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Survey of Gastrointestinal Parasites of Clarias Gariepinus Burchoil 1822 at River Amba, Lafia Local Government Area of Nasarawa State, Nigeria

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Abstract

Fish are a vital protein source for both humans and animals in tropical regions. Consuming undercooked fish infested with parasites such as nematodes, cestodes, and trematodes can lead to human debility. To assess the prevalence of gastrointestinal parasites, 100 *Clarias gariepinus* were acquired and examined from April to July 2021 in the Zoology Laboratory 1 at Nasarawa State University, Keffi. Out of these samples, 50 were found to be infected, yielding a total of 65 parasites. The parasites identified included *Diphyllobothrium latum* (45.15%), Ascaris spp. (15.39%), *Paralecithodendrium chilostomum* (15.39%), and *Glossidium pedatum* (23.08%). Infection rates did not significantly differ between male and female fish. The most commonly infected organ was the stomach (46.15%), followed by the intestine (30.77%), the esophagus (15.38%), and the rectum (7.69%). There was no significant variation in parasite prevalence across different sections of the gastrointestinal tract or in relation to the standard length of the fish, with the highest infection rate (62.75%) occurring in fish measuring 30-39 cm. The presence of gastrointestinal parasites can significantly reduce the productivity of the fish studied. High parasite incidence remains a significant challenge for the successful economic development of fish farming. It is advisable to thoroughly cook or heat all fish before consumption, as some endoparasites capable of zoonosis were found in the Amba River and can be transmitted to humans through partially cooked fish.

Keywords: Gastrointestinal Parasites, Clarias Gariepinus, River Amba, Parasite Prevalence, Helminths And Zoonotic Diseases.

Introduction

Fish is one of the most important sources of protein for humans and animals in the tropics, providing over 40% of the protein diet for two-thirds of the global population (FAO, 2003). Beyond its nutritional value, fishing also supports economic livelihoods and job creation (FAO, 2005). Processed fish products from the tropics have a significant market in developed countries, making them valuable foreign exchange earners (Imam and Dewu, 2010). Nigeria is among the largest fish consumers globally, with over 1.5 million tons consumed annually (Imam *et al*., 2010). However, parasitic diseases in fish, particularly in the tropics, pose significant challenges. Parasites usually exist in equilibrium with their hosts as a survival strategy, but in conditions like overcrowded aquaria or fish farms, they can spread rapidly and cause high mortality (Ayanda, 2009). This issue can also arise in natural environments disturbed by human activities, leading to altered parasite distributions (Imam *et al*., 2010). Studies have documented various parasitic infections in fish. Ayanda (2009) reported species of cestodes, nematodes, and acanthocephalans in wild and cultured Clariidae in Ilorin, Nigeria, while Hussen *et al*. (2012) reported similar parasites in *Clarias gariepinus* from Lake Hawassa, Ethiopia. Almost all animal and plant groups host parasites, which do not always cause illness in fish (Claude, 2010). These parasites, now referred to as macro-parasites, often have complex life cycles requiring multiple hosts (Claude, 2005). They have evolved various adaptations, such as specialized organs for attachment and prolific egg production, to enhance their survival and transmission (Claude, 2005). The rising mortality rates in aquaculture due to parasitic infections in fish are a significant concern. These infections not only impact fish health but also pose risks to human health, causing gastrointestinal issues that require medical intervention (Angera, 2008). The demand for fish and fish protein is growing with the increasing population, but global fish production is declining due to overfishing, harmful fishing practices, and parasitic diseases (FAO, 2006). Given the importance of catfish (*Clarias gariepinus*) to food security and agriculture in Nigeria, it is crucial to investigate the intestinal parasites affecting wild Clariidae in the River Amba, Lafia Local Government Area of Nasarawa State.

MATERIALS AND METHOD

Study Area

This study was conducted at River Amba, located in the Lafia Local Government Area of Nasarawa State, Nigeria. Lafia is situated between latitudes 8°N and 9°E and longitudes 8°E and 9°E within the Guinea savanna vegetation zone. The area experiences an average annual rainfall of about 823 mm.

Sample Collection

A total of 100 *Clarias gariepinus* were obtained from artisanal fishermen at River Amba between April and July 2021. The fish were transported in plastic containers covered with net to the Zoology Research laboratory at the Faculty of Natural and Applied Sciences, Nasarawa State University, Keffi, for parasitological analysis.

Equipment and Reagents

The following equipment and reagents were

used in this study: electron microscope, dissecting kits, petri dishes, pipettes, slides, cover slips, plastic containers, net, hand lens, gloves, surgical blades, normal saline, test tubes, rag, centrifugal machine, meter rule, sodium chloride solution

Laboratory Investigation

Sex Identification

The sex of each fish was determined by examining the papillae, which is long in males and rounded and reddish in mature females (Imam *et al*., 2010). The presence of gonads in males and ovaries in females further confirmed their sex.

Measurement of Standard Length

The standard length of each fish was measured by placing the fish laterally on a dissecting board and using a meter rule to measure from the mouth to the caudal end (Kariman, 2008).

Measurement of Fish Weight

The weight of each fish was determined using a weighing balance, measured to the nearest 0.1g (Biu & Arorede, 2013).

Examination of Parasites

Following Salawu *et al*. (2013), each fish was immobilized by cervical dislocation for easy handling. The fish were dissected through the abdomen with a longitudinal incision from the arm to a point level with the pectoral fins using a surgical blade. The gastrointestinal tract was isolated, stretched out, and grouped into the esophagus, stomach, intestine, and rectum, with each section placed into separate petri dishes. The sections were slit longitudinally, washed with sodium chloride solution, and examined using flotation and sedimentation techniques (Kawe *et al*., 2016).

Flotation Method

The contents of the gastrointestinal tract sections were washed with normal saline solution and poured into vertical standing vials in a rack. The vials were filled to the brim with a sugar solution. After about an hour, clean slides placed on top of the vials were examined under a microscope using x10 and x40 objectives.

Sedimentation Technique

The contents of the intestinal tracts were washed with normal saline in petri dishes, poured into centrifuge test tubes, and centrifuged at 1000 rpm for 5 minutes. The residues were then placed on clean slides with cover slips and observed under an electron microscope using x10 and x40 objectives (Ahmed *et al*., 2013).

Parasite Identification

Parasites were identified using the keys provided by Lom and Dykova (2006).

Data Analysis

All data collected were analyzed using SPSS version 20. Chi-square tests were conducted to determine the significant relationship between the prevalence of parasites and the sex, weight, and standard length of the fish.

RESULTS

Parasite Load of Fish

Among the 100 wild Clarias gariepinus examined, half were found to be infected with parasites, while the remaining 50 were not infected. The parasites retrieved from these Clarias gariepinus included Diphyllobothrium latum, Ascaris spp, Paralecithodendrium chilostomum, and Glossidium pedatum. Within the sample, there were 39 males, of which 23 were infected, constituting 46% of the infected fish. Additionally, there were 61 females, with 27 of them being infected, accounting for 54% of the infected fish (as shown in Table 1).

Table 1: Prevalence of gastrointestinal parasite of Claridae in relation to sex.

Sex	No examined	No infected	Percentage infection
Male	39	23	46%%
Female	61	27	54%
Total	**100**	**50**	**100%**

Out of six fishes with a standard length of less than 30 cm, three were found to be infected, representing 5.88% of the infected fish. Among the 68 fishes with a standard length ranging from 30 to 39 cm, 32 were infected, accounting for 62-75% of the infected fish. Additionally, of the 26 fishes with a standard length exceeding 39 cm, 16 were infected, comprising 31-37% of the infected fish (as detailed in Table 2).

Table 2: Prevalence of gastrointestinal parasite of Claridae in relation to standard length.

Body Length (cm)	No examined	No infected	Percentage infection (%)
Less than30	6	3	5.88
30-39	68	32	62.75
Above 39	26	15	31.37
Total	**100**	**50**	**100%**

Fifteen fishes with an average weight less than 90 were examined, of which five were found to be infected, representing 10% of the infected fishes. Among the 27 fishes with an average weight ranging from 91 to 149, 15 were infected, constituting 30% of the infected. Additionally, out of the 10 fishes with an average weight between 150 and 249, 10 were infected, accounting for 20% of the infected. Furthermore, among the 48 fishes with an average weight above 249, 20 were infected, making up 40% of the infected (as presented in Table 3).

Table 3: Prevalence of gastrointestinal parasites of Claridae in relation to total weight.

Average Weight (g)	No examined	No infected	Percentage infection (%)
Less than90	15	5	10
91-149	27	15	30
150-249	10	10	20
Above249	48	20	40
Total	**100**	**50**	**100%**

The prevalence of gastrointestinal parasites in Clarias gariepinus based on different sites within the gastrointestinal tract is presented in Table 4. The four sites examined were the oesophagus, stomach, intestine, and rectum. Ten parasites were found in the oesophagus, accounting for 15.38% of the total parasites encountered. Thirty parasites were located in the

stomach, constituting 46.15% of the total. Twenty parasites were found in the intestine, making up 30.77% of the total. Lastly, five parasites were discovered in the rectum, representing 7.69% of the total parasites encountered.

Table 4: prevalence of gastrointestinal parasite of Claridae in relation to site of gastrointestinal tract.

Gastrointestinal Tract	No. examined	No. of parasites encountered	Percentage Infection (%)
Oesophagus	100	10	15.38
Stomach	100	30	46.77
Intestine	100	20	30.77
Rectum	100	5	7.69
Total		**65**	**99.99%**

Table 5 shows the species-specific prevalence of gastrointestinal parasites in Clarias gariepinus. Out of the 100 fishes examined, four species of parasitic helminths were identified: one cestode, one nematode, and two trematodes. The cestode, Diphyllobothrium latum, was found in 30 cases, accounting for 46.15% of the total parasites. The nematode, identified as eggs of Ascaris spp., was encountered in 10 cases, making up 15.39% of the total. The trematodes included Paralecithodendrum chilostomum, found in 10 cases (15.39%), and Glossidium pedatum, found in 15 cases (23.08%).

Table 5: Prevalence of gastrointestinal parasites of Claridae species specific.

Species Identified	Taxomomic Group	No of parasite Identified	Percentage (%)	t-Test (P-value)
D. latum	Cestode	30	46.15	$T = 2.000$
Ascaris spp	Nematode	10	15.39	$t = 0.726$
P. chilostomum	Trematode	10	15.39	
G. pedatum	Trematode	15	23.08	$P = 0.05$
Total		**65**	**100%**	

(t< T, i.e 0.726 <2.000).

DISCUSSION, CONCLUSION AND RECOMMENDATION

Discussion

The examined fish population revealed a higher number of females compared to males, with females exhibiting a higher prevalence and mean intensity of parasite infections. The study indicated that more female *Clarias gariepinus* were infected with helminth parasites than males, although there was no statistically significant difference (P<0.05) in the number of intestinal helminths between the sexes. The greater infection rate in females might be attributed to differences in feeding behavior or resistance to infection. The highest infection rate of 40% was observed in fish weighing over 249g, while the highest infection rate of 62.75% was found in fish with body lengths between 30-49 cm. Similar findings have been reported by Ayanda (2009) and Olurin and Samorin (2006), indicating that larger and heavier fish are more susceptible to parasite infections. This could be due to the larger surface area available for parasites in bigger fish and changes in diet from plankton to insect larvae, snails, worms, and crustaceans as fish grow (Obano *et al*., 2010). The highest prevalence of parasites in this study was observed in the stomach (46.77%) and intestine (30.77%), followed by the

oesophagus (15.38%), with the rectum recording the lowest prevalence (7.69%). This contrasts with the findings of Owolabe (2008), who reported the lowest endoparasite helminth numbers in the oesophagus of catfish. Additionally, the intestinal helminth parasites found in *Clarias gariepinus* from the Amba River in Lafia Local Government Area of Nasarawa State could potentially cause zoonotic diseases.

Conclusion

Out of the 100 fish samples collected, 50 were infected with parasites, and a total of 65 parasites belonging to different classes of Platyhelminthes were recovered. Four species of parasites were identified: *Diphyllobothrium latum*, *Ascaris spp*., *Paralecithodendrum chilostomum*, and *Glossidium pedatum*. These parasites are capable of reducing fish productivity. The study found that females had a higher prevalence of parasites than males, with the highest infection rates observed in fish weighing over 249g and those with body lengths between 30-49 cm. This suggests that larger and heavier fish are more susceptible to parasite infections.

Recommendation

Given the increasing demand for catfish, particularly *Clarias gariepinus*, and the prevalence of endoparasites in wild fish, which serve as seed stock for aquaculture, it is crucial to address the issue of parasite contamination. High parasite incidence remains a significant challenge for the successful economic development of fish farming. It is advisable to thoroughly cook or heat all fish before consumption, as some endoparasites capable of zoonosis were found in the Amba River and can be transmitted to humans through partially cooked fish.

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