



Helminth Parasites in the Gastrointestinal Tract of *Oreochromis niloticus* (Nile Tilapia) in Dadin Kowa Dam, Yamaltu Deba Local Government Area, Gombe State, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. Authors AJ and YMY designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors AJ, YMY, TM, AR and AB managed the analyses and the literature searches of the study. All authors read and approved the final manuscript.

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ABSTRACT

Aim: The aim of the study is to identify helminth parasites in the gastrointestinal tract of *Oreochromis niloticus* in Dadin Kowa Dam, Yamaltu Deba Local Government Area, Gombe State.

Study design: *Oreochromis niloticus* fish species were randomly obtained from the local fishermen in the landing sites; between 7:00am-10:00am weekly.

Place and duration of study: The study was carried out at Dadin Kowa Dam in Yamaltu Deba Local Government Area of Gombe State between the months of March to June, 2019.

Methodology: 60 *Oreochromis niloticus* (Nile Tilapia) were obtained and examined for gastrointestinal parasites. Sex of the fish was determined by the presence and absent of an intromittent organ. The total length, standard length and body weight was measured using standard method. Dissection was done using standard procedure and the Parasites recovered were identified using the helminth parasites of fish identification guide.

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Results: Out of the 60 fish species examined. (23 female and 37 males), 21 (35.00%) were infected and were observed to harbour six (6) endoparasites; viz nematodes, Cestodes and trematodes. The results show that there was a significant difference between infection rate, total length and weight of fish with female species having relatively higher percentage prevalence 11(43.50%) than the males 10 (29.70%). It was observed that the prevalence of parasitic infection increase with length and weight of the fish.

Conclusion: Presence of these fish helminth parasites may lead to devaluation in protein constant in the body of the fish. The work therefore recommends water quality assessment of Dams as it is one of the factors that bring about the increase in parasitic infection.

Keywords: Dadin kowa dam; Helminth parasites; *Oreochromis niloticus*; gastrointestinal tract.

1. INTRODUCTION

Fish is important in the development of Nigeria both economically as a source of subsistence income and health wise as source of protein with low cholesterol level in the diets of populace [1]. Tilapia is one of the most widely distributed fish in the world, second only to common Carp, Tilapia are wide spread in the tropics and subtropics [2].

Over seventy species of tilapine fish have been identified, though global tilapia production has been dominated by three members of the genus *Oreochromis*: Nile tilapia (*Oreochromis niloticus*), Blue tilapia (*Oreochromis aureus*) and Mossambique tilapia (*Oreochromis mossambicus*). Fish resources are being depleted at an alarming rate as a result of over harvesting, and pollution, thus fish production is struggling to meet the increasing demand of the growing population. Poor environmental conditions and pollution often result in reduced immunity of fish and increased susceptibility to parasitic infestation and disease [3]. Parasites particularly helminthes are among the most devastating agents in aquaculture affecting the health of many fish species and making them susceptible to secondary infection. (E.g. Fungi, bacteria and viruses). Resulting in the nutritive devaluation of fish and subsequent economic losses [4]. Parasites could be harmless, harmful or beneficial to the host. The number of parasites necessary to cause harm to a host varies considerably with species and size of the host and its health status [5]. In recent times, fish worth millions of naira are lost directly or indirectly due to parasitic infection each year [6].

One stressor influencing fish health is that imposed by parasites. Some factors that enhance parasite infection in fishes includes reduced oxygen content of water, increase in organic matter in the water and poor environmental conditions, changes in social,

dietary or cultural norms which have led to the increased opportunity for exposure [7]. Due to the importance of fish as one of the major source of animal protein, studies on this aspect of biology, morphology and diseases of fish is very important [8]. The present study identified the gastrointestinal parasites infecting *Oreochromis niloticus* (Nile Tilapia) in Dadin kowa Dam, Gombe State, North Eastern Nigeria.

2. MATERIALS AND METHODS

2.1 The Study Area

Dadin Kowa Dam is located in Yamaltu Deba Local Government Area of Gombe State in the North Eastern Nigeria. The dam is about of 35km to the East of Gombe town with latitude of $10^{\circ} 19' 11''$ N and longitude of $11^{\circ} 28' 54''$ E. The dam was built by the Federal Government of Nigeria in 1984 on the Gongola River, with the goal of providing irrigation and electricity for the planned Gongola sugar plantation project.

The reservoir has a capacity of 800 million cubic meters of water and a surface area of 300 square kilometers, and has a potential as a source of fish. The Dam presently supply the entire Gombe Metropolis and other settlement along the road with portable drinking water for both human and animals use, which supply about 30,000 cubic meters daily. The dam also irrigates about 6,600 hectares of farmland yearly and also acts as a popular tourism attraction area [9].

2.2 Sample Collection

A total of 60 randomly selected *Oreochromis niloticus* were obtained from the local fishermen in the landing sites; between 6:00am-9:00am. Samples collected were kept in a plastic container. Water from the Dam was added to the samples before it was transported immediately to the Zoology Laboratory, Department of Biological

Sciences, Gombe State University for processing.

2.3 Sample Processing

2.3.1 Determination of sex

Sex of the fish was determined by the presence and absent of an intromittent organ. The visual examination of the external and internal reproductive structures was used to determine the sex of fish. Males were characterized by the presence of their genital papilla located immediately behind the anus through which both mild and urine pass, this structure is absent in females. [10].

2.3.2 Determination of length (cm) and weight (g)

The total length, standard length and body weight was measured using standard method described by Olatunde [11]. The total length was measured from the snout to the end of the caudal fin. The standard length was obtained by subtracting the length of the caudal fin from the total length. This was recorded in centimeter (cm). Fish weight was determined using Weighing balance after draining excess water, and it was estimated to the nearest gram.

2.4 Dissection of Fish and Parasites Identification

The body of the fish was examined and placed on a dissecting board. The body cavity was cut open by making a longitudinal slit on the ventral surface from the anal opening to the lower jaw using a surgical blade. The gastrointestinal tract was carefully observed and all the helminthes seen were carefully detached. The recovered parasites were placed in a normal saline and refrigerated for about 5 minutes this enable the parasite to stretch and relax for a clear observation under microscope. They were stained and pass through graduated alcohol level for 45 minutes to dehydrate. They were then cleared in xylene and mounted on a glass slide in Canada balsam for examination and identification [12]. Nematode were fixed and stain using acetocarmine and lactophenol The parasites were viewed under light microscope. Parasites recovered were identified morphologically and parasitologically by using the helminth parasites of fish standard identification keys by Paperna [13]; Kabata [14]; Roberts [15].

3. RESULTS AND DISCUSSION

3.1 Result

The overall prevalence of helminth parasites was recorded to be 35.0%. The result showed that out of the 60 *Oreochromis niloticus* species of fish examined, 21 were infected with different helminth parasites. The parasites recorded were *Paracamallanus spp* 1 (1.66%), *Camallanus spp* 5(8.33%), *Euclinostomum spp* 4(6.66%), *Diphyllobothrium spp* 3(5.00%), *Monobothrium spp* 7(11.66%) and *Allocreadium spp* 1(1.66%). Table 1.

Table 2 shows the prevalence of parasitic infection in relation to sex of fish. 11 of the male were infected with the parasite which brings the prevalence of infection to be (29.7%), while the infection occurred in 23 (43.5%) of the female.

The prevalence rate base on the standard length of fish is presented in Table (3). The result shows that the prevalence of parasitic infection decreases with length of fish species examined. According to weight, the weight class 110-120 had the highest prevalence rate 4(66.7) while the weight class 60-70 had the least prevalence rate 1 (14.3). Table 4.

3.2 Discussion

The result of this study reveals that six helminthes parasites were found infecting *Oreochromis niloticus* in Dadin Kowa Dam. The parasites recovered were; *Paracamallanus spp*, *Camallanus spp*, *Euclinostomum spp*, *Diphyllobothrium spp*, *Monobothrium spp* and *Allocreadium spp*. This finding is in agreement with the work of Yakubu et al., [16] who studied the gut helminth parasites of Nile Tilapia and *Claria gariepenus* and reported that *Monobothrium spp*, *procamellanus laeiviconchus*, *proteocephalid* species, and *clinostomum spp* were found parasitizing the two species. The overall prevalence of 21(35.00%) was recorded. The finding of the study was higher than the finding of Uneke [12] who had reported a prevalence of 20%. However it was lower than that of Akinsanya et al., [6] who had reported 38.7%. This suggests that the occurrence of parasitism varied from one habitat to the other which could be due to host parasite relationship, abiotic factors, composition of the water dissolved oxygen, temperature, salt content and PH as explained by Bichi, et al. [8]. The rate of infection was significantly higher in females than in males. In an earlier work by

Ugwuzor [17], he reported that the difference of the physiological condition of the females especially gravid ones could be the reason for the high rate of infection in female as this physiological state could reduce the resistance of the fish to infection by the parasites. With respect to age of the fish species, the infection rate was significantly ($p=0.05$) higher in the adult fishes. This contradicts Akinsanya et al., [6] but agrees with Olurin et al., [18] the high prevalence

of helminth parasites in adult could be attributed to accumulation of parasites year by year as adult fish consumes a great variety of food and exhibit variety of feeding styles that leads them to the ingestion of intermediate host harboring infective stages of helminth parasites inside their body as explained by Nwuba et al., [19]. According to Olofintoye [20], the difference in prevalence of infection between the younger and the adults is related to their diet.

Table 1. Parasite species of *Oreochromis niloticus* in Dadin kowa Dam

Taxonomic group	Parasites	Number of fish infected	% Prevalence
Cestode	<i>Monobothrium spp</i>	7	11.66
	<i>Diphyllobothrium spp</i>	3	5
Trematode	<i>Allocreadium spp</i>	1	1.66
	<i>Euclinostomum spp</i>	4	6.66
Nematode	<i>Paracamallunus spp</i>	1	1.66
	<i>Camallanus spp</i>	5	8.33
Total		21	35



Fig 1. Map of the study area

Table 2. Relationship between parasitic infections with the sex of *Oreochromis niloticus*

Sex	Number of fish examined	Number of fish infected	% Prevalence
Male	37 (61.66)	11	29.72
Female	23 (38.33)	10	43.47
Total	60	21	35.00

Table 3. Relationship between parasitic infections with the length of *Oreochromis niloticus*

Length (cm)	Number examined	Number infected (%)
10-15	36	14 (38.9%)
15-20	22	6 (27.3%)
20-25	2	1 (50.0%)
Total	60	21 (35.0%)

Table 4. Relationship between parasitic infections with the weight of *Oreochromis niloticus*

Body weight (g)	Number Examined	Number Infected (%)
50-90	27	11(40.7)
90-130	22	9 (40.9)
130-160	11	1 (9.0)
Total	60	21 (35.0)

In this study, the length group 10-15 cm was recorded to have the highest prevalence. This agrees with Akinsanya et al., [6]. He further explained that this may be attributed to the low level of immunity in the smaller sized fish, and probably high level of immunity in larger sized fish. The infection rate in relation to weight of the fish reveals that the weight group 90-130 was recorded to have the highest prevalence of infection, followed by 50-90 weight group. The weight group 130-160 recorded low prevalence of infection. This might be due to the fact that the fish species were randomly selected.

4. CONCLUSION

The result of this study reveals the presence of intestinal parasites of *O. niloticus* in Dadin kowa Dam. The prevalence of the intestinal parasite was high with 6 intestinal parasitic species present in fish. Intestinal parasites are among the important problems affecting fish production. Therefore, the risk of infection with fish borne parasites present a threat to human consumers and can transmit disease to man resulting to poor public health.

Fish in aquaculture are more susceptible to parasitic infection, therefore there is possibility that the fish species examined might have suffered malnutrition arising from parasitic infection. This is not without attendant consequences; they may lead to devaluation in protein constant in the

body of the fish. Invariably, protein deficiency impairs normal metabolism of the liver particularly in Man.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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