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HELMINTH PARASITES OF *CLARIAS GARIEPINUS* (TEUGELS) IN ZARIA, NIGERIA

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ABSTRACT

A total of 240 *Clarias* gariepinus (Teugels) were randomly purchased from fish landings in Sabon-gari market, Zaria. The fish were examined parasitologically for gastrointestinal parasites. Five species of helminth parasites comprising 3 cestodes, 1 nematode and 1 acanthocephala were isolated from the fish. The cestodes and their prevalence were *Anomotaenia* sp. (2.5%), *Monobothrium* sp. (13.33%) and *Polyonchobothrium clariae* (1.67%). The nematode, *Procamallanus laevionchus* and the acanthocephalan, *Neoechinorhynchus rutili* had a prevalence of 0.83% and 0.83% respectively. Majority of the parasites were found in the intestine. Infection was limited to fish with length ranging from 30.0 – 39.9 cm (prevalence: 15.83%; mean intensity: 3.78) and 40.0 – 49.9 cm (prevalence: 3.33%; mean intensity: 2.5) Fish specimens that were lighter in weight (150.0 – 299.9 g) were free of infection, but those found with parasites weighed between 350.0 – 399.0 g (prevalence, 7.5%) and 450.0 – 500.0 g (prevalence 6.67%). There was no statistically significant difference ($P > 0.05$) in the infection of the male and female *C. gariepinus*. The study highlights the importance of changing feeding habit of *C. gariepinus* with age on the prevalence and intensity of gastrointestinal parasites, and parasitised male fish have lower condition factor than unparasitised ones.

KEYWORDS: Helminth, parasites, *Clarias gariepinus*, Zaria.

INTRODUCTION

Clarias gariepinus (Teugels) is very common in swamps, lakes and rivers throughout Africa (Viveen *et al.*, 1977), and in the catches of fishermen throughout the year in Zaria. It is highly priced and requested for by fish farmers and consumers in Nigeria, either as smoke-dried or fresh. Studies on the biology, nutrition/growth and management of catfish have been carried out (Viveen *et al.* 1977; Faturoti *et al.* 1986; Jeje, 1992; Adeyemo *et al.* 1994; Eyo and Olatunde, 2001; Banyighi *et al.* 2001; Ovie and Ovie, 2002). Irrespective of these, various parasites are associated with *C. gariepinus* in the wild and culture environment, where they cause morbidity, mortality and economic losses in aquaculture practice in the world (Subashinghe, 1995).

Studies have revealed a rich parasitic fauna in some fresh water fish species of Nigeria (Awachie, 1966; Onyia, 1970; Aderounmu and Adeniyi, 1972; Onwuliri and Mgbemena, 1987; Ugwuzor, 1987; Umoren *et al.*, 1988), but only a few known to us are specifically directed to address the parasites of the gastrointestinal tract of *C. gariepinus* (Akogun and Goddard, 1989; Anosike *et al.* 1992; Basu *et al.* 1993). In spite of the premium placed on this catfish in Zaria, existing information is based only on its gill parasites (Aken'Ova and Shotter, 1988; Aken'Ova, 1999a and b). This study therefore reports on the parasitic fauna of the gastrointestinal tract of *C. gariepinus* in Zaria area, Nigeria.

MATERIALS AND METHODS

A total of 240 *Clarias gariepinus* caught from several water bodies around Zaria were purchased (alive) from fresh fish sellers in Sabon-gari market, Zaria, between March and July 2002. In the laboratory, the standard length (cm) and weight (g) of the fish were measured. The Fulton's condition factor, defined as weight percent divided by the cube of the length of fish (Ikomi and Odum, 1998) was calculated for each fish.

The fish were dissected to expose the alimentary canal, which was isolated. Its various sections (oesophagus, stomach, intestine and rectum) were placed separately in petri dishes containing normal physiological saline. Each section was slit longitudinally and examined for parasites under a dissecting microscope. Parasites found were counted, placed in physiological saline overnight in the refrigerator to enable it stretch and relax, and thereafter, fixed and preserved in 5% formalin. Representative of each parasite was stained overnight with a weak solution of Erlichs haematoxylin. The worms were then passed through graduated alcohol (30%, 50%, 70%, 90% and absolute) for 45minutes each to dehydrate, then cleared in methyl-salicylate and mounted on a slide in Canada balsam. Parasites were identified by using the texts of Yamaguti (1959 and 1961), Markevich (1963), Petrochenko (1971), Cheng (1973), Soulsby (1982), William and Jones (1994) and Paperna (1980; 1996). The terms prevalence and mean intensity were applied as defined by Margolis *et al.* (1982). Correlation coefficient and Student's t-test statistics were employed to test for significance.

RESULTS

Out of the 240 fish examined, 46 (19.17%) were infected by 164 helminth parasites, which comprised of three types of cestodes, one acanthocephalan and a

nematode (Table 1). The cestode, *Monobothrium* sp. occurred in the majority, 32 (13.33%), of the infected fish while the nematode, *Procamallanus laevionchus* and the acanthocephalan, *Neoechinorhynchus rutili* occurred in the minority (0.83% each) of the fish. All the parasites were restricted to the intestine except for *Monobothrium* sp. that was also found in the stomach as well as in the rectum (Table 1).

Fish with standard length ranging from 30.0 - 39.9 cm had the highest prevalence (15.83%) and mean intensity (3.78), while those with standard length of 40.0 - 49.9 cm had the least prevalence (3.33%) and mean intensity (2.5). Only these two standard length ranges were positive for parasitic infections (Table. 2). There was high correlation ($r = 1.0$) between the standard length and fish infected, parasites recovered, prevalence and intensity of infection.

Fish that weighed 150.0-299.0g were not infected; those that weighed between 350.0 - 399.0 g had the highest prevalence (7.5%) while the least prevalence (0.83% and 0.83%) were recorded in those fish that weighed 400.0 - 449.0 g and 550.0 - 599.0 g respectively (Table 3). Independent *t*-test analysis revealed no significant difference ($P > 0.05$) in the condition factor of infected and uninfected female fish, but that of the males differs significantly ($P < 0.05$) (Table 4).

The prevalence of infection (15.0%) and intensity (4.11) in male fish were higher than in the female (4.17% and 1.6 respectively). Student's *t*-test revealed lack of significant difference ($P > 0.05$) in the prevalence and intensity of infection between sexes.

DISCUSSION

Clarias gariepinus in Zaria area were infected by five helminth parasites that comprised of three species of cestodes, a nematode and an acanthocephalan. The cestodes are *Polyonchobothriium clariae, Monobothrium* sp. and *Amonotaenia* sp.; the nematode was *Procamallanus laevionchus*, and an acanthocephalan, *Neoechinorhynchus rutili.* The overall prevalence of these parasites in this study was low (19.17%) compared with 52.0% and 34.67% in cultured and wild populations of *C. gariepinus* respectively (Anosike *et al.*, 1992) and 59.8% in cultured and 63.0% in wild populations of *C. lazera* (Onwuliri and Mgbemena, 1987). Williams and Jones (1994) suggested that parasitism varies from one aquatic ecosystem to the other and this is influenced by the interplay of mixed biotic and abiotic factors. It is likely that the low prevalence of parasites in this study was due to decreased contact between host and parasite in the wild in comparison with culture situation where overcrowding in fish pond results in higher parasitism. A similar finding was reported by Anosike *et al.* (1992)

The predilection sites for the majority (89.0%) of the parasites was the intestinal lumen in contrast to 9.8% and 1.2% that were found in the stomach and rectum respectively. This finding is attributed to the fact that 60.0% of the parasites were cestodes. Anatomically, cestodes lack digestive system and obligatorily depend on end products of digested food in host, which are absorbed through the body surfaces, hence they are localized in the host intestine where their nutritional requirements are satisfied. Buchmann and Lindenstrom (2002) suggested that parasites have a built-in molecular disguise to avoid the host hostile secretions present in its microhabitat.

Monobothrium sp. was the only parasite that was found in the stomach where it was inactive, unlike the ones in the intestinal lumen that were motile. The parasite may have been hatched from an intermediate host that probably formed the food component of the fish, only for it to become active in the intestine where the microhabitat was conducive. Implicated intermediate hosts include cyclops, insects and other aquatic arthropods (Anosike *et al.*, 1992) and other small fish (*Oreochromis niloticus*) that may act as first vertebrate host, that were found in the stomach of *C. gariepinus.*

Some of the parasites encountered in this study and their related species have been labeled as causative agents of various debilities in fish. For instance, *Monobothrium hunteri* and *M.ulmeri* penetrate the intestinal wall and provoke nodule formation with a pronounced inflammatory reaction and necrotic debris (Williams and Jones, 1994). Similarly, *Polyonchobothrium clariae* causes inflammation of gut mucosa and its bothridium penetrates the gall bladder mucosa and initiates the formation of nodules in *Clarias gariepinus* (Paperna, 1996). *Neoechinorhynchus rutili,* like several other acanthocephalans, attaches to the epithelial mucosa where the extent of damage is proportional to the depth of penetration of the proboscis (Paperna, 1996). In contrast to these, *Procamallanus laevionchus* is equipped with an alimentary canal and would therefore roam around the intestine where it could graze on nutrients. This parasite is widely distributed in several fish hosts in Russia, Europe and Africa (Markevich, 1963, Ugwuzor, 1987, Onwuliri and Mgbemena, 1987, Auta *et al.*, 1999).

An increase in size is a reflection of increase in length and weight, which is hereby considered as a measure of age. Therefore the juvenile fish had no parasite while sub-adults and adults had higher prevalence of infection. A plausible explanation for this is the change in diet from weeds, seeds, phyto- and zooplanktons as juveniles to insect larvae, snails, crustaceans, worms and fish as adulthood is attained (Reed *et al.*, 1967). *Clarias* spp. are known to be omnivorous with the tendency towards being carnivorous as they age. These therefore point to the absence of an infective organism in the type of diet of the fish while young, and the contrast is the case in adults. Our findings tend to support that of Geets and Ollivier (1996) who postulated that herbivorous fish are generally considered to harbour less intestinal parasites than omnivorous or carnivorous; thus when *C. gariepinus* were juveniles, they tend to be herbivorous.

Table 1: Prevalence of intestinal helminth parasite in *Clarias gariepinus* (n = 240) on sale in Zaria, Nigeria

Parasite species	Taxonomic group	Number of fish infected	Prevalence (%)	Number of parasites in stomach	Number of parasite in intestines	Number of parasites in rectum
Amonotaenia sp.	Cestoda	6	2.50	-	10	-
Monobothrium sp.	Cestoda	32	13.33	16	128	2
Polyonchobothrium clariae	Cestoda	4	1.67	-	4	-
Procamallanus laevionchus	Nematoda	2	0.83	-	2	-
Neoechinorhynchus rutili	Acanthocephala	2	0.83	-	2	-
Total		46	11.96			

Table 2. Pattern of intestinal helminth infection in *Clarias gariepinus* on sale in Zaria in relation to their standard length

Standard length (cm)	Number (%) of fish examined	Number (%) of fish infected	Total number of parasite recovered	Prevalence (%)	Intensity
10-19.9	2 (0.83)	-	-	-	-
20-29.9	50 (20.83)	-	-	-	-
30-39.9	176 (73.33)	38 (21.50)	144	15.83	3.78
40-49.9	12 (5)	8 (66.67)	20	3.33	2.5
Total	240	46	164	19.16	-
Correlation (*r*) with standard length	0.26	1.0	1.0	1.0	1.0

Table 3: Pattern of intestinal helminth infection in *Clarias gariepinus* on sale in Zaria in relation to their body weight

Body weight (g)	Number (%) of fish examined	Number (%) of fish infected	Total number of parasite Recovered	Prevalence (%)
150 - 199	2 (0.83)	-	-	-
200 - 249	2 (0.83)	-	-	-
250 - 299	26 (10.83)	-	-	-
300 - 349	26 (10.83)	4 (15.38)	56	1.67
350 - 399	92 (38.33)	18 (19.57)	46	7.6
400 - 449	16 (6.67)	2 (12.5)	10	0.83
450 - 499	58 (24.12)	16 (27.59)	30	6.66
500 - 549	16 (6.67)	4 (25)	12	1.67
550 - 599	2 (0.83)	2 (100)	10	0.83
Total	240 (100)	46 (100)	164	19.16

Table 4: Monthly mean (±SE) condition factor of parasitised and non-parasitised male and female *Clarias gariepinus* in Zaria area.

Months	Male		Female	
	Infected	Uninfected	Infected	Uninfected
March	1.12 (±0.07)	2.03 (±0.24)	0.00 (±0.00)	1.77 (±0.22)
April	0.94 (±0.05)	1.67 (±0.33)	1.09 (±0.00)	1.62 (±0.30)
May	0.99 (±0.09)	0.91 (±0.04)	1.12 (±0.00)	1.02 (±0.04)
June	0.86 (±0.09)	0.99 (±0.04)	0.83 (±0.00)	0.96 (±0.13)
July	1.02 (±0.30)	1.38 (±0.09)	1.32 (±0.00)	1.54 (±0.16)
Total	1.03 (± 0.01)	1.33 (± 0.09)	1.09 (± 0.08)	1.31 (± 0.09)

The examined fish population shows that the male were more than the female. Higher prevalence and mean intensity of parasites were found in male than in female fish. These unequal parasitemia may be associated with Size of fish therefore had a marked relationship with helminth parasitism in *C. gariepinus* of Zaria area; this is also in agreement with the findings of Anosike *et al.* (1992). It is likely that utilization of different age classes

of the host by parasites is a special kind of temporal niche and or reproductive segregation (Geets and Ollivier, 1996) the time of this study (March to July, 2002), which coincided with reproductive period of *C. gariepinus* in Zaria, because nearly all females encountered were gravid. Spawning fishes are known to be less active and this may reduce their chances of contacting the infective stages of the parasites (Anosike *et al.*, 1992). The hormone level in *C. gariepinus* might have played an important role in the prevalence of infection in this study. Lees and Bass (1960) suggested that the increased level of the hormone, ostradiol, in frog during breeding season was associated with the reduction of helminth parasites. However, this differences in the prevalence of infection in male and female of *C. gariepinus* was statistically insignificant ($P > 0.05$). The lack of significant difference in the condition factor of the infected and uninfected females may be attributed to the presence of eggs and invariably lipids in the majority of the spawning fish. However the absence of this phenomenon in the males clearly revealed the effect of parasitism on the condition factor of the male fish, as parasitised male fish have lower condition factor than unparasitised ones. Condition factor is an indication of the well-being or robustness of a fish (Tesch, 1968).

In conclusion, the food items, age and spawning behaviour contributed to the type of helminth parasites of the gastrointestinal tract of wild *C. gariepinus* of Zaria area. It may be advisable to incorporate antihelminthic therapy into the diet of *C. gariepinus* obtained from the wild that might be used as broodstocks. In-depth understanding of the interplay between food items, length-weight, fecundity and elucidation of life cycle of parasites of the fish will have to await further studies.

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