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Helminth Parasites of *Sarotherodon galilaeus* and *Tilapia zillii* (Pisces: Cichlidae) from River Oshun, Southwest Nigeria

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Abstract: One hundred and thirty eight specimens of two cichlids, *Sarotherodon galilaeus* and *Tilapia zillii* from River Oshun, south-west Nigeria were examined for helminth parasites. The fish were caught using gill nets. In the laboratory, the acanthocephalans were killed and fixed in alcohol-formalin-acetic acid (AFA), stained with acetic hematoxylin, dehydrated using a graded alcohol series, cleared in xylene and mounted in DPX , while the trematodes were not stained before mounting on slides. Forty-five (32.6%) fish specimens had parasitic infection. Two helminth species were recorded: a trematode, *Clinostomum tilapiae* (metacercaria), and an adult acanthocephalan, *Neoechinorhynchus rutili.* No sex-related differences ($p > 0.05$) were found in parasite burden, and there was no relationship between parasite burden and fish size (length and weight). It is concluded that the helminth parasite fauna of these species is depauperate.

Key Words: Helminth, Parasites, Cichlidae, River Oshun, Nigeria

Introduction

The health of fish is affected by parasites which make them susceptible to secondary infection by disease causing agents (e.g. bacteria, fungi and viruses). Parasites also compete for food, thereby depriving fish of essential nutrients and inhibiting growth leading to morbidity and mortality with consequent economic losses (Khalil and Polling, 1997). Under intensive fish culture conditions, parasites tend to proliferate, because of compromised water quality (Paperna, 1991). In recent times, attention has shifted to fish parasites due to increased aquacultural practices. Information is available on parasites of cultured and wild fish (Ukoli, 1966; Andre *et al*., 2004; Chandra, 2006; Doreen *et al*., 2008; Martinez-Aquino and Anguilar-Anguilar, 2008; Shukerova *et al*., 2010).

The present study was aimed at determining

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The helminth parasites of two wild-caught cichlid species (*Sarotherodon galilaeus* and *Tilapia zillii*) commonly used for intensive fish culture.

Materials and Methods

Study area

River Oshun rises in the Oke–Mesi Ridge, about 5km North of Efon Alaiye in Ekiti State, south-west Nigeria, and is underlain by metamo-rphic rocks of the Pre-Cambrian Basement Complex (Joshua and Oyebanjo, 2010). It flows southwards through the western states in Nigeria into the Lagos lagoon and the Atlantic Gulf of Guinea.

Collection, identification and processing of fish samples for parasite examination

Study samples were obtained from fishers (with prior arrangement) at Ijebu-Igbo, Ogun State. The samples were caught by the fishers with gill nets (mesh size, 3cm) set either in the morning and retrieved in the evening or set in the evening and retrieved the following morning. Fishes were placed in an ice-chest and transported to the laboratory for identification, processing and examination for parasitic helmin-ths.

Fish samples were identified to the species level using taxonomic keys (Holden and Reed, 1972). The measurements taken were standard length (S.L) and total length (T.L), using a calibrated dissecting board. The weight of each fish was taken using a sensitive weighing balance (Metler®). Each fish was assigned a reference number during dissection to ensure proper documentation of records obtained. The sexes of the fish were determined after dissection (Martinez-Aquino *et al*., 2004). The skin, scales, gills, eyes and gut were all removed using appropriate dissecting tools. These organs were then placed in saline water contained in Petri-dishes to aid the emergence of parasites. The Petri-dishes were then thoroughly examined for parasitic helminths.

Killing and preservation of parasites

Parasites obtained were cleared by washing them in saline for thirty minutes to remove mucus, and the worms were relaxed in distilled water for ten minutes. The distilled water allowed the parasites to void their eggs. With the acanthocephalans, the distilled water also caused the proboscis to be extended. An applicator rod was also used to exude the proboscis of the acanthocephalans. After relaxation parasites were killed and fixed in Alcohol-Formalin-Acetic acid (AFA) solution. The parasites were left in the fixative for 24 hours and then transferred to a 70% alcohol solution.

Two methods were used in the treatment of the parasites: the staining method (acantho-cepala) and the non-staining method (trematode metacercaria).

The parasites were dehydrated using alcohol of different concentrations: 70% alcohol, 85% alcohol, 95% alcohol, and 100% alcohol for a period of ten minutes each. After dehydration, the parasites were cleared in xylene and stained with acetic hematoxylin for fifteen minutes. The parasites were then mounted on a slide using DPX. The slides were placed on a slide warmer for ten minutes for the curing process.

Non-staining method:

The parasites were dehydrated in 70% alcohol, 85% alcohol, 95% alcohol and absolute alcohol for a period of ten minutes each. After dehydration, the parasites were cleared in xylene and mounted on a slide using DPX. The slides were placed on a slide warmer for ten minutes. The slides were then observed under a light microscope and the parasites identified using information provided by Yamaguti (1963), Bunkley-Williams and Williams (1994), Ukoli (1966), Juan and Windsore (2006), Edor *et al*., (2008), Claudia *et al*. (2008).

Statistical Analysis

Relationships between parasite burden and other variables (length, weight and sex) were compared using correlation analysis and t-test (Steel and Torrie, 1981).

Results

Out of the 138 specimens examined, 45 (32.6%) had parasitic infection. Two parasites were obtained from host species: *Neoechinorhynchus rutili* (adult acanthocephalan), and *Clinostomum tilapiae* (trematode metacercaria).

Table 1 shows the prevalence and the intensity of parasites in the affected hosts. Highest parasite prevalence was obtained in *S. galilaeus* infested with *C. tilapiae*, while the highest mean intensity was recorded in *T. zilli* infested with *N. rutili.*

The relationship between parasite burden and sex is shown in Table 2. There was no difference ($p>0.05$) in parasite burden with sex in *S. galilaeus.* No male *T*. *zillii* were examined and there was no comparison between sexes. There was no relationship ($p>0.05$) between parasite burden and length (Table 3), and between parasite burden and body weight (Table 4).

Discussion

Only two species of helminths, *N. rutili* and *C. tilapiae* were encountered in this study indicating low species diversity.

These parasites have also been recorded from cichlids and other freshwater species (Ukoli, 1966, 1970; Douellow and Erlwanger, 1993; Olurin and Somorin, 2006), suggesting they are generalists.

Parasites are grouped into two broad categories: generalists and specialists (Margolis and Arthur, 1979; Holmes and Price, 1980). Generalists are capable of infesting a wide range of hosts, while specialists are restricted to one family of hosts in most cases.

Table 1: Helminths of *Sarotherodon galilaeus* and *Tilapia zillii* from River Oshun, South-west Nigeria

host	Helminth	Number Infected	Prevalence %	Range	Intensity (Mean ± S.D)
S. galilaeus	*Neoechinorhynchus rutili*	11	10.22	1-2	1.23 ± 0.43
	Clinostomum tilapiae	23	21.3	1-9	3.13 ± 2.45
T. zillii	*Neoechinorhynchus rutili*	8	26.7	2-6	3.37 ± 1.51
	Clinostomum tilapiae	3	10.0	2-3	2.00 ± 1.00

No of *S. galilaeus* examined = 108; No of *I. zillii* examined = 30; Total specimens examined = 138

Table 2: Relationship between sex and parasite burden in fish

Host	Sex	No Infected	Mean parasite load	df	t	Significance (p=0.05)
S. galilaeus	M	14	3.57	13	1.74	n.s
	F	14	2.07			
	Undifferentiated sex	6				
T. zillii	M	-				
	F	4	2.5			
	Undifferentiated sex	7				

Table 3: Relationship between parasite burden and length of fish

Species	r	Significance (p = 0.05)
S. galilaeus	0.0970	n.s
T. zillii	0.3324	n.s

Table 4: Relationship between parasite burden and body weight in fish

Species	r	Significance (p = 0.05)
S. galilaeus	0.005	n.s
T. zillii	0.293	n.s

The depauperate nature of helminths in this study can be ascribed to the flow of water as suggested by Martinez-Aquino *et al*., (2009). High water flow of the collecting site was suggested as the main factor determining the depauperate helminth assemblages in fish from Cuzalapa hydrological system in Mexico (Martinez-Aquino *et al*., 2009).

Other factors which contribute to the diversity of parasite fauna of fish include host age, diet, habitat and migratory behaviour (Stock and Holmes, 1986).

The period of collection of specimens from river Oshun coincided with the rainy season characterized by rising water levels and increased flow. The presence of *C. tilapiae* (metacercariae) suggests that the cichlids are intermediate hosts in the local trophic web. *C. tilapiae* is known to use fish as an intermediate host, while the cattle egret is the definitive host (Ukoli, 1966).

Piscivorous birds are the definitive hosts for many of the metacercariae found in fish, and bird migration is the greatest contributing factor for dispersal of metacercarial infection (Hoffman, 1999). Other distributive factors of metacercariae are the presence of suitable molluscan intermediate hosts (Hoffman, 1999).

N. rutilli was restricted to the gut of the fish species. Its preference for the organ may be attributed to the abundant food supply in the gut. The proboscis also serves as an organ of attachment to the gut wall.

The feeding pattern of fish is an important factor in their infestation with parasites. Lugue and Poulin (2004) reported that predatory fish species harbor a greater diversity and abundance of larval helminths than herbivorous and planktivorous species.

Predatory fish are exposed to more infective helminth larvae in their diet; thereby making them more susceptible to higher parasite colonization than phytophagous and planktivorous fish.

The cichlids *S. galilaeus* and *T. zillii* are both planktivorous species (Olurin and Fagade, 1994), which explains the paucity of their parasites. The species also included crustaceans and insects in their diets.

All acanthocephalans have an indirect life cycle that requires at least one intermediate host (FAO, 2006). Piscine acanthocephalans have aquatic insects and crustaceans (amphipods, isopods, copepods and ostracods) as their foremost intermediate hosts (FAO, 2006).

There was no relationship between parasite intensity and sex; and between parasite burden and size of fish. There are inconsistent results in the literature with regards to the above, with some results indicating a relationship with sex (Thomas, 1964), and others showing, the converse (Olurin and Somorin, 2006)). The same type of contrasting results have been obtained between parasite burden and size of fish (length and weight). In some fish, there are relationships (Price and Clancy, 1983) while in others there are no relationships (Sasal *et al*., 1997).

Poulin and Morand (2004) reported that these inconsistent results could be attributed to studies failing to control for two important confounding variables, study effort and the influence of phylogenetic relationship among fish species.

The results of this study indicate a paucity of parasite species in the cichlids of River Oshun, South West Nigeria, a pattern which is consistent with fast flowing streams and planktivorous diet.

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