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GUT HELMINTHS PARASITES AND HOST INFLUENCE IN NILE TILAPIA, OREOCHROMIS NILLOTICUS

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ABSTRACT

Ecological associations of helminthes were studied in 37 Nile tilapia fish from Michael Okpara University of Agriculture, Umudike fishpond and two streams: Anya and Obo-ogugu in Umuahia during 2001. Two helminthes parasites, Caryophyllaeldcestode (13) and *Euclinostomumheterostomum* (6) were recovered. Parasite load was found to be related to host sex, size (age), concurrent infections and collection site. Distribution of helminthes in the host intestine was related to the intensity of infection and concurrent infections. The findings provide strong evidence of increased parasite species richness with individual host body size.

Keywords: *Helminths, Host-influence, Nile tilapia*

INTRODUCTION

Tilapiine fish are members of Cichlid family of bony (teleost) fish. They are indigenous to Africa however, their distribution has now spread to over 100 tropical and subtropical countries through artificial introduction. Over seventy species of tilapiine fish have been identified, though global tilapia production has been dominated by three members of the genus *Oreochromis*: Nile tilapia, *Oreochromisniloticus*: blue tilapia, *Oreochromisaureus* and mossambique tilapia, *Oreochromismossambicus* (Rana, 1977). The worldwide harvest of fish is more than 97 million metric tons/year (107 million U.S. tons) and approximately 6 million metric tons (6.6 million U.S. tons) comes from aquaculture and farming of fish in artificial ponds and tanks (Bell, 1978). Despite this consumers demand continues to rise. More importantly tilapia fish are highly valued throughout the world as food source. Fish are also used as feed for poultry and pigs. They can be grown in aquaculture, backyard units or pond as well as intensive agro-industrial hatcheries. Parasites have a detrimental effect on fish tissues and on fish growth (Kabata, 1985; Fryer, 1968). This results in economic loses in fishing industry and aquaculture (Ukoli, 1972) and the share of such losses caused by heminth infections is not well known. Despite the large fish population, the economic benefits remain marginal due to the prevailing diseases, poor nutrition, reproductive inefficiency and management constraints. Investigation on fish parasites and disease in most parts of Nigeria are still lagging behind (Akenova, 1999). The role of tilapiines as part of the broader food production of tropical development countries needs further attention. This report presents an analysis of ecological data pertaining to host fish and associations of these helminths in different locations. It specifically discusses factor influencing the parasite load in tilapia fish host as well as its distributional pattern in the gut of the host.

MATERIALS AND METHODS

A total of 37 Nile tilapia, (*Oreochromisniloticus*) were collected from Michael Okpara University of Agriculture, Umudike fishpond and two streams: Anya and Obo-ogugu in Umuahia during 2001. The fish were taken to theBiological Science laboratory Michael Okpara University of Agriculture UmudikeUmuahia, Nigeria in containers containing pond water for examination. The total length of the fish was then measured from the tip of the snout to the longest end of the caudal fin. Fish were weighed to the nearest gram and then opened by a midventral incision. They were sexed using the presence of tests or ovary. The gut was removed and cut into sections corresponding with its natural regions, limbs and coils. Each section was separately dissected, and notes on the exact location of the parasite and related observations were recorded.This is the method of Amin(1974), which was found very adequate for rewarding of intestinal helminths distribution.

Sectioning of the gut to segments of 37 tilapia measuring 7.9 to 17cm (mean 13.9) in total length, 18 to 65g (mean 42.2) in weight, with the intestinal tract 12 to 26.5cm (mean 19) long was made as follows. Four sections were cut.

1. The stomach (intestinal swelling)
2. First limb and gastric ceca region
3. The coils
4. Posterior most limb leading to the vent

RESULTS

Mean figures represent the numbers of helminthes recorded/number of host infected. A total of 19 helminths parasites 7 fish (14/4 males, 5/3 female) were recorded from Nile tilapia, *Oreochromisnilotocus* (Table 1). The fish infection rate was 18.9% (7 out of 37). Of this Caryophyllaeidcestode (71.4%) and *Euclinostomumheterostomum* (57.1%) were detected from the intestine of the tilapia (Table 3). The pathology associated with the helminths infections includes oedematous changes in the bowel and viscera, haemorrhages on viscera including swim bladder.

Parasitic load

The intensity of fish infections with helminth parasites was found to be affected by host sex, size (age), concurrent infections and collection site. Each of these factors is discussed below.

Host Sex

More males (25.0%) were infected than females (14.3%). Males also had a relatively higher mean of 3.5 worms per fish compared to 1.7 in females (Table 1)

Host Size (age)

Variable infection parameters in Nile tilapia were observed and these are presented in Table 2. The data demonstrate a higher helminths infections in larger than in smaller fish. A comparison was made between the lengths of the intestinal tract of larger and the less

heavily infected smaller tilapia. The length of the intestine of the larger fish was about twice longer than the smaller fish. Older (larger) hosts were more heavily infected than younger ones.

Concurrent Infections

Two (5.4%) of the fish showed concurrent infections of the two different species of helminths detected and in each case (Caryophyllaeid occurred in significant numbers with a lowered density of *Euclinostomumheterostomum* as compared to its density in single infections (Table 3). The Caryophyllaeid also moved anteriorly while the *Euclinostomumheterostomum* moved posterioly in the intestinal region of the fish host.

Collection Site

Collections from Anya stream ranked first (30.8%) in terms of prevalence of infection, however there was no difference in the intensity of infections observed (Table 4).

Localization

The parasites were found within the intestinal tract of tilapia and in particular in the first limb of the intestine. In light infections the parasites occupy a limited portion while in heavy infection they were somewhat scattered within the normally inhabited region.

DISCUSSION

Increased food volume containing the infective stage consumed by older fish hosts of different ages(sizes) are probably involved in the heavier infections of the older (larger) fish host. The effect of cumulative infections is also important in determining worm density. In other words as the fish becomes older, exposure time for parasite colonization and re-infection also increase. The larger surface area of the gut in older than in younger fish resulting in making more space available to accommodate greater numbers of parasite might also be involved and previously reported by Thomas,(1964) in the brown trout, *Salmotrutta*. Wright, (1991) reported that this could happen by chance.

Information on the effect of host sex on parasitic load of helminths parasites species of tilapia is scarce, however higher prevalence observed in this study correlates with that reported by Ukpai,(2001) in Imo State, Nigeria who found all the infections in male fish. The observation of discrepancies in the infection rate from different collection sites could be associated with long time standing infections in some streams. In the case of concurrent infection Caryophyllaeid exhibited hierarchical association. All the helminths reported in this study were found within the intestinal tract of their hosts. The distribution of *Caryophylleus* species in host intestine was found to be affected by the extent or intensity of infections. In lightly infected fish, the parasites occupied a limited portion (the first limb) and this is within the normally inhabited range of the host intestine. However in heavier infections the parasites were scattered and this could be as a result of spreading out of worms but usually not beyond the normally inhabitable range. This study has revealed a valuable knowledge in

ecological aspects of fish parasites and also important observation in the design of parasite control measures.

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Table 1: Sex distribution of helminths infection of Nile tilapia

Sex of fish	No. examined	No.infected (%)	No. of parasites recovered	Means intensify/ Fish
Male	16	4 (25.0)	14	3.5
Female	21	3 (14.3)	5	1.7
Total	37	7 (18.9)	19	2.7

Table 2: Fish size relationship of helminths infections of Nile tilapia

Fish size (cm) Total length(Mean)	No. examined	No. infected (%)	No.of parasites recovered	Mean intensify/ Fish
5 – 99 (7.3)	11	0 (0)	0	0
10 – 14.9 (12)	14	2 (14.3)	4	2.0
15 - 20.9(17.5)	12	5 (35.7)	15	3.0
Total	37	7 (18.9)	19	2.7

Table 3: Prevalence of concurrent helminths infections in 37 Nile tilapia

Parasite species	No. of fish infected(%)	No.of parasites recovered	Mean intensify/Fish
Caryoohyllaeid	3 (8.1) (5:71.4)#	8	2.7
Euclinostomum heterostomum	2 (5.4) (4.57.1)#	4	2.0
Caryophyllaeid + *Euclinostomum heterostomum*	2(5.4)	5:2*	2.5:1.0*

Total number of single and concurrent infections:infection rate (%).
*Ratio of Caryophyllaeid to *Euclinostomumheterostomum*.

Table 4: Parasite load of tilapia from three collection sites

Collection site	No. collected (%)	No. infected (%)	No. of parasite recovered	Mean intensity/ Fish
MOUAU fishpond	10 (27)	1 (10.0)	1	1.0
Anyastream	13 (35)	4 (30.8)	12	3.0
Obo-ogugustream	14 (38)	2 (14.3)	6	3.0
Total	37(100)	7 (18.9)	19	2.7