

Prevalence and Intensity of Helminth Parasites of African Catfish *Clarias gariepinus* in Lake Manzala, Egypt

Rewaida Abdel-Gaber*, Manal El Garhy, Kareem Morsy

Zoology Department, Faculty of Science, Cairo University, Cairo, Egypt
Email: rewaida@sci.cu.edu.eg

Received 3 June 2015; accepted 27 July 2015; published 30 July 2015

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Abstract

The African catfish, *Clarias gariepinus*, is generally considered to be one of the most important tropical catfish species for aquaculture purposes. Parasitological investigation was performed in two hundred naturally collected fish samples during the period of February to December 2014. The prevalence of gastrointestinal helminth parasites infecting *C. gariepinus* was investigated. A total of 249 helminth parasites belonging to four genera were recovered from 130 (65%) examined fish samples. They were digenea *Orientocreadium batrachoides*, cestode *Polyonchobothrium clariae*, and nematode *Procamallanus laevionchus* and *Camallanus polypteri*. Majority of the recorded parasites were found in the intestine. Female fish samples had higher prevalence rate 72 (90%) than males 58 (48.33%), and there was no significant difference ($P > 0.05$) in infestation rate between the two sexes. The relationship of host size (weight/length) and parasite infection showed that there was no significant difference in the parasitic infection among three classes, although fish of larger sizes had more infections. In addition, this study determines the effect of fish age on the prevalence and intensity of gastrointestinal parasites.

Keywords

Lake Manzala, Fish, *Clarias gariepinus*, Helminth Parasites

1. Introduction

Fish is regarded as the cheapest source of protein among the urban and rural populace [1] [2]. The demand for fish as a source of protein increases as the human population grows [3]. In an attempt to increase fish supply as

*Corresponding author.

protein source, there has been tremendous increase in the development of fish farming [4]. *Clarias gariepinus*-Burchell 1822, the African catfish is generally considered to be one of the most important tropical catfish species for aquaculture in West Africa [5], with many names such as *C. mossambicus* Peters 1852 and *C. lazera*-Valenciennes 1840 being recognized as its junior synonyms [6]. This African catfish is widely distributed throughout Africa, inhabiting tropical swamps, lakes and rivers, some of which are subjected to seasonal drying [1]. However, farmers are constraint with massive fry and fingerling mortalities, especially in culture system due to the invasion of parasites [7] [8].

Akinsanya and Otubanjo [9] reported that fish from African freshwater were infected by a variety of adult helminth parasites ranging from monogenean, digenean, cestodes, nematodes, acathocephalans and aspidogastrea. Paperna [10] reported different helminth parasite had varying degrees of been pathogenic. For example *Spirocamallanus spirallis*, a common nematode parasite in the stomach of catfish which was reported to be non-pathogenic in spite of the form of attachment by their buccal capsule to the stomach mucosa of infected fish [11] [12], while species of *Philometra* and *Acanthocephalans* caused mild to severe pathology in fish. Parasites of fish could also constitute health hazards to humans when ingested with poorly cooked fish [13]. Therefore, this study reports the occurrence and prevalence for some helminth parasites inhabiting the gastrointestinal tract of *C. gariepinus* in Lake Manzala, Egypt.

2. Materials and Methods

2.1. Study Area

Lake Manzala is the largest lake in the northern region of Egypt and the most productive for fisheries [14]. It extends between longitudes 31°45' - 32°22'E and latitudes 31°00' - 31°30'N. It extends to 64.5 km in the maximum length and 49 km in the maximum width and 239 km in total length of the shore line [15].

2.2. Parasitological Examination

A total of 200 freshwater *Clarias gariepinus* (Family Clariidae) were collected alive from Lake Manzala at Kafr El-Sheikh governorate by the aid of fishermen and transported alive to laboratory of Parasitological Research in large plastic bags partially filled with water and supplied with a good aeration according to Langdon and Jones [16]. The collection was made between February and December 2014.

The total length of each fish were measured in centimeters (cm) using measuring tape, while the weight of each fish was taken in grams (g) using a weighing balance. The sex of the fish was determined by examination of the papillae. Then, the collected fish samples were dissected and the mesenteric cavity examined for parasites. The gastrointestinal tract was then dissected from the rectum to the oesophagus and all parasitic helminth encountered were carefully detached from the stomach or intestinal mucosa. The internal organs of each fish were also examined for parasites or cysts. The helminth parasites from each fish were then fixed in 70% alcohol. The parasites were later stained and identified using identification keys of Yamaguti [17], Ukoli [18], Paperna [10]. Prevalence and mean intensity for selected parasites were determined according to Margolis *et al.* [19].

2.3. Statistical Analysis

The prevalence (%), and mean intensity were analyzed according to Bush *et al.* [20]. The relationships between factors such as host sex, weight, length, and parasitic infection were obtained from data using analysis of variance (ANOVA). All statistical analysis were done using SPSS version 15 for windows.

3. Ethical Considerations

Animal use followed a protocol approved and authorized by Institutional Animal Care and Use Committee (IACUC) in Faculty of science, Cairo University, Egypt.

4. Results

A total of two hundred fish were examined from Lake Manzala, 120 out of the 200 were males while the rest were female (**Table 1, Figure 1(a)**). The overall prevalence of helminth parasite in *C. gariepinus* was 65% (130/200). In addition, the prevalence of helminth infection in relation to host sex of *C. gariepinus*. Although,

the prevalence in males (48.33%) was lower than in females (90%), and it was not statically significant ($\chi^2 = 0.85$; $P > 0.05$) (Table 2). A total number of 249 parasitic helminths were recovered from 130 infected fish, while helminth intensity was higher in the intestine than in the stomach. Table 2 and Figure 1(b) shown that helminth parasites belong to 4 genera which include nematodes, *Procamallanus laevionchus* Wedl 1862 (Camallanidae) and *Camallanus polypteri* Kabre and Petter 1997 (Camallanidae); one species of cestodes, *Polygonchobothrium clariae* Woodland 1925 (Ptychobothriidae); and one species of digenea, *Orientocreadium batrachoides* Tubanguui 1931 (Orientocreadiidae). In addition, nematodes have the highest occurrence (33.33%), while, cestodes showed maximum prevalence (25.0%) as tapeworms dominated in the examined fish species.

The examined fish were categorized into three groups according to their length, which were I, II, III (I larger size up to 29 cm, II medium size from 19 to less than 29, and III smaller size less than 19 cm). Table 3 and Figure 1(c) showed that the smallest fish are relatively less infected than the other length groups of the examined *C. gariepinus* and the percentage of infection increases with increasing fish lengths. The prevalence observed between sizes in relation to intestinal helminth was not significant ($\chi^2 = 5.14$; $p > 0.05$).

In addition, the weight of the normal and infected fish of *C. gariepinus* are grouped in three classes which were I, II, III (I larger weight up to 150 gm, II medium size from 132 gm to less than 150 gm, and III smaller size

Table 1. Overall prevalence of the intestinal helminth in *C. gariepinus*.

Fish sex	Different parameters			
	No. Examined fish	No. infected fish	Prevalence (%)	Percentage of infection
Male	120	58	29%	48.33%
Female	80	72	36%	90%
Total	200	130	65%	65%

Table 2. Prevalence, range and intensity for the recorded parasites of *Clarias gariepinus*.

Recorded parasites	Prevalence (%)		Range of parasites		No. of Parasites		Intensity	
	Stomach	Intestine	Stomach	Intestine	Stomach	Intestine	Stomach	Intestine
<i>Orientocreadium batrachoides</i>	--	8.33%	--	1 - 8	--	27	--	6.75 ± 0.2
<i>Procamallanus laevionchus</i>	--	23.33%	--	6 - 15	--	46	--	3.28 ± 0.1
<i>Camallanus polypteri</i>	10.0%	--	4-16	--	53	--	8.83±0.3	--
<i>Polygonchobothrium clariae</i>	--	25.0%	--	13 - 48	--	123	--	4.39 ± 0.1

Table 3. Relationship between body length and sex for *C. gariepinus* with the degree of parasitic infection.

Size categories of <i>C. gariepinus</i>	Body length (cm)		No. examined Fish		No. infected Fish		Prevalence of infection (%)	
	Non-Infected	Infected	Male	Female	Male	Female	Male	Female
Class I	29.0 - 45.4 (36.3 ± 0.2)	42.2 - 55.6 (50.6 ± 0.1)	35	55	23	40	65.71%	72.72%
Class II	19.0 - 24.9 (22.5 ± 0.1)	21.1 - 28.9 (25.1 ± 0.1)	30	40	18	26	60%	65%
Class III	11.9 - 16.9 (14.6 ± 0.1)	15.6 - 18.9 (17.1 ± 0.1)	16	24	10	13	62.5%	54.16%

Table 4. Relationship between body weight and sex for *C. gariepinus* with the degree of infection.

Weight categories of <i>C. gariepinus</i>	Body weight (gram)		No. examined Fish		No. infected Fish		Prevalence of infection (%)	
	Non-Infected	Infected	Male	Female	Male	Female	Male	Female
Class I	172.62 - 185.46 (80.32 ± 2.20)	150.32 - 160.10 (155.45 ± 1.30)	30	50	28	34	93.33%	68%
Class II	132.34 - 150.10 (145.54 ± 1.90)	128.34 - 142.10 (135.12 ± 1.90)	20	30	13	21	65%	70%
Class III	121.23 - 127.10 (125.92 ± 1.85)	115.79 - 122.29 (119.01 ± 1.55)	30	40	17	25	56.66%	62.5%

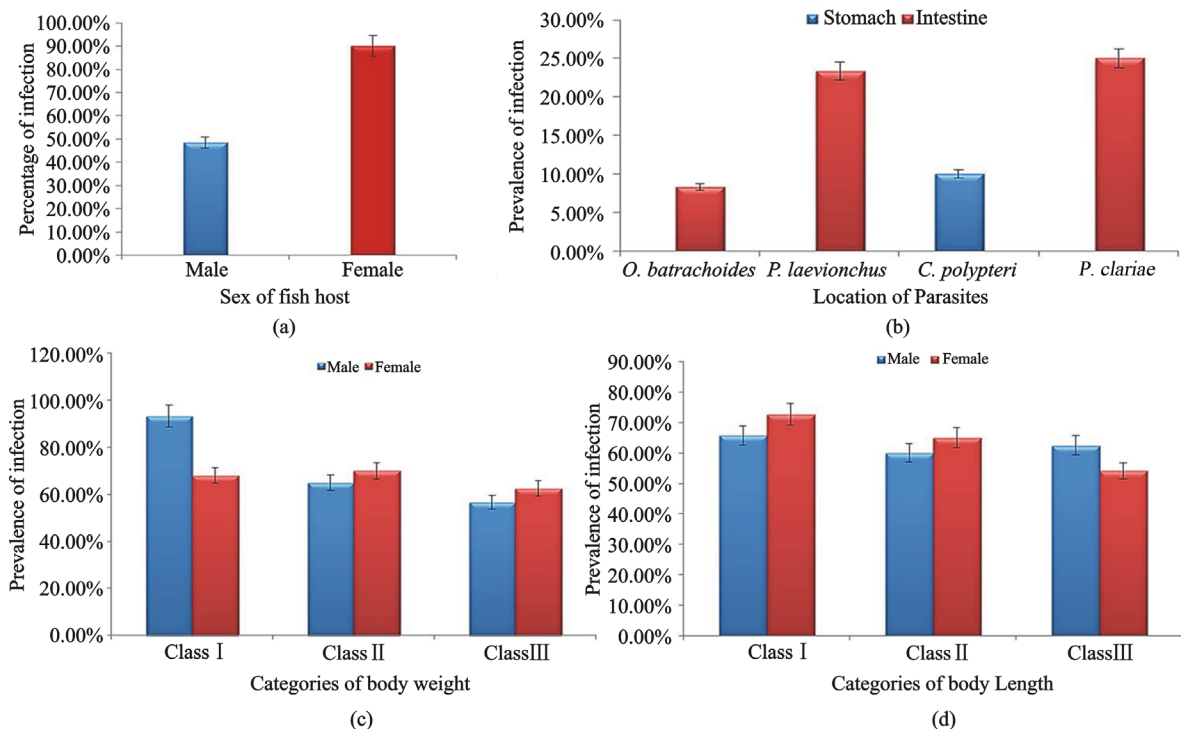


Figure 1. Different histograms for parasitic infection of *C. gariepinus* showing: (a) Percentage of infection in relation to sex fish host. (b) Distribution of parasitic infection on examined fish samples. ((c), (d)) Prevalence of infection in categorized three classes of the examined fish samples in relation to: c Body length. d Body weight.

from less than 132 gm). Parasitic helminthes were observed in all weight groups. Larger fish weights are heavily parasites than smaller ones (Table 4, Figure 1(d)). The prevalence observed between weight in relation to intestinal helminth was not significant ($\chi^2 = 8.91$; $P > 0.05$).

5. Discussion

African catfish is one of the most important fish species in Africa and the Middle East [21] [22]. However, parasitic infections are known to cause massive mortality in the fry and fingerling stages, especially in high-density aquaculture systems [23] [24]. In the present study, the high infection rate (65%) of *C. gariepinus* from Lake Manzala could therefore, be attributed to the contamination of the Lake by various pollutants and numerous tributaries coming from the River Nile. Khan and Thulin [25] reported that urban effluents promote aquatic pollution, thus making aquatic organism vulnerable to increased incidence of parasites. Although female fish were infected with more parasites species, infections were not significant in both males and females of *C. gariepinus*, these data are similar to the findings of Ayanda [26], who reported higher parasitic infestation in female *C. gariepinus* than the male as a result of their quest for survival, Omeji *et al.* [27], Emere and Egbe [28] who reported that due to physiological state of the female, most gravid females could have reduced resistance to infestation by parasites.

Of all helminth parasites recovered in the present study, they revealed that nematodes have the highest occurrence, while, cestodes showed maximum prevalence recovered from intestine, and these data are coincided by the results obtained by Paperna [10] and Eyo and Iyaji [29] who reported that the high infection of *C. gariepinus* by cestode parasites could be due to the ingestion of eggs, copepods and mollusks which serve as intermediate hosts of the larval stages of the cestodes.

Oniye *et al.* [30] reported that the increase in fish size is a reflection of increase in length and weight, which is hereby considered as a measure of age. In the present study, the high incidence of infestation obtained in bigger fish (>29 cm) is an indicator that size of the fish is important in determining the parasitic load compared to small fish, these data are similar to that obtained in previous reported by Mohammed [31] and Oniye and Aken'Ova

[32] who stated that the prevalence was found to be increased as the fish grow, and that could be attributed to the longer time of exposure to the environment by body size. In addition, the higher percentage of parasitic infection observed in the weight class (>150 g) indicated the increase in parasitism with increase in size. This could be due to the fact that bigger fish cover wider areas in search of food than the smaller ones and as a result, they take in more food than the smaller ones and this could expose them more to infestation by parasites. This agrees with the previous reports by Ayanda [26], Omeji *et al.* [27] [33] but disagrees with Tasawar *et al.* [34] who reported higher parasite load in smaller fish than the bigger counterparts.

6. Conclusion

It can be concluded that, there is a positive relationship between host age/size and increase in parasitism. In addition, the increased demand on fish as a source of protein should trigger further studies on fish species and their parasites to determine if there is a risk to humans by feeding more of a particular sex.

Acknowledgements

Authors extend their appreciation to Faculty of Science, Cairo University, Cairo, Egypt; which supported this work.

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