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GASTRO-INTESTINAL HELMINTH FAUNA OF *CLARIAS GARIEPINUS* (BURCHELL, 1822) IN JIBIA RESERVOIR, KATSINA STATE, NIGERIA

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ABSTRACT
Investigation of intestinal helminths in *Clarias gariepinus* from Jibia reservoir was carried out. *Clarias gariepinus* samples were purchased from fisher folks and identified at each of the three landing sites of the reservoir. Fish sampling was carried out between March to August, 2021. A total of 100 randomly selected samples of *Clarias gariepinus* obtained were examined. The fish samples were transported to Biology laboratory, Federal University Dutsin-Ma for standard morphometric determination and examination of the gut for parasites. The endo-parasitic fauna isolated were examined. Data were analysed using descriptive statistics and chi-square. Only cestodes and nematodes were found in the gut. A total number of sixty nine (69) intestinal parasites; cestodes (*Monibothrium* larvae, *Monibothrium* sp.) and nematodes (*Camallanus* sp., *Capillaria* sp. and *Contracaecum* sp.) were isolated. The cestode *Monibothrium* larvae were the most minor intense (9 worms), followed by the nematodes *Camallanus* sp., *Capillaria* sp. and *Contracaecum* sp. which were moderately intense (15, 19 and 10 worms, respectively). However, only 16 cestode worms belonging to *Monobothrium* were collected from the stomach and intestine of the experimental species from the three sample locations. Heavy infestation with a broad number of parasites in fish hosts could reduce performance and productivity of the species, especially in the wild. It is therefore recommended that the gastro-intestinal tract of harvested *Clarias gariepinus* from the study area should be discarded rather than consumed to prevent the transmission of zoonotic diseases.

Keywords: cestodes, *Clarias gariepinus*, gastro-intestinal parasites, Jibia reservoir

INTRODUCTION

Fish and fish products are very significant source of nutrients of animal origin for varying healthy nourishments. Fish is an inexpensive and an affordable source of animal protein and within reach of the ordinary inhabitants of most countries. Fish demand is continuously on the increase and this is due among other reasons to the ever-increasing human population, high price of other sources of animal protein and issues of disease and infections connected with the eating of other sources of animal protein (Tavarez-Dias and Martins, 2017). The increasing populations coupled with urbanization have resulted to problem of aquatic contamination and a corresponding prevalence or occurrence of parasites and diseases in wild fish populations. Increasing or accumulative aquatic ecological dynamics play a vital role in determining where the hosts (fish or other aquatic organisms), parasites and other microbial pathogens occur (Zarlenga *et al.*, 2014).

The African catfish *Clarias gariepinus* (Burchell, 1822) has been found to be a very significant freshwater fish in Nigeria and aquaculture industries due to its numerous advantageous features such as its ability to tolerate a varying range of ecological conditions, fast growth rate, high fecundity rate, ease of artificial breeding and it commands good price (Eyo *et al*., 2014). Its consumption is on the increase in both rural and urban centers in Nigeria due to its very much nutritious values (Afolabi *et al.*, 2020), thus prompting an increased demand from artisanal catches.

Abdel-Gaber *et al.* (2015) stated that fish from African freshwater were infected by a diversity of adult helminth parasites ranging from monogenaen, digenean, cestodes, nematodes, acathocephalans and aspidogastrean. Also, fish farmers are constrained with huge fry and fingerling mortalities, particularly in culture system due to the invasion of parasites (Abdel-Gaber *et al.*, 2015). Fish parasites often injure their hosts by destroying the hosts' tissues, providing site for development of secondary infections or taking blood and cellular fluids from the hosts (Onyishi and Aguzie, 2018). Heavy parasitic infections may result in death of the hosts. An increased anthropogenic activity in Jibia reservoir, Katsina State, Nigeria, has necessitated the need to examine the prevalence of helminth parasites of *Clarias gariepinus*.

MATERIALS AND METHODS

Study Area

The research area; the reservoir is within Jibia Local Government Area of Katsina State, in northern Nigeria. Jibia is located between latitude 13° 05′ N and 7° 13′ E and longitude 13° 09′ N and 7° 23′ E. It has an estimated total human inhabitants of 169,748 persons and total land mass of about 1,037 km^2. The reservoir located on the coordinates 13° 04″ 18′N and 07° 15″ 06′E, has a height of 23.5 m, a length of 3,660 m and a total capacity of 142 million m^3. The main purpose of the reservoir is for irrigation, other purposes include supply of drinkable water, domestic uses and fishing activities (Abba *et al*., 2018).

Fish was collected at the following sampling stations; station 1 station 2 and station 3 (Figure 1). Station 1 is located at the entry of the reservoir on the channel of River. Station 2 is located at the middle of the reservoir where human activity is minimal except agricultural and irrigational activities.

Station 3 is located at the extreme end of the reservoir and characterised by a lot of fishing activities taking place there.

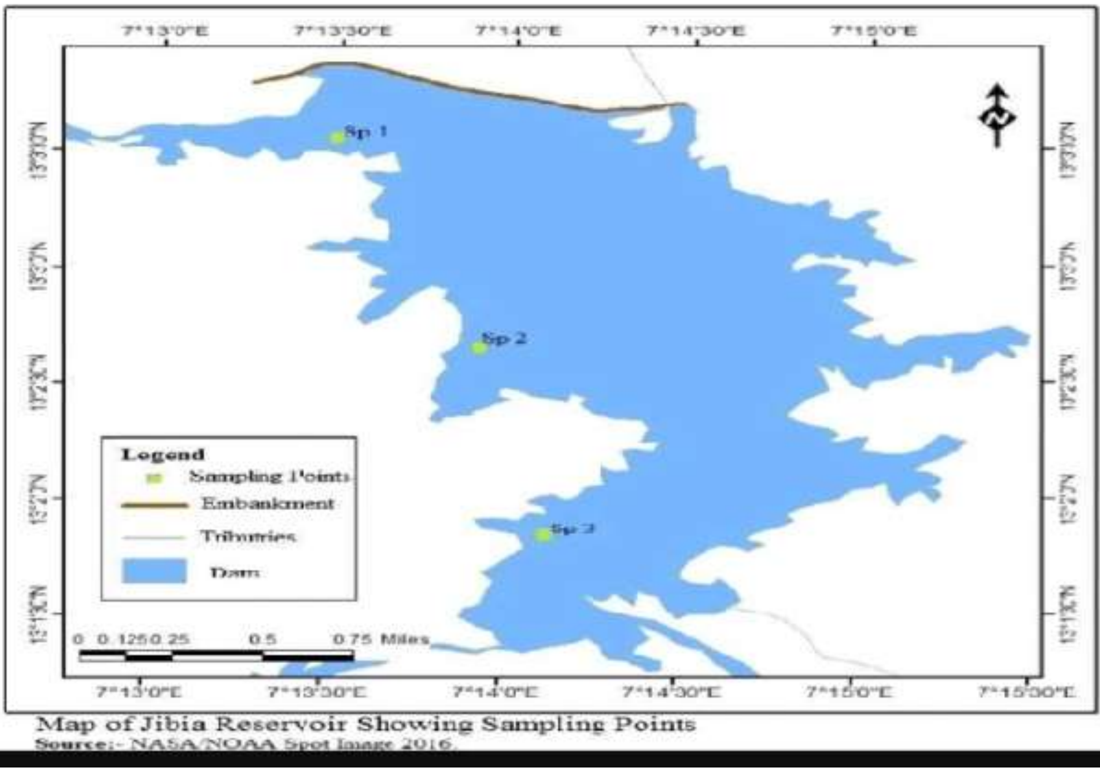

Figure 1: Map of Jibia reservoir showing sampling points

Sample Collection

One hundred live specimens of *C. gariepinus* of different sizes were bought from local fishermen from three landing sites in Jibia reservoir, Katsina. Fish samples were purchased from the selected study areas for a period of six (6) months. The fish samples were transported live in a 25 litre capacity plastic container to the Biology laboratory, Federal University Dutsin-ma for identification and examination.

Identification of C*larias gariepinus*

The fish were identified using the pictorial chart of Suleiman (2016) and description of Teugels *et al*. (1998).

Sexing of Experimental Fish

Sexing of sampled fish was done by physical observation of the urogenital papillae. Observation of the testes in male and ovaries in the female was confirmatory (Teugels *et al*., 1998).

Measurement of Experimental Fish

The standard length was measured with the aid of a measuring board, while the weight was measured using top loading sensitive weighing balance (GT4100 model) using standard methods described by Olatunde (1977).

Examination of Experimental fish for Intestinal Parasites

The sampled *Clarias gariepinus* were dissected to expose the alimentary canal. The alimentary canal was removed and sectioned into various parts; oesophagus and stomach, intestine and rectum. The gut was used for parasitic examination because this is where food is most abundant for the parasites. Each section was placed separately in Petri dishes containing 0.9% normal saline, slit longitudinally and examined for parasites under a dissecting microscope between x 10 and x 30 magnifications. The emergence of any worm was easily noticed by its wriggling movement in the saline solution under a microscope. Parasites found were counted, and thereafter fixed and preserved in 5% formalin. Representative parasites were stained overnight with weak solution of Erlich's haematoxylin.

Identification of Parasite

Parasites were identified using texts by Roberts (1978), Kabata (1985) and Paperna (1996).

Parasite Prevalence and Intensity Estimation

Prevalence of parasite infection

The prevalence of parasites infection was calculated using the model:

$$\text{Prevalence (\%)} = \frac{No\ of\ fish\ host\ infected\ x\ 100}{\text{Total no.of fish host examined}}$$ (Akinsanya *et al*., 2007)

Prevalence based on sex

The prevalence of parasites infection based on sex of fish was estimated using:

$$\text{Prevalence (\%)} = \frac{No.of\ a\ particular\ sex\ of\ fish\ infected\ x\ 100}{Total\ no.of\ particular\ sex\ of\ fish\ examined}$$ (Amos *et al*., 2018)

Intensity of Parasite

The intensity of parasites was estimated using model:

$$\text{Intensity} = \frac{\text{Total no.of parasite species in a sample of fish Examined}}{\text{No.of fish host infected}}$$ (Amos *et al*., 2018)

Data Analyses

Prevalence and intensity of infection were calculated using percentage (%) distribution. Length range frequencies in relation to prevalence within the samples were analysed. Parasites recovered were analysed using Chi-square test to determine the level of significant differences between the parameters of interests. Level of significance was set at $p \leq 0.05$.

RESULTS AND DISCUSSION

A total of 69 worms (cestodes and nematodes) were encountered in the gut of the catfish host, *C. gariepinus* resident in Jibia reservoir, Katsina. Researches have shown that helminths are normally found in all freshwater fishes, with their prevalence and intensity dependent on factors of parasite species and their biology, host and its feeding habits, physical factors and hygiene of the water body, and presence of intermediate hosts where necessary (Hussen *et al.*, 2012).

Out of the 100 *Clarias gariepinus* sampled, 45 were male and 55 were female. Female fish had a relatively higher number of infections 35 (63.63%) while the male fish recorded 25 (55.55%) as shown in Table 1. Though, statistical analysis showed that sex does not significantly influence ($p > 0.05$) parasitic prevalence, the relatively higher infection rate in most females than that of males is similar to the findings of Ratnabir *et al.* (2015) and Amos *et al.* (2018) who reported that female fish samples harbour more parasites compared male fish samples.

Table 1: Prevalence of intestinal helminth of *Clarias gariepinus* in relation to sex Jibia reservoir

SEX	No examined	No of infected	% of infection
Male	45	25	55.55
Female	55	35	63.63
Total	100	60	60.00

χ^2 (1, n = 100) = 0.169, p = 0.681

The level of parasitic occurrence in *Clarias gariepinus* sampled from Jibia reservoir varied, the parasite that had the highest occurrence was *Capilaria* sp. 19 (27.54%), followed by *Monobothrium* sp. 16 (23.18%). Some of the infected fishes had double infection and a total of 69 adult worms and larval were found in fishes investigated, out of which 69 *Camallanus* sp. 15 (27.74%), *Contracaecum* sp. 10 (14.49%), followed by larva *Miracidium* 9 (13.04%) as the least parasitic infection (Table 2).

Table 2: Prevalence of Intestinal helminth of *Clarias gariepinus* in relation of parasites in Jibia reservoir

Parasite	Rate of parasite infection	% of infection
Nematode		
Contracaecum sp.	10	14.49
Capillaria sp.	19	27.54
Camallanus sp.	15	27.74
Cestode		
Monobothrium sp.	16	23.18
Monobothrium larvae	9	13.04
TOTAL	69	(100)

In the sampled *Clarias gariepinus* obtained from Jibia reservoir, the intestine was the most infected 38 (55.07%) within the gut investigated, followed by the stomach with 31 (44.93%). Only cestodes and nematodes were found (Table 3).

Table 3: Prevalence of Intestinal helminth of *Clarias gariepinus* in relation to site of infestation in Jibia reservoir

Parasite	Site of infection	
	INTESTINE	STOMACH
Nematode		
Contracaecum sp.	6 (15.79)	4 (12.9)
Capilaria sp.	9 (23.68)	10 (32.36)
Camallanus sp.	9 (23.68)	6 (19.35)
Cestode		
Monobothrium sp.	10 (26.32)	6 (19.35)
Monobothrium larvae	4 (10.53)	5 (16.13)
TOTAL	38 (55.07)	31 (44.93)

χ^2 (4, n = 69) = 0.469, p = 0.832

Out of the 100 fish collected from three (3) sample locations from Jibia and examined, an overall prevalence of 60 (60.00%) was recorded (Table 4). Although statistical analysis showed that, sampling location did not differ significantly ($p > 0.05$) affect the prevalence of parasitic infection, *Clarias gariepinus* obtained from Station 3 apparently harboured the highest percentage (76.47%) of infection, followed by Station 2 (54.54%) while Station 1 sample location had apparently the least percentage (53.33%).

Table 4: Prevalence of Intestinal helminth of *Clarias gariepinus* in relation to sample location in Jibia reservoir

Locations	No examined	No of Infected	% of Infection
Station 1	33	16	48.48
Station 2	33	18	54.54
Station 3	34	26	76.47
TOTAL	100	60	60.00

χ^2 (4, n = 100) = 1.468, p = 0.480

Fish samples obtained from Jibia indicated that *C. gariepinus* within the length of 10.1 - 15.0 cm harboured more worms 25 (62.50%), followed by 15.1 - 20.0 cm 20 (66.66%), 20.1 - 25.0 cm had 11 (47.82%), 25.1 - 30.0 cm had 3 (20.00%) while those within the length of 30.1-35.0 cm had lesser worm burden 1(50.0%) (Table 5).

Table 5: Prevalence of Intestinal helminth of *Clarias gariepinus* in relation to length in Jibia reservoir

Fish length (cm)	No examined	No of Infected	% of Infection
10.0 - 15.0	40	25	62.50
15.1 - 20.0	30	20	66.66
20.1 - 25.0	23	11	47.82
25.1 - 30.0	5	3	20.00
30.1 - 35.0	2	1	50.00
TOTAL	100	60	60.0

χ^2 (4, n = 100) = 0.566, p = 0.967

Among 100 fish samples from Jibia showed that *C. gariepinus* within the weight of 10 - 20.9g harboured more intestinal parasite 20 (67.34%) followed by 21 - 50.9g 15 (43.73%), followed by 51 - 80.9g 10 (41.17%), 81 - 110.9g 10 (25.00%), while those within the weight of 111 - 140.9g had lesser worm burden 5 (62.50%). These apparent differences in prevalence however were not statistically influenced by fish weight (Table 6).

Table 6: Prevalence of Intestinal helminth of *Clarias gariepinus* in relation to weight in Jibia reservoir

Fish weight (g)	No examined	No of Infected	% of Infection
10 - 20.9	39	20	67.34
21 - 50.9	20	15	43.73
51 - 80.9	21	10	41.17
81 - 110.9	12	10	25.00
111 - 140.9	8	5	62.50
TOTAL	100	60	60.0

χ^2 (4, n = 100) = 1.718, p = 0.788

The current research exhibited that, the highest rate of parasites infestation in different fishes was recorded in small fishes. The possible reason for this could be that smaller fishes fed on less amounts of food hence gained less immunity compared to the larger fishes. This is in agreement with Shehata *et al.* (2018) who reported that smaller fish were more infected compared to larger probably due to their nature of acquired immunity with age. In contrast, the present study disagrees with findings of Ashade *et al.* (2013) who reported that bigger and therefore possibly mature fish have more parasites compared to small fish because they feed more on diverse food sources thereby exposing them to more parasitic infestation.

Condition factor is dependent on the length and weight of fishes. Generally, infestation has been attributed to the fact that the value of the condition factor is influenced by age of fish, sex, season, stage of maturation, fullness of gut, type of food consumed, amount of fat reserve and degree of muscular development (Amos *et al.,* 2018).

The outcome of this research shows that helminth parasites are prevalent in the *C. gariepinus* resident in Jibia reservoir. Effects of ecological state of affairs on parasites may be positive or negative, pollution may increase parasitism and on the other hand it may be deadly for certain parasite species leading to reduction in parasitism (Eissa *et al.,* 2014). Seasonality may also disturb parasite occurrence. Usually incidence of infection in freshwater fishes is higher in the dry season as the reduction/decrease in water capacity increased rate of contact of fish with parasites (Mikheev *et al.,* 2014).

CONCLUSION

The outcome of this research shows that helminth parasites are prevalent in the gut of *C. gariepinus* resident in Jibia reservoir. The helminth parasites recognised encompass 2 groups, namely; Nematoda and Cestoda. The nematodes *Contracaecum* sp., *Capillaria* sp., *Camallanus* sp. and the cestodes *Monobothrium* sp. and *Monobothrium* larvae were recovered. The findings of this study can serve as baseline parasitological information for future studies to protect and develop the ecological potential of Jibia reservoir.

Recommendation

Some of the parasites observed especially the cestode parasites isolated are zoonotic capable of inflicting serious public health infections in man, therefore, it is recommended that the gastro-intestinal tract of *Clarias gariepinus* harvested from Zobe reservoir should be discarded before the fish is consumed.

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