs have taken from the ovary

The number of ripe eggs in the gonads from a single fish had determined

by using the following formula: $E = \frac{Wg*ns}{We}$

Results

Table2. The mean ± SD Physico-chemical parameters at three sampling site of Lake Golbo

Parameters		**Sampling Site of Lake Golbo**		
		S1	S2	S3
pH	Mean±SD	8.24±1.22	8.32±1.33	7.79±0.61
	Rang	9.96-7.1	9.78-7.06	8.6-7.29
Conductivity (µs/cm)	Mean±SD	396.1±28.2	398.3±29.3	378.2±66.2
	Rang	436-351	433-347	456-281
Temperature(^{0}C)	Mean±SD	24.8±1.82	24.53±1.75	24.6±1.3
	Rang	27.8-23	26.9-22.5	26.7-23.3
Secchi depth (m)	Mean±SD	1.97±0.31	2.54±0.87	2.63±0.41
	Rang	2.33-1.75	3.54-1.98	3.1-2.3

Based on Morpho edaphic index, the average potential yield of fishes' community was 348.1 kg/year.

The overall mean relative Fulton's condition factors (Kn) obtained for C. gariepinus and O. niloticus were 1.01 and 0.6 in order. Based on the number Clarias gariepinus (54.1%) was the most dominant fish species.

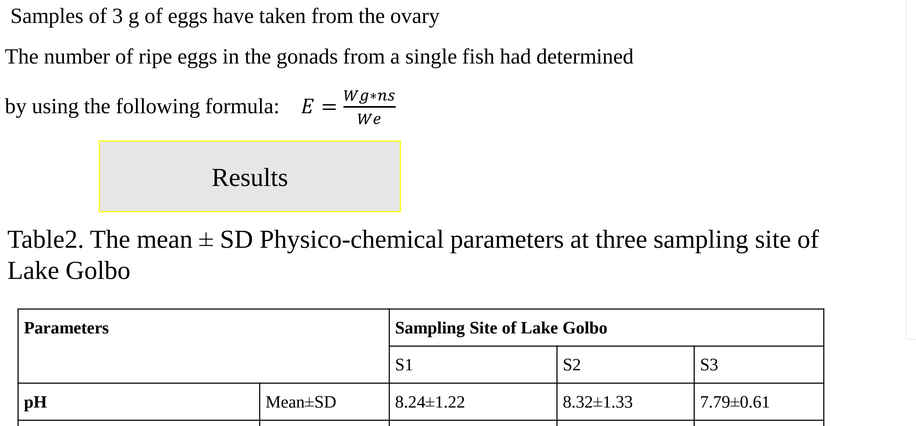

Figure1. The estimated length (TL)-total fresh weight (TW) relationships for O. niloticus(A) and for C. gariepinus (B)

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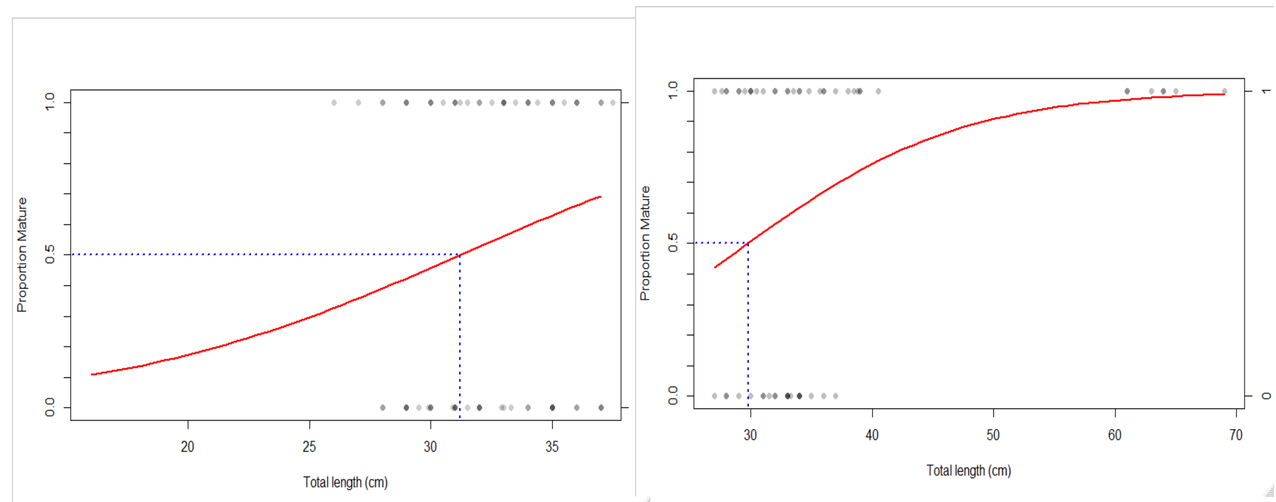
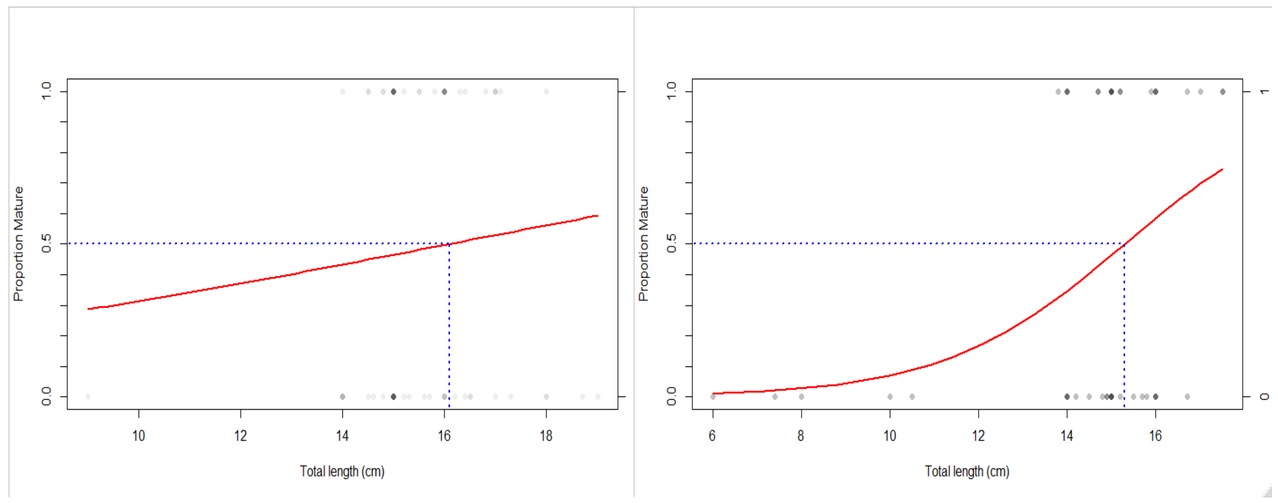
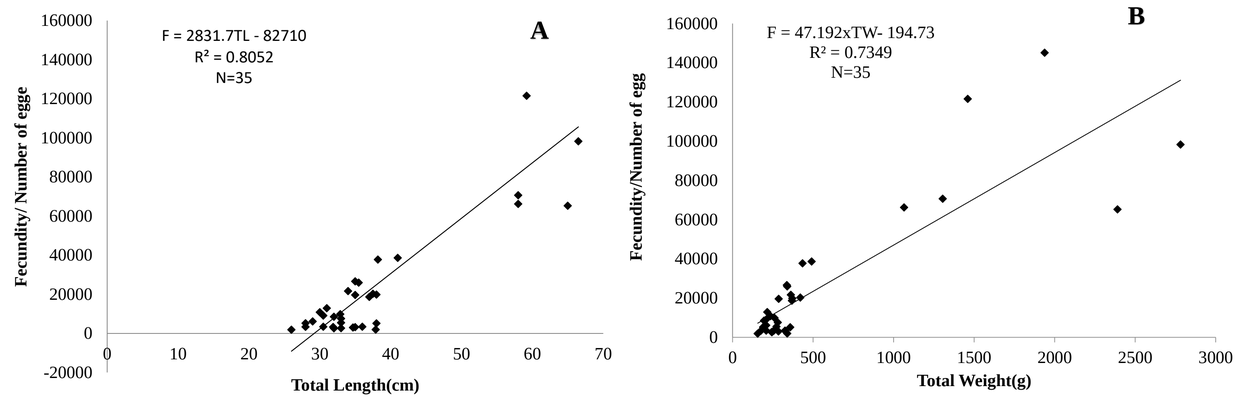
all the fish species showed a significant difference between sexes ($\chi 2$, $P < 0.05$).
The fecundity of C. garipenius in terms of numbers of eggs per female range from 1920 to 145118 with a mean of 25 890.



The size at first maturity of C. garipenius (Females=A, Males=B) was 29.8 cm for females and 31.2 cm for males



The size at first maturity of *O. niloticus* (Male =A, Females=B) was 15.3cm for females and 16.1 cm for males



The relationships of Fecundity with (a) Total Length, (b) Total Body Weight, (c) Gonad Weight length

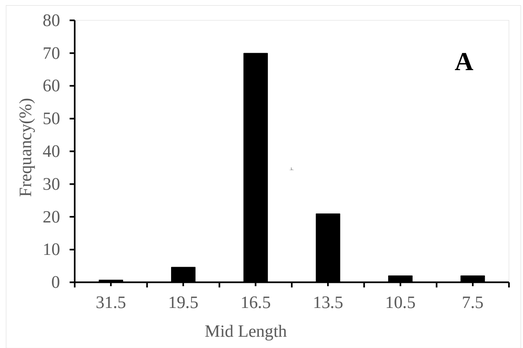


Figure2. Length frequency distributions of *O. niloticus* (A), *C. garipenius* (B)

Discussion

The value of "b" for combined sexes data is comparable to the value of b calculated for the same species (O. niloticus),

2.91 in Lake Awassa (Admassu 1990), 2.53, 2.93 in Lake Lugo and Ardibo in order (Mekonnen et al. 2019; Endalh et al. 2018), 2.74 in Lake Tana (Tadesse 1997) and 3.12 in Lake Tana (Dereje 2014).

According to Bagenal and Tesch (1978) and Froese (2006), the value of "b" varies according to habitat, gonad maturity, sex, diet, stomach fullness, health, and seasonal differences in environmental conditions.

The sex ratio results of O. niloticus of the present study are similar with the results for O. niloticus sex ratio between females and males 2.2:1; 2.38:1 did differ significantly from 1:1 ($\chi 2 = 4.5$; $\chi 2 = 40.3$; $P < 0.05$) in Lake Lugo and Ardibo respectively.

In Lake Lugo C. gariepinus 1:1.6 ($\chi 2 = 10.3$; $P < 0.05$) which is statically significant from 1:1 (Mekonnen et al. 2018, 2019).

Measurement of the fish condition has correlated to the general fish health, fat and lipid content, prey or food availability, reproductive potential, environmental conditions, and water level fluctuations.

In general, the high amount has associated with higher energy (fat) content, increased food base, reproductive potential, or more favorable environmental conditions (Paukert & Rogers, 2004).

Better FCF of O. niloticus in Lake Golbo has correlated with higher ovarian development.

the length at first maturity in Lake Golbo is smaller than in Lake Tana and Fincha Reservoir.

These differences may be affected by the abundance and seasonal availability of food, temperature, photoperiod, and dissolved oxygen and other environmental factors, changes in lake water level, and poor condition (Babiker and Ibrahim 1979; Bwanika et al. 2004.

fecundity of the fish is closely related to the fish total length, Gonad weight and total weight in both study lakes. This study revealed that with an increase in total length, fecundity increases significantly.

Table3. Length at maturity (TL50%) of fish species as determined by different authors at different times.

Species	**Present study (2018-2019)**		**Endalh et al, 2019, Lugo**		**Dereje (2014) Tana**		**Endalh et al, 2018, Ardibo**	
	F	M	F	M	F	M	F	M
O. niloticus	15.3	16.1	14.6	15.3	21.2	23.4	16.5	15.4
C.gariepinus	29.8	31.2	31.7	31.1	57.7	43.2		

Conclusion

All the physical and chemical parameters of Lake Golbo water were within desirable limits. The mean productivity potential of Lake Golbo has 348.1 kg/year. The Physico-chemical characteristics of lake water suggested that there was no harm to aquatic life in general and fishes in particular. So, it is better to use the fish's resources of the lakes. In Lake Golbo fishes practice not started much longer, the fishermen involved in fishing were less in number, and hence production obtained from the lake was very low compared to its potential.

Based on my field observation, the lake ecology, and its catchment areas, and its natural resources face several threats that are greatly affected by a phenomenon currently aggravated by several anthropogenic activities. Consequently, more runoff, silt, and nutrients have been discharged into the Lakes through inflow line or flood plain, increase jobless youths, absence of effective lakes management system.

Future Direction

We recommends that limit the number and type of gears to be used for fishing practice than 8 cm mesh size gillnet used, Protect closing area, Prohibited from fishing in peak spawning seasons, Creating awareness to fishing communities, best watershed management systems should be applied, and the experts thought the local community about the possible effects of intensive irrigation activities on the lake it is more aggravating during dry seasons and protecting sensitive areas of the habitat (breeding, feeding and resting sites of fish and birds).

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