HELMINTH ENDO-PARASITES OF MOCHOKIDS IN A TROPICAL RAINFOREST RIVER SYSTEM

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ABSTRACT

A study of the helminth endo-parasites of Brachysynodontis batensoda, Hemisynodontis membranaceous, Synodontis gobroni, S. clarias, S. sorex, S. budgetti, S. xiphias, S. nigrita, S. filamentosus, S. eupterus, S. schall, and S. ocellifer, randomly sampled from commercial fishers, was made in the lower reaches of Anambra river from March 2001 to February 2002. The helminth endo-parasites recovered were Sandonia sudanensis (Trematoda), Wenyonia synodontis, W. youdeoweii, W. kainji (Cestoda) and Procamallanus laeviconchus (Nematoda). B. batensoda, S. clarias, S. eupterus, S. gobroni and S. ocellifer are new geographical records for W. synodontis, which appeared to be the most important endo-parasite of mochokids in terms of fishery management in the Anambra river. It infected more hosts than the other Wenyonia species put together or the other parasite species. The prevalence of all the endo-parasites was low (≤ 20 %). There were cases of mixed infection involving S. sudanensis and P. laeviconchus as well as Wenyonia species and P. laeviconchus but never between Wenyonia congeners. The habitat most preferred by S. sudanensis and Wenyonia species was the small intestine, whereas P. laeviconchus was found only in the stomach. Prevalence, mean intensity and abundance of all the endo-parasites were generally higher in the dry than in the rainy season. No visible damage or injury resulting from the endo-parasites was evident on parasitized fish.

Keywords: Parasites, Mochokids, Anambra river

INTRODUCTION

The mochokids, with approximately 110 species, occur throughout the Afro-tropical region. In Nigeria, the family has about 30 species distributed in five genera, namely, *Chiloglanis, Mochokus, Brachysynodontis, Hemisynodontis* and *Synodontis* (Olaosebikan and Raji, 1998). *Synodontis* has the highest number of species (19), whereas *Hemisynodontis* and *Brachysynodontis* have one each. The last two genera are, therefore, monotypic and common in the lower Niger drainage basin of which the Anambra river basin constitutes an important part. In the Anambra river, there are probably 16 synodontid species; 10 of these and the hemisynodontid and brachysynodontid species are examined in this study.

The mochokids, particularly species of *Brachysynodontis, Hemisynodontis* and *Synodontis*, are of commercial importance. They constitute from 11 to 16 % by number and 10 to 18 % by weight of the total catch of fish in the Kainji lake (Lelek, 1973; Lewis, 1974; Willoughby, 1979) and in river basins where they occur, including the Anambra basin (Reid and Sydenham, 1979; Teugels *et al.*, 1992; HMGE, pers. obs.). This is particularly so during the rainy season when they are very abundant, reflecting their high fecundity. Despite the long and strong spines of mochokids, they are a delicacy and a source of scarce animal protein and nutrients for the riverine inhabitants of the Anambra basin.

While there are reports on various aspects of the biology and ecology of the commercially important species (Breder and Rosen, 1966; Willoughby, 1979; Hickley and Bailey, 1987; Agnese *et al.*, 1990; Oberdorff *et al.*, 1990; Ofori-Danson, 1992), little exists on their parasites and diseases (Khalil, 1969; Khalil and Thurston, 1973; Azugo, 1978). Azugo's (1978) study in the Anambra river system is highly limited by sample size, generally less than six specimens, and is over 20 years old.

This paper investigates the helminth endo-parasites of *Brachysynodontis batensoda* (Rupell, 1832), *Hemisynodontis membranaceous* (Geoffroy Saint-Hilaire, 1893), *Synodontis gobroni* Daget, 1954, *S. clarias* Linne, 1758, *S. eupterus* Boulenger, 1901, *S. ocellifer* Boulenger, 1900, *S. schall* (Bloch and Schneider, 1801), *S. sorex* Gunther, 1864, *S. budgetti* Boulenger, 1911, *S. xiphias* Gunther, 1864, *S. nigrita* Valenciennes, 1840 and *S. filamentosus* Boulenger, 1901 in the Anambra river paying particular attention to their composition, habitat, seasonality and effect on their host(s).

MATERIALS AND METHODS

Fresh specimens of the mochokids were randomly sampled from commercial fishers around Otuocha, Anam and Nsugbe in the lower reaches of the Anambra river from March 2001 to February 2002. The geographical location, climate, vegetation and other features of this area in the Anambra river basin have been described (Ezenwaji, 1998).

The standard length (snout to end of caudal peduncle) (SL, to the nearest centimetre) and body weight (W, to the nearest gram) of each specimen were measured and their sexes determined. The internal organs were thoroughly examined for helminth parasites after dissection. Parasites recovered were first shaken in normal saline to remove mucus and other host debris. The trematodes were shaken vigorously in cold 4 % formaldehyde until they died, while the cestodes were relaxed in distilled water and fixed in formal (5 %) - alcohol (90 %) - acetic acid (15 %) (F. A. A.). Live nematodes were killed in extended form by pouring steaming 70 % alcohol on them in Petri dishes; they were then preserved in 70 % alcohol to which 2 % glycerine had been added to prevent brittleness.

The terminology of infection statistics (Bush *et al.,* 1997) was employed in the analysis of data. ANOVA was done using a two-way classification. Means were separated with the aid of the new Duncan's multiple range test (Duncan, 1955).

RESULTS

The helminth endo-parasites recovered from the fish hosts were the paramphistomatid digenean, *Sandonia sudanensis* (Trematoda), the monozoic caryophyllaeid tapeworms, *Wenyonia synodontis, W. youdeowii, W. kainji* (Cestoda) and the camallanid roundworm, *Procamallanus laeviconchus* (Nematoda) (Table 1).

The overall prevalence was low; only 52 (8.7 %) of the 601 mochokids examined were infected and 2687 helminth specimens were recovered (Table 1). This table also showed that the prevalence of *S. sudanensis* in *H. membranaceous* was higher than in *Synodontis* species ($\leq$ 10.0 %), which it parasitized ($P<0.05$). The prevalence of *W. synodontis* ranged from 1.9 % in *S. gobroni* to 13.3 % in *S. ocellifer, S. schall* and *B. batensoda*. More mochokids were infected by *W. synodontis* than the other tapeworms – *W. youdeowii* and *W. kainji* – which, generally, had lower prevalence. The mean intensity and abundance of *W. synodontis* in *S. ocellifer* and of *W. youdeowii* in *S. eupterus* were exceptionally very high. The prevalence of *P. laeviconchus* ranged from 3.8 % in *S. nigrita* to 20 % in *S. xiphias*. No *S. filamentosus (*n = 40) examined was infected. All the endo-parasites were present in *S. clarias* at low prevalence (2.9 – 7.2 %).

The habitats of *S. sudanensis* and *Wenyonia* species were the small and large intestines and stomach but the preferred habitat appeared to be the small intestines of the infected mochokids (Table 2). *P. laeviconchus* infected only the stomach.

There were two cases of mixed infection involving *S. sudanensis* and *P. laeviconchus,* and nine involving *Wenyonia* species and *P. laeviconchus* but no case involving *Wenyonia* congeners was found. In all cases of mixed infection, the parasites occupied their preferred habitats.

Generally, the prevalence, mean intensity and abundance of *S. sudanensis, Wenyonia* species and *P. laeviconchus* in the mochokids were higher in the dry than the rainy season ($P < 0.05$) (Table 3). Some of the endo-parasites were not even present in the rainy season.

Apart from the *P. laeviconchus* specimens that were reddish, apparently from engorgement of blood, no noticeable harm was evident on the stomach mucosa to which they were attached by their buccal capsules. Fish, such as *S. ocellifer* (mean intensity = 262.5) and *S. eupterus* (mean intensity = 333.3), with heavy *Wenyonia* species worm burden appeared weak, moved sluggishly and died easily in the process of marketing them. Yet, no visible injury resulting from their infection was observed.

DISCUSSION

Several species of mochokids, particularly members of the genera *Brachysynodontis, Hemisynodontis* and *Synodontis,* are known to harbour monogenean, digenean, cestode, acanthocephalan, nematode (and other) parasites (Khalil, 1971; Khalil and Thurston, 1973; Azugo, 1978). Among these, *Wenyonia* species appear to show a marked preference for mochokids in which several of them have been recorded (Ukoli, 1965; Khalil, 1971; Azugo, 1978); *B. batensoda, S. clarias, S. eupterus, S. gobroni* and *S. ocellifer* in this study are new geographical records for *W. synodontis*. Similarly, *S. budgetti, S. clarias, S. eupterus* and *S. sorex* are new geographical records for *W. kainji*. As a truly transafrican species, which appears to be host-specific, *P. laeviconchus* occurs widely in synodontids and other tropical catfish, especially *Clarias* species (Khalil and Thurston, 1973; Ezenwaji and Ilozumba, 1992; Paperna, 1996; Oniye *et al.,* 2004).

The low prevalence of parasites in fish from lotic flood water systems has been widely reported. Our results on the prevalence of endo-parasites in mochokids from the Anambra river are consistent with the reports of Ezenwaji and Ilozumba (1992), Anosike *et al.* (1992), Ezenwaji (2002), Nwani (2004) and Oniye *et al.* (2004). This is to be expected because the relatively fast flow of water in lotic habitats would inevitably reduce host-parasite contact frequency resulting in low prevalence.

While the low prevalence may be causally related to flow regime, Williams and Jones (1994) report the interplay and effect of other abiotic factors (such as, rainfall, pH and dissolved oxygen) and biotic factors (such as, food and crowding) on the level of parasitism in aquatic systems. This interplay may be responsible for the higher prevalence, mean intensity and abundance of the parasites in the mochokids in the dry than the rainy season. During the rains, particularly at high flood, the increased volume of water and higher flow regime result in wide dispersal of the infective stage of the parasite and the fish host. Consequently, there is a drastic reduction in host-parasite contact frequency. On the other hand, the contraction of water in the main river channel and floodplain lentic water bodies in the dry season would bring the infective stage of the parasite in close proximity to the fish host, both of which become crowded into a smaller area, resulting in much higher contact between them.

Table 1: Parasite species spectrum and their prevalence in the mochokids from the Anambra river

Parasite taxa	Parasite species	Host fish	No. of fish examined	No. of fish infected	Total no. of parasites recovered	#Prevalence (%)	**Mean intensity	¶Abundance
Trematoda	*Sandonia sudanensis*	*Hemisynodontis membranaceous*	20	4	16	20.0	4.0	0.8
		Synodontis clarias	69	2	4	2.9	2.0	0.1
		S. filamentosus	40	0	0	0	0	0
		S. schall	30	3	20	10.0	6.7	0.7
Cestoda	*Wenyonia synodontis*	*Brachysynodontis batensoda*	30	4	17	13.3	4.3	0.6
		Hemisynodontis membranaceous	20	2	30	10.0	15.0	1.5
		Synodontis clarias	69	4	20	5.8	5.0	0.3
		S. eupterus	50	6	200	12.0	33.3	4.0
		S. gobroni	160	3	32	1.9	10.7	0.2
		S. ocellifer	30	4	1050	13.3	262.5	35
		S. schall	30	10	30	33.3	3.0	1.0
	W. youdeowii	*S. clarias*	69	5	20	7.2	4.0	0.3
		S. eupterus	50	3	1000	6.0	333.3	20.0
	W. kainji	*S. budgetti*	30	3	15	10.0	5.0	0.5
		S. clarias	69	4	10	5.8	2.5	0.1
		S. eupterus	50	3	82	6.0	27.3	1.6
		S. sorex	32	4	20	12.5	5.0	0.6
Nematoda	*Procamallanus laeviconchus*	*S. clarias*	69	3	46	4.3	15.3	0.7
		S. eupterus	50	3	18	6.0	6.0	0.4
		S. nigrita	80	3	20	3.8	6.7	0.3
		S. schall	30	4	10	13.3	2.5	0.3
		S. xiphias	30	6	27	20.0	4.5	0.9
			601	52	2687	8.7	--	--

*#Prevalence: Number of host infected divided by the number examined expressed as a percentage. **Mean intensity: Mean number of parasites per infected host. ¶Abundance: Mean number of parasites per host examined.*

Table 2: The prevalence of the helminth parasites in relation to habitats in the mochokids from the Anambra river

Parasite species	Host fish	Habitat	No. of fish examined	No. of fish infected	Total no. of parasites recovered	Prevalence (%)	Mean intensity	Abundance
Sandonia sudanensis	*Hemisynodontis membranaceous*	Large intestine	20	4	16	20.0	4.0	0.8
	Synodontis clarias	Small intestine	69	2	4	2.9	2.0	0.1
	S. filamentosus		40	0	0	0	0	0
	S. schall	Small intestine	30	3	20	10.0	6.7	0.7
Wenyonia synodontis	*Brachysynodontis batensoda*	Small intestine	30	4	17	13.3	4.3	0.6
	H. membranaceous	Small intestine	20	2	30	10.0	15.0	1.5
	S. clarias	Small intestine	69	4	20	5.8	5.0	0.3
	S. eupterus	Stomach	50	1	7	2.0	7.0	0.1
		Large intestine	50	5	193	10.0	38.6	3.9
	S. gobroni	Small intestine	160	2	28	1.3	14.0	0.2
		Large intestine	160	1	4	0.6	4.0	+
	S. ocellifer	Small intestine	30	4	1050	13.3	262.5	35.0
	S. schall	Small intestine	30	10	30	33.3	3.0	1.0
W. youdeowii	*S. clarias*	Small intestine	69	5	20	7.2	4.0	0.3
	S. eupterus	Large intestine	50	3	1000	6.0	333.3	20.0
W. kainji	*S. budgetti*	Large intestine	30	3	15	10.0	5.0	0.5
	S. clarias	Large intestine	69	4	10	5.8	2.5	0.1
	S. eupterus	Small intestine	50	3	82	6.0	27.3	1.6
	S. sorex	Small intestine	32	4	20	12.5	5.0	0.6
Procamallanus laeviconchus	*S. clarias*	Stomach	69	3	46	4.3	15.3	0.7
	S. eupterus	Stomach	50	3	18	6.0	6.0	0.4
	S. nigrita	Stomach	80	3	20	3.8	6.7	0.3
	S. schall	Stomach	30	4	10	13.3	2.5	0.3
	S. xiphias	Stomach	30	6	27	20.0	4.5	0.9

Table 3: The prevalence of the helminth parasites in relation to the dry (n=270) and rainy (n=291) seasons in the mochokids from the Anambra river

Parasite species	Host fish	Season	No. of fish examined	No. of fish infected	Total no. of parasites recovered	Prevalence (%)	Mean intensity	Abundance
Sandonia sudanensis	*Hemisynodontis membranaceous*	Dry	8	3	11	37.5	3.7	1.4
		Rainy	12	1	5	8.3	5.0	0.4
	Synodontis clarias	Dry*	29	2	4	6.9	2.0	0.1
	S. schall	Dry*	20	3	20	15.0	6.7	1.0
Wenyonia synodontis	*Brachysynodontis batensoda*	Dry*	20	4	17	20	4.3	0.9
	Hemisynodontis membranaceous	Dry*	8	2	30	25.0	15.0	3.8
	Synodontis clarias	Dry	29	2	15	6.9	7.5	0.5
		Rainy	40	2	5	5.0	2.5	0.1
	S. eupterus	Dry	30	4	170	13.3	42.5	5.7
		Rainy	20	2	30	10.0	15.0	1.5
	S. gobroni	Dry	68	2	24	2.9	12.0	0.3
		Rainy	92	1	8	1.1	8.0	0.1
	S. ocellifer	Dry	10	3	600	30.0	200.0	60
		Rainy	20	1	450	5.0	450.0	22.5
	S. schall	Dry	20	6	20	30.0	3.3	1.0
		Rainy	10	4	10	40.0	2.5	1.0
W. youdeowii	*S. clarias*	Dry	29	3	15	10.3	5.0	0.5
		Rainy	40	2	5	5.0	2.5	0.1
	S. eupterus	Dry	30	2	704	6.7	352.0	23.5
		Rainy	20	1	296	5.0	296.0	14.8
W. kainji	*S. budgetti*	Dry	20	2	11	10.0	5.5	0.6
		Rainy	10	1	4	10.0	4.0	0.4
	S. clarias	Dry*	29	4	10	13.8	2.5	0.3
	S. eupterus	Dry*	30	3	82	10.0	27.3	2.7
	S. sorex	Dry	20	2	18	10.0	9.0	0.9
		Rainy	12	2	2	16.6	1.0	0.2
Procamallanus laeviconchus	*S. clarias*	Dry*	29	3	46	10.3	15.3	1.6
	S. eupterus	Dry	30	1	6	3.3	6.0	0.2
		Rainy	20	2	12	10.0	6.0	0.6
	S. nigrita	Dry	40	1	8	2.5	8.0	0.2
		Rainy	40	2	12	5.0	6.0	0.3
	S. schall	Dry	20	2	7	10.0	3.5	0.4
		Rainy	10	2	3	20.0	1.5	0.3
	S. xiphias	Dry	5	2	20	40.0	10.0	4.0
		Rainy	25	4	7	16.0	1.8	0.3

** No parasites were recovered in the rainy season*

The conditions (higher contact between infective stage of parasite and fish host, crowding and slow flow) existing in the dry season in lotic habitats are to a large extent replicated in static culture systems and in lentic habitats and explain the high prevalence of parasites in fish from these habitats (Onwuliri and Mgbemena, 1987).

The high infection of the mochokids with species of *Wenyonia* suggests their importance in the fishery of the group. *W. synodontis* is perhaps more important than *W. youdeoweii* and *W. kainji* as it parasitizes a very wide spectrum of the mochokids. The stomach contents – mainly aquatic insect larvae, plant matter and mud with associated load of worms, including oligochaete worms – of the mochokids, especially *S. eupterus, S. schall, S. ocellifer, S. sorex* and *S. clarias*, reveal the presence of intermediate hosts of caryophyllaeid tapeworms (HMGE, pers. obs.). Though no observable damage was evident even in heavily parasitized *S. eupterus* and *S. ocellifer*, the fact that they were weak, moved sluggishly and died earlier than others indicates stress, which possibly stems from some injury, including impairment of physiological functions. There is need for a more penetrating investigation to determine whether weakness and death were due to opportunistic infections, disruption of vital physiological processes or hitherto undetected physical damage. Such investigation may also determine why no discernible damage occurs in the stomach mucosa to which *P. laeviconchus* attaches by its buccal capsule, even in heavy infections. Engorgement of blood by *P. laeviconchus* may lead to anaemia in heavily parasitized fish.

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