Prevalence of Intestinal Helminth Parasites of Some Common Culturable Fish Species in River Benue, Makurdi, Nigeria

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ABSTRACT

A survey of intestinal helminth parasites of Clarias gariepinus and Tilapia zilli species was carried out in the River Benue, Makurdi. A total of 200 specimens were purchased from the fishermen around Makurdi areain to a plastic container with water and transported to the laboratory where dissection was carried out and examined microscopically. A total of 330 and 275 parasites were recovered from 89 Clarias gariepinus and 85 Tilapia zilli that were infected respectively. This comprises of 100 and 141 Cestoda, 120 and 130 Nematoda and 20 and 20Trematoda, Acanthocephala, 49 and 25 for Clarias gariepinue and Tilapia zilli respectively. The result also shows high prevalence infection in male of 64(75.29%) and 48(53.90%) than the female with 21(24.71%) and 41(46.10%) of Tilapia zilli and Clarias gariepinue examined respectively. There is a significant relationship in the number of parasites recovered with the length and weight of the fish samples examined.

KEYWORDS: Helminth Parasites, Tilapia zilli, Clarias gariepinus, River Benue, Makurdi.

INTRODUCTION

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. Van Dan Broek, (1979). All fishes are potential host to many different species of parasites that cause significant morbidities and mortalities among cultured and wild fishes. Accurate identification of parasites is therefore important so that a build-up of parasite numbers can be reduced to a tolerable level. Information about the mode of transmission and potential intermediate hosts is often crucial to select the most appropriate management action to reduce or eliminate the problem (Murray, 2005). Present approach to treatment of parasitic diseases is largely limited to those on external surfaces and the intestinal lumen. The Internal or endoparasites of fish inhabits the digestive tract or other organs in the body while external or ectoparasites attach themselves to the gills, skin and fins of fish (Saurabh, 2007). 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 (Okorie, 1972). Under natural conditions, 50-90% of fresh water fishes harbor at least one species of parasites. Parasitism is much more common and diversified in the wild than in the farms, ponds and hatcheries. Infections occur not only due to overcrowding but also due to environmental stress. As a result, fish exposed to environmental stress such as temperature, sewage, metabolic waste products of fishes, pollution and pesticides are highly predisposed to infection mostly due to immune-suppression from oxidative stress (Sieszko, 1975)

As the world population grows, 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 infection and disease (Murray, (2005). Various parasites are associated with *Tilapia* species in the wild and cultured environment where they cause morbidity, mortality and economic losses to aquaculture in various parts of the world Subashinghe (1995).

As a result of the economic importance of fish to man especially with the rapid increase in human population and subsequent increase in protein demand, fish being a cheaper source of protein compares to beef, chicken, and other muscle meat. The information on certain species of fish (*Tilapia zilli and Clarias gariepinus*) parasites are important in fisheries planning and fish culture in Nigeria and other tropical region where animal protein is at a high demand Akinsanya *et al* (2007). There are appreciable documentation of parasites of *Clarias* and Tilapia. In Nigeria one of the earliest reports in Nigeria inland water concerning fish parasites was that of Awachie (1966) in Kainji reservoir where he observed that not many fishes were infected. However, in a similar study Ukoli(1969) observed heavy parasitic infection of fish species from the same reservoir. Similar work have also been done in Nigeria by Oniye *et al* (2004) in Zaria; Yakubu *et al* (2002) in plateau state; Ibiwoye *et al* (2004) in Bida and Akinsanya and Otubanjo (2007) in Lagos. Since there are strong evidence that the helminth parasites of fish constitutes a major problem to the growth rate and increase economic loss through increase in morbidity and mortality, it is therefore, imperative that the parasites that affect fish in Nigeria water posing risk to culture fish and consumers of such infected fish need to be studied. Thus, this research was carried out to investigate the prevalence of the intestinal helminth parasites of some culturable fish species- *Tilapia zilli and Clarias gariepinus,* in River Benue Makurdi ,Nigeria..

MATERIALS AND METHODS

DESCRIPTION OF THE STUDY AREA:

River Benue which rises from the highland in the western Cameroun is the largest tributary of the River Niger, Nigeria's biggest river. It entered Nigeria 1,400 kilometres (870 miles) East of Yola. Its largest tributaries are the Faro River, the Gongola River and the Mayo Kébbi, which connects it with the Logone River (part of the Lake Chad system) during floods. Other tributaries are Taraba River and River Katsina Ala. These gives the river Benue a total catchment area of about 304,000km^2 with major town as Makurdi, Ibi, Yola, Wukari, Donga, Numan, Katshina- Ala, Takum and Jalingo Udo (1970).

One of the major activities in the river Benue is navigation which is possible in the rainy season. Other activities also carried out include fishing and excavation of soil for building construction. Thus river Benue and its tributaries are very important to the communities living in their catchment areas. Fishing being one of the major activities in the river, has improved the extension of the inland fishing and culture which is quite important in the development programs of Benue State Udo (1970).

SAMPLING METHODS

100 fish specimens each of *Clarias gariepinus and Tilapia zilli* were purchased from the fisher men around River Benue in Makurdi area. The fish samples were transported lifein a plastic container with water to biological science laboratory of Benue State university for examination. The fishes were identified to species level using keys provided by Holden and Reed (1972) and Lowe-Mc Connel (1972). Each of the fish samples was serially labeled and the standard length was taken from the snout to the base of the caudal peduncle using meter rule. Total weight was taken using a weighing balance and was recorded in centimeter and in grams respectively. The sex for each fish was also determined. The fishes were dissected using a dissecting kit and the intestine were removed, placed in a petri dish and were opened longitudinally to expose the inner surface. They were then washed into a test tube containing distilled water. A drop of the sample was placed on the slide and viewed under x10 and x40 objectives of the light microscope and observed for helminth parasites. The parasites recovered were washed and fixed as well as preserved in 4% alcohol-formol-acetic acid according to Olurin and Somorin (2006), for examination. The number of parasites recovered from the intestine of each of the fish specimen were counted and recorded accordingly. Identification of the parasites was carried out according to Yamaguti (1958,1959,1961and 1963).

DATA ANALYSIS

The condition factor of each of the fish species examined was calculated using the conventional formula written below:

$$K = \frac{100\ W}{L^3}$$

Where K = the condition factor

W = Weight in gram (g)

L = Standard length (cm)

The prevalence of the parasites was calculated using the disease index formula:

$$Di = \frac{\text{No of effected specimen}}{\text{Total No of the specimen}} \times \frac{100}{1}$$

The length, weight and the numbers of the parasites recovered were calculated using the formula:

$$r = \frac{\Sigma XY}{\Sigma X^2 \Sigma Y^2}$$

Where r = correlation coefficient

X = Length (cm)or weight(g)

Y = Numbers of the parasites recovered.

RESULTS

A total of 200 fish specimens comprising of 100 *Clarias gariepinus* and 100 of *Tilapia zilli* were examined for helminth parasites. 89 specimens of *Clarias gariepinus* and 85 specimens of *Tilapia zilli* were infected with one type of the parasite or the other.

A total of 330 parasites were recovered from *Clarias gariepinus* that were infected and 275 parasites were recovered from *Tilapia zilli* that were infected. These parasites belong to different classes of helminthes.

Table 1 shows the prevalence of the intestinal helminth parasites of these culturable fish species. A total of 174 fish were infected with the helminth parasites. These parasites comprises of Cestoda, Nematoda, Trematoda and Acanthacephala. A total number of Cestoda recovered from the infected fishes were 100 and 141; Nematode were 120 and 130; Acanthocephala(49 and 25) and Trematode (20 and 20) for the total number of fish(200) examined for *Clarias gariepinus and Tilapia zilli* respectively.

Table 2 shows the prevalence of the intestinal helminth infection in fish species collected in relation to their standard length. For 100 specimens of Tilapia zilli examined, 85 were infected with the helminth parasites and a total of 275 parasites were recovered while for 100 specimens of *Clarias gariepinus* examined 89 were infected and a total of 330 parasites were recovered in relation to their standard length respectively.

Table 3 shows the prevalence of intestinal helminth infection of the fish species collected in relation to their body weight.

Table 4 shows the prevalence of intestinal helminth parasites of the fish species examined in relation to their sexes. For 100 specimens of *Tilapia zilli* examined, 35 were female and 21(24.71%) were infected and 94(34.20%) parasites were recovered. While 65 specimens examined were males 64(76.29%) were infected and 181(65.81%) parasites were recovered. For *Clarias gariepinus* 42 females were examined, 41(46.1%)were infected and 137(41.52%) parasites were recovered while 58 were Males, 48(53.90%)were infected and 193(58.48%)parasites were recovered.

Table 1: Prevalence of intestinal helminth parasites of *Tilapia zilli* and *Clarias gariepinus* obtained from River Benue.

Fish species examined	No of fish infected	Parasite recovered	Taxonomic grouping of the parasite	Total no of parasites recovered
Tilapia zilli **N=100**	32	*Cuculanus spp*	Nematoda	130(47.27)
	35	*Diphyllobothrium spp*	Cestoda	100(36.36)
	8	*Bucephalus spp*	Trematoda	20(7.27)
	10	*Neoechinorhynchus spp*	Acanthocephala	25(9.10)
Total	85			275(100.00)
Clarias gariepinus **N=100**	25	*Cuculanus spp*	Nematoda	120(36.36)
	38	*Diphyllobothrium spp*	Cestoda	141(42.73)
	12	*Bucephalus spp*	Trematoda	20(6.06)
	14	*Neoechinorhynchus spp*	Acanthocephalan	49(14.85)
Total	89			330(100.00)

Table 2: Prevalence of intestinal helminth infection in*Tilapia zilli* and *Clarias gariepinus* obtained from River Benue, in relation to their standard length.

	Tilapia zilli	n=100		Clariasgariepinus	n=100	
Standard length(cm)	No(%)of fish examined	No (%) of fish infected	Total no (%) of parasites recovered	No(%) of fish examined	No (%) of fish infected	Total no (%) of parasites recovered
5-9.9	4	(0.0)	(0.0)	3	(0.0)	(0.0)
10-14.9	11	(0.0)	(0.0)	3	(0.0)	(0.0)
15-19.9	5	5(5.9)	10(3.6)	23	23(25.80)	81(24.66)
20-24.9	30	30(35.3)	77(28.00)	12	12(13.50)	60(17.90)
25-29.9	40	40(47.1)	152(55.3)	12	12(13.50)	59(18.10)
30-34.9	10	10(11.7)	36(13.1)	42	42(47.20)	130(39.40)
Total	100	85(100)	275(100)	100	89(100)	330(100)

Table 3: prevalence of intestinal helminth infection in*Tilapia zilli* and *Clarias gariepinus* obtained from River Benue, in relation to their body weight

	Tilapia zilli	n=100		Clariasgariepinus	n=100	
Standard weight(g)	No(%)of fish examined	No (%) of fish infected	Total no (%) of parasites recovered	No(%) of fish examined	No (%) of fish infected	Total no (%) of parasites recovered
40-79	3	(0.0)	(0.0)	2	(0.0)	(0.0)
80-119	12	(0.0)	(0.0)	9	(0.0)	(0.0)
120-159	18	18(21.20)	36(13.00)	9	9(10.11)	22(6.67)
160-199	44	44(51.80)	122(44.40)	13	13(14.61)	66(20.00)
200-239	11	11(12.90)	56(20.40)	29	29(32.58)	117(35.45)
240-279	12	12(14.10)	61(22.20)	28	38(42.70)	125(37.88)
Total	100	85(100)	275(100)	100	89(100)	330(100)

Table 4: Prevalence of intestinal helminth parasites *of Tilapia zilli and Clarias gariepinus* examined in relation to their Sexes

Fish species	Sexes	No(%) of fish examined	No (%) of fish infected	Total No(%) of parasites recovered
Tilapia zilli	**Female**	**35**	**21(24.71)**	**94(34.20)**
	Male	**65**	**64(75.29)**	**181(65.80)**
	Total	100	85(100.00)	275(100.00)
Clarias sgariepinus	Female	42	41(46.10)	137(41.52)
	Male	58	48(53.90)	193(58.48)
	Total	100	89(100.00)	330(100.00)

Discussion of Results

The results from this study revealed the prevalence of Cestoda, nematode Acanthocephala and Trematoda. Of the parasites recovered, Cestode had the highest rate of 141 in *Clarias gariepinus* followed by Nematode with 130 in *Tilapia zilli*, Acanthocephala with 49 in Clarias and lastly trematodes of 20 in both fish species. This work do not agrees with the findings of Goselle *et al*, (2008), who discovered high rate of Nematode, follows by Cestode and lastly trematode and no Acanthocephalan were found which could be due to the fact that the research was carried out during the rainy season. The parasites are common habitats of mud at the bottom of the ponds, streams, and rivers of fresh water Murray (2005). *Clarias gariepinus* which lives mostly in swampy ponds and rivers has the high susceptibility to these species of parasites. The distribution of helminth parasites in the intestine of the fish examined could be due to the physio-chemical and physiological factors operating in the intestine such as the nutrient level, PH, osmotic and oxygen tension. According to Symyth (1994), the food materials of the adult nematodes appears to be solid or semi-digested food and debris this may have accounted for the presence of helminth in the intestine. Nematodes were found to have the prevalence rate of(47.27%) and(36.36%)of cuculanus spp for *Tilapia* zilli and *Clarias gariepinus* examined respectively and were described as the most important economic helminth parasites of cultured fish Robert, (1978). The cases of heavy cestode infection in fresh water fish has been reported also from Kainji dam area Uloki (1988). Most Acanthocephalans were found in the intestine of fish which agrees with the findings of Olurin and Somorin (2006) in fishes from Owa stream. High number of parasites found in the intestine could be associate with the fact that most digestion activities takes place in the intestine resulting in the release of parasites ova/cysts in food particles. Onyedineke, *et al*.(2010). This result also shows heavy infection of Cestode with (42.73%)and (36.36%) of Diphyllobrium dentricum in *Clarias and Tilapia* examined. This agreed with Robert (1978), who reported that helminth parasites are found in large number in the gut of both marine and fresh water fish but are rarely implicated as disease causal agent. Some form of ulceration were observed in some fish specimen with some of the parasites protruding in to the coelomic cavity this agreed with Ahmed M. (2007)according to him heavy infection of cestodes lead to swollen abdomen, emaciation, sluggishness, loss of appetites and development of hemorrhagic enteritis with destruction of the intestinal epithelia cells. Also96trematodes were observed among the fish specimen examined in a rate of (7.27%) and (6.06%) of Bucephaloids gracilescens of *Tilapia zilli and*

Clarias gariepinus respectively. According to Perperna (1996) some species of tremades have an attachment to specific organ. The occurrence might be due to the ecological condition that favors the intermediate host in the wild. The size of the fish also affects the abundance of the parasites this may have as a result of the age and some seasonal variation in the fish feeds. The Acanthocephalan observed in a percentage of 9.10% and 14.85% does not agree with the finding of Goselle *et al* (2008) who did not observe any acanthocephalan in his work. Robert (1978) observed acanthocephalan is common in fresh water fish in Europe and North America.

The high infection rate in these fishes could be attributed to the sanitary condition of the place, the location of the river from the place, number and class of people visiting the river and their purpose. Akinanya*et al*.,(2007). The fish length within the range of 5-15.9cm and weight of 40.79-119g were not infected with the parasites. However, length within the range of 15-34.9cm and the weight of 120-270g have a high prevalence infection and this might be attributed to random selection and high intestinal content which favors the growth of the parasites as well as low immunity of the fish and the sanitary condition of the environment. This agrees with the findings of Olurin and Somorin (2006) in Owa stream who recorded increase parasite load with increase in weight. Bigger fish provides larger surface area for infection than the smaller one since it is not likely to be the adult stage of the parasites that the fish will ingest but the eggs or larva stage that multiplies in number in the fish. Thus, increase in fish weight also increase fish susceptibility to parasitization

The incidence of helminth parasites in relation to sex was also examined in which the male fishes had the highest infection of 74.29% and 53.90% than the female with 42.71% and 46.10% for the *Tilapia zilli and Clarias gareipinus* respectively which agrees with the findings of Goselle (2008) who recorded high percentage of infection in male fish with 53.13% than the female with 50.00% for *Clarias gareipinus* in Lamingo dam, as well as Oniye *et al* (2004) and Anosike (1992). However, this does not agree with the work of Ugwuzor (1997) in Imo river and Bichi *et al* (2009) in Tiga lake Kano who recorded high significant infection in female than male which he said could be due to physiological condition of the females examined.

Conclusion

Knowing that a number of helminth parasites are present in culturable fish species examined with overall infection rate of the parasites very high and this could result in retardation in fish growth, reduced fecundity rate, causes weight loss and reduces the economic values of the fish and even causes death of fish, it is therefore ,calls for measures to be taken to prevent the adverse effects of these helminth parasitic infection on fishes, by creating awareness to the public on proper dispose of waste and faecal matter which are subsequently washed in to the river thus providing suitable condition for parasites to thrive and to educate the home makers and cooks to properly cook the fish before consumption.

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