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# *Oreochromis niloticus* L. and *Cyprinus carpio* as a host for helminthes parasite

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**Abstract**
Lack of understanding of fish disease is one of the concerns for fisheries expansion in Ethiopia. Parasite infestation leads to losses in nutritional contribution of fish to the diet and loss of the population. The parasitized fish can be served also as a host for fish feeding vertebrates. Consequently reduce farm efficiency and production, which in turn impacts the livelihood of the local people. This study was designed to investigate the status of parasitic infections on *Oreochromis niloticus L*. and Common carps. Parasitological analysis of *Oreochromis niloticus* L. and Common carps (n=250) was carried out. Wet mounts of body fragments of the collected fish were examined using compound light microscope at x 10 and x 40 magnification powers. All parasite specimens were preserved in 70% ethanol. 21.2% of the fishes were found to be infected. There was no statistical significant difference (P= 0.11) in the prevalence rate of the parasites between the two fish species. Higher frequency was found in adult compared to juvenile fishes. The intensity was statistically significant (p=0.001) in different body parts. The gut harbors 86% of the parasites which is significantly higher comparing to the other body sites. Physico-chemical conditions of the Lake were suitable for the growth of the parasites. Parasitic infestation could affect palatability, productivity, market and aesthetic value of the fish. Potential public health risk parasites are observed in this finding. It is necessary therefore to eliminate all conditions favorable for parasitic infection.

**Keywords:** *Clinostomum*, fishes, gut, prevalence

## Introduction
The increasing human population is not in equivalence with food production worldwide. In addition to increasing agricultural production, the need to search for alternative food source is unquestionable. Fisheries have an important position to animal protein supplies for many developing countries in the world [1] where malnutrition is a major concern. It is an important part of nutrition and food security particularly, for low income population.

Africa will have to increase production of food by 300%, in order to supply the minimum diet requirement for the projected population by 2050 [2]. The consumption and demand for fish is on the increase in Ethiopia. Particularly, in the shorelines and around the inland water bodies, there is higher dependency on fish for consumption and commercial use [3]. There are about 168 to 183 different species of fish and 37-57 of them are native to the country [4]. The tilapia *Oreochromis niloticus* L. and *Cyprinus carpio* (Common carp) are among the commercially most important fish species in the country [4].

Although the freshwater fish industry in Ethiopia has marvelous potential for development, lack of understanding of fish infectious disease is one of the concerns for fisheries expansion. The survival of fish in intensive culture is continuously diminished by a broad range of diseases, particularly those causes by diverse taxa of helminthes, protozoa, arthropod and other miscellaneous groups of parasites [5]. In addition to the direct losses cause by mortality, parasite infestation may have a substantial impact on the growth and behavior of the fish [6], which leads to defeat in nutritional contribution of fish to the diet and loss health of the consumers. The parasitized fish can be served also as an intermediate host for fish feeding vertebrates including humans if an infection left uncontrolled. Consequently reduce farm efficiency and production, which in turn impacts the livelihood of the local people. Although only few studies on fish diseases have been so far reported in Southern and North-Western Ethiopia including Lake Ziway [18, 14], Lake Tana [19], however, there is scantiness of information on fish disease in the Northern part of the country. In this study, we evaluated the

status of helminthes infectious disease in *O. niloticus* and Common carp fish in Lake Hashenge.

## Materials and Methods

The study was conducted from December 2016 to June 2017 at natural Lake Hashenge, Southern Tigray, Ethiopia. Lake Hashenge has coordinates of 12°34′50″N longitude and 39°30′00″E latitude, an elevation of 440 m above sea level. It is located about 628 km north of Addis Ababa, capital of the country. It has surface area and maximum depth of 20 $km^2$ and 25 m respectively [17].

A total of 250 fishes (200 *O. niloticus* and 50 Common carps) were collected from the legal fishery associations of Lake Hashenge. Fish were examined for the presence of ecto and endo parasites, keeping them wet throughout the procedure. Uses of fresh specimens assist the visualization of motile parasites. Before dissection, an external examination was carried out. Then, wet mounts of fragment (body surface mucus from the gill, eye, liver and gut) of freshly killed fish were examined for parasites abundances and distribution using dissecting and compound light microscope at ×10 and ×40 magnification power. All parasite specimens was preserved in 70% ethanol for storage prior to further identification, using keys described by [7, 8].

Physico-chemical parameters of the Lake were measured every month. The dissolved oxygen concentrations (DO) were measured using Winkler method. Water temperature of the Lake was analyzed with ordinary mercury thermometer. pH was measured using electronic pH meter (Metrohm 620 pH meter).

Data collected from the study sites were coded and entered in to a Microsoft excel spread sheet program for analysis. Statistical analysis was done on SPSS software version 20. Descriptive statistics like percentage was used to state prevalence while chi-square test was applied to compare the association between variables. For all statistical analysis, a significant level (P-value) of less than 0.05 was considered as statistically significant.

## Results

Out of the total examined fish species, 53 were found to be infected by helminthes parasite, giving the overall prevalence of 21.2%. As demonstrated in (Table 1) from the overall prevalence, 18.8% of the fish had multiple infections, a combination of helminthes infestation harboring more than two parasites.

**Table 1:** Percentage of fish species (n=250) parasitized.

| Fish species | *N* | Total fish infection No (%) | Multiple infection No (%) |
|---|---|---|---|
| *O. niloticus* | 200 | 42(21.0) | 38(19.0) |
| *Common carps* | 50 | 11(22.0) | 9 (18.0) |
| Total | 250 | 53(21.2 ) | 47( 18.8) |

For those parasite genera for which there were sufficient data, infection rates varied significantly among parasite species ($p<0.05$). There was no statistical significant difference ($P= 0.11$) in the prevalence rate of the parasites between the two fish species. All single and multiple infections within different body parts revealed a significantly higher intensity ($p=0.0001$). The gut harbors 86% of the parasites which is significantly higher comparing to the other body sites (Table 2 and 4). None of the fish were infected with ectoparasites. There is an increasing trend in the proportion of infection with increase in fish size (Figure 1).

**Table 2:** Intensity of the the parasites in different organs of the fish.

| Infected body part | No (%) of parasite |
|---|---|
| Gut | 326(86.0) |
| Eye | 8(2.1) |
| Gill &Liver | 45(11.9) |

Nematodes appear to be the most prevalent in both fish species followed by trematoda (Table 3). Ascaris species was the most common parasite following by *Contracecum* species affecting both species in the Lake.

**Table 3:** Abundance of egg/cyst and adults (%) parasites recorded in *O. niloticus* and common carp.

| Parasite group | Egg/cyst/ larvae No (%) | Adult No (%) | Abundance No (%) |
|---|---|---|---|
| Nematoda | 288(91.4) | 27(8.6) | 323(83.1) |
| Trematoda | 42(93.3) | 3(6.7) | 45(11.9) |
| Cestoda | 9(81.8) | 2(20.0) | 11(2.9) |
| Total | 347(91.6) | 32(8.4) | 379(100) |

**Table 4:** Distribution, locations and number of parasites.

| Taxonomic group | Infested organs of fish | No (%) of parasite | Range of parasites |
|---|---|---|---|
| Nematoda | | | |
| *Contracecum sp.* | Gut | 58(15.3) | 0-5 |
| *Ascaris sp.* | Gut | 257(67.8) | 0-10 |
| Cestoda | Gut | 11(2.9) | 0-3 |
| Trematoda | | | |
| *Clinostonum sp.* | Gill & liver | 37(9.8) | 0-3 |
| *Diplostomum sp.* | Eye | 8(2.1) | 0-2 |

The pH ranged from 6.3 to 8.2 with average mean of 7.2. The dissolved oxygen (DO) ranged from 7.2 to 9.3 mg $L^{-1}$ with a mean of 8.1 mg $L^{-1}$. The temperature varies from 23.9$^0$C to 27.6$^0$C with mean value of 25.6$^0$C (Table 5).

**Table 5:** Monthly values of physio-chemical parameters of the Lake.

| Month | Dissolved oxygen (DO) mg $L^{-1}$ | Temperature$^0$C | pH |
|---|---|---|---|
| December | 9.1 | 24.1 | 8.1 |
| January | 9.3 | 24.8 | 7.1 |
| February | 7.9 | 25.4 | 7.3 |
| March | 7.6 | 25.9 | 7.1 |
| April | 7.3 | 27.6 | 6.4 |
| May | 7.2 | 27.4 | 6.3 |
| June | 8.5 | 23.9 | 8.2 |
| Mean | 8.1 | 25.6 | 7.2 |

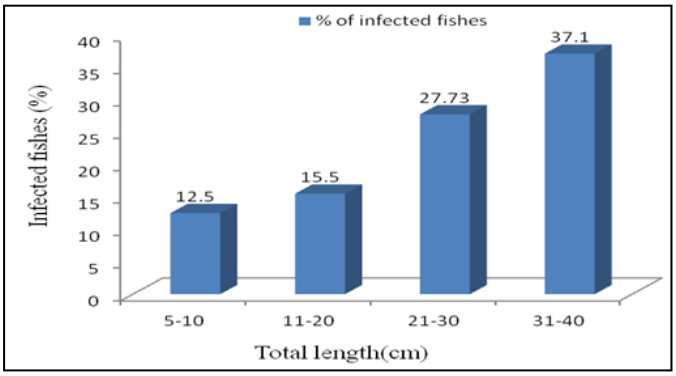


**Fig 1:** Prevalence of parasite in fishes collected in relation to their total length at Lake Hashenge.

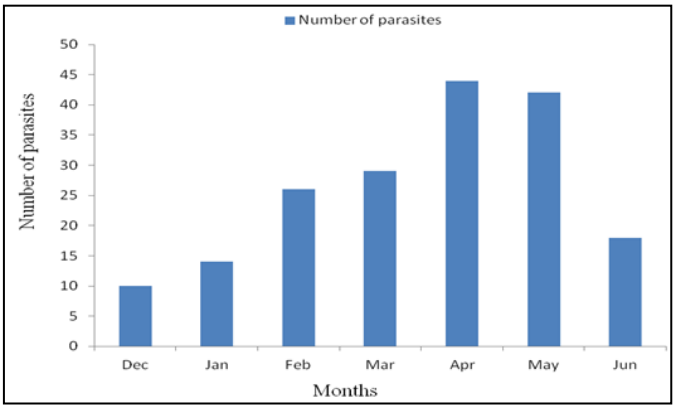


**Fig 2(a):** Monthly distribution of parasites on *O. niloticus*

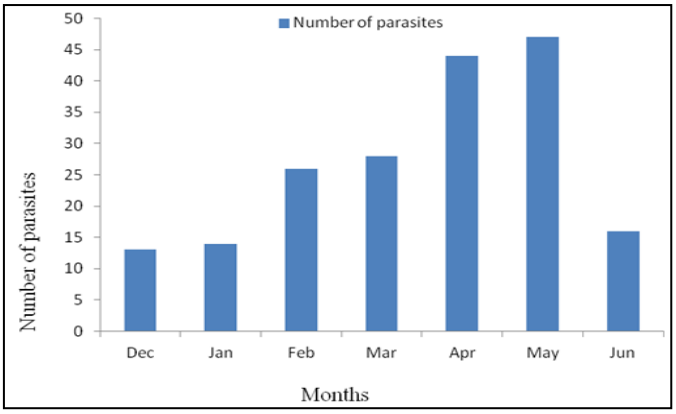


**Fig 2(b):** Monthly distribution of parasites on common carp

## Discussion

The total prevalence of 21.2% of parasites observed in the current study was lower than the observation of 66.3% in Koka, Ethiopia [5] and 42.7% reported from some fresh water fishes from Nigeria [9]. Compared with previously reported value, our results were similar with 22.2% in Mehran River, Iran [10], it is however, higher than the prevalence of 17.9% in Lake Tana, Ethiopia [11] and 6.9% reported in Okhuo River, Nigeria [12]. This may be related to the fact that the rate of parasitism differ from one habitat to the other by environmental factors such as variation in water Physico-chemical conditions, climatic situations of the areas, season and host parasite relationship. Ascaris and *Contracecum* species were found to be the most prevalent fish parasites in the current observation. The reason may be because of the availability of divers host required to complete their life cycle [13]. In addition, higher infection rate may be due to the less selective feeding behavior of the fishes.

There is an increasing trend in the proportion of infection with increase in fish size. This agrees with the finding of [14] that reports higher infection rate in adult (62.13%) compared to juveniles (46.90%) *Tilapia zilli.* This could be attributed due to increasing total length and age of the fish, increases their chance of acquiring the parasite infection. The longer fish provide greater surface for infection than smaller ones. This contrasts sharply with [15] who reported higher prevalence rate of helminthes in juvenile (60.7%) compared to adult (14.3%) in *Tilapia.*

The current finding reported higher intensity of parasites in the gut. This finding supported previous report of [9] that shows gastrointestinal tract is the most ideal site for some helminthes. This could be associated with the fact that stomach act as a temporary food storage cavity which could probably result in the release of the ova or cysts of parasites in the food the fish swallow.

The Physico-chemical condition of the Lake was suitable for the growth of the parasites. Climax infection was highest in the hot months in April and May with decreasing in the wet months in December at Lake Hashenge. This may be due to the fact that hot condition is favorable for the growth of parasites. This observation disagrees with the findings of [16] that report the highest peak infection in the wet season.

The results of the study conclude that the rate of helminthes infection in *O. niloticus* and *Common carps* is apparently high and may be one of the obstacles to maximize productivity of the fish in the study area. It is important to recognize that intensity of parasitic infections in the cavity could diminish the normal growth performance of fishes hindering adequate growth to attain good market value. Palatability and aesthetic value of the fish could be also affected. The finding of *Clinostomum* and *Contracaecum* species is an indicative of the existing risk of health problem of the local community. Elimination of all conditions favorable for parasitic infection is required. Moreover, the local people and who consume uncooked fish need to be aware of the potential risk of acquiring zoonotic infections.

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