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Parasitic Helminth Fauna of *Parachanna obscura* in River Ogun, Southwest Nigeria

OSHO, F.E.
Department of Aquaculture and Fisheries Management,
University of Ibadan, Nigeria
**Corresponding Author*
Email: oshofriday@yahoo.com

Abstract

The helminth parasites in African snakehead, *Parachanna obscura* in River Ogun was investigated to determine the occuring parasite species with respect to size (length class) and gender of the fish. A total of 180 specimens of *P. obscura* was sampled from January to August 2016. The fish were processed through standard parasitological procedures. Two nematodes (*Procamallanus leavionchus and Camallanus spp.)*, three cestodes (*Diphyllobothrium latum, Ligula intestinalis and Khawia sinensis)* and one monogenean trematode (*Gyrodactylus spp)* were recovered from the specimens. Overall, 96.3% of fish samples collected had helminthic infection with male (94.2%) and female (97.8%) incidences not being significantly different ($p>0.05$). Generally, there were no correlations between the total number of each parasite with respect to fish gender but many of the helminth species number showed positive correlations with increasing length of the fish. The mean densities of infection among the length classes were significantly different, *P. leavionchus* (1.5 ±0.9 - 15.41 ±3.4)*, Camallanus spp* (0.2 ±0.8 - 12.7 ±11.2)*, L. intestinalis* (1.0 ±1.1 - 7.4 ±12.9)*, Gyrodactylus* (1.1 ±2.2 - 12.3 ±10.8) and *K. sinensis* (0.2 ±0.6 – 7.1 ±12.3).

Keywords: Helminths, *Parachanna obscura,* nematode, monogenean, cestodes.

Introduction

In many parts of Africa, *Parachanna obscura* has been introduced to aquaculture at experimental levels but success is yet to be recorded in its commercial culture (Kpogue *et al.,* 2013). One of the reasons for such is that the seeds come from the wild stocks and culturists have little information on the parasitic loads of the seeds. Parasites and diseases are some of the most important challenges confronting fishery and thereby limiting productivity. 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 (Salawu *et al*., 2013). Parasites are the most commonly encountered pathogens in fish culture. Parasitological studies are therefore, very important in the development of fisheries potential of freshwater habitats. For the culture of this species to contribute meaningfully to food security, there is the need to study aspects of the health status of the natural populations, that serve as repository for aquaculture. Therefore, this study investigated the types and prevalence of helminthes parasitic infection in the *Parachanna*

obscura from River Ogun, with respect to sex and size of the fish.

Materials and Methods

Specimen Collection and Parasite Iolation

One hundred and eighty samples of live *P. obscura* were procured from fishermen catches from River Ogun ($6^0 35^1 32$"N and $3^0 27^1 42$"E) from January to August 2016 on a monthly basis. The fish samples were taken to the Microbiology Laboratory, Department of Aquaculture and Fisheries Management, University of Ibadan. Total and standard length measurements of the fish were taken using a graduated wooden measuring board to the nearest 0.1 cm. Fish specimens obtained were classified into five length classes (15 – 20, 20 – 25, 25 – 30, 30 – 35 and 35 - 40 cm). Weights were taken using the Trip weighing balance. Balance – Ohaus Havard Mechanical Trip Balance with readability of 0.1 g and capacity of 2000 g.

Fish were necropsied following the ethical procedures according to Adebisi (1981). *Parachanna obscura* was dissected, degutted and the dissected organs were placed in Petri dishes with 0.85% physiological saline and inspected for helminths. The entire fish was thoroughly examined and worms carefully extracted under a stereozoom microscope (Leica S4 E). Nematodes present per fish were further isolated, counted and their numbers recorded. They were washed with glycerol and transferred into slides for microscopic examination (Rafique, 2002). All nematodes obtained from the intestine of the *P. obscura* were killed by gentle heating and fixed in 4% formalin. After being cleared in 2% glycerol the larvae were examined by light microscopy. Some nematodes were preserved in Gilson fluid. Parasites were identified using guides provided by paperna (1996). The sexes of the fish were determined according to the method of Olurin and Somorin (2006). The number of parasites, incidence and density of infection were determined.

Data analysis

Descriptive statistic, simple percentile, t-test and analysis of variance (ANOVA) and means were separated with the Duncan Multiple Range Test on SPSS 22.0.

Results

The parasitic helminths ecountered in *P. obscura* during the study were *Procamallanus leavionchus, Camallanus spp., Diphyllobothrium latum, Ligula intestinalis, Gyrodactylus spp, and Khawia sinensis* as presented in Table 1. The species with the highest occurrence in both male and female specimens was *Procamallanus leavionchus* and the least occurring was *Diphyllobothrium latum.*

Overall, 96.3% of fish samples collected had helminthic infection. The male had 94.2% incidence of infection, while the female had 97.8% incidence of infection. The average number of *P. leavionchus* from the male samples of *P. obscura* collected was 37.71 ± 25.94 which was significantly different ($P< 0.05$) from that of the female. There was however, no significant difference ($P> 0.05$) in the number of occurrences of the other helminth species across the sexes of *P. obscura*. There was also no significant difference between ($p>0.05$) the density of each parasite in the male and female samples collected as shown in Table 2. The percentage incidence and prevalence of *Procamallanus leavionchus* was highest in both male and female

Table 1: Mean number of Parasites in the Samples Collected by gender

Parasite	Male		Female		P values
P leavionchus	37.71 ± 25.94	(76.00-0.00)	53.18±31.51	(85.00 -0.00)	0.021
Camallanus spp.	10.06 ±20.79	(57.00 -0.00)	6.58 ±21.32	(79.00 - 0.00)	0.466
D. latum	0.00 ±0.00	(0.00 -0.00)	4.31 ±16.35	(68.00 - 0.00)	0.123
L. intestinalis	24.69±34.86	(80.00 -0.00)	20.56 ±31.37	(86.00 - 0.00)	0.580
Gyrodactylus spp.	28.03±35.04	(80.00 -0.00)	31.18 ±34.68	(86.00 - 0.00)	0.689
Khawia sinensis	3.80±15.67	(68.00 -0.00)	10.47 ±24.88	(80.00 - 0.00)	0.170

Values in parenthesis represent the maximum and minimum values.
P values represent the significant values at $P<0.05$

samples of P. obscura. Among other parasites although the female samples of *P. obscura* had the highest percentage incidence and prevalence of 75.56% and 0.43% respectively when compared to the male samples which had 71.43% and 0.31% respectively. The prevalence and incidence of *Diphyllobothrium latum* was low in both sexes (Table 3).

The number of parasites among the various length groups of *P. obscura* samples collected during the period of study revealed that *Procamallanus leavionchus* had the highest mean

Table 2: Mean density of parasites collected in the samples with respect to sex

Parasite	Male		Female		P values
Procamallanus leavionchus	1.08 ±0.74	(2.17 -0.00)	1.18 ±0.70	(1.89 -0.00)	0.520
Camallanus spp.	0.29 ±0.59	(1.63 -0.00)	0.15 ±0.47	(1.76 -0.00)	0.239
Diphyllobothrium latum	0.00 ±0.00	(0.00 -0.00)	0.10 ±0.36	(1.51 -0.00)	0.123
Ligula intestinalis	0.71 ±1.00	(2.29 -0.00)	0.46 ±0.70	(1.91 -0.00)	0.193
Gyrodactylus spp.	0.80 ±1.00	(2.29 -0.00)	0.69 ±0.77	(1.91 -0.00)	0.587
Khawia sinensis	0.11 ±0.45	(1.94 -0.00)	0.23 ±0.55	(1.78 -0.00)	0.284

Values in parenthesis represents the maximum and minimum values
P values represent the significant values at P<0.05

Table 3: Percentage incidence and prevalence of parasites in *P. obscura* with respect to sex

Parasite	**Incidence of infection**		**Prevalence of infection**	
	Male	**Female**	**Male**	**Female**
Procamallanus leavionchus	71.43	75.56	0.31	0.43
Camallanus spp	20.00	8.89	0.09	0.05
Diphyllobothrium Latum	0.00	6.67	0.00	0.04
Ligula intestinalis	34.29	31.11	0.15	0.18
Gyrodactylus spp	40.00	46.67	0.18	0.26
Khawia sinensis	5.71	15.56	0.03	0.09

Table 4: Number of Parasites with respect to Length Groups of *P. obscura* examined

Parasites	Length Classes (cm)				
	15 -20	20 -25	25 -30	30 -35	35 – 40
Procamallanus leavionchus	43.00± 9.02^{b}	46.56±30.05^{b}	52.52±31.99^{b}	45.46±32.99^{b}	46.33±40.28^{b}
Camallanus spp	2.73± 9.05^{b}	8.53± 20.17^{b}	3.52± 16.15^{b}	11.00±26.87^{b}	38.00±33.65^{a}
Diphyllobothrium latum	5.09± 16.88^{b}	4.25 ± 16.82^{b}	0.00± 0.00^{b}	0.00± 0.00^{b}	0.00± 0.00^{b}
Ligula spp	17.82±30.65^{a}	31.09±36.51^{b}	28.86±34.65^{b}	36.69±36.53^{b}	22.33±38.68^{a}
Gyrodactylus spp	37.00±32.51^{b}	37.69±34.67^{b}	40.52±37.12^{b}	14.85±28.71^{a}	37.00±32.51^{b}
Khawia sp.	12.91±28.78^{a}	6.00±18.99^{c}	13.19±28.20^{a}	5.46±19.69^{c}	21.33±36.95^{b}

Values in parenthesis are the numbers of *P. obscura* in each of the length classes. Values with the same alphabet superscript are not significantly different P> 0.05 from each other

value of 52.52± 31.99 in length class of 25 – 30 cm while length class 15 – 20 cm had the lowest value of 43.00± 29.02. The highest mean number of *Camallanus spp.* was found in length class 35 – 40 cm while it was lowest in length class 15 – 20 cm. *Ligula intestinalis* was highest in length class 30 – 35cm, while it was lowest in length group 15 – 20cm. The result showed that there was no statistical significant difference (P > 0.05) between the numbers of *P. leavionchus* but there were significant differences in the number of *Camallanus spp, L. intestinalis and K. sinensis* among the length groups as shown in Table 4.

The percentage incidence of *Procamallanus leavionchus* in length class 25 – 30 cm was highest (76.2%), *Camallanus spp.* was highest in length class 35 – 40 cm, *Diphyllobothrium latum,* highest in length class 15 – 20cm, *Ligula intestinalis* was highest in length class, 20 – 25 cm, *Gyrodactylus* spp. was highest in length group 25 – 30 cm while Khawia sinensis was highest in length 25 – 30cm. *Procamallanus leavionchus h*ad the highest prevalence rate across the length groups that were examined. Table 5 shows the mean densities of the parasites recovered in each length class. The density of *Procamallanus leavionchus, Camallanus spp., Ligula intestinalis, Gyrodactylus spp.,* and *Khawia sinensis* recovered in the length group 35 – 40 was significantly different (P< 0.05) from the other length groups. There was no significant difference (P > 0.05) among the density of *Diphyllobothrium latum* recorded for all the length groups. The mean density of infection was highest in the 35-40 cm class groups for all the parasites except for *D. latum.* The densities of infection were also significantly different in *P. leavionchus, Camallanus spp, L. intestinalis, Gyrodactylus spp* and *K. sinensis.*

Discussion

This study showed the presence of nematodes, cestodes and monogenean parasites in *P. obscura* from River Ogun. Two nematodes (*Procamallanus leavionchus and Camallanus spp.)*, three cestodes (*Diphyllobothrium latum, Ligula intestinalis and Khawia sinensis)* and one monogenean trematode (*Gyrodactylus spp*) were encountered. The nematode, *P. leaviochus* was the most prevalent parasites among the fish samples while *Camallanus spp* was the second. These parasites have also been recorded in various tropical freshwater fish species. Okoye *et al*. (2014), encountered cestodes and nematodes in fish samples from Agulu Lake, reporting more incidences of *Camallanus* sp. in *H. fasciatus* than *Chrysicllthys auratus.* Yakubu *et al.* (2002) also documented the occurrence of *Procamallanus* species in P. *obscura* while Ogbulie *et al.* (2003) and Oden *et al.* (2015), isolated *Camallanus* species from P. *obscura. Absalom et al.* (2018) documented the presences of *Diphyllobothrium latum* in *Clarias gariepinus* from River Gudi, Nigeria. The determinants of the distribution of fish parasitic infection in aquatic environments are, the diet of the host, the life span, mobility of the host throughout its life, variety of habitats encountered, its population density and the size

Table 5: Mean Density of Infection with Respect to Length Groups

Parasite	Length Class (cm)				
	15 -20	20 -25	25 -30	30 -35	35 – 40
Procamallanus leavionchus	3.9 ±2.6^{b}	1.5 ±0.9^{b}	2.5 ±1.5^{b}	3.5 ±2.5^{b}	15.41 ±3.4^{a}
Camallanus spp	0.2 ±0.8^{b}	0.3 ±0.6^{b}	0.2 ±0.8^{b}	0.8 ±2.1^{b}	12.7 ±11.2^{a}
Diphyllobothrium latum	0.5 ±1.5	0.1 ±0.5	0.0 ±0.0	0.0 ±0.0	0.0 ±0.0
Ligula intestinalis	1.6 ±2.8^{b}	1.0 ±1.1^{b}	1.4 ±1.6^{b}	2.8 ±2.8^{b}	7.4 ±12.9^{a}
Gyrodactylus spp	2.1 ±2.9^{b}	1.2 ±1.1^{b}	1.9 ±1.8^{b}	1.1 ±2.2^{b}	12.3 ±10.8^{a}
Khawia sinensis	1.2 ±2.6^{b}	0.2 ±0.6^{b}	0.6 ±1.3^{b}	0.4 ±1.5^{b}	7.1 ±12.3^{a}

Values with the same alphabet superscript are not significantly different P> 0.05 from each other

attained (Holmes, 1990). Omnivorous feeding habits of *P. obscura* and wide choices of food through different stages of growth of *P. obscura* maybe contributory factors of the high number of parasites harboured by the fish. Ama-Abasi and Affia (2010), observed that as they grow into juveniles, they feed on insect larvae, small crustaceans, and fry of other fishes. The juveniles migrate in schools, hunting *zooplanktons,* small insects and crustaceans while the adults are solitary feeders, eating both terrestrial and aquatic birds, fishes, frogs, tadpoles (Oben *et al.,* 2015). Many of these foods are largely transport hosts since copepods are the intermediate host for parasites.

From the present study, it could be deduced that the rate of infection of *Parachanna obscura* in River Ogun with parasitic helminth (96%) is very high. However, this high prevalence is corroborated by the research of Salawu *et al.* (2012) who did a comparative survey of helminth parasites of *Clarias gariepinus* and *Clarias pachynema* from the Ogun River and Asejire Dam in South-west Nigeria and reported a relatively high prevalence of 75 % and 45.1%, respectively while the prevalence for Asejire were 25.9% and 31.5%, respectively, for the fishes. Sosanya (2002) reported high positive correlation between pollution and prevalence rate of helminth parasite in fish.

Results of the present investigation revealed that the rate of infection was slightly higher in female *P. obscura* than in the male samples. There was however, no significant differences ($p>0.05$) between the infection rates with respect to the sexes. This indicates that parasitic helminth infection of *P. obscura* in River Ogun was independent of sex. This finding is similar to the discovery of Hassan *et al*. (2010), who reported that there was no significant difference in the infection rates between male and female of *Clarias gariepinus* from Lekki Lagoon, even though the female samples had higher rate of infection than the male. However, Oben *et al*., (2015) discovered that female samples of *P. obscura* from the lower Cross River system had significantly lower parasite burden than the male samples. This was also in tandem with the works of Akinsanya (2005), who recorded higher prevalence of helminths in the males than in the females from the Lekki Lagoon, Lagos. Biu *et al.* (2014), also reported a significantly lower incidence rate of 27.5% in females than the males among *Oreochromis niloticus* from Lake Alau, Maiduguri, Nigeria. Differences in the incidence of infestation between male and female fish may be due to differential feeding either by quality or quantity of food eaten or as a result of different degrees of resistance and infection (Emere, 2000). Parasites have been reported to infect male and female fish differentially because the sexes often have different feeding habits and food preference (Rhode, 1993). However, and the main reason for the differences in parasitic load with sex, is thought to be physiological.

This study revealed that the larger sizes *P. obscura* had more parasitic helminth load than the smaller sizes. The number of parasites for most of the organisms was dependent on the size of the fish. The correlation between parasitic helminth infection and the size of *P. obscura* is contrary to the observation of Oden *et al*. (2015), who reported that nematode infection among the *P. obscura* population from lower Cross River system of Nigeria was independent on the size of the fish. However, Obiekezie and Ekanem (1996), who noted that severe infection and damage caused by *Trichodina maritinkae* to *Heterobranchus longifilis* showed strong correlation with age, with the youngest suffering more damages than the older ones. There was progressive increase in parasites' incidence and density as the length of the fish increased. Increase in length is often used to depict increase in age and size of fish. The high incidence and density of helminth in the larger sized fish samples in this study implies that the smaller/ younger fish were more infested than the bigger and older fishes. Biu *et al.,* 2014 reported that the intensity and incidence of infection of endo parasites in fish increased with increasing length. Allumma and Idowu (2011), also stated that these parameters are synonymous to age, and that higher infection rate in adults than in the young may be due to longer exposure of the adult fish to agents of infection in the environment. Older fish has more chances of acquiring parasites with time, and this could be attributed to the longer

time of exposure to the environment. Poulin and Morand (2000) opined that longer fish provides greater surface area for infection than smaller fishes. This means that increases in the abundance of parasites is to be expected with increases in host size.

Conclusion

Results from the present study showed that there was a high incidence rate of helminths in the *P. obscura* from River Ogun. There were no correlations between the total number of each parasite with respect to fish gender but many of the helminth species number showed positive correlations with increasing length of the fish. It could also be deduced that the rate of infection of *P. obscura* in River Ogun with parasitic helminth is very high. Correlation between pollution and prevalence rate of helminth parasite in fish of this water body should be investigated.

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