

Research Article

Preliminary Survey of External Parasites: Crustacean and Monogeneans of Commonly Caught Fish Species in Lake Hayke of Amhara Region

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Abstract

A cross study was conducted from November, 2015 to April, 2016 in Lake Lugo (Hayke), which is located in South WolloZone, northeast Ethiopia, with the aim of isolation and identifying the external parasites (crustacean and monogenean) from fresh water fish. A total of 124 randomly selected fishes comprising of 61 *Oreochromis niloticus*, 20 *Clarias gariepinus* and 43 *Cyprinus carpio* were examined for external parasites. The fish were examined thoroughly examined externally and sample of skin scraping and gills were taken for the presence of external parasite and lesion. From the total 124 fish species 23 (18.5%) fish species were infested with external parasite. From these infested fish species four external parasites which are three parasites of crustacean (*Lernaeasp*, *Dolophusspp* and *Ergasilusspp*) and one parasite of monogenean (*Dactylogyrusspp*) were detected at the genes level. Prevalence of external parasites was higher in *Clarias gariepinus* (25%) followed by *Cyprinus carpio* (18.6%) and *Oreochromis niloticus* (18%) species. The statistical analysis showed that no statistically significant difference in among species, age and sex of fish ($p>0.05$). Based on this study crustaceans and monogeneans parasites have a great significance for the production of fish in the Hayke (Lake of Lugo) so it needs husbandry practice (water quality assessment and feed and feed delivery management), a serious control and preventive programs.

Keywords: Crustacean; Ethiopia; Fish; Isolation; Lake lugo; Monogenea

Introduction

Ethiopia is endowed with many lakes and rivers comprising diverse aquatic ecosystems of great scientific interest and economic importance [1]. The country fish potential is estimated at 45,000-51,500 tons per year. In 2008, fish catch was estimated at around 17,000 tons (accounting for about 1.7% of the regional volumes), the bulk of which (74%) originating from the six main lakes (Tana, Ziway, Langano, Hawassa, Abaya and Chamo) and a further 26% from the other water bodies. Thus, less than 38% of this potential is currently exploited, demonstrating considerable room for further expansion through proper management. Aquaculture is recognized as an alternative means of achieving food security and poverty reduction in the rural area, and is now considered an integral part of rural and agricultural development policies and strategies in Ethiopia [2,3].

A hundred local fish species have been identified, while the bulk of the production is made of Tilapia, Lates, Barbus, Bagrus, Clarias and Labeo species. Approximately 80% of the catch is Tilapia, although Nile perch is caught in large quantities on Lakes Chamo and Abaya, as well as in major riverine fisheries [4-7]. Lake Lugo (Hayke) provides a habitat to different fish species, water birds and aquatic organisms. The fish production potential of the Lugo Lake is estimated as 400 ton/year [8], and the off take rate is 83% as reported by FDRE (Federal Democratic Republic of Ethiopia).

Fish in wild and aquaculture farms face a wide range of enemies including competitors, predators and parasites. The major diseases

associated with fish are parasites, bacteria, viruses and toxic algae that reduces fish production by affecting the normal physiology of fish and if left uncontrolled [9-12], it can result in mass mortalities or in some cases, can be serve as source of infection for human and other vertebrates that consumed fish. Parasites may induce a shift in fish species densities, size composition and affect commercially interesting stocks [13]. Ectoparasite infestations can cause severe skin damage such as abrasions and ulcerations on the body surface, hemorrhagic spots on the skin and eroded fins resulting in economic losses due to reduced growth, fecundity and increased morbidity and susceptibility to secondary infections [14-17].

Production in Ethiopia as other developing countries is strengthened by the availability of extensive inland water systems made up of streams, rivers and lakes that support a large number of fish species, many of which are of economic importance [18]. To fully develop and manage these diverse and rich fish resources in these inland water bodies, there is need for adequate knowledge of parasites that infect them with a view to adopting preventive and control measures to improve fish yield. However research commitments to the study of parasites of fresh water and marine fishes of the Ethiopia have been sporadic and inadequate considering the fish wealth of the countries. In Lake Lugo, little information is available on internal parasite of fish but there was no any researches have been conducted regarding to the external parasitic diseases of fish. There for the objective of this study is to identify crustacean and monogenean parasites of the three fish species (Tilapia, Catfish and Carp) in Lake

Table 1: Proportion of fish species, age and sex.

		Number	Percent (%)
Fish species	<i>Cyprinus carpio</i>	43	34.70%
	<i>Clarias gariepinus</i>	20	16.10%
	<i>Oreochromis niloticus</i>	61	49.20%
Age	Adult	104	83.90%
	Juvenile	20	16.10%
Sex	Female	53	42.70%
	Male	71	57.30%
Result	Positive	23	18.50%
	Negative	100	81.50%

Hayke of Amhara region.

Materials and Methods

Study area

The study was conducted on one of the high land Lakes of Ethiopia; Lake Lugo (Hayke) which is located in South Wollo Zone, Northeast Ethiopia. It is located 440km north of Addis Ababa, situated at 1101y5'N latitude, 39057'E longitudes, and at an altitude of 2030 M.A.S.L. The study area is categorized as sub-humid tropical with an annual rainfall of 1173 mm and a mean temperature of 18.2°C. The major rainy season is from July to September. Lugo Lake has an area of 23km² and a maximum depth of 88.2m and mean depth of 37.37m. The fishes that inhabit Lake Lugo are *Oreochromis niloticus* (Nile Tilapia), *Clarias gariepinus* (African catfish), and *Cyprinus carpio* (Common carp).

Study population

The study population consists of fish at different age, species and sex categories in the study area. According to the methods described by Paperna (47) the fishes were categorized into groups based on their weight (0.08-0.1 kg were classified as the fingerlings, 0.1-0.2 kg as juvenile, 0.21-0.3 kg as young and >0.31kg as adult fish) and sex organ. The sexes of the fish were determined using one or more of three procedures: (i) the abdomen of each fish specimen was pressed for the extrusion of whitish milt (for males) or eggs (for females). This approach was used if the fish was in ripe or running stage; ii) the fish was dissected for the presence or absence of testes or ovaries. Presence of testes signified maleness, while the presence of ovaries indicated that the fish was a female [19].

Study design and sample size

A cross-sectional study was conducted in Lake Hayke of Amhara

region and random sampling technique was employed to select the samples after they are drawn from the water. Three hundred seventy two samples were taken from one hundred twenty four fishes. All the fish was caught using gill nets with mesh sieverangingf rom 60 to 120mm for sampling. All the specimens of fish were examined with in less than 12 hours of catch.

Data collection methods

The samples were collected immediately and observed externally from selected fresh specimens of *Oreochromis niloticus*, *Clarias gariepinus* and *Cyprinus carpio* recovered by local fishermen. After the samples were collected and purchased from fisher men then taken into the Kombolcha animal health investigation and diagnostic laboratory in ice boxes for parasitological examination and the sample were preserved with 10% formaldehyde. According to the procedure employed by Paternal, microscope and unaided eye were used for quick identification of ectoparasites on the external body surface (scales, gills, fins, opercula and eye) of the fish samples. Special note was taken of any damage to tissues/organs of the host by recovered parasites.

Data management and analysis

SPSS version 20 was used to analysis the collected data. The quantitative data was analyzed using descriptive statistics and the qualitative data was analyzed using descriptive statistics and compared as percentages, mean and frequency. Chi-square (χ^2) test was applied to compare the infestation status with regard to different variables like fish species, sex and age.

Results

During the present study, 124 fishes were investigated for the presence of parasitic Crustaceans and Monogeneans. From a total of 124 fish sample, 23 fish (18.5%) were infested with ectoparasites. Through the parasitic serious examinations *Lernaea spp.*, *Ergasilus spp.*, *Dolophus spp.* and *Dactylogyridae spp.* were detected (Table 3). The isolated parasites belonged to two Copepods, one Branchiura and one Monogeneafamilies. Fourteen and nine fish species were infested with Copepods, Branchiura and Monogenea respectively.

The results that explained in (Table 1,3) showed that from total percentage (18.5%) of detection 11.3% of detected parasites were Copepods (8.1% *Lernaea spp.*, 3.2% *Ergasilus spp.*), 3.2% were Branchiura (3.2% *Dolophus spp.*) and 4% were Monogenic Trematodes (4% *Dactylogyridae spp.*). Prevalence of 18%, 25% and 18.6%, were recorded from *Oreochromis niloticus*, *Clarias gariepinus* and *Cyprinus carpio* species, respectively, and the difference between species were not statistically significant at $p>0.05$ (Table 2). As indicated in (Table

Table 2: Prevalence of parasites respect on fish species, age and sex.

Risk factor		No of fish examine	No of fish with parasite	prevalence	χ^2	p-value
Fish species	<i>Cyprinus carpio</i>	43	7	16.30%	0.71	0.702
	<i>Clarias gariepinus</i>	20	5	25%		
	<i>Oreochromis niloticus</i>	61	11	18%		
Sex	Female	53	10	18.90%	0.01	0.937
	Male	71	13	18.30%		
Age	Adult	104	17	16.30%	2.07	0.15
	Juvenile	20	6	30.00%		

Table 3: Prevalence of external parasites respect onsite.

Fish species	Parasite species	Site	Prevalence (%)	X ²	p- value
Carp	<i>Dactylogyrus spp.</i>	Gills	4.70%	7.04	0.055
	<i>Dolophus spp.</i>	Skin	2.30%		
	<i>Ergasilus spp.</i>	Gill	2.30%		
	<i>Lernea spp.</i>	Skins	7.00%		
Catfish	<i>Dactylogyrus spp.</i>		0%		
	<i>Dolophus spp.</i>		0%		
	<i>Ergasilus spp.</i>	Skin	5%		
	<i>Lernea spp.</i>	Gill and Skin	20%		
Tilapia	<i>Dactylogyrus spp.</i>	Gill	4.90%		
	<i>Dolophus spp.</i>	Gill and Skin	4.90%		
	<i>Ergasilus spp.</i>	Skin	3.30%		
	<i>Lernea spp.</i>	Gill	4.90%		

2) males had higher prevalence of infection with parasite (19.7%) than their female counterparts (18.9%), but the difference between sexes were not statistically significant at P>0.05.

Discussion

Among the diverse universal questions relating to the patterns of distribution of parasitic crustaceans in fresh water fish, the geographical pattern has been not addressed with much regularity in comparison with the situation regarding marine fish. A few studies have attempted to identify geographical patterns in the distribution of these parasites within particular regions, e.g. for Africa or in relation to a single taxon of parasites, e.g. for Brazil. The current study revealed that four external parasites namely *Lernea* spp., *Dactylogyrus* spp., *Ergasilus* spp. and *Dolophus* spp. were isolated as genes level. In this regard *Lernea* spp. (8.1%), were the most frequently found parasite followed by *Dactylogyrus* spp (4%), *Dolophus* spp (3.2%) and *Ergasilus* spp. (3.2%). In these study a prevalence of 18.5% which was 17.3% in adult, 30% in juvenile, 19.7% in male, 18.9% in female, 16.3% in *Cyprinus carpio*, 25% in *Clarias gariepinus*, and 18% in *Oreochromis niloticus* (Table 2). However the differences among these categories were not statistically significant. That the higher prevalence in smallest sized and juveniles in this study may be due to the random selection of the specimens and to probable high level of immunity built up in the adult fish specimens as explained by Akinsanya. The higher prevalence of *Lernea* spp. was recorded due to *lerneae* spp. was found everywhere and can affect wide range of host. Among the organs that were observed only the gills and the skin were found to be infected but, there were no parasites found on fins.

The dominance of *Lernea* species in this study is in agreement with similar findings in Lake Elan reported by Gebawo, (2006) from *Oreochromis niloticus* with the prevalence of 4%. In Egypt *Lernea* spp. were reported from *oreochromis niloticus*, grass carp and common carps and two crustaceans (*Lernea* sp and *Ergasilus* spp) were isolated with the prevalence of 39.6% and 39.4%; respectively Abd EL-Gawad, and also in Kenya of *lerneae* spp. was isolated from *Oreochromis niloticus* with 5.2%. The prevalence of infestations by *Lernae* spp., and *Ergasilus* spp. of present study were less than these countries. This variation occurs may be due to geographical difference, fish

population and water qualities [20,21].

During this study period *Dactylogyrus* spp. was isolated from the *Oreochromis niloticus* and *Cyprinus carpio* with the prevalence of 4%. Matlaet al. reported *Dactylogyrids* on *Labeo* and *Barbus* spp. from Lake Tzaneen, while Mbokaneet al. reported *Dactylogyrids* from *Labeobarbus* and *Barbus* spp. from Nwanedi-Luphephe Dams. *Dactylogyrus* spp. was obtained from *Oreochromisniloticus* reared in hatcheries in Aswan Governorate with the higher prevalence (36.7%), (. Daniel et al. reported *Dactylogyrus* spp. on *oreochromis niloticus* fish species from a total 685, 222 and 75 tilapias with 22.5%, 55% and 16% in Kenya, Uganda and Ethiopia respectively. *Dactylogyrus* occurred at high prevalence both in farmed and wild fish, indicating the existence of conditioning factors such as shallow waters and low water exchange in both the aquatic systems. The prevalence values of several parasite groups show remarkable differences in comparison to those observed in tilapias from Kenya and Uganda.

The genus Dolops is a South-American genus with only two known exceptions: *D. ranarum* is found in sub-Saharan Africa and *D. tasmanianus* is found on Tasmania. *Dolophus* spp. was recovered from *oreochromis niloticus* and *cyprinus carpio* with the prevalence were 4.9% and 2.3% in this study. This species of crustaceans were also reported from Lake Tana on one African catfish out of 124 examined fish. They were also observed on Nile tilapia from Wonji out of cages, Lakes Babogaya and Awassa but with lower prevalence from 3 to 8.6%. *Dolophus* spp., were also reported from Lake Elan on African catfish and *Labeobarbusintermidus* with intensities of up to 26 parasites per host and the prevalence was 4%. The variation of prevalence rate these lakes are probably due to geographical difference, number and type of fish species and water quality offering suitable ecological niches for the parasites and/or affecting the susceptibility of the hosts and the availability of intermediate hosts.

Conclusion and Recommendations

In conclusion during the present study *Lernea* spp., *Ergasilus* spp., *Dolophus* spp. and *Dactylogyrus* spp. Were identified from *oreochromis niloticus*, *cyprinus carpio* and *Calarias gariepinus* which are commonly caught fish in Lake Lugo. The finding have shown that the gill of fish have been found to be harboring of a large group of external parasite that may be resident and transit parasite than skin and fin. The results of the present study entailed that the importance of external parasitic infestation as it affects health, palatability, productivity, market and aesthetic value of fish. Based on the conclusion the following recommendations were forward:-

- Isolation of external parasite from fish indicates pollution of the Lake so that sanitary measures around the Lake should be taken by the concerned authorities and organization,
- Further detailed studies should be conducted on the epidemiology and ecology external parasite especially crustacean parasite,
- Awareness creation is needed for fishermen on the new products like smoking & drying

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References

- AbdEL-Gawad RA. Studies on ectoparasites of fresh water fish. Unpublished, MV Sc, Faculty of Veterinary Medicine: Zagazig University. 2004.
- Akinsanya B, Hassan AA, Adeogun AO. Gastrointestinal helminth parasites of the fish *Synodontis Clarias* (Siluriformes: Mochokidae) from Lekki lagoon, Lagos, Nigeria. *Int J Trop Biol.* 2008; 56: 2021-2026.
- Amare A, Alemayehu A, Aylate A. Prevalence of Internal Parasitic Helminthes Infected *Oreochromisniloticus* (Nile Tilapia), *Clariascariepinus* (African Catfish) and *Cyprinuscarpio* (Common Carp) in Lake Lugo (Hayke), Northeast Ethiopia. *J Aquac Res Development.* 2014; 5: 233.
- Andrew TG, Huchzermeyer KDA, Mbeha B, Nengu SM. Epizootic ulcerative syndrome affecting fish in the Zambezi river system in Southern Africa. *Veterinary Record.* 2008; 163: 629-631.
- Anonymous. OIE Manual of Diagnostic Tests for Aquatic Animals. 5th ed. World Organization for Animal Health (OIE): Paris. 2006.
- Baxter RM, Golubitsch DL. A note on the limnology of Lake Hayke, RM, Ethiopia. *Limnology and Oceanography.* 1970; 15: 144-148.
- Daniela F, Andrea G, Monica C, Francesco T, Francesco Q, Kassahun A, et al. Veterinary and public health aspects in tilapia (*Oreochromisniloticusniloticus*) aquaculture in Kenya, Uganda and Ethiopia. 2009; 54-86.
- Dereje TK. Spatial and temporal distributions and some biological aspects of commercially important fish species of Lake Tana, Ethiopia. *J Coastal Life Med.* 2014; 2: 589-595.
- Eissa I, Badran A, Aly S, Diab A, Azza A. Clinical and Pathological Studies on Lernaeiosis among Freshwater Fishes. Proceedings of the 2nd Veterinary Medical Conference at Suez Canal University. 2002; 300-322.
- Eshetu Y, Mulualem E. Parasites of fish at Lake Tana, Ethiopia. In *SinetEthiop. J SCI.* 2003; 26: 31-36.
- FAO. Fishery country profile: Food and Agriculture Organization of the United Nations FID/CP/ETH, Rev 3. 2003.
- FAO. Review of the fisheries and aquaculture sector: Ethiopia. FAO: corporate document repository. 2012.
- FDRE (Federal Democratic Republic of Ethiopia). Information on fisheries management in the Federal Democratic Republic of Ethiopia. 2003.
- Fryer G. The parasitic Crustacea of African freshwater fishes; their biology and distribution. *J Zool.* 1968; 156: 45-95.
- Gebawo T. Study on the prevalence and temporal abundance of parasite of fish in Lake, Elan. *Global Journal of fisheries and aquaculture.* 2006; 3: 265-269.
- Lacerd ACF, Takemoto RM, Lizama MAP, Pavanelli GC. Parasitic copepods in the nasal fossae of five fish species (Characiformes) from the upper Paraná River floodplain, Paraná, Brazil. *Acta Sci Biol Sci.* 2007; 29: 429-435.
- Mamani M, HameL C, Vandamme PA. Ectoparasites (Crustacea: Branchiura) of *Pseudoplatystomafasciatum* (surubi) and *P tigrinum* (chuncuina) in Bolivian white-water floodplains. *Ecología en Bolivia.* 2004; 39: 9- 20.
- Matla MM, Mokgalong NM, Mashego SN. Monogenea of the genus *Dactylogyrus* from cyprinids of the genera *Barbus*, *Labeobarbus* and *Labeo* in Lake Tzaneen, South Africa. *Journal of the South African Veterinary Association.* 2010; 81: 181-182.
- Mbokane EM, Luus-Powell WJ, Matla MM, Theron J. Three Dactylogyrids (DactylogyridaeBychowsky 1933: Monogenea) from selected cyprinid species of the Nwanedi- Luphephe Dams in the Limpopo Province, South Africa. *Journal of the South African Veterinary Association.* 2010; 81: 186-187.
- Papernal I. Parasites, Infections and Diseases of fishes in Africa- an update, CIFA Technical Paper No. 31, Rome. Food and Agriculture Organization of the United Nations (FAO). 1996; 220.
- Piasecki W, Goodwin AE, Eiras JC and Nowak BF. Importance of copepoda in freshwater aquaculture. *Zoolog. Studies.* 2004; 43: 193-205.