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Original Research Article

Prevalence and Diversity of Helminths Fauna in Fishes of Ogun River, Nigeria

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ABSTRACT

In aquaculture, some parasites are highly pathogenic and contribute to high fish mortalities and economic losses. Prevalence of helminths parasite in fishes of Ogun River at Lafenwa, Abeokuta, Ogun State, Nigeria was investigated. Commercially available fish samples with a total of 91 fish samples from three families "Channidae, Claridae and Cichlidae" were examined. Gut contents were cut into parts in 0.9% normal saline, parasites movement were noticed, picked and counted before fixing in 70% alcohol for preservation. Each organism was cleared in xylene before being mounted in Canada balsam to be observed under the microscope and identified. Prevalence of parasitic infection among the fish species was statistically determined. Helminths identified were *Clinostomum complanatum, Spirocamallanus spiralis, Contracaecum multipapillatum* and larva of *Neoechinorhynchus* species. Male fish species had higher intensity of infection than the female with higher concentration in the intestine > stomach > gills. Intensity of the infection was higher in *H. bimaculatus* (2.00 ± 0.00) > *P. obscura* (1.60 ± 0.16) > *O. niloticus* (1.53 ± 0.13) > *T. zillii* (1.38 ± 0.13) > *C. gariepinus* (1.33 ± 0.14) >*T. mariae* (1.25 ± 0.16). The study showed that helminths parasitic infection remains the same in different fish hosts once infected and their prevalence was higher in Cichlidae.

Keywords: Canada balsam, *Clinostomum complanatum*, *Hemichromis bimaculatus*, *Parachanna obscura*, Parasite.

Introduction

Fishes are the earliest known vertebrates that flourished during the Devonian period.[1] About 400 million years ago, they formed a highly successful group of animals comprising more than 40,000 species inhabiting all aquatic bodies such as seas, rivers, lakes and dams which differ from each other in size, shape, salt composition, flow rate among others.[1] Fish is an important source of food, income, employment and recreation for people around the world and as sources of protein for both man and livestocks.[2] Wide distribution of fishes into different ecological habitats has resulted to numerous adaptations in their morphology, physiology and behavior.[3]
In natural water ecosystems, parasites may threaten the abundance and diversity of indigenous fish species.[4] This parasitic infection in fish, causes production and economic losses through mortality, reduction in growth, fecundity and increase in the susceptibility to diseases.[5] Meanwhile, Bichi and Ibrahim [6] opined that fish culture provides large reservoirs of parasites that are common to both wild and cultured fishes but no epidemic species has been reported in Nigeria.
Several research works have been documented on the occurrence of parasite infections in different fish species in some rivers and lakes. Domo and Ester [1] reported *Clinostomum* sp., *Procamallanus* sp., *Serradacnitis serrata, Wenyonia* sp. from the intestine and gills of *O. niloticus* and *C. gariepinus*from lake Geriyo, Adamawa state. Moreso, Yakubu *et al.* [7] documented *Diplostomum tregenna, Crepidostomum meteocus, Sphaerostoma bramae, Camallanus* sp., *Procamallanus laeviconchus, Dibothriocephalus* sp., *Eubothrium crassum* and *Proteocephalid* sp. from the stomach and intestine of *T. zillii* and *C. gariepinus* of River Uke in Plateau State. Also, Akinsanya *et al*. [8] reported *Procamallanus* sp. (*spirocamallanus)* and *Contracaecum* sp. from the gastrointestinal tracts of *Parachanna obscura*.
In addition, Salawu *et al.* [5] identified *Procamallanus* sp., *Polyonchobothrium* sp., *Wenyonia* sp., Pleurocercoid larva, *Clinostomum* sp. from the stomach, intestine and gills of *C. gariepinus* of River Ogun at Isheri, Lagos state Nigeria. Meanwhile, the present study was aimed at determining the prevalence and diversity of helminths infection in fish species of Ogun River, Lafenwa, Abeokuta, Ogun State, Nigeria, which will further contribute to our understanding on helminths abundance and diversity.

Materials and Methods

Study area
Ogun River is one of the main rivers in South-west Nigeria with a total area of 22.4km^2 and a fairly heavy flow of about 393m^3 during wet seasons.[9] Its geographical coordinates lies between 3º28'E and 8º41'N from its source in Oyo state to 3º25'E and 6º35'N in Lagos where it enters into Lagos lagoon.[10] Two seasons are distinguishable in Ogun River, a dry season from November to March and a wet season between April and October. Mean annual rainfall ranges from 900mm in the North to 2000 mm in the South of geographical cardinal. The estimates of total annual potential, evapo-transpiration have been put between 1600 mm and 1900 mm.[11]
The River is used for various industrial and domestic purposes such as agriculture, transportation, consumption among others. The River constantly receives effluents from breweries, slaughter houses, dyeing industries, tanneries and other domestic wastewater along its course before discharging into Lagos Lagoon.[10]

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Fish collection and identification

Commercially available fish species from fishermen in the study site was sampled and obtained between April and September (2016) with a total of 91 fish samples collected. All the fish species obtained were immediately transported to the Department of Plant Science and Applied Zoology laboratory, Olabisi Onabanjo University, Ago – Iwoye, Ogun State, Nigeria. At the laboratory, the fish samples were sorted into different species and sexes.

Identification of the fish species was done based on morphological and taxonomical features described by Holden and Reed [12] and Olaosebikan and Raji [13]. Sexes of the fish species were determined by the presence or absence of a distinct sexual papilla conspicuously located behind the anus and other morphomeristic features that distinguish male or female fishes. This was later reconfirmed after dissection, by the presence of testis in (male) and ovaries in (female). In addition, total length (TL) and standard length (SL) of each fish species was measured using a standard calibrated measuring board in centimetres (cm) and weight was determined by digital weighing scale in gram (g).

Examination and identification of the parasites

Examination of fish parasites from each fish species were carried out using methods described by Olurin and Somorin [14] and Bichi and Ibrahim [6]. A cut was made on the ventral side from the anal opening to the lower jaw of the fish species, then, two more cuts were made on the lateral side to expose the body cavity with alimentary canal and other internal organs. The alimentary canal of each fish species was removed and each part (intestine and stomach) was put in separate dishes while 0.9% normal saline was introduced for parasite recovery. Each part was carefully slit open to aid the emergence of the parasites. Gastrointestinal parasites were seen wriggling on emergence. Gills and liver were also examined under normal saline for presence of any parasites.

Recovered helminths were shaken vigorously in normal saline to enable the parasite stretch for better observation. All parasites observed were counted and recorded before fixing in 70% alcohol for preservation. Staining of the helminths parasite for identification was done by placing them separately in acetocarmine stain for 5 to 10 minutes. Each stained helminth was washed in 70% alcohol, dehydrated in absolute alcohol and cleared in xylene before finally mounted in Canada balsam as reported by Olurin and Somorin [14]. Each helminth was viewed under microscope and identification was done using the standard keys described by Paperna [15].

Statistical analysis

Statistical package for social sciences (SPSS) version 20.0 was used to determine the mean value and differences in the prevalence among the fish species of the parasitic infection. The percentage rate of incidence and intensity was calculated using the formula reported by Olurin *et al.* [16] and Mamani *et al.* [17] respectively.

$$\% \text{ Incidence} = \frac{\text{Number of Infected Fish}}{\text{Total Number of Fish Species Examined}} \text{ X } 100$$

$$\text{Intensity} = \frac{Sum\ of\ Parasite\ Found}{Sum\ of\ Infected\ Fish}$$

Results and Discussion

A total of three families (Claridae, Cichlidae and Channidae), four genera (*Clarias*, *Tilapia Hemichromis* and *Parachanna*) and eight species comprising of *Clarias gariepinus, Clarias anguillaris, Sarotherodon galilaeus, Oreochromis niloticus, Tilapia zillii, Tilapia mariae, Hemichromis bimaculatus* and *Parachana obscura* were identified. A total of 27 (29.7%) had parasitic infection out of 91 fish specimens examined. Helminths distribution in fishes of Ogun River is presented in Table 1. This revealed that total number of helminths found in *T. mariae* and *H. bimaculatus* are 6 each, while *C. gariepinus, O. niloticus, T. zillii* and *P. obscura* have 7, 11, 4, and 5 parasites respectively.

Results obtained showed the presence of *Clinostomum complanatum* in *C. gariepinus, O. niloticus, T. zilli* and *T. mariae* which were reported Domo and Ester [1] from River Ogun at Isheri Olofin, Lagos which showed that the River houses the intermediate hosts for the parasites. However, presence of *S. spiralis, Neoechinorhychus* larvae, and *C. miropillatus* in the River has not been reported from the study area but, has been documented in Nigeria freshwater rivers.[18]

Table 2 showed the percentage helminth infection in relation to sex distribution of the fish species. Male of *T. mariae* had highest prevalence of 100%, while female *T. mariae* and male *H. bimaculatus* was of 50% incidence. Male of *T. zillii* and *P. obscura* has 33.3% prevalence and being the lowest percentage in males. *O. niloticus* had higher number of incidence in females than the males. It also depicts that *S. galilaeus* and *C. anguilliaris* had no incidence of helminths infections in both sexes that were examined. Male specimens from the study site were found more vulnerable to parasitic infection than female which agreed with the report of Emere [19] and Tachia *et al.* [20] that higher percentage of parasitic infestation was in male as a result of more physical engagements and activities in males than in females.

The lowest mean of prevalence was reported in *C. gariepinus* with the highest range found in *C. anguiliaris*. *S. galilaeus* and *H. bimaculatus* has the highest intensity of the parasites class Acanthocephala than other species, while *T. zilii* and *T. mariae* has highest number of the helminth class found which could be associated with the types of food and their feeding habits as opined by Olurin and Somorin [14] that an omnivore animal, feeds on the lower food chain i.e phytoplankton, zooplankton, aquatic insects and macrophytes which makes it to be infested with different parasites.

The overall parasites at the three attachment sites (intestine, stomach and gills) of all the fish species shows that helminths parasite attached to the fish host in descending order of intestine > stomach > gills (Table 3). Parasites distributions in fishes of River Ogun were found restricted to the intestine, stomach and gills which may be due to the presence of attachment organs to host parasite (proboscis), surface area, environmental susceptibility and availability of food in this region which was in agreement with the findings of Crompton [21]. Distribution of the parasites from the fishes of River Ogun with preference to intestine and stomach coincides with the report of Crompton [21] that distribution of parasite in the fish species shows a clear preference for the intestine and the stomach due to possible high availability of food in the region.

Table 1: Helminths distribution in fish species of River Ogun, Nigeria

Fish Species	*Clinostomumcomplanatum* (Trematoda)	*Neoechinorhynhus*larvae (Acanthocephala)	*Spirocamallanusspiralis*(Nematoda)	*Contracaecummicropillatus*(Nematoda)	Total
Clariasgariepinus	3	1	1	2	**7**
Clariasanguiliaris	0	0	0	0	**0**
Sarotherodongalilaeus	0	0	0	0	**0**
Oreochromisnoliticus	5	3	2	1	**11**
Tilapia zillii	1	1	1	1	**4**
Tilapia mariae	2	1	2	1	**6**
Hemichromisbimaculatus	1	2	1	2	**6**
Parachannaobscura	1	1	2	1	**5**
	13	**9**	**9**	**8**	**39**

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Table 2: Percentage Helminths Infection in Relation to Sex Distribution

Fish Host	Female Examined	Female Infected	(%) Incidence	Male Examined	Male Infected	(%) Incidence	Total no Examined	Total Infected	(%) Prevalence	Intensity Mean ± S.D
Clariasgariepinus	8	3	37.5	5	2	40	13	5	38.5	1.33 ± 0.14
Clariasanguiliaris	11	0	00.0	2	0	00.0	13	0	0	0.00 ± 0.00
Sarotherodongalilaeus	4	0	00.0	8	0	00.0	12	0	0	0.00 ± 0.00
Oreochromisnoliticus	7	2	28.6	8	7	87.5	15	9	6.0	1.53 ± 0.13
Tilapia zillii	10	1	10.0	6	2	33.3	16	3	18.0	1.38 ± 0.13
Tilapia mariae	6	3	50.0	2	2	100.0	8	5	62.5	1.25 ± 0.16
Hemichromisbimaculatus	0	0	00.0	4	2	50.0	4	2	50.0	2.00 ± 0.00
Parachannaobscura	4	1	25.0	6	2	33.3	10	3	30.0	1.60 ± 0.16
	50	**10**		**41**	**17**		**91**	**27**		

Table 3: Overall Parasite in the three Organs of Fish Species from Ogun River

Fish Species	Attachment Site			Total
	Intestine	Stomach	Gills	
Clariasgariepinus	5	2	0	**7**
Clariasanguilaris	0	0	0	**0**
Sarotherodongalilaeus	0	0	0	**0**
Oreochromisniloticus	7	4	0	**11**
Tilapia zillii	3	1	0	**4**
Tilapia mariae	4	0	2	**6**
Hemichromisbimaculatus	5	1	0	**6**
Parachanaobscura	5	0	0	**5**
	29	**8**	**2**	**39**

Table 4: Incidence and Intensity of Helminths Infection in Fish Families of River Ogun

Fish Host	No of Fish Examined	Numbers of Infected Host	Numbers of Parasite	Incidence of Infection (%)	Intensity of Infection
Clariidae	26 (91)	5 (91)	7	19.2	1.44
Cichlidae	56 (91)	19 (91)	27	33.9	1.44
Channidae	10 (91)	3 (91)	5	30	1.44

The incidence and intensity of helminths infection in fish families of River Ogun was represented in Table 4. All the fish families have the same intensity of infection (1.44) and incidence of infection ranges from 19.2%, 33.9%, and 30% in Clariidae, Cichlidae and Channidae respectively. It also showed that Cichlidae has the highest number of parasite and infected host followed by Channidae with the least found in Clariidae. Higher percentage of Cichlidae with incidence and intensity of infection might be due to their abundance in the study site, differential feeding habits or low level of resistance to infestation in accordance to Meye and Ikomi [22] findings.

Conclusion

The study recorded drought of parasite infection in fish species of Ogun River which characterized fast flowing freshwater. Absence of helminth parasite in *S. galilaeus* affirmed the susceptibility of the species to parasitic infection, being a planktivorous fish species. Helminthes recorded in this study are frequently reported in Cichlids and other freshwater fish species which established them to be generalists.

Conflict of interest

The authors declare no conflict of interest.

Authors' Declaration

The authors hereby declare that the work presented in this article is original and that any liability for claims relating to the content of this article will be borne by them.

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