Vandi and Daniel (2023)
Biological and Environmental Sciences Journal for the Tropics 20(3) December, 2023
ISSN 0794 – 9057; eISSN 2645 - 3142
BEST JOURNAL 20(3): 182 - 188
Date received: 11/09/2023
Date accepted: 13/11/2023
https://dx.doi.org/10.4314/bestj.v20i3.18

Prevalence of Gastrointestinal Parasites and Condition Factor of *Oreochromis niloticus* (L.) in Kiri Reservoir, Shelleng, Adamawa State, Nigeria

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ABSTRACT
It is known that a number of parasite groups from various taxa, including helminths, protozoans, and other groups, can infect fish and harm their hosts. Finding out how common gastrointestinal parasites are in *Oreochromis niloticus* was the study's main goal. On the landing site a total of 200 species of *O. niloticus* were randomly sampled, sort and identified using keys twice in a month for a period of six months from May to October, 2017. The total length and standard length to the nearest 0.1 cm. was taken using a measuring ruler. The total body weight was determined to the nearest 0.01 g using a top loading Mettler balance. Specimen was dissected and emptied in to a Petri dish. The distribution of parasite species showed that male had 26 (48.15 %) *Posthodiplostomum* minimum and 16 (47.06%) *Myxobolus* species, while the females had 28 (51.85 %) *Posthodiplostomum* minimum and 18 (52.94%) *Myxobolus species*. Chi square was used to show the prevalence of parasites in relation to sex, length and weight. The prevalence of parasites in relation to the Standard Length showed that the size range of 15.0 to 7.9 cm had the highest parasitic infection with 24 (61.54%) infected, the size range 21.0 to 3.9 cm had the least rate with 11 (31.43%). There was statistically significant difference between parasite infection and length (cm) at $p < 0.05$. Therefore, there is occurrence of helminth parasites in Nile Tilapia (O. *niloticus*) found in Kiri reservoir, and thus good culinary practices should be adopted.

Keywords*:* Helminths Parasites, *Oreochromis niloticus*, Condition Factor, Kiri Reservoir, Shelleng.

INTRODUCTION

Fish production is finding it difficult to keep up with the growing demand of the world's population as a result of overfishing and pollution, which are depleting fish stocks at an alarming rate. Fish with lower immunity and greater susceptibility to parasite infestation and sickness are frequently the products of poor environmental conditions and pollution (Luque, 2004). Despite the large fish population, the economic benefits remain marginal due to the prevailing diseases, poor nutrition, and reproductive inefficiency and management constraints. Parasites have a detrimental effect on fish tissues and on fish growth (Kabata, 1995). Fishes are hosts for many protozoan parasites. Some of the parasites that causes diseases disease affecting fishes health and reproduction, making them an easy prey to predators. In fish farming, parasites may lead to epidemics and mortalities resulting in economic losses (Khalil and Polling, 1997). Parasite infections in fish causes production and economic losses through direct fish mortality, reduction in fish growth, fecundity and stamina, increase in the susceptibility of fish to diseases and predation (Cowx, 1992), the share of such losses caused by helminth infections is well known.

Investigation on fish parasites and disease in most parts of Nigeria are still lagging behind (Oniye *et al*., 2004). Parasites of fish constitute one of the major problems confronting the modern fish culturists, and pathological conditions arising from parasitic infections assume a high magnitude especially under crowded conditions. All fishes are potential host to many different species of parasites that cause significant mortalities among captive and wild fish stocks (Uneke, 2015)

The importance of fish pathology has been realized and efforts are being made to intensify work in this field in various part of the world especially in Africa. Parasites occurring in African fresh water fishes require urgent attention; particularly those that infect economically important fishes which in many cases devalue their aesthetic quality and palatability (Olurin and Samorin, 2006). Thus this paper seeks to provide valuable information on the prevalence of helminthes parasites of Nile Tilapia fish in Kiri reservoir. Also to determine the rate of infection with these parasites and the relationship between parasite infection and length of the fish, to evaluate the relationship between helminths parasites infection and the host sex, to determine the prevalence of helminths species infecting Nile Tilapia in Kiri reservoir, Shelleng Local Government, Adamawa State, Nigeria.

MATERIALS AND METHODS

The Kiri Reservoir in Shelleng Local Government Area, Adamawa State, Nigeria, served as the study area. It lies in longitude 90 40' 47" N and latitude 120 00' 51" E. In order to supply Savannah Sugar Company (SSC) with irrigation, the Gongola River was dammed to create the reservoir (Figure 1). The reservoir has an interior clay blanket and is 11.2 km long by 20 m high zoned embankment. 1982 saw the completion of the reservoir (ICE, 1990). 615 m3 is the reservoir's capacity (Enplan, 2004).

Sampling Collection:

Fish specimens were procured from artisanal fishers using cast net and lift net at the landing site for the study. Sampling of landed catches was done twice in a month for a period of six months from May to October, 2017. The fishers used a wide range of fishing gear such as hook and line, long line, cast nets, gill nets and traps. On the landing site, fish specimen **was** randomly sort and identified using keys and descriptions by Olaosebikan and Raji, (1998) and Idodo-Umeh, (2003). Both male and female species were bought and conveyed immediately to the laboratory in plastic containers with ice-block for laboratory analysis on the same day as they were bought. A total of 200 species were sampled for this study. The fish were sacrificed using the mechanical stunning method (Humaira *et al.,* 2015)

Laboratory Analysis of Fish Sample

In the laboratory, the Total Length (cm) of each fish was taken from the tip of the mouth to the extended tip of the caudal fin using a measuring ruler to the nearest 0.1 cm. Standard Length (cm) for each fish was taken as measurement from the tip of the mouth to the caudal peduncle to the nearest 0.1 cm as described by Lowe McConnell, (1972). The total body weight in grams was measured for each fish species to the nearest 0.01 g using a top loading Mettler balance. The sex of *O. niloticus* was determined only after dissection and noting the presence of testes or ovaries (Imam and Dewu, 2010). The gastrointestinal tract of individual fish was dissected from the rectum to the oesophagus and all helminths seen were carefully detached, processed using standard parasitological methods as described by Olurin and Samorin, (2006).

The parasites obtained were counted and placed in normal saline overnight in a refrigerator and later fixed in 5% formalin.

Biological and Environmental Sciences Journal for the Tropics 20(3) December, 2023
ISSN 0794 – 9057; eISSN 2645 - 3142

They were stained overnight with Ehrlich's haematoxylin solution and passed through graduated alcohol levels (30, 50, 70, 90 % and absolute) for 45 minutes to dehydrate, cleared in xylene and mounted on a glass slide in Canada balsam for examination and identification under the light microscope at x10 as described by Uneke, (2015). The identification of parasites collected relied on the key of identification by Paperna, (1996).

The prevalence of parasites infection was calculated using the model;

$$\text{Prevalence of infection (\%)} = \frac{\text{Number of host infected}}{\text{Total number of host examined}} \text{ X } 100\%$$

Intensity of parasite was estimated using the model;

$$\text{Intensity of infection} = \frac{\text{Total number of parasites species in a sample of fish examined}}{\text{Total number of fish host infected}}$$

The prevalence of parasite infection base on sex of fish was estimated using;

$$\text{Prevalence of individual parasite (\%)} = \frac{\text{Number of a particular sex of fish infected}}{\text{Total number of a particular sex of fish examined}} \text{ X } 100\%$$

RESULTS

The distribution of the recovered parasites revealed the presence of two (2) classes, each containing a single species of parasite: Posthodiplostomum minimum, with a parasite load of 54, and Cyst of *Myxobolus* sp., with a parasite load of 34 (Table 1). According to the distribution of infected species by sex, out of 102 tested species, males had a prevalence rate of 51.96% with 53 infected individuals, while females had 22 (49.00%) infected individuals out of 98 studied species. According to the distribution of parasite species, males had a parasite load of 42 with 26 (48.15%) *Posthodiplostomum* minimum and 16 (47.06%) Myxobolus sp., while females had a parasite load of 51.85% with 28 *Posthodiplostomum* minimum and 18 (52.94%) *Myxobolus* sp. The Chi square test showed that there was however significant difference in the prevalence of parasite infection in *O. niloticus* by sex (P >0.05, χ^2 =3.67, df 2) in Kiri Reservoir Table 2

The prevalence of parasites in relation to the Standard Length showed that the highest parasitic infection in the size range of 15 to 7.9cm with 24 (61.54%) species infected, with a parasite load of 27 parasites, followed by the size range 18 to 0.9cm with 14 (28.57%) and 24 **to** 6.9cm with 14 (35.90%), with a parasite load of 18 and 17 respectively. The size ranges 12 **to** 4.9cm had 12 (31.58%) infected with a parasite load of 14. The size range 21 to 23.9cm had the least infected number with 11 (31.43%) with a parasite load of 12. The Chi square test showed that there was no significant difference in the prevalence of parasite infection in *O. niloticus* by Standard Length (P >0.05, χ^2=4.79, 8df) in Kiri Reservoir (Table 3). The prevalence of parasites in relation to Weight showed that the weight range 102 to 127g had the highest with 26 (50.98%) species infected with a parasite load of 36, followed by the weight range of 76 to 101g with 27 (51.92%) species infected with a parasite load of 30, the weight range 154 to 179g had 9 (25.71%) species infected with a parasite load of 10, while the least was 128 to 153g with 6 (18.18%) and 50 to 74g with 7 (24.14%) with a parasite load of 7 and 5 respectively. The Chi square test showed that there was however no significant difference in the prevalence of parasite infection in *O. niloticus* by weight (P >0.05, χ^2=6.71, df 8) in Kiri Reservoir Table 4

The condition factor (K) for *O. niloticus* showed that males ranged from 0.58 -4.68 (mean value of K=1.72± 1.03) females ranged from 0.47 to 4.68 (mean value of K=1.25±1.05) while combined sexes has the range of 0.52 to 4.05 (mean value of K=1.50±1.06) (Table 5).

Table 1: Distribution of Parasites Recovered from *O. niloticus* Species in Kiri Reservoir

Class	Parasite species	Parasite Load	Percentage (%)
Trematode	*Posthodiplostomum* minimum	54	61.36
Protozoa	Cyst of *Myxobolus sp.*	34	38.64
Total		88	100

Table 2: Prevalence of Parasites in Relation to Sex of *O. niloticus* in Kiri Reservoir

Sex	No Examined	No. Infected	*Posthodip*	*Myxobol*	Parasite Load (%)
Male	102 (51.00%)	53 (51.96%)	26 (48.15%)	16 (47.06%)	42 (47.73)
Female	98 (49.00%)	22 (44.45%)	28 (51.85%)	18 (52.94%)	46 (52.27)
Total	200 (100%)	75 (37.50%)	54 (100%)	34 (100%)	88 (100)

χ^2 =3.67, df = 2, p > 0.05

Table 3: Prevalence of parasites in relation to standard length (cm) of *O. niloticus* in Kiri reservoir

Stand. Length (cm)	No. examined	No. infected (%)	Parasite Load	Intensity
12 – 14.9	38	12 (31.58)	14	1.17
15 – 17.9	39	24 (61.54)	27	1.13
18 – 20.9	49	14 (28.57)	18	1.29
21 – 23.9	35	11 (31.43)	12	1.09
24 – 26.9	39	14 (35.90)	17	1.21
Total	200	75 (37.50)	88	1.17

χ^2=4.79, df = 8, p > 0.05

Table 4: Prevalence of parasites in relation to weight (g) of *O. niloticus* in Kiri reservoir

Weight (g)	No. examined	No. infected (%)	Parasite Load	Intensity
50 -75	29	7 (24.14)	5	0.71
76 -101	52	27 (51.92)	30	1.11
102 -127	51	26 (50.98)	36	1.38
128 -153	33	6 (18.18)	7	1.17
154-179	35	9 (25.71)	10	1.11
Total	200	75 (37.50)	88	1.17

χ^2=6.71, df = 8, p > 0.05

Table 5: Condition factor of *O. niloticus* in Kiri reservoir

Sex	No. examined	Range value (K)	Mean value (K)
Male	102	0.58-4.68	1.72± 1.03
Female	98	0.47-4.68	1.25±1.05
Combine	200	0.52-4.05	1.50±1.06

K= Condition factor

DISCUSSION

A total of 200 *Oreochromis niloticus* was dissected; the prevalence of those infected in relation to sex was in contrast with the report from Uneke, (2015), who examined a total of 120 samples of *O. niloticus* in the Mid Cross River Flood System, South-eastern Nigeria out of which 15 (12.5%) males and 9 (7.5%) females were infected. The report from this study also contradict the report of Domo and Ester, (2015), who reported 13 (42.9%) males, and 10 (25.6%) females in Lake Geriyo, Jimeta Yola, Adamawa State, and with the report of Francis *et al.* (2013), who examined a total of 100 *O. niloticus* fish samples from the Lower New calabar

River and reported an infection rate of male 43 (43%) and female 16 (16%).

There have been inconsistent explanations in previous literature as regards to the relationship between sex and prevalence, some indicating positive correlation and others showing the converse (Olurin *et al*., 2012). But a difference in the incidence of infestation between male and female fish has been reported by Emere**.** (2000), attested it to differential feeding either by quantity or quality of food eaten, or as a result of different degrees of resistance or infection. Emere and Egbe**.** (2006), reported that due to the physiological state of the female, most gravid females could have reduced resistance to infection by parasites.

The prevalence of infections in relation to species of parasites in the present studies confirm the findings of Domo and Ester, (2015), who reported that the parasites isolated from *O. niloticus* were *Clinostomium species*, and *Procammalanus species* among others, and the report of Uneke, (2015), who also recordeda species of helminthes; *Procamallanus laevinochus*was found in Nile *Tilapia*in Cross River flood system. Reports have shown that helminths are generally found in all freshwater fishes, the prevalence and intensity depends on factors such as; parasite species and their biology, host and its feeding habits, physical factors and hygiene of the water body, and presence of intermediate hosts where necessary which play a vital role (Hussen *et al*., 2012).

The prevalence of helminth parasites in relation to length agrees with the report of Uneke, (2015), who recorded higher helminths prevalence in groups between 10 to 15 cm and 16 to 20cm. The reason could be due to the low level of immunity in the smaller sized fish, which explain the high prevalence of helminthosis, but some authors like Olurin and Samorin, (2006), and Ray, (2005), had observed that the larger the fish, the greater the susceptibility to parasite infection, because adult fish consumes a great variety of foods and exhibit a great variety of feeding styles. Hence the correlation of prevalence of parasitic infections with fish length which in turn corresponds to fish age (Hussen *et al*., 2012).

The mean condition factor (K) for *O. niloticus* was in agreement with Obasohan *et al*. (2012), on the well-being of the fish, who recorded 3.26 as the condition factor of *O. niloticus*, Anene, (2005), recorded 4.3 in man-made lake in Imo, with K greater than 1 shows that the fish is in good condition. When the value is less than 1, this imply that the fish are not in good state of well-being in the stream. Many factors such as sex, age, state of maturity, size, state of stomach fullness, sampling methods and sample sizes and environmental conditions affect fish condition and parameters of length-weight relationships in fish (Ama-Abasi, 2007; Yem *et al.*, 2007; Adeyemi *et al* ., 2009).

CONCLUSION

There is a significant prevalence of helminth parasites of Nile Tilapia (*O. niloticus*) in Kiri Reservoir, with single species each from two classes of parasites recovered. The infection seems to be sex bias but not specific to sizes and weight of *O. niloticus.* Thus; good culinary practices should be adopted to decimate risks to human health

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