fjrs.futa.edu.ng

FUTA Journal of Research in Sciences

ISSN: 2315-8239

FUTA Journal of Research in Sciences, 2015 (1): 87-94

PARASITES OF *SYNODONTIS SOREX* (GUNTHER, 1866 MOCHOKIDAE, SILURIFORMES) IN RIVERS NIGER AND BENUE AT THE CONFLUENCE AREA IN LOKOJA, NIGERIA.

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ABSTRACT

Monthly sampling of catches at the confluence area of Niger and Benue rivers was carried out between March 2007 and February 2008 to determine the occurrence of parasites in *Synodontis sorex* as part of a larger research work on parasites of Siluriformes. A total of 64 hosts were examined and the prevalence of infection was 59.37%. Parasite species encountered included the protozoan Trichodinids, 2 digeneans (*Allocreadium ghanensis*, Metacercaria of *Pygidiopsis* spp), 2 cestodes (*Monobothrioides woodlandii*, *Bothriocephalus acheilognathii*), 5 nematodes (*Procamallanus laevionchus*, *Rhabdochona congolensis*, *Spinitectus guntheri*, *Camallanus* spp, *Contracaecum* spp*)* and acanthella - the larval stages of acanthocephalans). Nematode parasites infected *Synodontis sorex* more than other parasite groups, with *Camallanus* spp recording the highest prevalence of 28.13%. Infection of *S.sorex* was between 26-100+ gm weight classes and 0-30cm length classes. The overall worm burden was independent of sex of the fish hosts.

Key Words: Parasites, infection, *Synodontis sorex*, confluence, River Niger, River Benue.

INTRODUCTION

The Mochokid catfish, *Synodontis sorex* is generally rare but quite common in the confluence area and is relished as food fish among consumers (Iyaji, 2011). The species contribute significantly to the economy and health benefits of the fishers in the riverine areas where other animal sources of proteins are beyond the reach of the poor populace. Health benefits of fish and fishery products are increasingly being recognized (Mollsten *et al*., 2001; Tammy, 2002a), placing a high demand on fishery products. Contrary to the increasing demand, increase in fish production has been minimal in the recent past (FAO, 1979-2003) Among the factors that contribute to the reduction in fish production are parasitic infections and diseases (Dougnon *et al.,* 2012). Parasites are known to act as pathogens, causing direct mortality or rendering the fish more vulnerable to predators (Kunz and Pung, 2004). They have also been variously reported to cause muscle degeneration, liver dysfunction, nervous system impairment, castration, mechanical interference with spawning, gross distortion of the body and inflammation or haemorrhages during penetration (Sindermann, 1987; Obiekezie, 1987 and Echi, 2009 a, b). Studies on the parasites of *S. sorex* have not been reported in the confluence area of rivers Niger and Benue. This study was aimed at investigating the parasitofauna of this fish species in the three localities and to determine the prevalence, mean intensity and mean abundance of the parasites in relation to the host size and sex.

MATERIALS AND METHODS

The study area is located around the confluence of the two major rivers in Nigeria, River Niger

and River Benue between latitude 7º 45N-latitude 8º 12N and longitude 6º 39E-longitude7º 00E (Fig. 1). There are extensive flood plains with numerous perennial ponds and marshes on both banks of the rivers before and within the confluence. The vegetation along the rivers comprises mainly of wooded savannah grassland with shrubs and trees. The climate of the area consists of two seasons, the dry season and wet season. The wet season begins towards the end of March and ends towards the end of October or early November while the dry season begins in November and lasts until late March. Fish were sampled from fishers using a variety of fishing gears (set nets, cast nets, hooks, gill nets, etc) at the 3 localities for 12 months.

Locality 1: Ohono village, along Lokoja - Koton Karfe road, (Niger River).

Locality 2: Mozum village, located on the eastern bank, (Benue River).

Locality 3: Ganaja village, below the confluence of the two rivers, (confluence)

Fish were sampled from each locality for a period of 12 months, and examined for parasites. The fish species were indentified according to Reed (1967) and Olaosebikan and Raji (1998).

Examination of fish for parasites followed methods of Arthur and Albert (1994) and Marcogliese (2002). Treatment, fixation and preservation of parasites were adapted from Ash and Orihel (1987). The helminth parasites were identified based on Yamaguti (1959; 1971); FAO (1996) and Moravec (1998) while the Trichodinids were identified, using the work of Klinger and Floyd (2002). Infection statistics of Bush *et al*. (1997) was used for the determination of prevalence, mean intensity and mean abundance. The correlation between host factors such as weight, standard length and parasite infection were done using SPSS version 15.

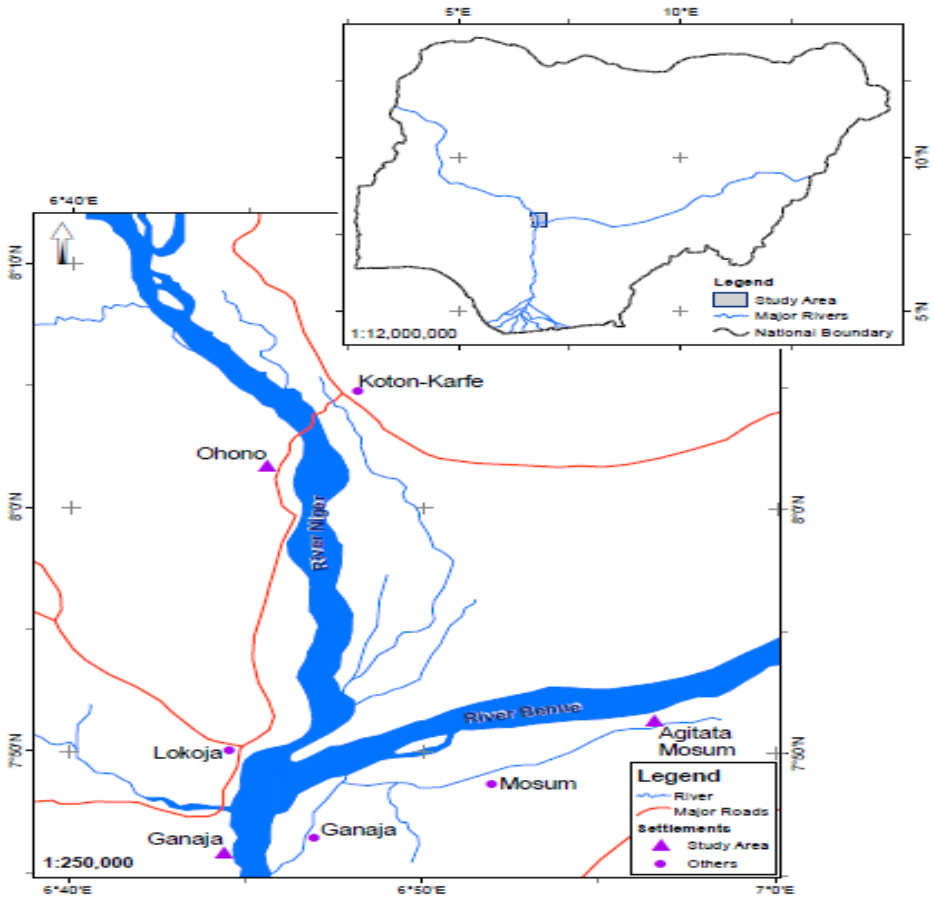

Figure 1. Map showing location of study area.

RESULTS

Of the sixty four (64) *S. sorex* examined for parasites, 38 (59.37%) fish hosts were infected while 26 (40.62%) were uninfected with 433 parasites recovered. In River Niger (Locality 1), 31 hosts were examined, 22 (70.96%) hosts were infected and 200 parasites recovered. In River Benue (Locality 2), of the 23 hosts examined, 13 (56.52%) hosts were infected and 165 parasites recovered while at the confluence (Locality 3), 10 hosts were examined, 5 (50.0%) were infected with a total of 68 parasites recovered. Parasite species encountered were: The protozoan Trichodinids, the digenean trematodes, *Allocreadium ghanensis* and Metacercariae of *Pygidiopsis* spp, the cestodes, *Monobothrioides woodlandii* and *Bothriocephalus acheilognathii*, the nematodes, *Procamallanus laevionchus, Rhabdochona congolensis, Spinitectus guntheri, Camllanus* spp, *Contracaecum* spp and acanthella, (larval stages of acanthocephalans). All helminths were recovered from the intestines while the Trichodinids were found in the gills of fish hosts. Nematode parasites infected more fish hosts than other parasite groups. *Camallanus* spp recorded the highest infection with 18 fish hosts and a prevalence of 28.13%. Infection of other nematode species were as follows; *Rhabdochona congolensis* and *Procamallanus laevionchus* infected 13 and 12 hosts with prevalence of 20.31% and 18.75% respectively. The rest nematode parasites infected between 3 and 4 hosts with low prevalence. The cestodes, *Monobothrioides woodlandii* and *Bothriocephalus acheilognathii* had low infection rates in *S. sorex* in this study. The Trichodinids and the metacercariae of *Pygidiopsis* spp. infected 12 and 7 fish hosts with prevalence of 18.75% and 10.94% respectively (Table 1). Although some of the parasites were found across the three localities, Locality 1(River Niger) had the highest number of parasites and infection rates (Table 2). Parasite infection by body weight of *S. sorex* showed infection in all weight classes except 0-20 weight category. The nematode, *Camallanus* spp had the highest prevalence of 40% and 33.3% in 76 – 100 and 100+ gm weight classes respectively. *Procamallanus laevionchus* and *Rhabdochona congolensis* infected fish hosts between 26-100+ gm weight classes but with highest prevalence of 24% in the 26- 50 gm weight class. The highest prevalence of 30.0% by Trichodinids was in 76 – 100 gm weight class. The cestodes, *Monobothrioides woodlandii* infected fish in 100+ gm weight class only with low prevalence of 6.7 % while *Bothriocephalus acheilognathii* was found in 51-75 and 76 -100 gm weight classes with prevalence of 18.8% and 25% respectively. *Allocreadium ghanensis* and the larval stage of acanthocephalan were recorded in the 100+ gm weight class with low prevalence of 6.7% while metacercariae of *Pygidiopsis* spp were recorded between 26 – 100+ gm weight classes with the highest prevalence of 24% in 26- 50 gm weight class. No infection was recorded in 0- 20 gm weight class (Table 3).

Table 1: Parasitic infection of *S. sorex* at the River Niger-Benue confluence

Parasite Groups	Parasite sp.	A	B	C	D	E	F
Protozoan	Trichodinids	64	12	152	18.75	12.67±12.35	2.38
Digeneans	*Allocreadium ghanensis*	64	1	2	1.56	2.0±0.01	0.03
	Metacercaria of *Pygidiopsis genata*	64	7	13	10.94	1.86±0.69	0.20
Cestodes	*Monobothrioides woodlandii*	64	1	5	1.56	1.67±0.82	0.08
	Bothriocephalus acheilognathii	64	5	9	7.81	5.0±0.01	0.14
	Procamallanus laevionchus	64	12	27	18.75	2.25±1.48	0.42
	Rhabdochona congolensis	64	13	57	20.31	4.38±2.79	0.89
	Spinitectus guntheri	64	4	32	6.25	8±4.69	0.50
	Camallanus spp	64	18	126	28.13	7±5.93	1.97
Nematodes	*Contracaecum* spp	64	3	13	4.69	4.33±4.93	0.20
Acanthocephala	Acanthella	64	1	1	1.56	1.0±0.01	0.02

Key: A=Host examined, B= Hosts infected, C= Parasites recovered, D= Percentage Prevalence, E =Mean intensity,F= Mean Abundance

Table 2: Parasitic infection of *S. sorex* at the three localities (Niger, Benue and Confluence)

	R. Niger						R. Benue						Confluence					
Parasite	A	B	C	D	E	F	A	B	C	D	E	F	A	B	C	D	E	F
Trichodinids	31	5	50	16	10±12.59	1.61	23	6	78	26	13±13.27	3.4	10	1	24	10	24	2.4
Allocreadium ghanensis	31	1	2	3.2	2	0.06	-	-	-	-	-	-	-	-	-	-	-	-
Metacercaria of *Pygidiopsis. genata*	31	4	6	13	1.5±0.58	0.19	23	2	5	8.7	2.5±0.71	0.2	10	1	2	10	2	0.2
Monobothrioides woodlandii	-	-	-	-	-	-	23	1	5	4.4	1	0	-	-	-	-	-	-
Bothriocephalus acheilognathii	31	5	9	16	1.8±0.84	0.29	-	-	-	-	-	-	-	-	-	-	-	-
Procamallanus laevionchus	31	7	14	23	2±1.41	0.45	23	4	12	17	3±1.63	0.5	10	1	1	10	1	0.1
Rhabdochona congolensis	31	7	33	23	4.71±2.63	1.06	23	2	5	8.7	2.5±2.12	0.2	10	4	19	40	4.75±3.59	1.9
Spinitectus guntheri	31	2	15	6.5	7.5±7.78	0.48	23	2	17	8.7	8.5±2.12	0.7	-	-	-	-	-	-
Camallanus spp	31	9	58	29	6.44±5.98	1.87	23	5	47	22	9.4±5.81	2	10	4	21	40	5.25±6.65	2.1
Contracaecum spp	31	3	13	9.7	4.33±4.93	0.42	-	-	-	-	-	-	-	-	-	-	-	-
Acanthella	-	-	-	-	-	-	-	-	-	-	-	-	10	1	1	10	1	0.1

Table 3: Parasitic infection of *S. sorex* by body weight at the River Niger-Benue confluence

Parasite species	Body weight 0-25 N=2					26-50 N=21					51-75 N=16					76-100 N=10					100+ N=15				
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
Trichodinids	0	0	0	0	0	3	43	14	2	2	4	38	25	2.38	2.4	3	33	30	3.3	3.3	2	38	13.3	2.5	2.5
Allocreadium ghanensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	6.7	0.1	0.1
Metacercaria of *Pygidiopsis.* spp	0	0	0	0	0	3	6	14	0	0	1	2	6.3	0.13	0.1	1	2	10	0.2	0.2	2	3	13.3	0.2	0.2
Monobothrioides woodlandii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	6.7	0.3	0.3
Bothriocephalus acheilognathii	0	0	0	0	0	0	0	0	0	0	3	4	18.8	0.25	0.3	2	5	25	0.3	0.3	0	0	0	0	0
Procamallanus laevionchus	0	0	0	0	0	5	14	24	1	1	2	7	12.5	0.44	0.4	2	2	20	0.2	0.2	3	4	20	0.3	0.3
Rhabdochona congolensis	0	0	0	0	0	5	25	24	1	1	3	8	18.8	0.5	0.5	2	11	20	1.1	1.1	3	13	20	0.9	0.9
Spinitectus guntheri	0	0	0	0	0	1	13	5	1	1	0	0	0	0	0	2	12	20	1.2	1.2	1	7	6.7	0.5	0.5
Camallanus spp	0	0	0	0	0	6	46	29	2	2	3	13	18.8	0.81	0.8	4	18	40	1.8	1.8	5	49	33.3	3.3	3.3
Contracaecum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	11	20	1.1	1.1	1	2	6.7	0.1	0.1
Acanthella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	6.7	0.1	0.1

Key: A = Number fish hosts infected, B= Total number of parasites recovered per host, C = Percentage prevalence, D = Mean intensity of parasite, E= Mean abundance of parasite, N= Total number of fish examined in each weight class

Table 4. Parasitic infection of *S. schall* by standard length at the River Niger-Benue Confluence

	0-10 N=4					11-20 N=57					21-30 N=3					30+ N=0				
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
Trichodinids	0	0	0	0	0	12	152	21.1	12.67	2.7	0	0	0	0	0	0	0	0	0	0
Allocreadium ghanensis	0	0	0	0	0	1	2	1.75	2	0	0	0	0	0	0	0	0	0	0	0
Metacercaria of *Pygidiopsis genata*	1	2	25	2	0.5	6	11	10.5	1.83	0.2	0	0	0	0	0	0	0	0	0	0
Monobothrioides woodlandii	0	0	0	0	0	1	5	5	5	0.1	0	0	0	0	0	0	0	0	0	0
Bothriocephalus acheilognathii	0	0	0	0	0	5	9	8.77	1.8	0.16	0	0	0	0	0	0	0	0	0	0
Procamallanus laevionchus	0	0	0	0	0	11	25	19.3	2.27	0.44	1	2	33	2	0.67	0	0	0	0	0
Rhabdochona congolensis	1	4	25	4	1	12	53	21.1	4.42	0.93	0	0	0	0	0	0	0	0	0	0
Spinitectus guntheri	0	0	0	0	0	3	25	5.26	8.33	0.44	1	7	33	7	2.33	0	0	0	0	0
Camallanus spp	0	0	0	0	0	17	119	29.8	7	2.1	1	7	33	7	2.33	0	0	0	0	0
Contracaecum spp	0	0	0	0	0	2	11	3.51	5.5	0.2	1	2	33	2	0.67	0	0	0	0	0
Acanthella	0	0	0	0	0	1	1	1.75	0	0	0	0	0	0	0	0	0	0	0	0

Key: A = Number fish hosts infected, B= Total number of parasites recovered per host, C = Percentage prevalence, D = Mean intensity of parasite,
E= Mean abundance of parasites , N= Total number of fish examined in each weight class

In the standard length category, most of the fish specimens (89.06%) were found in the 11 – 20 cm length, with almost all parasites being found there. The highest prevalence of 29.8% was recorded in this category by *Capillaria* spp (Table 4).

DISCUSSION

The study showed overall infection prevalence of 59.37% in *S. sorex* examined. River Niger recorded the highest prevalence of 70.96% while River Benue and the confluence had 56.52% and 50% respectively. The high prevalence of parasite infection in river Niger could be due to higher turbidity of river Niger (Eyo and Iyaji, 2014). River Niger which has its source on the Fouta Djalon Mountains in the Republic of Guinea (Lae *et al*., 2004) passes through four West African countries and has several tributaries and thus has more pollutants discharged into it. Heavy parasite infection in fish has been linked to environmental contamination by different pollutants, including heavy metals and hydrocarbons (Schludermann *et al*., 2003, Williams and Mackenzie, 2003), organic enrichment of sediments by domestic sewage (Marcogliese and Cone, 2001). Khan and Thulin (1991) and Kemp and Spotila (1997) reported that urban effluents promote aquatic pollution, thus making aquatic organisms vulnerable to increased incidence of parasites. The higher infection rate of fish hosts in R. Niger could therefore be attributed to the contamination of the river by various pollutants from the various West African countries with the numerous tributaries along the river course (Eyo and Iyaji, 2014). Nematode parasites infected more fish hosts and were diversified. Up to 4 species of nematodes were recovered from the intestines of *S. sorex*. The diversity of nematode parasites in fish hosts is not new in tropical freshwater ecosystems. Khalil (1971) reported 40 species of adult nematode worms, representatives of 9 families from fish in Africa with majority occurring in the alimentary system and a few in tissues or inner cavities. Heavy infections of nematode parasites of Mochokid fish hosts were also reported in Rivers Niger and Benue at the confluence (lyaji, 2011). *Synodontis* species are mainly bottom dwellers,

feeding on mud, detritus and debris (Reed, 1967) which may explain why they acquire heavy burden of nematode parasites.

The protozoan ciliate, Trichodinids, were found across the localities. The ciliates and flagellates have been reported (Klinger and Floyd, 2002) to have direct life cycles and may build up to high numbers when fish are crowded causing weight loss, debilitation and mortality. Fish were observed to be in good condition which could be due to low infection rate and sparse population of *S. sorex* in the localities.

The higher prevalence and mean intensity of parasites recorded in fish of larger weight classes indicated the increase in parasitism of *S.sorex* of larger weight. High prevalence of infection in fish of such weight classes had been reported in other studies (Betterton, 1974; Madhavi and Rukmini, 1991; Chandler *et al.*, 1995, Brickle *et al.*, 2003). Poulin, (2000) stated that larger fish have more internal and external space for parasite establishment and therefore tend to have heavier worm burdens. Fish of intermediate length classes recorded highest prevalence of infection in this study. It could be that most fish specimens were found in the intermediate length category. High prevalence of infection in fish of intermediate length classes had also been reported in several other studies (Hanek and Fenando, 1978 a,b; Obiekezie, 1987; Valtonen *et al.*, 1990; Chapman *et al.*, 2000 and Owolabi, 2005). This study was an effort to contribute to the knowledge of parasitism of *Synodontis* fish species in the tropical freshwater ecosystems and to stimulate research interest in other fish species in the confluence area.

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