



Helminth Parasites of *Synodontis clarias*, *Chrysichthys auratus* and *Chrysichthys nigrodigitatus* from Asejire Reservoir, Osun State, Nigeria

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Abstract

Two hundred and fifty randomly selected fish samples made up of 100 *Chrysichthys auratus*, 62 *Chrysichthys nigrodigitatus* and 88 *Synodontis clarias* procured from Asejire reservoir in Osun State were examined for intestinal helminth parasites, between January and June, 2011, using conventional parasitological techniques. *Caryophyllaeus* spp (cestode) and *Cosmoxyema* spp (nematode) were observed in *C. nigrodigitatus*. *Wenyonia* spp, *Polyonchobothrium* spp, *Caryophyllaeus* spp, *Paraglaridacris* spp (cestodes) and *Procamallanus* spp, *Cosmoxyema* spp, *Rondonia* spp (nematodes) were recovered from *Synodontis clarias*. No parasite was recovered from *C. auratus*. The site preference of parasites was the small intestine. Overall prevalence of helminth parasites was lower in *C. nigrodigitatus* (8.1%) ($P < 0.05$) than in *S. clarias* (82.23%). This implied that there was no relationship in the parasitic infections between *C. nigrodigitatus* and *C. gariepinus*. In *C. nigrodigitatus*, the males recorded a prevalence of 6.25% while the females of the fish species recorded prevalence of 10%. In *S. clarias*, the males had a prevalence of 84.9% while the females recorded a prevalence of 86.7%. This implied that the females of the fish species had higher loads of parasitic infections, than the males. No seasonal variation in parasite intensity was observed.

Keywords: Helminth parasites, *Rondonia* sp, Freshwater fish, Asejire reservoir, *Chrysichthys auratus* and *Synodontis clarias*.

Introduction

Fish helminthology in Nigeria is not as widely studied as other aspects of aquatic parasitology which relate to fish biology. Fish makes a vital contribution to the survival and health of a significant portion of the world's population. It is important as a source of protein with low cholesterol level and economically as a source of subsistence income [1]. It also accounts for about one fifth of world total supply of animal protein and this has risen to almost five folds over the last forty years from 20 million metric tons to 98 million metric tons in 1993 and projected to exceed 150 million metric tons by the year 2010 [2]. With this increasing need for cheap sources of protein, more and more attention is being focused on fish from natural freshwaters, even those from fish farms [3].

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 [4]. Under natural conditions, 50-90% of fresh water fishes harbour at least one species of parasites [5], which could result in decreased yield, aesthetic value, palatability, as well as increased susceptibility to disease and predation. The effects of parasitic infections on fish are of notable importance since these effects cause fish to become dull, feeble, frequently swimming to water surface with erratic movement and may therefore die of exhaustion [6].

Freshwater fish can serve as definitive, intermediate, or paratenic hosts in the life cycles of many species of helminth parasites. There was a report that the parasites usually affect the market

value of commercially produced fish, thus raising public health concerns especially in areas where raw or smoked fish is eaten [7].

In fish farming or aquaculture, some parasites may be highly pathogenic and contribute to high economic losses, while in natural systems, they may threaten the abundance and diversity of indigenous fish species. *Chrysichthys* species is a silver coloured African catfish that is found in shallow waters of lakes with mud and fine sand bottom. It is also regarded as an omnivore feeding on seeds, insects, bivalves and detritus.

Synodontis clarias is a benthopelagic, potamodromous freshwater fish that inhabits water with a pH range of 6.5-9.5 [8].

The present study determined the intestinal helminth fauna of *Synodontis clarias*, *Chrysichthys auratus* and *Chrysichthys nigrodigitatus* in Asejire reservoir. This will further contribute to the understanding of helminth community and diversity.

Methodology

Study Area

Asejire reservoir, a man-made lake located 30km east of Ibadan, was constructed on River Osun in 1972, one of the main river basins of South-western Nigeria. The reservoir lies on latitude 07°21'N and longitude 04°07'E at an altitude of 137m above sea level with a total length of 19.5km and impounded area of 2,342 hectares and an approximate gross storage capacity of 7,403 million litres [9].

The vegetation around the reservoir is characterised by forest. The reservoir experiences both dry and rainy seasons typical of the southern part of Nigeria. The fish fauna of the lake comprised of 23 species (belonging to 13 families) among which is *Chrysichthys nigrodigitatus*, *Chrysichthys auratus*, *Synodontis clarias*, *Clarias gariepinus*, *Clarias pachynema*, *Heterotis niloticus*, *Mormyrus rume*, *Heterobranchus bidorsalis*, *Sarotherodon melanotheron*, *Gymnarchus niloticus*, *Tilapia zillii*, *Tilapia galilae*, *Hemichromis fasciatus* and *Parachanna obscura*.

Sample Collection, Identification and Examination:

Two hundred and fifty randomly selected whole live fish specimens, consisting of 88 *Synodontis clarias*,

100 *Chrysichthys auratus* and 62 *Chrysichthys nigrodigitatus* were purchased from fishermen at Asejire reservoir. The specimens were obtained between January and June, 2012. Identification of the fishes were confirmed based on external body features described by [10]. The weight of fishes were taken with the aid of Mettler digital weighing balance while the standard length and total length were measured using a measuring board. The sex of fishes were determined by the presence or absence of sexual papilla located behind the anus. The sex of fishes were later confirmed after dissection with the presence of testes (in males) and ovaries (in females).

The fishes were dissected in order to expose the body cavity, alimentary canal and other internal organs. The alimentary canals were removed and cut into various parts; oesophagus, stomach, intestine and rectum in 0.09% physiological saline for parasite recovery. Also, the gills were carefully removed from the gill cavity, placed in a petri dish containing physiological saline and shaken. With the aid of forceps, each gill lamellae was raised and examined to enhance parasite recovery. The intestine and stomach were carefully slit open to aid the emergence of parasites. The recognition of worms was enhanced by their wriggling movement on emergence.

Processing and Identification of Recovered Parasites

The recovered helminth parasite was counted, recorded and allowed to stretch fully in 0.09% normal saline recommended by [11]. They were later fixed in 70% alcohol for their identification up to species level. Whole mount histological preparations of worms were made using standard histological technique for heamatoxylin stain. The recovered helminth parasites were identified using description by [12], [7], [13] and [14].

Data Analysis

The prevalence and intensity of the parasites were calculated. Chi-square was used for the analysis to determine if there was any association between the prevalence of infection and sex. Two-factor ANOVA was used to determine if there was any relationship between prevalence of infection and standard length, as well as, monthly prevalence of helminth infection.

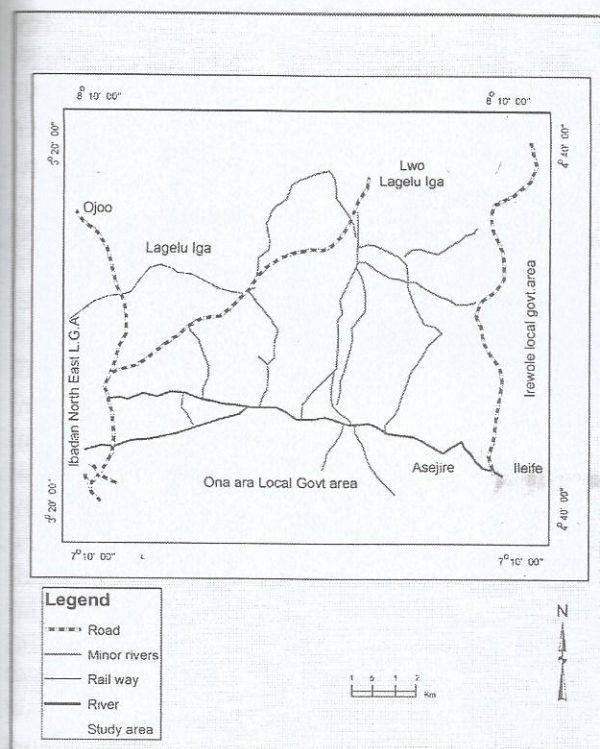


Fig. 1: Map of Oyo State Showing Location of Asejire Dam

Results

Two kinds of helminth parasites; cestodes and nematodes were observed. These included four cestodes; which are *Wenyonia* spp, *Polyonchobothrium* spp, *Caryophyllaeus* spp, *Paraglaridacris* spp and three nematodes; *Rondonia* spp., *Procamallanus* spp and *Cosmoxyinema* spp. No cysts, trematodes and acanthocephalans were observed. Polyparasitism was observed in *C. nigrodigitatus* and *S. clarias* (Table 1) while no parasite was recovered from *C. auratus*. All the parasites recovered were restricted to the stomach and small intestine. In *C. nigrodigitatus*, prevalence of helminth parasites in the intestine was 92.6% while that of the stomach was 7.4 %. In *S. clarias*, prevalence of helminth parasites in the intestine and stomach were 90.8% and 9.2% respectively.

A very high infection rate was observed in *S. clarias* with 75(85.2%) fishes infected out of the 88 specimens examined. However, the prevalence 5(8.06%) of helminth parasites in *C. nigrodigitatus* was significantly lower compared with *S. clarias* $P(< 0.05)$. Table 2 presents the prevalence of

helminth infections of the two parasitised fish species. The females had a higher prevalence of infections than the males in both fish species. There was a relationship between the prevalence of infections of the two infected fish species. ($P<0.05$). The mean parasite infection for *C. nigrodigitatus* and *S. clarias* was 2.78 and 13.99 respectively (Table 3).

In *C. nigrodigitatus*, fishes in the length category 15-17.9cm had the highest prevalence of helminth infection, with a total of 15 recovered parasites, while in *S. clarias*, the highest prevalence was observed in the fishes in the length category 12-14.9cm which harboured a total of 1,054 parasites (Table 3). Comparison of parasite burden in relation to length category, using analysis of variance (ANOVA) showed that there was no significant difference ($P>0.05$) in the parasitic burden of fishes in the various length categories of *C. nigrodigitatus*. However, in *S. clarias*, there was significant difference ($P<0.05$) in the parasite burden of fishes in different length categories.

The weight of fishes collected ranged between 30.0 and 149.9g. In *C. nigrodigitatus*, the highest prevalence was observed in the weight range of 60-69.9g, with a total of 17 parasites recovered. In *S. clarias*, the highest prevalence was observed in weight range 40-49.9g with a total of 410 parasites recovered. In *S. clarias*, smaller fishes had more infections than bigger fishes. In *S. clarias*, over 70% prevalence of helminth parasites were recorded for all other months. The highest prevalence (100%) was observed in June. However, in *C. nigrodigitatus*, the highest prevalence (25%) was observed in March while zero prevalence was observed in the months of January, April and June.

Table 1: Parasite Types in *C. nigrodigitatus* and *S. clarias*

Taxonomic Group	Parasites	Fish	
		<i>C. nigrodigitatus</i>	<i>S. clarias</i>
Cestoda	<i>Wenyonia</i> species	-	+
	<i>Polyonchobothrium</i> species	-	+
	<i>Caryophyllaeus</i> species	+	+
	<i>Paraglaridacris</i> species	-	+
	<i>Procamallanus</i> species	-	+
Nematoda	<i>Procamallanus</i> species	-	+
	<i>Cosmoxyinema</i> species	+	+
	<i>Rondonia</i> species	-	+

Table 2: Overall Prevalence of Helminth Infection in Relation to Sex or Fish Hosts

	<i>C. nigrodigitatus</i>		<i>S. clarias</i>		Combined Sex	
	M	F	M	F	<i>C. nigrodigitatus</i>	<i>S. clarias</i>
Number Examined	32	30	73	15	62	88
Number Infected	2	3	62	13	5	75
Percentage of Infection	(6.25%)	(10%)	(84.93%)	(86.67%)	8.06%	85.23%

M-Male, F- Female

Chi-square=54.35, P<0.05

Table 3: Intensity of Helminth Infection in Relation to Standard length

Standard Length	Fish Species					
	<i>C. nigrodigitatus</i>			<i>S. clarias</i>		
	No.	No. (%)	NPR	No.	No. (%)	NPR
Length	Examined	Infected		Examined	Infected	
9-11.9	1	0(0.00)	0	19	15(78.944)	330
12-14.9	25	0(0.00)	5	49	34(69.38)	1054
15-17.9	22	1(4.54)	15	13	8(61.53)	232
18-20.9	11	0(0.00)	0	0	0(0.00)	0
21-23.9	3	1(33.33)	7	3	2(66.67)	45
24-26.9	0	0(0.00)	0	1	1(100.00)	9
27-29.9	0	0(0.00)	0	0	0(0.00)	0
30-32.9	0	0(0.00)	0	2	1(50.00)	8
33-35.9	0	0(0.00)	0	1	1(100.00)	6

**NPR- No. of Parasites Recovered

Discussion

Fish helminth parasites were common in freshwater fishes with about 50-90% harbouring at least one species of parasite [15, 5]. Parasite prevalence and intensity depended on many factors, such as life cycle of parasites, host and its feeding habits, the physical factors of water body where the fish inhabit as well as the presence of intermediate hosts, such as piscivorous birds which spread cestode infections [16].

Wenyonia spp, (cestode) which was recovered from *S. clarias* appeared to be the most important endoparasites of the fish species which had been greatly reported. Species which have been documented included *W. Kainji* in *S. clarias* [17], *W. longicauda* in *Synodontis gambiensis* and *Wenyonia virilis* in *Synodontis batensoda*, *Synodontis schall* and *Synodontis clarias* [3, 18]. *Wenyonia* species have therefore been known to infect members of the family Mochokidae.

Polyonchobothrium spp has been documented to infect *C. gariepinus* [19], *Procamallanus* spp in *S. clarias* [20], *Procamallanus* in *C. gariepinus* [19, 21]. The nematodes; *Rondonia* sp and *Coxmoxynema* sp and the cestodes; *Polyonchobothrium* sp, *Paraglaridacris* sp and *Caryophyllaeus* sp have not been documented in literatures to infect *S. clarias*.

The parasite checklist also documented a sparse parasite fauna for *C. nigrodigitatus* and *Synodontis clarias* [3]. The overall prevalence (85.2%) observed for *S. clarias* in this study was high particularly when compared to the 38.7% reported from Lekki Lagoon [22] and from Anambra River [23]. However, a relatively high prevalence of 65.57% was reported in Lekki Lagoon. This was probably due to some factors such as pollution by human waste, physico-chemical properties in the lagoon and availability of the right fish host for the parasite [2]. The differences in prevalence and parasite burden in *S. clarias* when compared with *Chrysichthys* spp can be attributed to differences in diet and feeding habit. *Synodontis clarias* being an omnivore would have consumed most of the intermediate hosts of the parasitic helminth fauna with heteroxenous life cycle. [24] reported a high percentage of debris in the gut of *S. schall*. Their ability to explore the bottom habitat despite the higher pressure due to the possession of a large swim bladder, bony head shield and high fat deposition could also predispose them to infection. The low prevalence of 8% observed in *C. nigrodigitatus* in the study was similar to 12.7% [25] and 20% from Oviariver in Edo State by [26].

The higher incidence of helminth parasites in females (86.7% and 10% in *S. clarias* and *C. nigrodigitatus* respectively) in this study could be due to certain ecological factors probably from feeding differences between males and females. It may also be attributed to random selection due to the few number of females examined as compared with males. The distribution of helminth parasites in the gut of these fish species showed that the intestine was the preferred site. This could be due to the physiochemical and physiological factors operating in the gut such as nutrient levels, pH, osmotic tension and oxygen tension. Also, most digestive activity takes place in the intestine resulting in the release of parasite ova/cyst in food particles.

[21] reported a significant difference in the intestinal helminth parasite burden of *S. clarias* in relation to size. This is in contrast to this study due to random selection of specimens where few fish

species in higher length or weight ranges were examined and so were not good representative of the entire population. Similar to this finding was the observation by [27,28.].

The length group 15-17.9cm and 12-14.9cm in *C. nigrodigitatus* and *S. clarias* respectively had the highest prevalence of infections. This may be attributed to the low level of immunity in the smaller sized fish. However, in *C. nigrodigitatus*, the length group 9-11.9cm recorded zero prevalence, which could be attributed to random selection.

In addition, findings of this study showed an irregular trend in prevalence of helminth parasites in various months. The highest prevalence of 100% observed in *S. clarias* in June coincided with the peak of rainy season. This observation was in contrast to that of [23] who reported a higher prevalence of helminth parasites in the dry season due to relatively slow-moving flow of water in lentic habitats which inevitably increased host-parasite contact frequency which resulted in high prevalence.

The obtained results in this study showed that helminths are important parasites of fish (especially *S. clarias*) in Asejire reservoir. Therefore, more detailed studies are recommended, in order to further establish the parasite fauna of these fish species (*Chrysichthys spp* and *S. clarias*). Also, studies on seasonal trend of helminth infection in the reservoir is also recommended.

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