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Observations on the Helminth Parasites of Fish in Insukamini Dam, Zimbabwe

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Abstract: 50 samples of *Clarias gariepinus* (n=10), *Oreochromis macrochir* (n=12), *Oreochromis mossambicus* (n=18) and *Serranochromis robustus* (n=10) were caught in Insukamini Dam between February and April 2006. Nine helminth species including 4 nematodes (*Paracamallanus cyathopharynx*, *Capillaria*, *Contracaecum* sp. larvae and *Eustrongylides* sp. larvae), 3 cestodes (*Bothriocephalus acheilognathi*, *Polyonchobothrium clarias* and *Proteocephalus glanduliger*), 1 digenean trematode (*Glossidium pedalum*) and 1 acanthocephala (*Acanthogyrus*) were found in *C. gariepinus*, *O. macrochir*, *O. massambicus* and *S. robustus*.

Key words: Fish, Insukamini Dam, helminth parasites, Zimbabwe

INTRODUCTION

With the ever increasing demand for natural resources such as water due to high populations as well as minimizing the effects of drought, the government and non-governmental organizations have constructed dams which supply water to the local communities for small scale farming, industry and general house hold use. Such developments have brought with them benefits that can be exploited by the locals such as commercial and/or subsistence fishing activities[1]. This has stimulated studies in fish ecology: the species present, fish population dynamics, trophic interrelationships and causes of mortality [2].

Data on the helminth parasites of fish in Zimbabwe are limited to studies that were done in Lake Kariba[3-4] and in Lake Chivero[5]. No meaningful work has been done on helminth parasites of fish in small dams that are an important source of fish to the local communities. Parasitic diseases of fish are very common throughout the world and are of particular importance in the tropics[6]. Fresh water fish serve as definitive and/or intermediate hosts in the life cycles of many helminth parasites. Parasites affect fish health, growth and survival.

The aim of the present study was to determine the helminth parasite fauna of fish species in Insukamini Dam and the status of their parasite communities (prevalence, mean intensity, abundance and dominance).

MATERIALS AND METHODS

Insukamini Dam was built in 1987 in Vungu rural district, Midlands Province to provide water for general household use and irrigation. The dam is 11km long, 850m wide at its widest point, has a volume of $7.85x10^6m^3$ at full capacity, has a surface area of 204 hectares, has a crest length of 888m, a wall height of 18m and a catchment area of 1636 km^2 . Fish such as *Clarias gariepinus*, *Oreochromis macrochir, Oreochromis mossambicus* and *Serranochromis robustus* are found in the dam. A total of 50 samples of 4 fish species, namely, *Clarias gariepinus* Burchell, 1822 (n=10), *Oreochromis macrochir* Boulenger,1912 (n=12), *Oreochromis mossambicus* Peters,1852 (n=18) and *Serranochromis robustus* Boulenger, 1876 (n=10) were collected from February to April 2006 in Insukamini Dam. Fish were caught using gill nets and their weight and length were measured. Common necropsy and parasitological techniques were used to isolate the parasites. Parasites were preserved in 4% formalin. Worms were cleared in lactophenol before identification using standard keys[7-8].

Standard statistical computations (mean intensity, standard deviation, prevalence, abundance and dominance) were carried out using Microsoft Excel (Office 2000). The mean intensity was determined by dividing the total number of recovered parasites by the number of infected fish samples, while abundance was calculated by dividing the total number of recovered parasites by the number of (infected and uninfected) fish samples. The dominance of a parasite species was calculated as N/N sum (where N=abundance of a parasite species and N sum = sum of the abundance of all parasite species found.

RESULTS AND DISCUSSIONS

In this study, a total of 329 worms of nine helminth species including 4 nematodes (*Paracamallanus*

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cyathopharynx, *Capillaria, Eustrongylides* sp. larvae and *Contracaecum* sp. larvae), 3 cestodes (*Bothriocephalus acheilognathi*, *Polyonchobothrium clarias* and *Proteocephalus glanduliger*), 1 digenean trematode (*Glossidium pedalum*), and 1 acanthocephala (*Acanthogyrus*) were found in *C. gariepinus*, *O. macrochir*, *O. mossambicus* and *S. robustus*. The fish biometrics are shown in Table 1. Tables 2-4 show the prevalence, mean intensity, range, abundance and dominance of the recovered parasites.

A total of 300 helminths of 5 species were found in the samples of *C. gariepinus* (Table 2). 100% of the fish had parasites. The sole recovered nematode *P. cyathopharyn*x and the cestode *P. clarias* had the highest prevalence of 80 % although *P. cyathopharynx* had the highest mean intensity and dominance of 25.5 and 68.9% respectively. Two *Clarias* had above 65 *P. cyathopharynx* in their stomachs. The cestode *P. glanduliger* and the trematode digenean *G. pedalum* had the least abundances of 0.6 and 1.6 respectively. According to Table 3, a total of 21 helminths were recovered in the samples of *O. mossambicus*. 33.3% of the fish had no helminth parasites. Of the 3 nematode species recovered, *Eustrongylides* larvae had the highest prevalence of 27.7% and the highest dominance of 60.9%. The mean intensities of all the recovered 5 helminth species were low. Only 1 helminth species, the acanthocephala *Acanthogyrus* was recovered in *O. macrochir* specimens and its prevalence was low (16.7%) (Table 4). Similarly, only 1 helminth species *Contracaecum* larvae were recorded in *S. robustus* specimens with a prevalence of 40% (Table 4).

Other recovered parasites were piscine coccidia that was found in the intestines of 2 *C. gariepinus* with oocysts ranging from 500-1200. The ectoparasite *Argulus japomicus* was recovered in all the fish species (range 0-3). Most *A. japonicus* was recovered in the mouth cavity and on the fins.

There are a few reports about the parasites of fish in Zimbabwe. Chishawa[3] and Douellou[4] recovered nematodes such as *Callamanus, Procamallanus laeviochus* in fish in Lake Kariba that were not recovered in the present study. Douellou and Erlwanger[9] recovered *Clinostomum metacercaria* in non-siluroid fishes in lake Kariba that were also not recovered in fish in Insukamini dam. Barson,[5] recorded *Contracaecum* larvae in *Clarias gariepinus*. In the current study no *Contracaecum* larvae were recovered in *C. gariepinus* but in *Oreochromis mossambicus* and *S. robustus*. The mean intensity of *Contracaecum* sp. larvae recovered was low and similar to the observations made by Barson[5]. *C. gariepinus* in Insukamini Dam had only one nematode species, *Paracamallanus cyathopahrynx*. The heavy *P. cyathopharynx* infections in the stomach of *Clarias* is similar to the findings of Mashego and Saayman[10] and Boomker[11] in South Africa. An interesting finding was the recovery of the trematode *Glossidium pedalum*, the cestodees *Bothriocephalus acheilognathi*, *Polyonchobothrium clarias* and *Proteocephalus glanduliger* in *Clarias* only. Douellou[4] also reported finding *P. clarias* in *Clarias*. According to Van As and Basson[12], tapeworms are widespread throughout all major water systems of Africa and demonstrate a high degree of host specificity, with Siluriform fish being the most common hosts for both monozoic and segmented cestodes. The recovery of the adult plagiochird trematode *Glossidium pedalum* in the intestines of *C. gariepinus* is similar to the findings of Mashego[13] in South Africa.

The current study showed that *C. gariepinus* and *O. mossambicus* had the greatest diversity of helminth parasites. Unlike other fish species, *Clarias* had the highest worm burdens. This could be attributed to the habitat favoured by *Clarias* that consists of turbid environments and shore areas which are covered with vegetation, as was the case of Insukamini Dam. This habitat also favours the intermediate hosts of cestodes as well as trematode digeneans. Hoffman[14], reported that in the mud habitat second intermediate hosts of many fish digeneans such as larvae of aquatic insects like Ephemeroptera, Odonata, Chironomidae and various Crustacea are found and form part of the diet of *Clarias*[15-16].

Another reason for the recovery of a large number of helminths in *Clarias* could be related to the large size of *Clarias* as compared to other fish species (Table 1). The recovery of very few helminth parasites in *O. macrochir* and *S. robustus* could be attributed to resistance to helminth infections.

It is not surprising to find *Contracaecum* and *Eustrongylides* larvae in some of the fish species in Insukamini Dam. Birds such as commorants and pelicans were always found in the vicinity of the dam. Aquatic birds are important in the ecology of fish parasites because most helminths complete their life cycles in the bird host[17]. *Contracaecum* appears to have a trans African distribution and has also been recorded in *Clarias gariepinus* and *Oreochromis mossambicus*[7]. Another interesting finding of our study was the recovery of piscine coccidia in *Clarias* only. Coccidiosis in fish usually manifests itself as a chronic infection and mortality is gradual and overlooked in most fish farms[18].

In conclusion, the obtained results show that helminths are important parasites of fish in Insukamini Dam, and detailed studies on the seasonal variations of these helminth parasites is recommended.

Table 1: Biometric characteristics (weight and total length) of *C.gariepinus*, *O. mossambicus*, *O. macrochir* and *S. robustus* caught in Insukamini Dam. The range is given in parantheses.

Fish	Weight (g) ±SD	Total length (cm) ±SD
C. gariepinus	1082.9±187.3 (506-1220)	40.3±6.4 (31.5-51)
O. mossambicus	378.1±54.8 (240-500)	19.8±2.2 (14.3-25.5)
O. macrochir	371.4±21.6 (348-400)	21.2±3.7 (16.2-28.2)
S. robustus	307.0±33.5 (200-456)	23.8±1.6 (21.5-27.5)

Table 2: The prevalence, mean intensity, abundance and dominance of some helminths in *C. gariepinus*.

Parasites	Number of Infested fish	Prevalence %	Mean intensity ±SD	Range	Abundance ±SD	Dominance %
P. cyathopharynx (n=204)	8	80	25.5±29.5	0-69	20.4±27.9	68.9
B. acheilognathi (n=30)	6	60	5.0±6.9	0-13	3.0±5.6	10.1
P. clarias (n=44)	8	80	5.0±4.08	0-9	4.0±4.2	13.5
P. glanduliger (n=6)	6	60	1.0±0.0	0-1	0.6±0.5	2.1
G. pedalum (n=16)	4	40	4.0±4.2	0-7	1.6±3.1	5.4

Table 3; The prevalence, mean intensity, abundance and dominance of some helminths in *O. mossambicus.*

Parasites	Number of Infested fish	Prevalence %	Mean intensity ±SD	Range	Abundance ±SD	Dominance %
P. cyathopharynx (n=2)	2	11.1	1.0±0	0-1	0.1±0.3	10
Eustrongylides L (n=12)	5	27.7	2.4±0.6	0-3	0.7±1.1	60.9
Contracaecum L (n=2)	2	11.1	1.0±.0	0-1	0.1±0.3	10
Capillaria (n=4)	3	16.6	1.3±0.6	0-2	0.2±0.5	14.5
Acanthogyrus (n=1)	1	5.6	1.0±0	0-1	0.1±0.12	4.5

Table 4: The prevalence, mean intensity, abundance and dominance of some helminths in *O. macrochir* and *S. robustus*

Parasites	Number of Infested fish	Prevalence %	Mean intensity ±SD	Range	Abundance ±SD	Dominance %
O. macrochir *Acanthogyrus* (n=3)	2	16.7	1.5.±0.7	0-2	0.3±0.6	100
S. robustus *Contracaecum* L (n=6)	4	40	1.5.±0.6	0-2	0.6±0.8	100

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