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Parasite prevalence in *Bagrus filamentosus* and *Citharinus citharus* from lower River Benue, Makurdi

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ABSTRACT

Objective: To determine the parasite prevalence in *Bagrus filamentosus* (*B. filamentosus*) and *Citharinus citharus* (*C. citharus*) from lower River Benue in Makurdi.
Methods: A total of 100 specimens each of both *B. filamentosus* and *C. citharus* were collected from River Benue, Makurdi, Nigeria and were examined for parasites after measuring basic morphometric parameters.
Results: A total of 198 parasitic organisms comprising *Eustrongylides africanus* (nematode), *Diphyllobothrium latum* (cestode), *Microsporidium* sp. (fungi) and *Clinostomum complanatum* (trematode) were isolated and identified in *B. filamentosus* while 16 parasitic trematode (*Clinostomum complanatum*) were found in *C. citharus*. There was high correlation between total parasites and length as well as weight of the sample ($r = 0.945$ and $r = 0.727$ respectively).
Conclusions: The result suggests that carnivorous/omnivorous fish species harbor more heterogeneous communities of parasites than herbivorous species do. This implies that the feeding habit is a major factor associated with parasitic infestation.

1. Introduction

Fish make up more than 40% of the world's vertebrate species and occupy different levels of the aquatic food chain. Since they are restricted to a particular mode of life related to their food source and reproductive requirement, they interact with various levels of food chain and influence the structure of rivers, lakes, streams and estuaries[1]. Many species of fish have been found to harbour several parasites such as protozoan and parasitic helminths; these parasites play an important role in the ecology of aquatic ecosystems. Fish is prone to be attacked by a variety of microorganisms just like other animals especially those rich in protein[1]. Fish are the most parasitized among all vertebrates, and in recent times attention is shifted to fish parasites since they often produce disease, thereby increasing fish susceptibility to other diseases[1,2].

Parasitic diseases of fish are very common all over the world and of particular importance in the tropics[3]. Some parasites have been discovered to have zoonotic potential in mammalian host including man, thereby making them of public health importance[4].

Ekanem *et al*. reported that *Clinostomum* (Acanthocephalans), when ingested with poorly cooked fish, is capable of producing laryngopharyngitis which is an unpleasant inflamatory condition[5]. *Bagrus filamentosus* (*B. filamentosus*) and *Citharinus citharus* (*C. citharus*) are among the fishes of high commercial importance in Nigeria, but there is paucity of information on their parasitic burden. This study therefore was designed to provide information on the parasitic burden of both species.

2. Materials and methods

Fish samples were obtained from River Benue at Makurdi. One hundred specimens each of *B. filamentosus* and *C. citharus* of various sizes were randomly sampled between June and September, 2013 and identified using methods described by Adesulu and Sydenham[6]. The total length and standard length of each freshly caught fish were measured to the nearest millimetre (mm) using a standard fish measuring rule. The fresh weight of all the fish was measured using an electronic weighing scale and recoded to the nearest 0.01 kg. The sex of each fish was determined by examining the genital papilla of *B. filamentosus* (which is pointed in males and oval-shaped in females), while specimens of *C. citharus* were dissected and the genitals examined.

A dissecting kit microscope and zoom digital microscope (26× to 130×) were used for viewing and isolating parasites from the fish. The slime from the body surface and scale of *B. filamentosus* and *C. citharus* respectively and the gills cut from both fishes were placed in different Petri dishes containing 0.09% normal saline. Each specimen of the different species was thereafter dissected to expose the gut. The liver, intestine and stomach were examined for parasites. Parasites were noticed by the wriggling movement in the normal saline under the microscope. Parasites isolated from both species were identified using the identification kit of Lerssuthichawal and Chinabut[7].

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All experimental procedures involving animals were conducted in accordance to standard specifications in the guide for handling experimental animal in University of Agriculture Makurdi, and approved by the Senate Committee on Research of University of Agriculture Makurdi.

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Statistical analysis in this study included descriptive statistic and Pearson correlation, and the analysis was done using Minitab edition 14.

3. Results

The results of the relation between the parasitic infection and fish length are presented in Table 1. It was observed that *B. filamentosus* of 49.0–69.0 cm in length had the highest parasites count of 107 (54.04%); while this species of 89.0–109.0 cm had the least number of parasites of 3 (1.52%). In *C. citharus* the highest number of parasites occurred in length class 29.0–49.0 cm [12 (75%)]; while no parasite was isolated in the highest length class (49.0–69.0 cm). In both species fish weighing between 1.01–1.90 kg had the highest number of parasites, with 184 (92.93%) and 11 (68.75%) isolated in *B. filamentosus* and *C. citharus*, respectively. However, *B. filamentosus* had the least parasite load of 3 (1.52%) in the highest weight class 1.96–2.91 kg while *C. citharus* had the least parasites [2 (12.50%)] in the least weight range 0.05–1.01 kg. Results shown in Table 2 reveal that females of *B. filamentosus* were more infested with parasites (60.87%) than the males (37.04%). Similarly, the same trend of infestation was observed for *C. citharus* with only 10.26% of the female infected and 9.84% of the male infected. The correlation between total number of parasites and length as well as weight of *B. filamentosus* is presented in Table 3. Result shows that there is high correlation of total length and weight with total number of parasites (r = 0.945, r = 0.727, respectively).

Table 1

Relationship between range in length, weight and total number of parasites in *B. filamentosus* and *C. citharus.*

Range		TNP of B. f.	TNP of C. c.
Length (cm)	9.0–29.0	0 (0.00%)	4 (25%)
	29.0–49.0	88 (44.44%)	12 (75%)
	49.0–69.0	107 (54.04%)	0 (0%)
	69.0–89.0	0 (0.00%)	
	89.0–109.0	3 (1.52%)	
	Total	198 (100.00%)	16 (100%)
Weight (kg)	0.05–1.01	11 (5.56%)	2 (12.50%)
	1.01–1.96	184 (92.93%)	11 (68.75%)
	1.96–2.91	3 (1.52%)	3 (18.75%)
	Total	198 (100.00%)	16 (100.00%)

TNP: Total number of parasites; B. f.: *B. filamentosus*; C. c.: *C. citharus*.

Table 2

Relationship between total number of parasites and sex of *B. filamentosus* and *C. citharus.*

Sex	*B. filamentosus*	*C. citharus*
Infested female	28 (60.87%)	4 (10.26%)
Uninfested female	18 (39.13%)	35 (89.74%)
Infested male	20 (37.04%)	6 (9.84%)
Uninfested male	34 (62.96%)	55 (90.16%)
Total	100	100

TNP: Total number of parasites.

Table 3

Correlation for total length, total number of parasites and weight of *Bagrus filamentosus*.

	Total length	Weight
Weight	0.784**	–
	(P = 0.000)	
Total number of parasites	0.945**	0.727**
	(P = 0.010)	(P = 0.030)

**: Correlation is significant at P < 0.05 (Pearson Correlation).

Parasite species isolated from *B. filamentosus* in the present study included *Eustrongylides africanus* (*E. africanus*) (nematode), *Diphyllobothrium latum* (*D. latum*) (cestode), *Microsporidium* sp. (fungi) and *Clinostomum complanatum* (*C. complanatum*) (trematode), while *C. complanatum* was the only parasite found in *C. citharus* (Table 4). The parasites *E. africanus* and *D. latum* were isolated from the stomach and intestine, while *D. latum* was also present in the gills of *B. filamentosus*. The intestine had more infestation of *D. latum* (63.54%) followed by *E. africanus* (36.46%). *C. complanatum* was mainly in the gills (69.04%) compared to their counterpart *D. latum* (30.96%). *Microsporidium* sp. dominated the parasitic species isolated in the stomach (57.89%) while *E. africanus* and *D. latum* had least isolation rate of 21.05% each in *B. filamentosus*.

Table 4

Percentage infestation of parasitic species and in different body parts of *B. filamentosus* and *C. citharus*. %.

Fish	Parasites	Stomach	Intestine	Gill
B. fillamentosus	*E. africanus*	21.06	36.46	-
	D. latum	21.05	63.54	30.96
	Microsporidium sp.	57.89	0.00	0.00
	C. complanatum	0.00	0.00	69.04
	Total	100.00	100.00	100.00
C. citharus	*C. complanatum*	-	-	100.00

4. Discussion

The result of prevalence of parasite in relation to length and weight shows a trend suggesting that total number of parasites increases with length and weight of the fish to an extent; this is further justified by the high positive correlation of these parameters. Eyo *et al*. noted that larger fishes are heavily parasitized than smaller ones[8]. Alluma and Idowu further explained that fishes of longer length present greater surface area for infection[9]. Also the fact that there is change in diet of juveniles from weeds, seeds, phyto and zooplanktons to insect larvae, snails, crustaceans, worms and fish as they become adulthood increases their parasitic load[10]. Large fish are older than smaller individuals of the same species, so that they have more opportunities to become infected[8,11,12]. In contrast, however, both species fishes with highest standard length recorded low prevalence, which may as a result of body defense developed by the fish over long period of parasitic infection. This agrees with the result of Oniye *et al*. who noted that fishes with highest standard length had the least prevalence and that the low prevalence in adults may be due to immunological factor[10]. Akinsanya *et al*.[13], and Ofem *et al*.[14] stated that lower weight groups of fish are more susceptible to parasitic infection than higher ones as they probably have higher level of immunity. Khan also noted that immune response is age dependent[15]. Adams justified his finding with an hypothesis that apart from posible immunity development in large fishes, changes in diet from food item which functions as intermediate host (for adult parasite) to other foods which are not part of the parasite life cycle are possible causes of less parasites in larger fish[16].

B. filamentosus females were infested more than males, while in *C. citharus*, rate of infection was similar in males and females. Guidelli *et al*. reported that out of 41 females and 87 males of *Hemisorubim platyrhychos* studied, there was a significant relationship between host sex and prevalence of parasites with the females being more infected[17]. Several researchers have argued that due to the cost of sexual selection males are more heavily infected with parasite than females[18-22]. It was further explained that due to competition for mates, males may be operating closer to their physiological limits than females[23,24], hence resulting in higher levels of stress and reduced immunocompetence in males relative to females[25]. Sex-biased parasitism can result from differences in immunocomptence with males predicted to bear a greater cost of sexual selection and immunosuppressive effects of testosterone production[19,20,24] and thus to become more susceptible to parasitic infection than females. However, sex-biased parasitism appears to be host specific as approximately the same ratio of parasitism was observed in both sexes of *C. citharus*.

The result of the parasitic species isolated from organs shows that *E. africanus* and *D. latum* were more abundant in the intestine than stomach and gills of *B. filamentosus*. D'Silva *et al*. stated that intestine is a common organ of infestation for most of the parasites, where they feed on the digested contents of the host in the alimentary canal or the host own tissues[26]. The small intestine seems to be a favourite site for helminths. *Microsporidian* sp. was most abundant in the stomach while *C. complanatium* occupied the gills. Only *C. complanatium* was isolated from the gills of *C. citharus*.

Conflict of interest statement

We declare that we have no conflict of interest.

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