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OCCURRENCE OF PARASITES IN LIVE *Clarias gariepinus* SOLD AT JIMETA MODERN MARKET, YOLA, ADAMAWA STATE

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ABSTRACT

Fish is a cheap and important source of protein and minerals for humans. *Clarias gariepinus* accounts for over two-thirds of the fish consumed by an average Nigerian family. Various parasites infect *C. gariepinus* in the wild and in cultured environments, where they are captured and taken to various selling points to be sold to consumers. The present study is aimed at determining the occurrence of parasitic infection in live *C. gariepinus* from Jimeta Modern Market, Yola, Adamawa State, Nigeria. A total of 30 *C. gariepinus* were randomly bought from five different fish vendors, six from each. The fish were transported to the Department of Microbiology, Modibbo Adam University, Yola for further studies. The fish sexes were determined before they were examined for parasitic infections. Skin scrapings were obtained, and the gills were examined for ectoparasites while the gastrointestinal tracts were dissected and examined for endoparasites. Parasites were isolated and identified using standard parasitological procedures. Five classes of parasites were identified, namely, Nematode, Trematoda, Protozoa, Cestoda, and Hirudinea. The prevalence of parasites in *C. gariepinus* sampled from Jimeta Modern Market indicated 57.14% in the male *C. gariepinus*, while female *C. gariepinus* were infected with a prevalence rate of 42.85%. This study revealed some major groups of fish parasites that are of zoonotic importance.

Keywords: Fish parasites, *Clarias gariepinus*, Zoonotic, Public health, Fish market

INTRODUCTION

Fish is a cheap and important source of protein and minerals for humans (Grzegorz and Jerzy, 2018). More than half of the world's population depends on fish as a principal source of animal protein, which represents nearly 50% of the animal protein intake of many on the continent of Africa (James *et al*., 2019). In Nigeria, fish accounts for about 40% of the total animal protein intake (Valentina et al., 2018). From a socio-economic point of view, besides being a significant source of income, fish, especially *Clarias gariepinus*, has continued to be the most affordable source of animal protein for an average Nigerian family (Eric *et al*., 2018).

However, despite being a valuable source of food, the consumption of fish comes with its own set of public health issues. Their consumption by humans may contribute to food poisoning and infections as they contain pathogenic bacteria and/or their toxins and parasites that are zoonotic in nature (Thora *et al*., 2020). Fish-derived parasites often go unrecognised and are responsible for several emerging zoonotic diseases (Dorny *et al*., 2009; Shamsi, 2019). The public health issues caused by zoonotic parasites and the prevention of their transmission to humans and other animals are of great importance. Information on the occurrence, prevalence, and pathogenicity of fish parasites and diseases is essential in aquaculture production, as such information enables aquaculturists to apply correct prevention and control measures in their fish production and also provide useful information on their public health-related concerns (Oso *et al*., 2017).

Since fish is an affordable and accessible source of animal protein for Nigerian families (Eric *et al*., 2018), the marketing of freshly captured live fish is common in the markets (Bimal *et al*., 2019). Various public health-related issues in humans have been reported due to zoonotic parasites found in the animals they consume (Ali and Reza, 2018). There are several parasites of fish that are found to be zoonotic in nature (Onyedineka *et al*., 2010; Ali and Reza, 2018). The aim of this study is to access the occurrence of parasites in freshly captured live *Clarias gariepinus* sold at Jimeta Modern Market, Yola, Adamawa State.

MATERIALS AND METHODS

Study Area

The study was carried out at Modibbo Adama University, Yola, Adamawa State. Adamawa State is one of the largest states of Nigeria and occupies about 36,917 square kilometres located at latitudes 9°20'–9°33'N, longitudes 12° 30–12° 50E, and an altitude of 185.9m. It has an average annual rainfall of about 759mm and a maximum temperature of 39.7°C. The rainy season runs from May through October, while the dry season commences in November and ends in April. The driest months of the year are January and February, when the relative humidity drops to 13% (Canback Global Income Distribution Database [C-GIDD], 2014). The state is endowed with many rivers; hence, it is an important area for fishing and fish farming (Mallum, 2016).

Collection of Fish

Fish samples were purchased from Jimeta Modern Market, Yola. A total of thirty (30) C. *gariepinus* were sampled for parasitic investigation. Six fish samples each were bought from five (5) different live fish sellers in the market. The fish samples were transported alive to the Laboratory of the Department of Microbiology, Modibbo Adama University, Yola, in separate plastic containers filled with water from the fish sellers, respectively, for parasitic examination. The sample collection was done from January to February 2022. The sexes of the fish samples were identified by physical observation of the urogenital papillae as described in Lagrue *et al*. (2011).

Identification of Parasites

The external surfaces (skin and fins) were placed under a light microscope for examination. Gills were cut out and placed into separate petri dishes and observed with hand lenses for parasites. Parasites were collected and fixed in buffered 5% formalin for further identification (Idowu and Anthony,

2022). The external examination of the fish surface was first carried out by using hand lenses for the detection of parasitic manifestations, as described by Tachia *et al*. (2010). Subsequently, a sterile scalpel blade was used to scrape the skin from the head to the tail to obtain a skin smear, which was then kept in different sample plates containing 0.9% saline solution. (Adeyemo and Falaye, 2007; Ekanem *et al*., 2014). Drops of the mixed solution were collected using a dropper, placed on a clean slide, and examined. The detection of parasites from the gills of the sampled fish was made using the methods described by Adeyemo and Falaye (2007) and Ekanem *et al*. (2014).

A cut was made on the ventral side of the fish from the anal opening to the lower jaw using dissecting scissors to expose the body cavity and the internal organs. The gastro-intestinal tracts were examined by cutting the fish sample through the oesophagus to the anus. The stomach and intestine were separated and kept in different sample plates containing 0.9% saline solution. The contents of the stomach and intestine were washed in the normal saline solution for sedimentation and flotation. A drop of the residue was placed on the slide, and the wet mount was examined for parasites under the microscope. The parasites were identified using a standard text by Ajala and Fawole (2014) and Kawe *et al*., 2016.

Prevalence of Parasite Infection and Intensity (%)

$$= \frac{No\ of\ fish\ infected\ X\ 100}{Total\ No\ of\ fish\ host\ examined}$$

Prevalence Based on Sex (%)

$$= \frac{No\ of\ particular\ sex\ of\ fish\ host\ infected\ X\ 100}{Total\ No\ of\ particular\ sex\ of\ fish}$$

Prevalence Based on Collection Site (%)

$$= \frac{No\ of\ fish\ host\ infected\ in\ a\ collection\ site\ X\ 100}{Total\ No\ of\ fish\ host\ infected}$$

Intensity of Parasite

$$= \frac{Total\ No\ of\ parasite\ species\ in\ a\ sample\ of\ fish\ examined}{No\ of\ fish\ host\ infected}$$

Statistical Analysis

The prevalence and intensity of parasites were calculated using simple percentages (%) by sex, parasite-based site, sex, and frequency in relation to prevalence within the samples.

RESULTS

Five classes of parasites and twelve parasite species were reported from the study, which sampled the gills, skin, stomach, and intestine of *C. gariepinus*, respectively.

Incidence of Parasites in *Clarias gariepinus* from the Jimeta Modern Market

The incidence of parasites in *C. gariepinus* indicated that the highest number of parasites recovered was found in the skin, with a total number of 15 (53.55%), followed by 9 (32.13%) in the gills, and the least number of parasites recovered in the stomach, at 3 (10.71%) (Table 1).

Table 1: Incidence of parasites in *Clarias gariepinus* from Jimeta Modern Market

Parasite	No of fish infected (%)	Gills (%)	Skin (%)	Stomach (%)	Intestine (%)
Dactylogyrus spp	4 (14.28)	1 (3.57)	5 (17.85)		
Crytopcaryon Spp	1 (3.57)				
Camallanus spp	3 (10.71)				3 (10.71)
Philometroides africanus	1 (3.57)				1 (3.57)
Piscicola germetid	5 (17.85)	2 (7.14)	4 (14.28)		
Epistylis spp	2 (7.14)	1 (3.57)	2 (7.14)		
Gyrodactylus spp	3 (10.71)	2 (7.14)	2 (7.14)		
Icthyopthnous lioteri	3 (10.71)	2 (7.14)	2 (7.14)		
Cenohabditis elegan	2 (7.14)			1 (3.57)	1 (3.57)
Clinostomum complanatum	1 (3.57)				1 (3.57)
Spirometra erinaceieropaci	2 (7.14)			2 (7.14)	
Icthyophilius mulfiliis	1 (3.57)	1 (3.57)			
Total	28	9	15	3	6

Prevalence and Intensity of Parasites in Relation to Sex from the Jimeta Modern Market

Table 2 showed the prevalence and intensity of parasites in the sampled *C. gariepinus* in relation to sex. Male and female *C. gariepinus* were infected, with a prevalence of 57.14% and 42.85%, respectively.

Table 2: Prevalence and intensity of parasite in relation to sex in Jimeta Modern Market

Sex		No. of Fish Examined	No. of Fish infected	Percentage (%)	Intensity of Parasite
Male	17	16	57.14	1.00	
Female	13	12	42.85	1.00	
Total	30	28	100		

Burden of Parasites in *Clarias gariepinus* from Jimeta Modern Market

The total parasite burden of 28 was recorded in *C. gariepinus* from Jimeta Modern Market. Among the classes of parasites recovered, the highest burden of parasites was reported for Trematoda and Protozoa (28.57%), while the lowest was reported for Cestode (7.14%) (Table 3).

Table 3: Burden of parasite in *Clarias gariepinus* from a Jimeta Modern Market

Class of parasites Species	No. of fish infected (%)
Nematoda	6 (21.42)
Caenorhabditis elegans	
Camallanus	
Philometroides africanus	
Trematoda	8 (28.57)
Clinostomum complanatum	
Dactylogyrus spp	
Gyrodactylus spp	
Protozoa	8 (28.57)
Icthyopthnous hoferi	
Ichthyopphithius multifiilis	
Epistylis spp	
Cryptocaryon Spp	
Cestoda	2 (7.14)
Spirometra erinaceieropaci	
Hirudinea	5 (17.85)
Piscicola geometra	
Total	28

DISCUSSION

The present study revealed a high number of parasites found in *C. gariepinus* from Jimeta Modern Market. This high parasite incidence can be attributed to where the fish samples were collected from—either a fish farm or the wild—before the fish sellers brought them to the market for sale.

The results obtained in this study revealed a varying degree of prevalence and intensity rate of parasites in the examined *C. gariepinus*. Male *C. gariepinus* had a higher incidence and prevalence rate than females. This agreed with the findings of Bichi and Dawaki (2010), who reported differences in the incidence of parasite infestation between male and female *Clarias gariepinus* and attributed the difference to differential feeding either by quantity or quality of feed or as a result of different degrees of resistance to infection. This difference could be due to the physiological state of the male, as most gravid males tend to have reduced resistance to parasite infection. Moreover, several researchers have argued that due to sexual selection, male fish are more heavily infected with parasites than female fish (Omeji *et al*., 2011; Dan-Kishiya *et al*., 2013). These authors also explained that sex-biassed parasitism in fish can result from differences in immune competence, with males predicted to bear a greater cost of sexual selection and immune suppressive effects of testosterone production and thus become more susceptible to parasitic infection than females.

The result of the classes of parasites recovered from the fish samples from Jimeta Modern Market is in consonance with the earlier study of Idowu and Anthony (2022), who report high occurrence of Trematoda and Protozoa parasites in the *C. gariepinus* samples examined in their study. Allumma and Idowu (2011) observed similar results in their work, and they explained that this could be due to the low specificity of the adult stages of the parasites they discovered in their study, which make those parasites capable of infecting different fish genera and species.

Different fish parasites from fresh water have been reported to have zoonotic potential if eaten raw or partially cooked (Markus *et al*., 2012; Ali and Reza, 2018). The major groups of fish parasites that are known to be zoonotic in nature are also reported in the present study (Ali and Reza, 2018). Parasitic agents, including cestodes (tapeworm), trematodes (fluke), nematodes (round worms), and protozoan organisms (such as *Cryptosporidium* spp.), are considered fish-derived zoonotic pathogens (Ziarati *et al*., 2022). These authors (Ziarati *et al*., 2022) also argued that the majority of the fish-derived zoonotic parasitic diseases are transmitted to humans mainly via the consumption of improperly cooked or raw fish or fish products. This makes it of public health importance to the consumers of fish and fish products bought from the study area.

CONCLUSION

The present study reported that sampled male fish were more parasitized than female fish and that some major groups of fish parasites that are known to be zoonotic in nature are present in the examined *C. gariepinus* from Jimeta Modern Market. Further research can be conducted to identify parasites to the species level by molecular techniques and parasite genomics of *C. gariepinus*. Moreover, more awareness should be raised about public health-related issues surrounding fish-derived zoonotic parasites and their consumption.

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