

# **A Survey of Parasitic Helminths of *Clarias gariepinus* (Burchell, 1822) Collected from Odo-Ogbe Market in Ile-Ife, Nigeria**

Onana Ediseimokumoh Edith, Akinpelu Akinsola Ishola

Department of Zoology, Obafemi Awolowo University, Ile-Ife, Nigeria

## **Email address**

ediseionana@yahoo.com (O. E. Edith)

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## **Abstract**

A parasitic survey of *Clarias gariepinus* collected from commercial fish sellers in Odo-Ogbe market, a major market in Ile-Ife, Osun State, Nigeria was investigated. A total of 120 specimens of *C. gariepinus* were collected between April and May 2009. The fishes were bought early in the morning from the market women and transported directly to the laboratory in the Department of Zoology within thirty minutes. Four different parasitic helminth parasites were recovered from the *C. gariepinus* in this study. These parasites include two cestode species (*Lytocestus marcuseni* (and *Fimbriaria sp.*), two nematode species (*Paracamallanus cyanthopharynx* and *Physaloptera sp.*). Of the one hundred and twenty *C. gariepinus* examined only (32.5%) were infected with parasitic helminths. The overall prevalence of helminth infection in male fishes (36.8%) was more than that of female fishes (28.6%). *Fimbriaria sp.* was the most predominant helminth parasite recovered in this survey. Helminth infections were observed to be more prevalent in fishes of higher standard lengths and weights than those of lower standard lengths and weights suggesting that prevalence is higher in older fishes.

## **Keywords**

*C. gariepinus*, Helminth, Prevalence, Intensity, Odo-Ogbe Market

## **1. Introduction**

The term “fish” is most precisely used to describe a non-tetrapod craniate (i.e. an animal with a skull and in most cases a backbone) that has gills throughout life and limbs in the shape of fins [1]. Unlike groupings such as birds or mammals, fish are not a single clad but a paraphyletic collection of taxa, including hag fishes, lampreys, sharks and rays, ray-finned fishes, coelacanth and lungfishes [1].

Fish have some unique anatomical and physical characteristics that are different from mammals. However, they still possess the same organ systems that are present in other animals. Unlike birds and mammals which are homeothermic, all fish are poikilothermic and they must be able to adapt to changes in water temperature. Fish live in a variety of temperatures ranging from less than 0°C to hot geothermal springs. Yet, each species of fish must live in its

particular specific temperature range. Abrupt temperature changes in the water can be lethal to fish [2].

There are at least 20,000 known species and more than 58% are found in the marine environment. More recently, [1] stated that there are almost 28,000 known extant species, in which 27,000 are bony fish, with 970 sharks, rays, and chimeras and about 108 hagfishes and lampreys.

A breakdown showed that fish accounts for more than forty percent of the protein diet of two-third of the global population [3]. Fish interact with the various levels of food chain and influence the structures of lakes, streams and estuaries since they are usually restricted to particular modes of life related to their food sources and reproductive requirements [4]. The ever-increasing cost of beef leaves fish as the most feasible option in resolving protein shortage [5].

*Clarias spp.* inhabit calm freshwaters ranging from lakes, streams, rivers, swamps to flood plains, many of which are subject to seasonal drying [6]. Since the last three decades, *Clarias gariepinus* has been considered to hold great promise for fish farming in Africa. Documentation of the parasite fauna of fishes especially used in aquaculture is equally on the increase.

The most important species of fish which account for about 90% of Nigeria's fishery include croakers, catfishes, tilapias, threadfins, soles, threadfins and the clupeids [7]. Fish is prone to attack by a variety of microorganisms, many of these microbial infections are caused by organisms which are also referred to as parasites which are responsible for infections and diseases that constitute a major hindrance to productivity in fish farming in Nigeria [8]. Parasites are capable of causing harm to the fish host notwithstanding the species either through injury to the tissues or organs in the process of burrowing or consuming food or the removal of digested food in the gut of the fish as well as the secretion of proteolytic enzyme [9].

## 2. Materials and Methods

Odo-Ogbe market is a major market located in the ancient city of Ile-Ife, Osun State (Figure 1). Ife is located within the tropical rainforest climate zone of West Africa and lies between 7° 28' N 4° 34' E and 7.467° N 4.567° E. It has an average rainfall of 1000-1250mm usually from March to October and a mean relative humidity range of 75% to 100%. Ife is located east of the city of Ibadan highway and also 40km from Osogbo with a road network to other cities such as Ede, Ondo and Ilesha.

### 2.1. Collection of Fish Specimens

Fish collection was carried out once a day from April 2009 to May 2009. Cultured fishes were bought fresh directly from market women in the morning between 8.00am to 9.00am. The fishes were put in a bucket with some of the pond water to preserve them alive and covered with a net before being transported directly to the laboratory at the Department of Zoology, Obafemi Awolowo University, Ile Ife for examination. In the laboratory each fish was rendered immobile by cervical dislocation, then given an identification number. Thereafter, the dimensions and the weights of the fishes were taken, their sexes determined, and then examined for parasites. The standard length and weight of each fish was determined using the standard meter rule and recorded in centimetres and salter balance with measurements in grams respectively.

### 2.2. Sex Determination

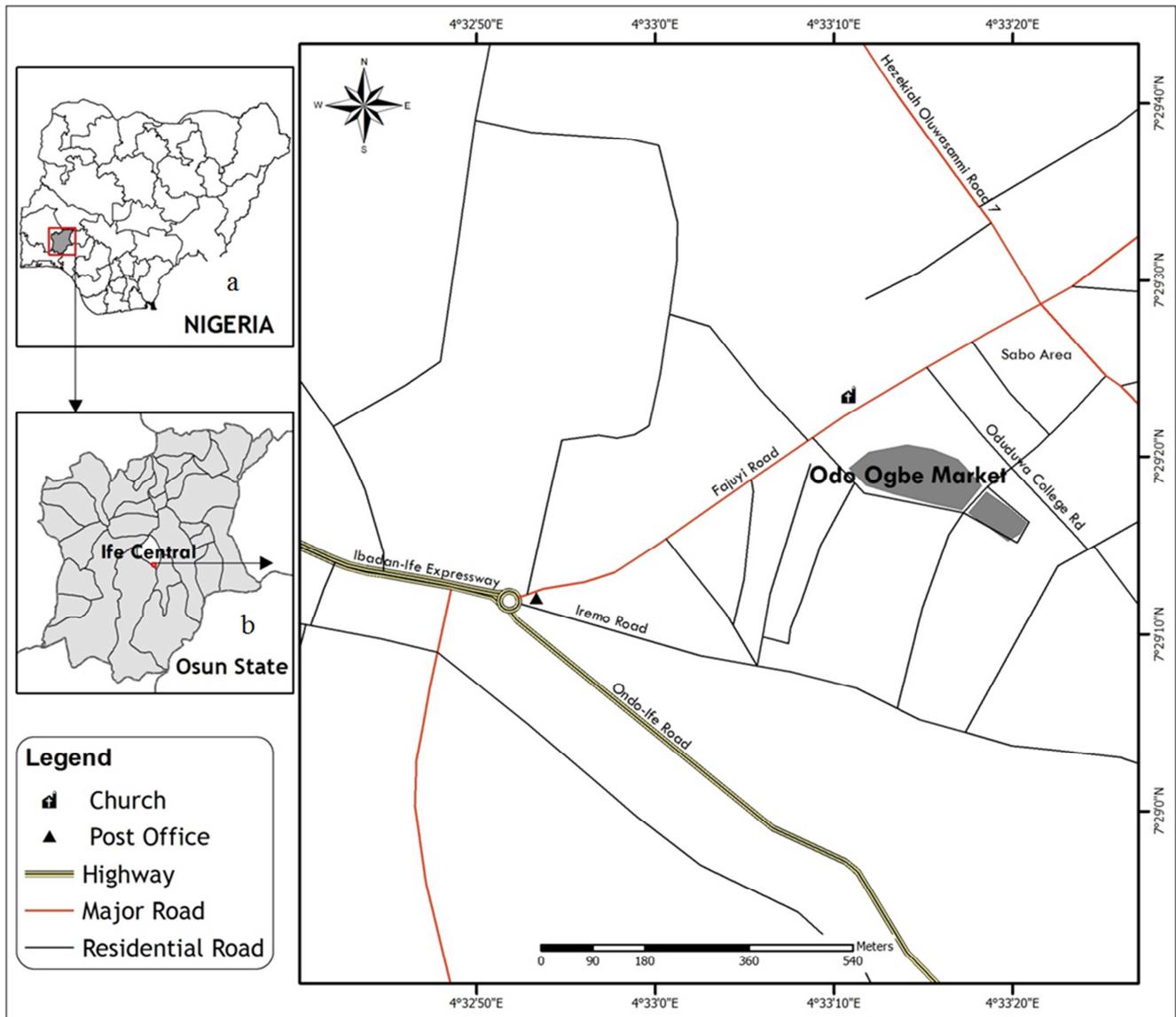
The sexes of the fish were determined by either pressing the abdomen of each fish specimen for the extrusion of sperm for males and eggs for females or they were dissected for the presence or absence of testes and ovaries. The presence of testes signified a male while the presence of ovaries indicated a female.

### 2.3. Examination of Fish for Parasites and Identification of Parasites

The fish abdomen was slit open by a longitudinal incision and the gut dissected out. The gut was separated into stomach and intestine. Each section was placed in a different petri dish containing 0.9% saline where it was then cut open and the contents expressed in saline. Each organ was then examined under a dissecting microscope with a black background to make the parasites more visible. The nematodes recovered from the stomach and intestine of examined fishes were transferred from saline to alcohol formol acetic acid in a clean petri dish to get them stretched and fixed were then preserved in 70% ethanol in different specimen bottles labelled with the fish ID number later they were cleared and mounted in lactophenol without staining and the edges of the cover slips were sealed with Glycerol. The cestodes recovered were allowed to die and stretch fully in cold water before fixation in alcohol-formol-acetic (AFA) and later preserved in 70% alcohol with one or two drops of glycerine to prevent complete evaporation. The acanthocephalan recovered was stained in acetocarmine, dehydrated in graded alcohol series, cleared in xylene and mounted in Canada balsam. The number of each species of worms recovered from the two habitats in each fish was counted and recorded against the ID number of each fish. Measurements of the whole length of the worms and organs were made using calibrated binocular microscope. Prepared slides of the mounted parasites were examined under a light microscope with objective lenses of x10 and x40.

### 2.4. Data Analysis

The data collected were coded and entered into SPSS for version 17 (SPSS Inc., Chicago, IL) and Microsoft excel for data analysis based on descriptive statistics (such as frequency tables, means and percentages) as appropriate. Inferential statistics like student t-test were used for comparative analysis of parasite prevalence and mean intensity with respect to sex.



**Figure 1.** Map of Part of Ile-Ife Central, showing Odo-Ogbe market. (a- map of Nigeria showing location of Osun State. b- map of Osun State showing location of Ile-Ife central).

### 3. Results

Table 1. Shows the summary of different helminth parasites recovered, their total number and location in the one hundred and twenty specimens of *C. gariepinus* bought from Odo-Ogbe market Ile-Ife. Four different helminth parasites were recovered which was made up of two species of Cestodes (*L. marcuseni*, *Fimbriaria sp.*) and two species of nematodes (*P. cyanthopharynx* and *Physaloptera sp.*). All helminth parasites recovered were from the stomach. A summary of the overall prevalence, mean intensity and variance of helminth parasites recovered from 120 specimens of *C. gariepinus* in Ile-Ife is shown in Table 2. The prevalence, mean intensity and variance of *L. marcuseni* were calculated as 5%,  $125 \pm 35.3$  and 9.9 respectively. *Fimbriaria sp.* had a prevalence, mean intensity and variance of 7.5%,  $215.5 \pm 40.3$  and 7.6 respectively. *P. cyanthopharynx* had a prevalence, mean intensity and variance of 10%,

$445.5 \pm 63.5$  and 9.1 while *Physaloptera sp.* had a prevalence, mean intensity and variance of 10%,  $111.8 \pm 47.8$  and 20.5 respectively.

The level of parasitization with helminth parasites in relation to the standard length and weight of *C. gariepinus* is shown in Tables 3 and 4. In Table 3, the fishes caught were grouped into three using their standard lengths and weights. Fishes with standard length less than 20cm were uninfected with parasitic helminths, while fishes with standard lengths between 20-30cm had a prevalence of 13.33%, fishes with standard lengths greater than 30cm had prevalence of 50%. Intensity was also found to increase with increase in the standard length of fish from 0.5 to 1.82 helminths per infected host.

Table 4 shows the level of helminth parasitization in relation to *C. gariepinus* body weight. Fishes with weight less than 200g were uninfected by parasitic helminths, while a total of eight fishes with weight between 200 and 300g

were infected with a prevalence of 34.78%. Among fishes with weight above 300g, a total of 15 fishes were infected with a prevalence of 50%, similarly intensity increased with increase in host body weight from 1 to 2.60 worms per infected host. Sexual variation in level of parasitization in *C. gariepinus* is shown in Table 5. With *C. gariepinus* males being more heavily parasitized than the females. Out of a total of 57 male fishes collected, 21 were infected with a

prevalence and intensity of 36.84% and 1.29 respectively while from the 63 females collected only 18 were infected with a prevalence and intensity of 28.57% and 2 respectively. However Table 5 shows that female specimens had higher worm intensity than the males and also a higher number of worms. The number of infected male was not significantly higher than those of the females.

**Table 1.** Distribution of helminth parasites of *C. gariepinus* collected from Odo-ogbe market, Ile-Ife.

Class	Parasite Species	Total number of parasites	Location
Cestoda	<i>L. marcuseni</i>	9	Intestine
Cestoda	<i>Fimbriaria sp.</i>	24	Intestine
Nematoda	<i>P. cyanthopharynx</i>	12	Intestine
Secernenta	<i>Physaloptera sp.</i>	18	Intestine

**Table 2.** Overall Prevalence, mean intensity and variance/mean ratios of helminth parasites recovered from 120 specimens of *C. gariepinus* in Ile-Ife.

Parasite species	Prevalence (%)	Mean intensity ( $\bar{x} \pm SD$ )	Variance ratios ( $S^2 / \bar{x}$ )
<i>L. marcuseni</i>	5	125.3 $\pm$ 35.3	9.9
<i>Fimbriaria sp.</i>	7.5	215.5 $\pm$ 40.3	7.6
<i>P. cyanthopharynx</i>	10	445.5 $\pm$ 63.5	9.1
<i>Physaloptera sp.</i>	10	111.8 $\pm$ 47.8	20.5

**Table 3.** Level of Parasitization with helminth parasites in relation to the standard length of *C. gariepinus* (cm).

Group	Standard length range	No. of specimens examined	No. infected	No. of worms recovered	Prevalence (%)	Intensity
A	<20	9	0	0	0	0
B	20-30	45	6	3	13.33	0.50
C	>30	66	33	60	50.00	1.82
TOTAL		120	39	63	32.50	1.62

**Table 4.** Level of Parasitization with helminth parasites in relation to the body weight of *C. gariepinus* (g).

Group	Weight range	No. of specimen in each group	No. of infected specimen	No. of worms recovered	Prevalence (%)	Intensity
A	<200	21	0	0	0	0
B	200-300	69	24	24	34.78	1.00
C	>300	30	15	39	50.00	2.60
TOTAL		120	39	63	32.50	1.62

**Table 5.** Prevalence and intensity of infection with helminths in relation to sex of *C. gariepinus*.

Sex	No. of specimen in each group	No. of Infected specimen	No. of worms recovered	Prevalence (%)	Intensity	T-Test	
						T	P
Male	57	21	27	36.84	1.29	0.3525	0.7422
Female	63	18	36	28.57	2.00		
Total	120	39	63	32.50	1.62		

## 4. Discussion

The investigation carried out in this study has shown the different helminth parasites in the alimentary canal of *C. gariepinus* collected from Odo-Ogbe market, Ile-Ife, Osun State, Nigeria. Four parasitic helminths were recovered which include: two cestodes species *L. marcuseni* and *Fimbriaria sp.*, and two nematode species *P. cyanthopharynx* and *Physaloptera sp.* The study showed a high overall infection rate in all the fish examined, this is unlike the low infection rate reported by [10] among 240 specimens of *C. gariepinus* purchased from fish landings in Sabon-gari market, Zaria. The high infection rate could be attributed to

the fish farming practices of different fish pond owners in Ile-Ife suburb who serve as major suppliers of fresh catfish to the market. Such practices include overcrowding of fishes, improper disposal of pond water and lack of proper treatment of fishes. It was found that helminth parasites showed some degree of specificity in their habitats within their fish hosts. This specificity could be as a result of the physico-chemical and physiological factors operating in the various sites such as pH, osmotic tension, oxygen tension and nutrient levels. The location of helminth parasites in the body of different fish species examined showed that all of occurred in the intestine. Similar finding was reported by [11]. High number of helminth parasites found in the intestines could be attributed to the presence of already digested food available

within that site. It could also be due to the conducive nutritional advantage presented by the host's intestine to the parasites. Male fishes were found to be more infected than females, in this study but this was at variance with the findings of [18] who recorded higher level of parasitic infections among female fishes. According to [11] differences in infection between the two sexes could be due to differential feeding, either by quantity or quality of food eaten and as a result of different degrees of resistance to infection. Differences in infection between the sexes can also be attributed to the fact that male fishes are more active than their female counterparts who are sometimes slowed down by reproductive activities.

The relationship between the levels of helminth infection of *C. gariepinus* in this study to their standard lengths and weights showed that larger fishes had the highest number of infected fishes which agreed with the work of [12] who reported that the longer the fish the greater the susceptibility to parasite infection, as adult fish exhibited a great variety of feeding styles such as being carnivorous, herbivorous and omnivorous. With the correlation of prevalence of parasitic infections with fish length, it could be assumed that prevalence of infections in turn corresponds to fish age if fish length is related to fish age [13].

The feeding pattern of fish is an important factor in their infestation with parasites. [14] reported that predatory fish species harbour a greater diversity and abundance of larval helminths than herbivorous and planktivorous species. Predatory fish are exposed to more infective helminth larvae in their diet thereby making them more susceptible to higher parasitic colonization than phytophagous and planktivorous fish. Nevertheless, the pattern of high infection rate in predators and omnivores might be the inevitable outcome of these fishes being more exposed to parasitic helminth larvae in their diet than other categories of fish. *Clarias spp.* are known to be omnivorous with the tendency towards being carnivorous as they age, hence more likely to be infected by parasitic helminths as a result of their feeding pattern.

## 5. Conclusion

This study shows that *C. gariepinus* sold at Odo-Ogbe market, a major market in Ile-Ife and its suburb were infected with helminth parasites. Hence the need for continuous monitoring as it becomes imperative that extension officers should properly educate the fish farmers in Ile-Ife and its environs to inculcate proper management techniques in the farms to reduce the rate of worm burden in this commercially important fish.

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