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Prevalence of helminthes parasite of fish, *Orechro musniloticus* and *Cyprinus carpio* in pond of national fishery and other aquatic life Research center, Sebeta, Ethiopia

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Abstract

A cross sectional study was conducted from November 2011 to April 2012 in National Fishery and Other Aquatic Research Center Pond, Sebeta, Ethiopia, to assess the prevalence of helminthes parasites of fish (*Oreochromus niloticus* and *Cyprinus carpio*). The overall prevalence of helminthes parasite infection in the two species of fish (*Oreochromus niloticus* and *Cyprinus carpio*) was 46.66%. Species, sex and size of fish were taken as a risk factor for the occurrence of helminthes worm infection. There was statistically significant difference in the prevalence of the helminthes parasite (X^2=26.858 P=0.001) and (X^2=91.25 P=0.000) among sex of fish and different body sized fish respectively. There were no statistically significant difference (X^2=5.693; P>0.05 (P=0.770)) in the prevalence of the helminthes parasite between the two species of fish. Out of the 95 Female fish 58 (61.05%) and 85 male fish 26 (30.58%) was infected with helminth parasites. The highest prevalent helminthes was 13.63% *Clinostomum species* followed by 11.02% *Botherocephalus species* and 9.55% *Contracaum species.* Less prevalent helminthes was 2.94% *Gyrodactlus species* and followed by 3.67% *Euclinostomum spesies*, which was recovered, from bronchial cavity, intestine mesentery pericardial cavity, gill and kidney of the fish respectively. Hence the prevalence of helminthes parasite in the study area was high, washing and disinfecting of ponds regularly, and good quality water providing for pond were recommended.

Keywords: *Fish; Helminthes; Prevalence; Sebeta*

Introduction

Over seventy percent of the earth is covered with water. Fish are ubiquitous in habitats of this ecosystem with over 30,000 named species and many more that may not be discovered and they are the most successful vertebrate group, which plays an extremely important ecological role in both natural environments and fish culture [1]. They are cold blooded (their body temperature varying passively in accordance with the temperature of the surrounding water) [2].

Aquaculture is the fastest growing segment of agriculture worldwide [3]. The most commonly cultured fish include carp (Family *Cyprinidae*), *Trout and Salmon* (*Salmonidae*), *Catfish* (*Ictalurdae, Clariidae, Pangasidae, Siluridae)*, Eel (*Anquillidae*) Tilapia (*Cichlidae*), Mullet (*Mugiludae*), Milkfish (*Chanidae*), Yellow tail fish (*Carangidae*) [1].

Fishing industry is an important economic activity that provides food and job opportunity for millions of people. More over fish are excellent source of protein, one of a chief nutrient people need for a good diet.

As the world population has grown too fast the demand for food, especially food rich in proteins is high. Fish represent a very important food source for low-income population [4]. As well, several million people in the world depend on fish for their livelihood from fishing, processing and transporting [5].

The fish sector make a vital contribution to food nutritional security of 200 million Africans and it provides income for over 10 million Africans engage in fish production, processing and trade. More ever fish has become a leading export commodity for Africa with an annual export value of 2.7 billion USA dollars [6]. Ethiopia possesses many lakes and river, which are important for the habitat of fish. In Ethiopia, they are over 100 species of fish [7]. Of which *Orochromus niloticus* are most successful found widely spread in the country, easy to handing and captivity and more accepted as food fish in [8].

Even though different species are available in various water bodies in Ethiopia, significant amount of fish are not harvested from them. One factor that hinders fish production is disease. Apart from loss of production disease are known to causes mortality in fishes and some are also causes human diseases [9]. Fish have a very full complement of disease like all animals and many of these are due to external agencies and other arises internally. From external source viruses, bacteria, fungi and parasites are known to affect fish while internally they suffer from almost all the common organic and degenerative disorders. Parasitic infestation frequently occurs in fish that retarded the growth rate; reduce production and high infestation cause mortality in fish [10].

From the parasites of fish nematode, Trematod and Cestode are the most important helminthes parasites of fish [11]. Helminthes are highly specialized parasites that require specific definitive hosts [12]. They frequently occur within the body cavity and viscera of fish. Due to their location in host fish, they may affect one or more important organ systems [9]. Nematodes occur worldwide in all animal [2].

Larval nematodes, in addition to adults, occur either encysted in tissue or fee in body cavities, most often in pericardial cavity. Most notorious larval nematodes existent in our country lakes include are the genera Amplicecum, Contracecum and Porrocaecum [13]. The clinical symptoms of Nematodiasis include anemia, emaciation, and untherifitness [14].

Cestodes (tapeworms) are ribbon like worms. They infect the alimentary tract, muscle or other internal organ [15]. Lingual intestinal, *Proteocephallus* and *Bothriocephalus* are those observed in natural fish habitat of Ethiopia [15, 16]. The clinical sing when fish is affected by Cestode parasite are variable degree of drossy, distended abdomen reduced in activity [13]. Monogeneans are flatworms (Platyheiminthes), ectoparasites and attached by special posteriorly positioned attachment organs to their host skin gills. Dactylogyoidea and Digeneans is flat worms and hetroxenous [12].

Diagnosis of nematode parasite is done by identification of the parasite under microscope that is round worms, fusi form, yellow capsule and esophagus muscular and glandular part and site of localization [16]. Identification of the Cestodes parasite can be made from wet mount fecal contents having proglottides or organs. Identification of adult Cestode parasite to species uses features of the scolex and organs of the mature proglotid; immature Cestode might only be classifiable to order [1]. Digeneas are distinguished from Mongeneas by the absence chitinous hooks and from Cestode by the presence of a ventral suckers and by the absences of body segmentation [15].

Febendazole at dose rate of 0.25% in feed three times per day repeat in three weeks most commonly used as chemotherapeutic agent for nematode parasite infection [2]. Niclosamids has proven effective against Cestode parasite infection [18]. Reducing the intermediate host population is very important for the control of Cestode infection in fish. The most practicable preventive method of controlling Trematodes infection in fresh water fish is elimination of the vector snail [12].

So far, very few diseases have been described from fish of Ethiopian waters, although their pathogenic significance is well-recognized [16]. Study on disease of fish in general and helminthes parasites in particular are not well studied in the country and national fisheries and other aquatic life research center. Therefore, the objective of this paper is to determine the prevalence of common helminthes parasites in *Oreochomus niloticu*s and *Cyprinus carpio* in National Fisheries and Other Aquatic Life Research Center Sebeta.

Materials and Methods

Study Area

A cross sectional study was conducted from November 2011 E.C. up to April 2012 E.C. in National Fisheries and Other Aquatic Life Research Center, Sebeta, Ethiopia. The center is located at 25 km southwest of Addis Ababa. It is situated at 2200 meter above sea level and covers a total area of 16 hectare. The area characterized by a moderately warm climate with annual mean temperature of about 21^0C. The area gets annual rainfall of about 866-1200 millimeters. The farming system in the area is mixed (crop and live stock production). The average humidity and wind of the study area is 43% and 9.2 km/h respectively. The crop type in the area is teff, barely, guaya and bean [19].

Study population

The study population was fishes of both sexes group, which are collected from different water bodies of our country and placed in pond of the NFALRC. The main commercially important fish species in national fisheries and other aquatic life research center pond are *Oreochromus niloticus*, *Clarias garipnus*, *Cyprirnus carpi*o, *Bar bus* and *Tailapia zilli.*

Study Design

The study was across sectional survey involving 180 fish (136 *Orchromus niloticus* and 44 *Cyprinus carpio*) of with 85 were male and 95 female. The explanatory variables considered were species of the fish, sex, size and parasite type.

Sample size

Sample size needed to detect at least one infected host in fish population is 150, which represent greater than 10,000 fish population however, for better precision value 180 fish sample size were taken. At 5% desired level of accuracy and at an estimate prevalence rate of 50% are most commonly used for presumed pathogenic agent with a 95% confidence limit [20].

Study Methodology

In this study, a total of 180 fish sample of two species was caught using scup nets. The fish specimen was transported in cold icebox of the laboratory. In the laboratory, the total length (cm) was measured with the aid measuring board and weight of the fish (gm) was measured using balance. Before dissection, an external examination was carried out in each case. Mucus sample was taken from the body surface especially from pectoral and ventral fish and direct smear was made on a side and examined using compound microscope.

The abdominal wall up to the mouth along the ventral mid line was opened by inserting a sharp end of scissor through the anus. The alimentary canal were there after removed sectioned in its parts; esophagus, stomach, intestine and rectum and each section was separated in to Petri dish containing normal pond water, incised and examined for parasite by naked eye and under microscope. Other organs such as gas bladder, liver, spleen, heart, gill eye pericardial cavity, kidney, brachial cavity was examined thoroughly. Parasites collected from each fish was examined under the microscope to identify each parasite to the lowest possible tax using standard of Zhokhave and Mironovsky [21], and Paperna [22].

Data Analysis

The data was entered and managed in MS excel work sheet. The analysis was conducted using stata version 17. Prevalence of helminthes a fish label was expressed as percentage, with 95% confidence interval by dividing the total number of animal positive to helminthes to the total number of fish examined. The significance of differences between the prevalence of helminthes was determined using Chi-square text. The explanatory variable, which includes species of fish, sex, and size of the fish, were considered as risk factors to see their association with the level of prevalence.

Results

A total of 180 fishes are used as study sample from the national fishery and other aquatic life research center pond to assess the prevalence of helminthes parasite. *Orechromus nilotisun* (*Nile tilapia*) and *Cyprinus carpio* (*Common carp*) were the species of fish used during the study. An overall helminthes prevalence of 46.66% was recorded from bronchial and pericardial cavity, mesentery of intestine, kidney and gill. The prevalence of helminthes was compared between the two sexes of fish (table1). The prevalence of helminthes was higher in female than male fish. There is statistically significant difference ($x2>3.83$, $p<0.05$) in prevalence of helminthes parasite among the sex.

Table 1: Overall prevalence and prevalence of helminth parasite in relation to sex of *Orochromus niloticus* and *Cyprinus carpio*.

Sex	Number of examined	positive	Prevalence (%)
Male	85	26	30.58
Female	95	58	61.05
Total	180	84	46.66
X^2=26.858, P=0.001			

The prevalence of helminthes parasite was also compared between the species of *Orochromus niloticus* and *Cyprinus caprio* fish (table 2). The result showed that both species are susceptible to helminthes parasite however there were no statistically significance difference in the prevalence of the helminthes parasite between the two species (x2<3.84, p>0.05).

Table 2: Prevalence of helminthes parasite in relation to species of *Orchromus niloticus* and *Cyprinus carpio.*

Species	Number of examined	positive	Prevalence (%)
Orchromus niloticus	13.6	62	45.58
Cyprinus carpio	44	22	50
X^2=5.69, P=0.770			

Comparison of the prevalence of helminthes parasite was also done by taking in to account the size of the fish (table3). Generally, the prevalence has been observed to be higher in bigger sized fish than smaller sized fish. There was statistically significance difference in the prevalence of the helminthes parasite among different size fish (x^2>3.84,p<0.05) .

Table 3: Prevalence of helminth parasite in relation to size of *Oreochromus niloticus* and *Cyprinus carpio.*

Size (cm)	number of examined	Positive	prevalence (%)
1-10	88	31	35.22
11-20	78	46	60.52
21-30	11	7	63.63
31-40	5	4	80.00
X^2=91.252 P=0.00			

From the result nematodes, all are localized in the pericardial cavity (table 4). The prevalence of *Contracecum species* in the *Oreochromus niloticus* was found to be 9.55 and the prevalence of *Contracecum species* in the *Cyprinus carpio* was found to be 9.09%. There is no statistically significant deference in the prevalence of the Contracecum parasite between the two species of fish (X^2<3.83; P>0.05).

Table 4: Prevalence of nematode species.

Species of fishes	Parasite species	site of localization	number of examined	positive	Prevalence (%)
Oreochromus niloticus	*Contracecum spp*	Pericardial cavity	136	13	9.55
Cyprinus carpio		Pericardial cavity	44	4	9.09
X^2=0.604 P=0.437					

With regard to the cestode species all are obtained from abdominal cavity as their predilection sites (table 5). The relative prevalence of *Bothrocephalus* in *oreochromus niloticus* and *Cyprinus carpio* was found to be 11.02% and 9.09 respectively. There is no statistically significant difference (X2<3.84, P>0.05) between the two species with regard to the prevalence of *Bothroecphalus spp*.

Table 5: Prevalence of custodies species.

Species of fishes	Parasite species	Site of Localization	Number of fish examined	Positive	Prevalence (%)
Oreochromus niloticusspp	*Bothrocephalus*	Intestine mesentery	136	15	11.02
Cyprinus Carpio	*Bothrocephalus spp*	Intestine mesentery	44	4	9.09
X^2=0/710 P=0.399					

The site of localization of the *Trematode Clinostomum, Euolinostamum* and *Gyrodactlus* were found to be bronchial cavity, kidney and gill respectively. The prevalence in O*reochromus noloticus* and *Cyprinus carpio* was found to be 11.02%, 3,67%, 2.94% and 13.63%, 6.81%, 9.09% respectively (table 6). There is no statistically significant difference (x^2<3.84; P>0.05) between the two species of fish with respect of the prevalence of *Clinostomum spp., Euclinostomum spp.,* and *Gyrodactlus spp.*

Table 6: Prevalence of trematod spp.

Species of fishes	**Parasite species**	**Site of Localization**	**Number of examined**	**Positive**	**Prevalence (%)**
Oreochromus niloticus	***Clinostomum spp***	Brachial cavity	**136**	**15**	11.02
	Euclinostomumu spp	Kidney	136	5	3.67
	Gyrodactlus spp	Gill	136	4	2.94
Cyprinus Carpio	***Clinostomum spp***	Brachial cavity	44	6	13.63
	Euclinostomumu spp	Kidney	44	3	6.8
	Gyrodactlus spp	Gill	44	4	9.09
X^2=0.790; P=0.374					

Discussion

The study showed that the overall prevalence of helminthes parasites infection in *Oreochromus niloticus* and *Cyprinus carpio* is 46.66%. The most prevalence helminth parasites was *Clinostomum species* followed by *Botherocephalus species* and *Contracecum species*. The less prevalent helminthes parasites were *Gyrodoctlus species* and followed by *Euclinostomum spp.* This parasite recovered from bronchial cavity, intestine mesentery, pericardial cavity, gill and kidney of the fish respectively. This finding was lower than one (59.8%) reported by Yimer and Enyew [16] at Lake Tana. The variation in prevalence could be associated with variation in distribution of definitive host, piscivorous birds and the primary intermediate host's copepods as well as on the season on which the studies are conducted and probably high level of immunity built up in fish sample that were sampled and examined during the study period.

The percentage helminthes infection is higher in Female than male. There were statistically significant difference ($P<0.05$) in the prevalence of the helminthes parasite between the sex. The findings agree with Mgbemena [23] that report high percentage of infection in females. The variation may be due to female fish (special *Oreochromus nilotics* fish species) has over stresses during reproduction time that is incubate their egg within its own mouth for 3-5 day without swimming and feeding of any type of feed, rest at one place until the larvae emerged. In addition, after this period the female fish able to feed whatever in the surrounding and some of this was probably intermediate hosts for helminthes parasite.

The current study has recorded no statically significant difference in susceptibility of the two species of fish for all five parasites. This finding was agreed with Shelemo [24], which was reported from NFALRC. This might be due to the fact that parasitism is much more diversified in the wild than in the farm, ponds and hatcheries where there is relatively the same environments, the same biotic condition and diversity of intermediate hosts. Parasitic infection rates and diversities are expected to vary greatly from one area to another and this depends on a number of factors, which includes among other things, the nature of water and endemic of infection in the area [25]. Parasitic infection rates and diversities are expected to vary greatly from one area to another, this depends on a number of factors, which includes among other things, the nature of water, and the endemic of infection in the area where the study was conducted [26]. For the current study sampling was done in rather one station. Other places were not used for sampling and hence diversity and difference in prevalence was not reflected in between two species.

Regarding the size of fish, the prevalence has been observed to higher in bigger fish. There is statistically significance difference ($P<0.05$) in the prevalence of the helminthes among the different sized fish. This finding agree with a report of Wondem [27] that helminthes infection increase with length of fish and paperna [28] reported that the prevalence of helminthes parasite increased in large sized fish. The increased number of helminthes parasite per host and the rate of infection with increasing length were attributed to number factors. Some of these included the bigger quality of food consumed by larger fish and fact that they preyed on other organisms [29]. Some of these were probably intermediate hosts for the helminthes parasite because the fish preyed up on bigger food item carrying the infective stages.

The nematode Contracecum was found 9.55% and 9.09% on *Oreochromus niloticus* and *Cyprinus caripo* fish species respectively in the present study at the NFALRC pond. The result of current study agrees with the Senas [30] and Shelemo [24] and is reported from fresh water fishes in Japan and from NFALRC respectively. Nematode usually considered as the most important parasites of fishes of the world [11].

The Cestodes were also found 11.02% and 9.09% on the *Oreochromus niloticus* and *Cyprinus carpio* fish species respectively. This finding is higher than 1.33 recorded by Yemer [31] at Lake Ziway. This variation may be due to the lack of regular clearing and disinfecting of the pond, distribution of intermediate host snail and feeding habits of fish's species.

Infection by the *trematodes digenea*, stage of metacrcariae Clinostomum recorded an infection rate of 11.02% and 13.63% in *Oreochtomus niloticus* and *Cyprinus Carpio* fish species respectively. The finding is lower than 74.3% reported by Wondem [27] at Lake Tana. Prevalence of *Euclinostomum* and *Gyprodactlus species* (6.81% and 9.09% respectively) agrees with the Yimer [31] and is reported from Lake Ziway. This difference in prevalence rate may be due to management of the lake, water quality, feeding habits and overcrowding of fishes, presence of aquatic birds that contribute to the exposure of fish to the parasite [32].

The helminthes infection is reported to interfere with the absorption of nutrients in the intestine of the fish and may reduce food intake. The metabolites produced by some of these parasites could adversely affect vital system of the fish. Further pathological effects due to the parasites can be attributed to the abrasions and lesions caused during attachment and may be accompanied by secondary bacterial infection [25].

Conclusion and Recommendations

The present work which was conducted in National Fishery and Other Aquatic Life Research Center Pond revealed that the prevalence of the parasites that affect fish were high. Clinostomum, Botherocephulus and Contraceum were the most frequently occurrence of the parasite. The high prevalence of helminthes parasite in these ponds may be due to the lack of good management of the ponds, distribution of intermediate hosts and shortage of educational background. Female fish were more infected than male fishes and there were statistically significant among sex of fish. Both of fish were susceptible for helminthes parasite. The infection of helminthes increase as the fish length increases. Therefore, based on the above conclusion the following recommendations are forwarded:

- The water bodies which contain fish must be protected from piscivorous birds, an intermediate hosts for many species of helminth.
- Washing ponds and cage regularly to decrease the snail population and algae.
- Good water and environmental management of the ponds.
- Small sized fishes should be preferred for a human consumption.
- Further research should be conducted to assess the prevalence of disease of fish in lakes and streams of Ethiopia in order to increase the productivity of the lake and streams.

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