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Original Research

PREVALENCE OF GATRO-INTESTINAL PARASITES IN C*larias gariepinus* SOLD IN IBADAN CENTRAL MARKET, IBADAN, NIGERIA.

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Abstract

Gastrointestinal parasitic infections in fish pose significant public health and economic challenges, especially in urban markets with suboptimal handling conditions. This study examined the prevalence of gastrointestinal parasites in *Clarias gariepinus* (African catfish) sold at Ibadan Central Market, Nigeria, to assess associated health risks. Due to increasing catfish demand and limited research on market-sold fish, forty (40) *C. gariepinus* samples of varying sizes were randomly purchased and transported alive to the Fish Biology Laboratory, University of Ibadan. The gastrointestinal tracts were dissected, and parasites were identified using morphological analysis under a dissecting microscope. Statistical analysis were done using Microsoft excel to calculate prevalence in frequencies and percentages. Results showed a high prevalence of gastrointestinal parasites: tapeworms (37%), *Entamoeba histolytica* (25%), *Taenia* spp. (13%), and *Ascaris* eggs (25%), mainly in the intestines. Larger fish had higher parasite loads and female fish showed a greater prevalence of *Ascaris* eggs. Findings suggest contamination from environmental sources and poor fish-handling practices. These results highlight the public health risks of consuming inadequately cooked or improperly handled *C. gariepinus*. Given the zoonotic potential of some parasites, urgent interventions are needed to improve fish handling, storage, and market sanitation.

Keywords: Aquaculture, *Clarias gariepinus*, food safety, gastrointestinal, public health

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1.0 INTRODUCTION

Aquaculture plays a crucial role in global food security by supplying a significant share of the world's fish (FAO, 2022). Fish are aquatic animals, ranging from shellfish to mammals, that live in water for most or all of their lives. They are cultivated for various purposes, including providing a food source for home consumption, serving economic value when farmed commercially. They also offer aesthetic, recreational and tourist value through sport fishing, aquaria, or garden ponds (Adeyemo, 2016). According to Pal *et al*. (2018), Fish are an excellent source of protein, containing all the essential amino acids required by humans. They are considered a healthier alternative to red meat or poultry. The fats in non-polluted fish are beneficial to human health, as the omega-6 linoleic acid and omega-3 alpha-linolenic acid found in Fish can help synthesize all major fatty acids necessary for the body (Adeyemo, 2016). Furthermore, Fish flesh is highly nutritious and is also used to produce fish meal, which supports livestock and farmed fish production, while the waste can be utilized as fertilizer. Fish provide more than 1.5 billion people with nearly all of their average per capita intake of animal protein, and 4.3 billion people with at least 15% of their animal protein (FAO, 2014). Fisheries and aquaculture are significant sources of livelihood and employment.

In Nigeria, *Clarias gariepinus* (African catfish) is economically and nutritionally important due to its fast growth, resilience to harsh conditions and high market demand (Olagunju, 2024; Ibidapo-Obe, 2024). Moreover, Oyewole and Amosu (2012) reported that in many parts of Nigeria, catfish consumption is considered a delicacy associated with the upper class, although its cost is affordable to a large portion of the population. Additionally, in Nigeria, various fish species are farmed, with a prominent example which is catfish, a scale-less teleost omnivore (Sadauki *et al*., 2022), which is widely distributed across freshwater environments, such as reservoirs, rivers, creeks, and pools, as well as brackish waters like estuaries and lagoons in Africa. Catfish refers to a group of over 2,500 species belonging to about 30 families, found worldwide. These fish are named for the barbels near their mouths, resembling a cat's whiskers (Langi *et al*., 2024). According to Adeyemo (2016), the three main catfish species farmed in Nigeria are *Clarias, Heterobranchus* and *Chrysichthys* but the *Clarias gariepinusis* is widely accepted for rearing and consumption in Nigeria.

However, one major challenge in rearing and for safe consumption of fish is parasites, which is major concern in aquaculture and fish trade, as they can lead to severe economic losses and potential zoonotic transmission (Adewumi *et al*., 2021). Parasites are invertebrates, with some being free-living and others obligate, requiring hosts for survival and reproduction. Both types can infect fish, but most parasitic infections or diseases are caused by obligate parasites (Sadauki *et al*., 2022). Parasitic infections often compromise the health of *C. gariepinus* in both cultured and wild environments, impacting fish productivity, quality, and food safety (Eyo *et al*., 2019). Wogu and Orji (2024) emphasizes that parasitic diseases weaken fish immune systems and disrupt their normal physiology, leading to reduced fecundity, mass mortalities, nutritional loss, and significant economic consequences. Also, El-Tantawy *et al.* (2023) noted that parasites are one of the most diverse and common pathogens the agriculturist may likely encounter as parasitic disease are very common all over the world and are of particular importance in the tropics. It is also important to note that Fish parasites lead to commercial losses in both aquaculture and fisheries industries, with potential implications for human health and socio-economic stability in

both developed and developing countries as opined by Adeyemo (2016).

Moreover, studies by Allam *et al*. (2022) found that fish species from freshwater streams, including rivers and creeks in Africa, were infested with a variety of adult helminth parasites, such as *monogeneans, digeneans, cestodes, nematodes, acanthocephalans* and *aspidogastreans.* These parasites can be either internal or external and can lead to malnutrition, poor growth, and increased vulnerability to secondary infections in fish. Furthermore, these parasites can harm fish by injuring tissues while burrowing, consuming food, or removing digested food from the gut, as well as by secreting proteolytic enzymes. Infections in *C. gariepinus* may result from contaminated water, poor handling, and unsanitary market conditions, especially in densely populated areas like Ibadan, in which Akanle *et al*. (2019) described to be one of the notable commercial hubs in southwestern Nigeria. According to Odoh *et al*. (2019), parasitic infections in fish are indicators of water quality, as their abundance and diversity tend to increase in more polluted waters. Abubakar *et al*. (2024) also emphasized that the incidence and prevalence of parasite infections are closely linked to the ecological conditions of the water body and the overall health of the fish.

Moving on, despite the reported increase in catfish consumption in Nigeria by Oyewole and Amosu (2012), research on gastrointestinal parasites in *C. gariepinus* sold in urban markets, particularly in Ibadan, remains limited. Furthermore, many fish handlers and consumers are unaware of the risks posed by consuming inadequately processed or infected fish (Bedane *et al*., 2022). Moreso, previous studies on fish gastrointestinal parasites in Nigeria have mainly focused on fish farms. Meanwhile retail markets, where cross-contamination and improper handling are common, have received limited attention. Therefore, this study aims to examine the prevalence of gastrointestinal parasites in catfish sold at Ibadan Central Market, also known as Bodija Market. Afterwards, highlighting health risks and advocating for better sanitation in catfish handling and marketing.

2.0 MATERIALS AND METHODS

Description of study area

Ibadan Central Market is situated in the center of Ibadan, Oyo State, Nigeria, at coordinates 7.39°N latitude and 3.91°E longitude. The market is organized into different sections, each focused on specific goods or commodities. Narrow alleys and passageways link these sections, creating a maze-like layout (Amuko *et al.*, 2023; Olugbire and Aremu, 2014).

Sample collection and Identification of Clarias gariepinus

Forty live *Clarias gariepinus* fish samples of varying sizes were randomly purchased from vendors in the study area. Upon collection, the fish were identified using the freshwater fish identification guide by Omoniyi *et al*. (2013). Afterward, they were then transported alive to the Fish Biology Laboratory at the Department of Fisheries and Aquaculture, University of Ibadan, Oyo State for further analysis.

Sexing of Experimental Fish

The sex of the sampled fish was determined through physical observation of the urogenital papillae. The presence of testes in males and ovaries in females served as confirmation for grouping (Imam and Dewu, 2010; Sadauki *et al*., 2022).

Examination of Fish Samples for Gastrointestinal parasites

The fish's gastrointestinal tract, specifically the stomach and intestine, were examined. The fish

was dissected to expose the alimentary canal, which was then removed and sectioned into the stomach and intestine (Sadauki *et al*., 2022). These sections were placed in petri dishes with 0.9% normal saline for parasitic examination, as this is where food is most abundant for parasites. Afterwards, each section was slit longitudinally and inspected under a dissecting microscope at magnifications of x10 to x30 (Paperna, 1991). Any worms were easily detected by their wriggling movement in the saline solution. Parasites were counted, fixed in 5% formalin, and representative specimens were stained overnight with a weak solution of Erlich's haematoxylin (Omeji *et al.*, 2022).

Morphological Identification

The parasites were identified by examining their morphological characteristics under a microscope and using suggested guides by Poinar and Thomas (2012).

Statistical Analysis

The number of infected fish for each parasite type was recorded in Microsoft Excel for statistical analysis such as prevalence and percentages. The infection rate was calculated by dividing the number of infected fish by the total sample size and multiplying by 100. Moreso, the prevalence of gastrointestinal parasites in *Clarias gariepinus* was determined by calculating the frequency of infected fish in the examined samples.

3.0 RESULTS AND DISCUSSION

Results

Prevalence of Gastrointestinal Parasites in Clarias gariepenus sold in Ibadan Central Market

The examination of the gastrointestinal tracts of *Clarias gariepinus* collected from Ibadan Central Market revealed the presence of various parasites. Out of the 40 catfish samples analyzed, 37% were infected with tapeworms, making it the most prevalent parasite (Table 1, Figure 1). These were mainly found in the intestine, suggesting a favorable environment for the parasite's development and attachment. Moreso, *Entamoeba histolytica* was detected in 25% of the fish, primarily in the stomach and esophagus. *Taenia* spp. infections were observed in 13% of the fish, with all cases found in the intestine. However, *Ascaris* eggs were found in 25% of the fish, distributed across the stomach, intestine, and esophagus.

These findings highlight the high prevalence of gastrointestinal parasites in catfish sold in Ibadan Central Market, posing potential public health risks if consumed undercooked or improperly handled. This emphasizes the need for improved hygiene practices, routine fish health monitoring, and public awareness campaigns to reduce parasitic transmission and protect consumer health.

Parasite Distribution and Susceptibility in Clarias gariepinus

The parasites were mainly found in the intestines, with occasional occurrences in the stomach and esophagus. Additionally, the parasite distribution varied based on the size and sex of the fish, as shown in Table 1. The larger and older fish generally had a higher parasitic load. Also, Female fishes have a higher prevalence of Tapeworms and *Taenia spp*.

Table 1: Prevalence Distribution and Susceptibility of Gastrointestinal Parasites in *Clarias gariepinus* sold in Ibadan Central Market.

Parasite Type	No. of Infected Fish	Percentage (%)	Location	Group Size		Sex Distribution	
	(*n = 40*)			Large	Small	Male	Female
Tapeworm	15	37	Intestines	10	5	7	8
Entamoeba histolytica	10	25	Stomach and esophagus	6	4	4	6
Taenia spp.	5	13	Intestine	3	2	3	2
Ascaris eggs	10	25	Stomach, intestine, and esophagus	9	1	2	8
Total	40	100		28	12	16	24

Footnote *n*: Sample size

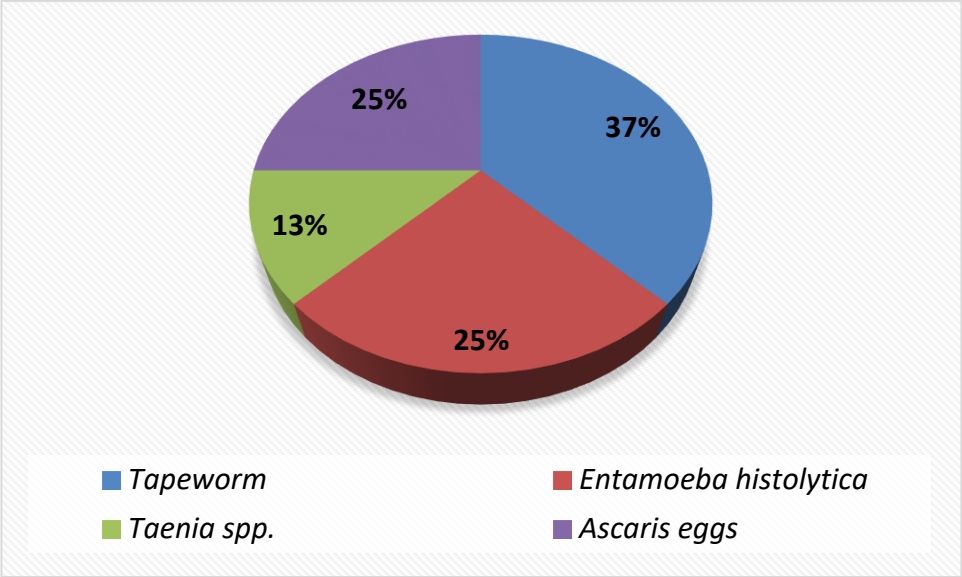
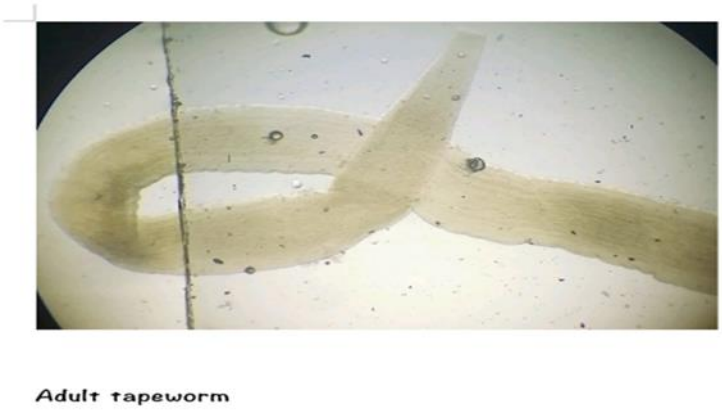


Figure 1: Percentage distribution of gastrointestinal parasites in *Clarias gariepinus*

Morphological Identification

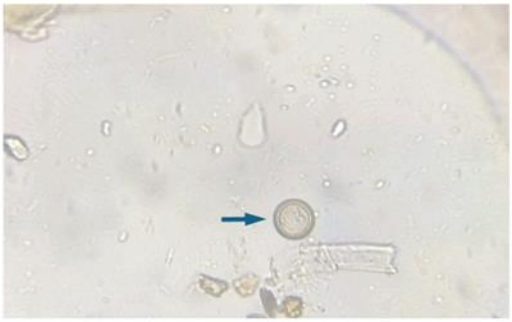
The parasites obtained from the gut of *Clarias gariepinus* were identified by their morphological characteristics. Images of the identified parasites are provided below.



Adult tapeworm

Figure 2: Adult Tapeworm isolated from the gut of *Clarias gariepinus*

Entamoeba histolytica



Taenia spp

Figure 3:*Entamoeba Histolytica and Taenia spp.* observed in the intestinal lining of the gastrointestinal tract of *Clarias gariepinus*

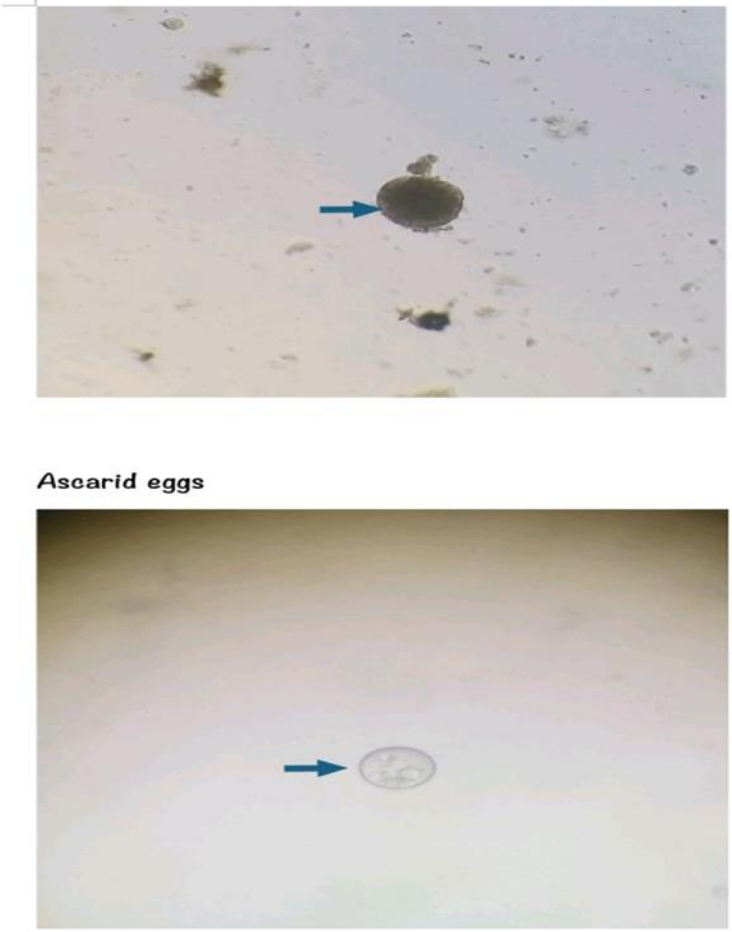


Figure 4: *Ascaris* eggs identified in female experimental fish

Discussion

This study examined gastrointestinal parasites in *Clarias gariepinus* sold at Ibadan Central Market, Nigeria. The findings reveal a significant prevalence of these parasites in *Clarias gariepinus* sold at the market.

First, out of forty (40) specimens examined, 37% were infected with tapeworms, 25% with *Entamoeba histolytica*, 13% with *Taenia* spp., and 25% with *Ascaris* eggs. These results confirm the previous studies of Omeji *et al*. (2011), which reported high incidences of parasitic infections in freshwater fish, particularly catfish, in Nigerian markets.

Additionally, the detection of tapeworms and *Taenia* spp. corroborates findings from Scholz and Choudhury (2014), which identified cestode infections as common in *C. gariepinus*. These parasites often infect fish through contaminated water sources and intermediate hosts. The presence of *Entamoeba histolytica*

and *Ascaris* eggs, which are typically associated with human hosts, suggests possible environmental contamination due to poor sanitation and improper waste disposal in and around the market (Adebambo, 2020).

Furthermore, the higher parasitic load observed in larger and older fish is consistent with the findings of previous studies, which have shown that host size is a crucial predictor of parasite load (Yemi and Bamidele, 2022). However, larger fishes have prolonged exposure to parasites, increasing their likelihood of infection. Research on *C. gariepinus* in Nigeria also reported that larger fishes (25–48 cm) had more parasite load than smaller ones (19–24 cm) (Omeji *et al*., 2011). It is important to note that, larger catfish have a greater surface area, making them more susceptible to parasite infestation (Wogu and Orji, 2024). Additionally, as they cover larger areas in search of food, they ingest more, which increases their exposure to parasites (Afolabi *et al*., 2020; Wogu and Orji, 2024).

Moreso, the significant difference in infection rates between size groups further supports the hypothesis that larger hosts provide a more suitable environment for parasite proliferation (Yemi and Bamidele, 2022). This study also found that female fish exhibited a higher prevalence of *Ascaris* eggs compared to males. The studies of Ukwa *et al*. (2018) suggested that males often have higher parasitic loads due to behavioral factors. In contrast, other studies (Wogu and Orji, 2024) indicate that physiological differences in females, such as hormonal fluctuations, may make them more susceptible to certain infections. Higher infection rates in female fish could be linked to their physiological state, as gravid females typically experience reduced immune resistance to parasites during gestation (Afolabi *et al*., 2020). Additionally, the increased food intake required for egg development may expose female fish to more contact with parasites (Wogu and Orji, 2024). However, these findings contradict studies that report higher parasite prevalence in males (Tachia *et al*., 2010; Eyiseh *et al*., 2022).

In this study, the parasites are primarily located in the intestines, with occasional occurrences in the stomach and esophagus, which is a typical pattern observed in many fish species. Parasites often inhabit specific regions of the gastrointestinal tract to maximize nutrient absorption and reproduction (Scholz and Choudhury, 2014).

Overall, the presence of gastrointestinal parasites in *Clarias gariepinus* sold at Ibadan Central Market poses significant health risks to consumers. Parasites such as tapeworms, *Entamoeba histolytica*, *Taenia* spp., and *Ascaris* eggs can cause diseases like gastrointestinal distress, malnutrition, and systemic infections (Scholz and Choudhury, 2014). The zoonotic potential of these parasites is a major concern, with *Taenia* spp. leading to human tapeworm infestations and *E. histolytica* causing amoebic dysentery, a public health issue in developing regions (Chávez-Ruvalcaba *et al*., 2021). However, to reduce these risks, it is crucial to improve sanitation in fish handling, processing and marketing. Moreso, proper hygiene practices, including thorough washing of fish, clean water sources, and routine parasitological screenings, should be enforced. More importantly, public awareness campaigns, education on proper cooking, and regular market inspections are necessary to ensure safe consumption. Strict aquaculture practices by fish farmers and community-driven hygiene initiatives suggested by Wogu and Orji (2024) will enhance public health and boost consumer confidence in *C. gariepinus* as a safe food source.

Conclusion

In conclusion, the study highlights a significant prevalence of gastrointestinal parasites in *C. gariepinus* sold at Ibadan Central Market, with

larger and female fish exhibiting higher infection rates. These findings underscore the need for regular monitoring and proper sanitary measures to mitigate health risks associated with the consumption of infected fish. Additionally, aside its impacts on consumers health gastrointestinal parasites negatively impact infected fish health, affecting growth, reproduction, and potentially causing death. Therefore, as recommended during the discussion, proper management practices in aquaculture are essential to minimize the harmful effects of parasites and improve fish health and thus safe for consumption.

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