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Comparative incidences ofgastro-intestinal parasite in *Clarias gariepinus* and *Oreochromis niloticus* from Biu dam, Borno state, Nigeria

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ABSTRACT

Aim: The aim of this study was to determine prevalence of gastro-intestinal parasite of *Clarias gariepinus* and *Oreochromis niloticus*was carried at Biu Dam.
Materials and Methods: Samples were collected for the period of four months (August – November, 2023) and the experiment was carried our using standard scientific methods.
Results: The results revealed that seven parasites belonging to four taxas namely; Cestodes (*Diphyllobothrum latum, Taenia saginata*), Nematodes (*Ancylostoma piscium, Dactylogyrus vastator, Capilliria hepatica*), Trematodes (*Heterophyes heterophyes*) and Protozoan (*Trypanosome chagasi*) were identified. Prevalence of nematodes was more than other taxas during the period of this study.
Conclusion: It was concluded that overall prevalence of parasites was recorded higher in *Oreochromis niloticus*. *Clarias garienpinus* recorded the highest prevalence of protozoan, trematodes and a species of nematodes *Ancylostoma piscium* throughout the period, while *Oreochromis niloticus*was observed to have higher nematodes such as *Dactylogyrus vastator, Capilliria hepatica*, and cestodes.

Keywords: *Clarias gariepinus*, Gastro-intestinal, *Oreochromis niloticus,* parasite, reservoir.

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Introduction

Fish is a rich source of protein and is an essential food item in the diet of millions of people. Among the popular fish species that are being farmed widely are *Clarias gariepinus* and *Oreochromis niloticus.* However, these fishes are vulnerable to various diseases and parasites that can affect their growth and health (Feis and Longshaw 2008). Among important factors that affect their growth and survival is prevalence of gastrointestinal parasites. They are affected by different parasites, as they are not only can act as intermediate hosts for many digeneans and cestodes, but they also can act as definitive hosts for many helminths. The infection of wild fish with parasites is common where requirement of parasites for intermediate and definitive hosts are chanced (Feis and Longshaw 2008).

The most common parasites are gastrointestinal parasites that compete with the fish host for nutrients, hence reducing the essential nutrients absorbed by fish. Subsequently, these parasites hamper the growth of fish leading to morbidity and mortality and making the fish more susceptible to surrounding predators (Azadikhah *et al.*, 2014 and Omeji *et al.*, 2015). Fish helminthology is not as broadly researched as other aspects of aquatic parasitology and fish biology. This is possibly because helminths are principally infecting the internal organs, chiefly the gastrointestinal tract (Ibrahim *et al.*, 2008). Parasitehave constituted a major problem confronting aquaculture with pathological conditions that arise from their infection, with potentially serious consequences (Vandenbrock, 1979). Parasite across different aquatic habitat which infected fish species, inflicting injuries, which become a substrate to other opportunistic microorganisms reducing fish production as a

result of the menace they cause. Aquaculturists may have done their best to combat this menace based on their knowledge which seems not adequate. Aliyu and Solomon (2012) also reported the presence of trematodes, cestodes and nematodes in fish. Despite *C. gariepinus and O. niloticus* are two major economically important fish species commonly cultured in aquaculture systems, both fish species are known to be susceptible to a wide range of gastro-intestinal parasites. Therefore, understanding the prevalence and distribution of these parasites is essential for effective management and control of fish disease in aquatic habitats.

Materials and Methods

Study Area: Biu Dam is situated in Biu local government in Borno State and located on latitude 10°38'14" N and longitude 12°05'21'' E. Constructed purposely to supply drinking water to Biu community being the second largest town in Borno state and the Damis used for irrigating the fertile agricultural land around the dam and fishing and source of water for large cattle farmer.

Sample Collection: Fish Samples were collected from the fisherman from the Biu reservoir from August to November 2023.The fish sample was kept in a plastic cooler with ices and then was transported to the Nigerian Army University, Department of Biology laboratory were the fishes were examined for parasites.

Examination of the Fish Parasite: Each fish was picked, examined carefully for any abnormalities on its body and then was open with a sharp scissor by cutting from the anal region up to the throat. The connective tissue the loops of the liverwas carefully cut and then each organ was separated.The gut was place in a petri dish, stretched and cut the esophagus, stomach and intestine. The intestine was open by pair of scissors scrapped on a slide and examined using X10 andX40 objective lens of the light microscope as described.

Data Analysis: Prevalence were calculated using the following formula according to Ekanem *at al.* (2014).

$$\text{Prevalence} = \frac{\text{Total number of infected fish}}{\text{Total number of fish examined}} \times 100$$

Results and Discussion

Prevalence of Parasites in Clarias gariepinus and Oreochromis niloticus: The prevalence, mean intensity and abundance of parasites in examined fish were recorded (Table 1). The overall prevalence infection was 16(53.33%) for both the two species fish. *Oreochromis niloticus* has the highest number of infection with the infection rate of 9(60.00%), while *Clarias gariepinus* has the less number of infection rate of 7(46.67%). The highest mean abundance of the parasites was recorded in *Clarias gariepinus* with the mean abundance of 7.53, while *Oreochromis niloticus* recorded 6.13 for the period of this study. The mean intensity of the parasites recorded were 16.14 and 10.22 for both *Clarias gariepinus* and *Oreochromis niloticus* respectively. The results of the present work showed the existence of four parasites taxa, 2 belongs to cestodes, 3 nematodes, 1 each of trematodes and protozoan. The overall prevalence rate was higher than 32.9%, 16.9% and 17.1% recorded in Warri River, Okhua River and Osse River by Onyedineke *et al.* (2010), Ekanem et al. (2011) and Okaka and Akhigbe (1999). This result revealed that, *Oreochromis niloticus* has the highest prevalence of infection rate than *Clarias gariepinus*. This agreed with the work of Uchechukwu and Princess (2019) who reported higher prevalence in *Oreochromis niloticus*. This was in contrast with the work Osimen and Anagha (2020) who reported higher prevalence in *Clarias angullaris* due to preference to zooplankton with increasing in size. The higher prevalence of infection rate in *Oreochromis niloticus* may be due to variation between the two species examined which may include size of fish, or differences in immunity against parasites.

Prevalence of Cestodes Parasites inClarias gariepinus and Oreochromis niloticus

The result of prevalence of cestodes in fish examined was presented (Table 2). The results revealed that, only two species of cestodes namely *Diphyllobothrum latum* and *Taenia saginata* were recovered in both *Clarias gariepinus* and *Oreochromis niloticus*. The prevalence of infection of *Diphyllobothrum latum* were 5(33.33%) and 3(20.00%) for *Oreochromis niloticus* and *Clarias gariepinus,* while *Taenia saginata* has a prevalence infection of 3(20.00%) and 1(6.67%) for both *Oreochromis niloticus* and *Clarias gariepinus.* The mean abundance of *Diphyllobothrum latum* and *Taenia saginata* recorded were 5.80 and 1.33 for *Oreochromis niloticus* and 1.20 and 0.40 for *Clarias gariepinus.* The mean intensity was also higher in *Oreochromis niloticus* with 17.50 and 6.67 for both *Diphyllobothrum latum* and *Taenia saginata*, while

Clarias gariepinus has 6.00 and 6.00 for the two parasites. The overall prevalence infection rates of parasites were 8(26.67%) and 4(13.33%) for both *Oreochromis niloticus* and *Clarias gariepinus* respectively. The *Diphyllobothrum latum* and *Taenia saginata*) were more prevalent on *O. niloticus* than *Clarias gariepinus*. There were very low abundance of *Diphyllobothrum latum* and *Taenia saginata* in *C. gariepinus* compared to *O. niloticus*. The prevalence and abundance of parasites on in *C. gariepinus* and *O. niloticus* could as well be related to nature of fish and feeding habits as reported by Arkoll *et al.,* (2011). Arkoll *et al.* (2011) also noted that, since *C. gariepinus* prefers to feed on bottom, edges and vegetation areas of the water while *O. niloticus* are pelagic and feed in higher water column and edges, it could affect exposure to parasites. The relationship of diets and feeding habits and parasites had been highlighted by Marcogliese (2002); Nunn *et al.,* (2008). These findings were in contrast with Bichi and Yelwa (2010) who reported higher prevalence in *C. gariepinus.*

Prevalence of Nematodes Parasites inClarias gariepinus and Oreochromis niloticus

The distribution of nematodes parasites in the examined fish was recorded (Table 3). Three species of nematodes parasites were recovered from *Clarias gariepinus* and *Oreochromis niloticus* namely; *Ancylostoma piscium, Dactylogyrus vastator* and *Capilliria hepatica. Ancylostoma piscium* was not recovered in *Oreochromis niloticus,* while *Capilliria hepatica* was not recovered in *Clarias gariepinus* for the period of study. The prevalence of infection of the parasites were 2(13.33%) and 2(13.33%) of *Ancylostoma piscium* and *Dactylogyrus vastator* in *Clarias gariepinus* and 1(6.67%) and 1(6.67%) of *Dactylogyrus vastator* and *Capilliria hepatica* in *Oreochromis niloticus.* The mean abundance of the parasites was 0.80 and 0.33 for *Dactylogyrus vastator* and *Ancylostoma piscium* in *Clarias gariepinus* and 4.93 and 0.13 for *Dactylogyrus vastator* and *Capilliria hepatica* in *Oreochromis niloticus*. The mean intensity of the parasites was 74 and 2.00 in *Oreochromis niloticus* for both *Dactylogyrus vastator* and *Capilliria hepatica*, while *Clarias gariepinus* recoreded 6.00 and 2.50 for both *Ancylostoma piscium* and *Dactylogyrus vastator*. The overall prevalence of infection were *Dactylogyrus vastator* 3(10.00%), *Ancylostoma piscium* 2(6.67%) and *Capilliria hepatica* 1(3.33%) respectively.The commonest infection of the fish was caused by a nematode. Royce (1972) reported that the presence of nematodes in fish lead to decline in population in their natural environment although, this study did not investigate this assertion. The abundance of nematode parasite *Ancylostomapiscium, Dactylogyrusvastator* and *Capilliria hepatica* in both *C. gariepinus* and *O. niloticus* is another indicator of cross sharing of parasites. In this research a comparative analysis of prevalence and abundance of parasites in both *C. gariepinus* and *O. niloticus* showed that *Dactylogyrus vastator* was a major parasite. Based on the results it seems that the nematode parasites could easily attack the fishes despite their trophic levels in water. *C. gariepinus* usually feeds at bottom and *O. niloticus* in water column or edges. From current result, the nematodes has highest species available in two fish species, this may be due to activity of parasites in natural environment even as reported by Uchechukwu and Princess (2019) that earthen ponds harboured much blood sucking parasite because it look like a natural environment.

Prevalence of Trematodes Parasites inClarias gariepinus and Oreochromis niloticus

The results of distribution of trematodes in examined fish species were presented (Table 4). Only one species of parasites (Heterophyes heterophyes) was recovered in *Clarias gariepinus.* The prevalence infection was 1(3.33%), while mean abundance of parasites was also 0.20. The mean intensity of parasites recorded stand at 3 and overall infection rates of parasite in *Clarias gariepinus* was 1(3.33%). Trematodes parasites have been reported in *C. gariepinus and O. niloticus*, causing damage to eyes, gills, and fins (Ojemaye *et al*., 2017; Ayanda *et. al*., 2014). From current study, it was observed that parasites were only recovered in *Clarias gariepinus* at a very low prevalence infection rate of 1(3.33%), which was lower than value reported by Dauda *et al.* (2016) in Gombe State who recorded 13.7% prevalence rate in Tilapia zilli. However, Amaechi (2014) reported highest prevalence (35.9%) infection rate in *Orechromis niloticus*. The presence of the trematodes in Biu reservoir was minimal since both the species investigated did not show any significant availability of the parasites.

Prevalence of Protozoan Parasites inClarias gariepinus and Oreochromis niloticus

The results of the distribution of protozoan in the examined fish species were presented (Table 5).

Table 1. Prevalence, mean intensity and abundance of parasites in examined fish

Fish species	NE	NI	NPR	P (%)	MI	MA
Clarias gariepinus	15	7	113	46.67	16.14	7.53
Oreochromis niloticus	15	9	92	60.00	10.22	6.13
Total	**30**	**16**	**205**	**53.33**	**12.81**	**6.83**

NE: Number Examined, NI: Number Infected, NPR: Number of Parasites Recovered, MI: Mean Intensity MA: Mean Abundance

Table 2. Prevalence, mean intensity and abundance of infection by cestodes

Parasites species	Fish species	NE	NI	NPR	P (%)	MI	MA
Diphyllobothrum latum	*Clarias gariepinus*	15	3	18	20.00	6.00	1.20
	Oreochromis niloticus	15	5	87	33.33	17.50	5.80
Total		**30**	**8**	**105**	**26.67**	**13.13**	**3.50**
Taenia saginata	*Clarias gariepinus*	15	1	6	6.67	6.00	0.40
	Oreochromis niloticus	15	3	20	20.00	6.67	1.33
Total		**30**	**4**	**26**	**13.33**	**6.50**	**0.87**

NE: Number Examined, NI: Number Infected, NPR: Number of Parasites Recovered, MI: Mean Intensity MA: Mean Abundance

Table 3. Prevalence, mean intensity and abundance of infection by nematodes

Parasites species	Fish species	NE	NI	NPR	P (%)	MI	MA
Ancylostoma piscium	*Clarias gariepinus*	15	2	5	13.33	2.50	0.33
	Oreochromis niloticus	15	0	0	0	0	0
Total		**30**	**2**	**5**	**6.67**	**2.50**	**0.17**
Dactylogyrus vastator	*Clarias gariepinus*	15	2	12	13.33	6.00	0.80
	Oreochromis niloticus	15	1	74	6.67	74.00	4.93
Total		**30**	**3**	**86**	**10.00**	**28.67**	**2.87**
Capilliria hepatica	*Clarias gariepinus*	15	0	0	0	0	0
	Oreochromis niloticus	15	1	2	6.67	2.00	0.13
Total		**30**	**1**	**2**	**3.33**	**2.00**	**0.07**

NE: Number Examined, NI: Number Infected, NPR: Number of Parasites Recovered, MI: Mean Intensity MA: Mean Abundance

Table 4. Prevalence, mean intensity and abundance of infection by trematodes

Parasites species	Fish species	NE	NI	NPR	P (%)	MI	MA
Heterophyes heterophyes	*Clarias gariepinus*	15	1	3	3.33	3	0.20
	Oreochromis niloticus	15	0	0	0	0	0
Total		**30**	**1**	**3**	**3.33**	**3**	**0.20**

NE: Number Examined, NI: Number Infected, NPR: Number of Parasites Recovered, MI: Mean Intensity MA: Mean Abundance

The result revealed that only *Trypanosome chagasi* was recovered in *Clarias gariepinus* and *Oreochromis niloticus.* The prevalence infection was 6(40.00) and 2(26.67%), while the mean abundance of the parasites were also 0.30 and 0.13 for both *Clarias gariepinus* and *Oreochromis niloticus*. The mean intensity of the parasites recorded stand at 2.00 and 1.50 for *Oreochromis niloticus* and *Clarias gariepinus.* The overall infection rates of the parasite in the examined fish specieswas 8(26.67%). The overall prevalence infection rate was higher than the overall prevalence infection reported byUrukwu and Adikwu (2017) in Benue River with the highest prevalence of 5.37% in protozoans than any other parasites which was also in contrast with Adeogun *et al*. (2014). Some species of protozoan were also being reported in both *C. gariepinus and O. niloticus* (Ugwu *et al.*, 2019; Hattingh *et al.*, 2018). In the present study, the prevalence of parasites was more in *Clarias gariepinus* than *Oreochromis niloticus*. This may be as a result of feeding habits and feeding location which varies between the two species. Since *Clarias gariepinus* was a bottom dweller and feed at the bottom, it may susceptible to parasites.

Prevalence of Parasites according to Sex in Clarias gariepinus andOreochromis niloticus

The result of sex of examined fish was presented (Table 6). The overall prevalence of the parasites was higher in the female *Oreochromis niloticus* 5(33.33%) than the male species of both *Oreochromis niloticus* and *Clarias gariepinus* which recorded 4(26.67) and 4(26.67%) respectively. The female *Oreochromis niloticus* also recorded the highest number of infected fish. Generally, *Oreochromis niloticus* recorded the highest prevalence of parasites 9(60.00%) than *Clarias gariepinus* which was 7(46.67). It was observed that 26.67 % of *C. gariepinus* males were infected; this percentage was higher than the infection of

female's *C. gariepinus* which was 20.00%. The sex ratio found in the study indicated that more females than males occurred in samples fish population but a higher number of parasites were found in males than females for *Clarias gariepinus*. A similar trend of results was reported by Hassan *et al.* (2010), who recorded higher percentage of infection in males (70.58 %) than in females (68.25 %). Akinsanya and Otubanjo (2006) recorded same trend with lower infection rates in males and females of *C. gariepinus*. Ayanda (2009) reported same prevalence of intestinal helminth infection (26.25%) in both *C. gariepinus* males and females. The disparity in prevalence of infection between males and females in many studies may be attributed to the locality, seasonal variation, and water temperature, size of fish, or differences in immunity against parasites between males and females. This also agreed with work of Medhat *et al.* (2020) Aliyu and Solomon (2012) who reported in their separate studies that male *C. gariepinus* habour more parasites than female. In *O. niloticus* on other hand, higher infection rates in females than males could be suggested to a marked of difference in fish feeding behaviours by sex. Kawe *et al.* (2016) and Uchechukwu and Princess (2019) reported a similar results in their separate studies. However, Olugbotemi and Olajumoke (2018) reported higher prevalence in male *Oreochromis niloticus* than the female. The disparity in prevalence of infection between males and females may be attributed to numbers of fishes examined against parasites or more females were available for infestation.

Prevalence of Parasites in organs of Clarias gariepinus and Oreochromis niloticus

The prevalence of the parasites in various organs of examined fish species was presented (Table 7). Three organs (gills, liver and intestine) were examined. Parasites were only recovered in the intestine 7(46.67%) and no parasite was recovered from both gills and liver of *Clarias gariepinus.* Parasites were recovered in all organs of *Oreochromis niloticus,* with theintestine having highest prevalence 11(73.33%), follow by gills 3(20.00%) and liver 3(20.00%). The distribution of parasites in organs of *Clarias garienpinus* and *Oreochromis niloticus* showed that the majority of the parasites occurred in intestine. Similar finding was reported by Aliyu and Solomon (2012), Auta *et al.* (2000) and Emere (2000). This could be due to the conducive nutritional advantage presented by the host's intestine to the parasites.

Table 5. Prevalence, mean intensity and abundance of infection by protozoan

Parasites species	Fish species	NE	NI	NPR	P (%)	MI	MA
Trypanosome chagasi	*Clarias gariepinus*	15	6	9	40.00	1.50	0.30
	Oreochromis niloticus	15	2	4	26.67	2.00	0.13
Total		**30**	**8**	**13**	**26.67**	**1.63**	**0.43**

NE: Number Examined, NI: Number Infected, NPR: Number of Parasites Recovered, MI: Mean Intensity MA: Mean Abundance

Table 6. Prevalence of parasites infection in examined male and female fish

Fish species	Sex	NE	NI	P (%)
Clarias gariepinus	M	6	4	26.67
	F	9	3	20.00
Total		**15**	**7**	**46.67**
Oreochromis niloticus	M	5	4	26.67
	F	10	5	33.33
Total		**15**	**9**	**60.00**

NE: Number Examined, NI: Number Infected

Table 7. Prevalence and Mean Intensity of Parasites in Organs of Fish Species Examined

Fish species	Organs	NE	NI	P (%)
Clarias gariepinus	Intestine	15	7	46.67
Oreochromis niloticus	Gills	15	3	20.00
	Intestine	15	11	73.33
	Liver	15	3	20.00

NE: Number Examined, NI: Number Infected

Onwuliri *et al.* (1989) observed that helminthes sometimes differ in their nutritional and respiratory requirements. Also, the distribution of helminth parasites in the fishes showed a clear preference for the intestine as sites of attachment attributable to the availability of food in these regions. The highest prevalence of parasites in the intestine implies that it is a more preferred predilection site; this could be due to the favourable conditions that enhance their survival. Similar findings were reported by Auta *et al.* (1999), Emere (2000) and Aliyu and Solomon (2012).

Conclusions

In conclusion, seven parasites belonging to four taxas namely; cestodes (*Diphyllobothrum latum, Taenia saginata*), nematodes (*Ancylostoma piscium, Dactylogyrus vastator, Capilliria hepatica*), trematodes (*Heterophyes heterophyes*) and protozoan (*Trypanosome chagasi*) were identified. The overall prevalence of the parasites was recorded higher in *Oreochromis niloticus*. *Clarias garienpinus*recorded the highest prevalence of protozoan, trematodes and a species of nematodes *Ancylostoma piscium* throughout the period of this study, while *Oreochromis niloticus*was observed to have higher nematodes such as *Dactylogyrus vastator, Capilliria hepatica*, and cestodes. Among the organs examined, intestine has the highest prevalence of infection rate than all other organs. The sex showed variation among the two species with male *Clarias garienpinus*recorded higher prevalence than the female, while *Oreochromis niloticus*was observed to have higher prevalence in female than male fish.

References

Aliyu MD and Solomon JR (2012). The Intestinal parasites of *Clarias gariepinus found at lower Usman Dam Abuja*،*Researcher*, 4(9): 38-44.

Azadikhah D, Nekuie Fard A, Seidgar M and Amin H (2014). The infection rate and pathologic lesions induced by Proteocephalus osculates (Goeze, 1782) in European catfish (*Silurus glanis*) from North-west of Iran. *Bull. Env. Pharmacol, Life Sci.* 3 (V): 63.

Ekanem AP, Eyo VO and Sampson AF (2011). Parasites of landed fish from great Kwa River, Calabar, Cross River State, Nigeria. International Journal of fisheries and Aquaculture, 3(12): 225-230.

Feist SW and Longshaw M (2008). Histopathology of fish parasite infections -importance for populations. J. Fish Biol., 73: 2143-2160.

Ibrahim AM, Taha HA, El-Naggar MM (2008). Redescription of the cestode *Polyonchobothrium clarias* and its histopathological impact on the stomach of *Clariasgariepinus*. *Egypt*. Journal of Aquatic Biology of Fish, 12(4): 165-174.

Omeji S, Obande RA and Member ST (2015). Prevalence of endoparasites of Synodontis shcall and Synodontis ocellifer (Upside-Down Catfish) from Lower River Benue, Nigeria. Int. J. Anim. Biol., 1(5): 176-181.

Onyedineke NE, Obi U, Ofoegbu PU and Ukogo I (2010). Helminth parasites of some fresh water fish from River Niger at Illushi, Edo State Nigeria. Journal of American Science, 6(3): 16-21.

Van-den Brock WLF (1979). Copepods ectoparasites of Mertanginus malangus and Platichihys flesus. Journal of fish Biology, 14: 371-380.

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