International Journal of Fisheries and Aquaculture Vol. 5(1), pp. 7-11, January 2013
Available online at http://www.academicjournals.org/IJFA
DOI: 10.5897/IJFA12.072
ISSN 2006-9839 ©2013 Academic Journals

Full Length Research Paper

Comparative survey of helminth parasites of *Clarias gariepinus* (Burchell, 1822) and *Clarias pachynema* (Boulenger, 1903) from the Ogun River and Asejire Dam in south-west Nigeria

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Accepted 10 August, 2012

A total of 250 randomly selected fish specimens consisting of 72 *Clarias gariepinus* and 51 *Clarias pachynema* from Ogun River around the cattle market, Isheri, Ogun State. 73 *C. pachynema* and 54 *C. gariepinus* from Asejire Dam (which has not been reported to be polluted) in south-west Nigeria were sampled for helminth infection between September 2008 and February 2009. All helminthic infections observed and recorded were restricted to the stomach, intestine and gill chamber. The helminths recovered included three cestodes, *Wenyonia* sp., *Polyonchobothrium* sp. and Pleurocercoid larva, a nematode, *Procamallanus* sp. and one digenean, *Clinostomum* sp. Prevalence and mean intensity of parasitic infection were higher in specimens from the Ogun River than those from the Asejire Dam. Overall, parasite prevalence of 75 and 45.1% were recorded for *C. gariepinus* and *C. pachynema* from the Ogun River, respectively, while 25.9 and 31.5% were recorded for *C. gariepinus* and *C. pachynema*, respectively, for the Asejire Dam. Male *C. gariepinus* from the Ogun River had the highest infection rate (76.5%), while those from Asejire Dam had the lowest (21.43%). No significant difference in the prevalence of parasitic infection in relation to the host sizes (P > 0.05) was recorded; however, largest size fishes had no parasitic infection. *Clinostomum* sp. was found only in *C. gariepinus* and *C. pachynema* from Ogun River.

Key words: Sharptooth catfish, *Clarias pachynema*, helminth parasites, south-west Nigeria.

INTRODUCTION

Fish has continued to be the most affordable source of animal protein to the average Nigerian family (Haruna, 2006). Parasitic infection causes production and economic losses through direct fish mortality, reduction in fish growth, fecundity and increase in the susceptibility of fish to diseases. *Clarias gariepinus* (Burchell, 1822) from the family Clariidae is one of the most important tropical catfish species for aquaculture in West Africa (Clay, 1979). It is identified by its elongated body and a large armored head enclosed by bony plates. The fish is scale-less and the body is dorsoventrally flattened (Adewumi, 2005). The fish is a general carnivorous feeder whose food consists mainly of fishes, terrestrial invertebrates, aquatic insects and zooplankton.

Clarias pachynema (Boulenger, 1903) is one of the fishes colonizing the freshwater bodies in Africa. The fish share some resemblance with *C. gariepinus* by being scale-less and elongated. The fish inhabit rainforest stagnant water bodies of streams, ponds, pools and swamps; they undergo breeding between May and July in shallow water (Idodo-Umeh, 2003). Their diets include aquatic insects, seeds, fruit, palmnuts and detritus. This study reports on helminth infection of both *C. gariepinus* and *C. pachynema* coexisting in the Ogun River and Asejire Dam experiencing contrasting impacts of abbatoir

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and non-abbatoir wastes, respectively.

MATERIALS AND METHODS

Study areas

The Ogun River along the cattle market in Isheri, Ogun State is one of the perennial rivers found in southwest Nigeria. It rises at approximately 8°41'N, 3°28'E with an altitude of 380 m flowing for 320 km southwards into the Lagos lagoon at approximately 6°35'N, 3°25'E. It has a total drainage area of about 21,800 km^2. Detailed information on hydrology had been provided by Sydenham (1977) and Adebisi (1981). Abattoirs at Lafenwa and Isheri-Olofin along the river course process between 300 and 320 cattle and 40 and 50 goats/rams daily. The processing wastes are washed directly into the river system. This is in addition to effluents from breweries, dyeing industries, tanneries and domestic wastewater before finally discharging to the Lagos lagoon.

Asejire Dam (04°05'E; 07°21'N) was constructed in 1970 on the Oshun River. It has an impounded area of 2342 ha with gross storage capacity of 7403 million litres and located about 30 km east of Ibadan, southwest Nigeria at an altitude of 137 m (Egborge, 1979; Ekpo, 1993; Ayoade et al., 2006). The impoundment was created primarily for the provision of public water supply with fisheries development as a major ancillary benefit.

Fish collection and identification

From September 2008 to February 2009, 250 randomly selected fresh fish specimens comprising of *C. gariepinus* (72 and 54 from Ogun and Asejire, respectively) and *C. pachynema* (51 and 73 from Ogun and Asejire, respectively) were purchased live from the local fishermen. The fishes were transported live in a container containing water from the study site to the laboratory where they were sorted into different sizes and species. Identification was done based on external features as described by Idodo-Umeh (2003). Sexes of fish were determined by the presence or absence of a distinct sexual papilla conspicuously located behind the anus. The sexual papillae are absent in females. This was later confirmed after dissection by the presence of testis (male) or ovaries (female). Length and weight of the fishes were taken using a measuring board and digital weighing balance, respectively.

Examination of parasites

The fish were rendered inactive by cervical dislocation for easy handling prior to dissection. A cut was made on the ventral side from the anal opening to the lower jaw. Then, two more cuts were made on the lateral side to expose the body cavity with alimentary canal and other internal organs. The alimentary canals were removed and cut into parts (intestine and stomach) in 0.09% physiological saline for parasite recovery. Each part was further carefully slit open to aid the emergence of parasites. Gastro-intestinal parasites were further recognized by their wriggling movements on emergence. Gills and liver were examined under normal saline for presence of parasites.

The recovered helminth parasites were shaken vigorously in physiological saline to enable them to stretch for better observation. The parasites were counted and recorded before fixing in 70% alcohol.

Staining of helminth parasites for identification was done by placing in acetocarmine stain for 5 to 10 min. The stained parasites were washed in 70% alcohol, dehydrated in absolute alcohol and cleared in xylene before finally mounted in Canada balsam (MAFF, 1971).

The specimens were then viewed with the aid of a microscope and identification was done using the keys by Yamaguti (1959) and Paperna (1996).

Data analysis

The overall prevalence of the parasitic infection was calculated. Chi-square (χ^2) was used to calculate the significant difference between levels of infection in the two study sites. Parasite biometrics were calculated using standardized Shannon-weaver (1949) (H') function, mean species richness (R_{MS}), Jaccard (J) index of species overlap and percentage similarity (PS) (Hulbet, 1978; Siddall et al., 1994; Lile, 1998).

RESULTS

Parasites recovered included a nematode, *Procamallanus* sp., three cestode, *Polyonchobothrium* sp., *Wenyonia* sp., Pleurocercoid larva and one digenean *Clinostomum* sp. Concurrent infections in intestine with *Procamallanus* sp. and *Polyonchobothrium* sp were common.

A total of 487 helminths were recovered in fishes from the Ogun River when compared with 203 helminths in fishes from the Asejire Dam. 62.6% of total fish were infected in Ogun River against 28.4% from Asejire Dam (Table 1). The highest prevalence (75.0%) was recorded in *C. gariepinus* from the Ogun River. The prevalence of *C. pachynema* (31.5%) was higher than that of *C. gariepinus* (24.1%) in Asejire Dam. A higher proportion of fish species were more infected in Ogun River as compared to Asejire Dam (Table 2), although *C. gariepinus* (>70%) recorded higher infection rates when compared with *C. pachynema* (<50%) in Ogun River. The lack of significant differences (P>0.05) in infection levels between the sexes indicated absence of parasite reliability on either sex. Infection was pronounced in fishes below 18 cm in length (Tables 3 and 4) although association of host and infections were statistically different for this study. The distribution of parasite in organs showed the intestine to be the most infected. Flukes were restricted to the gills of fishes from Ogun River with preference for *C. gariepinus*. The cestodes dominated parasite abundance in all cases (Table 5). Biometrics showed that *C. gariepinus* recorded marked diversities from the two locations, this contrasted with *C. pachynema* with comparable diversities (Table 6). In contrast, species richness differed between locations for both species and parasite overlaps were also low in all cases for the species. The quantitative percentage parasite similarity was higher in *C. gariepinus* (PS = 0.99) when compared with *C. pachynema* (PS = 0.69).

However, identical PS was observed between the sampling locations.

DISCUSSION

The helminth species composition observed in this study

Table 1. Overall prevalence of Helminth infections in fishes from Ogun River and Asejire dam, Nigeria.

Fish host	Ogun River				Asejire Dam			
	Number examined	Number infected	Prevalence (%)	Total parasite	Number examined	Number infected	Prevalence (%)	Total parasite
C. gariepinus	72	54	75.00	294	54	13	24.07	111
C. pachynema	51	23	45.10	193	73	23	31.51	92
Total	123	77	62.60	487	127	36	28.35	203

Table 2. Helminth infection in relation to host sex in Ogun River and Asejire Dam, Nigeria.

Fish host	Ogun River				Asejire Dam			
	C. gariepinus		*C. pachynema*		*C. gariepinus*		*C. pachynema*	
Sex	Male	Female	Male	Female	Male	Female	Male	Female
No examined	34	38	24	27	28	26	30	43
No infected	26	28	11	12	6	7	11	12
Infection rate (%)	76.47	73.68	45.83	44.44	21.43	26.92	36.67	30.23
	χ^2=0.01, d.f =1; P>0.05		χ^2=0.004, d.f =1; P>0.05		χ^2=0.138, d.f =1; P>0.05		χ^2=0.32, d.f =1; P>0.05	

Table 3. Helminth infection in relation to size of *C. gariepinus* in Ogun River and Asejire Dam, Nigeria.

Group length (cm)	Ogun River			Asejire Dam		
	Number examined	Number infected	Percentage of infection	Number examined	Number infected	Percentage of infection
14.0-17.9	6	6	100	11	4	36.36
18.0-21.9	34	27	79.41	27	6	22.22
22.0-25.9	28	20	71.43	14	3	21.43
26.0-29.9	4	3	75.00	2	0	0
Total	72	56	77.78	54	13	24.07
	χ^2=1.563; d.f= 3; P>0.05			χ^2=1.057, d.f= 3; P>0.05		

Table 4. Helminth infection in relation to size of the *C. pachynema* in Ogun River and Asejire Dam, Nigeria.

Group length (cm)	Ogun River			Asejire Dam		
	Number examined	Number infected	Percentage of infection	Number examined	Number infected	Percentage of infection
14.0-17.9	5	4	80.00	7	3	42.86
18.0-21.9	12	5	41.67	31	10	32.26
22.0-25.9	25	11	44.00	30	9	30.00
26.0-29.9	9	3	33.33	5	0	0.00
Total	51	23	45.10	73	22	30.14
	χ^2=0.973,d.f= 3; P>0.05			χ^2=1.805, d.f= 3; P>0.05		

differed from previous reports on species other than *Clarias* (Ukoli, 1972; Okaka, 1998; Auta et al., 1999; Omoniyi and Olofintoye, 2001; Oniye et al., 2004) and *C. gariepinus* (Omoniyi and Olofintoye, 2001; Oniye et al., 2004) from Ado-Ekiti and Zaria (Nigeria), respectively.

None reported helminth infections in *C. pachynema.* The present study is the first record of *Procamallanus* sp. and *Wenyonia* sp. in *C. pachynema* from Nigeria; *Procamallanus laevionchus, Polyonchobothriium* sp. and *Wenyonia* sp. were part of previously reported helminth

Table 5. Parasite distribution in organs of hosts from the study areas.

Fish species	Parasite taxa	Ogun River			Asejire Dam	
		Stomach	Intestine	Gills	Stomach	Intestine
C. gariepinus	Cestoda	42 (68.9%)	141 (67.1%)	0	7 (63.6%)	76 (78.4%)
	Nematoda	19 (31.1%)	34 (16.2%)	0	4 (36.6%)	21 (21.6%)
	Flukes	0	0	18 (100%)	0	0
	Flatworms	0	35 (16.7%)	0	0	0
C. pachynema	Cestoda	27 (96.4%)	89 (90.8%)	0	7 (70.0%)	65 (91.5%)
	Nematoda	1(3.6%)	9 (9.2%)	0	3 (30.0%)	6 (8.5%)
	Flukes	0	0	9 (100%)	0	0

Table 6. Helminth biometrics in hosts.

Parameter	*C. pachynema*		*C.gariepinus*	
	Asejire Dam	Ogun River	Asejire Dam	Ogun River
Shannon-weaver (H') function	0.64	0.63	0.55	0.72
Jaccard index (J)	0.33	0.30	0.27	0.29
Mean species richness (R_{MS})	0.89	0.38	0.47	0.24
Percentage similarity (PS)	0.69		0.99	
	0.51		0.50	

parasites from *C. gariepinus* by Omoniyi and Olofintoye (2001), Oniye et al. (2004) and Sowunmi and Akinlolu (2009). The occurrence of *Clinostomum* sp. in *C. gariepinus* from South Africa has been reported by Barson et al. (2008) and Maguza-Tembo and Mfitilodze (2008); however, information on the parasite in Nigeria is scarce. *Clinostomum* sp. was found in *C. gariepinus* and *C. pachynema* from Ogun River and none was recovered from Asejire Dam. This suggested the presence of the snail intermediate host of *Clinostomum* sp. in Ogun River and possibly its ability to withstand the level of pollution and increase in number as a result of organic pollutant present in the water body. The presence of *Wenyonia* sp. extended the suggested reliability on siluroids (Ukoli, 1972; Sowunmi and Akinlolu, 2009) and as suggested by Lile (1998), which could be classified as a specialist.

Prevalence of infection in the two species of fish was higher in Ogun River, with 75% prevalence in *C. gariepinus* and 45.10% in *C. pachynema*. The highest overall prevalence of helminth parasites observed in *C. gariepinus* from Ogun River around Isheri cattle market may be attributed to pollution load from the cattle market. Oketola et al. (2006) reported that this section of Ogun River is presently being overstressed by pollution loads mainly from the cattle market and run-off from the busy Lagos-Ibadan express road. This agreed with reported high positive correlation between pollution and prevalence rate of helminth parasite by Sosanya (2002).

In both *C. gariepinus* and *C. pachynema* from Asejire Dam and Ogun River, there was no significant difference in infection rate between the sexes. Adegbaju (2007) reported that this could be attributed to random selection of the specimen from study site. There was no significant prevalence difference observed among the host size in relation to helminth parasites recorded from Ogun River and Asejire Dam fish. However, the longest fishes in both species had no infection while the shortest were most infected. Lagler et al. (1979) reported correlation between parasitic infection and fish length which also corresponds to fish age. Akinsanya et al. (2007) attributed this to the random selection and the low level of immunity in the smaller sized fish.

Parasite biometrics indicated similar host-parasite dynamics in the two water bodies for each species. However, the observed differences may be due to foraging specializations, similar to the report of Dorucu et al. (1995) on sympatric morphs, *Salvelinus alpinus*. The diet of *C. gariepinus* facilitated more exposure to helminth parasites when compared with *C. pachynema*.

The parasitic fauna of *C. pachynema* still needs further studies due to apparent lack of information when compared with other related species.

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