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Helminth Parasites of Two Freshwater Fishes (*Oreochromis niloticus* and *Clarias gariepinus*) in Jibia Earth Dam, Katsina State, Nigeria

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Abstract- Investigation on helminth parasitic fauna of two freshwater fishes *Oreochromis niloticus* and *Clarias gariepinus* was carried out from August 2016 to January 2017. A total of 242 fish samples comprising of 117 *Oreochromis niloticus* and 125 *Clarias gariepinus* of different weights and length groups were collected from Jibia earth dam, Katisina state, Nigeria and subjected to parasitological examination. The overall prevalence of infection recorded in the two fish species was 38.43%. *Clariasgariepinus* recorded the highest prevalence of infection of 46.40%. Helminth parasites recovered were mainly the trematode: Neascussp, nematodes: *Procamallanus laevionchus* and *Contracaecum* sp, cestodes: *Polyonchobothrium clarias*, *Bothriocephalus aegyptiacus* and *Proteocephalus glanduliger* and acanthocephalan: *Neoechinorhynchus rutili*. Helminthic infections were recorded in the skin, stomach and intestine though majority of infection was found in the intestine.

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Helminth Parasites of Two Freshwater Fishes (*Oreochromis niloticus* and *Clarias gariepinus*) in Jibia Earth Dam, Katsina State, Nigeria

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Abstract- Investigation on helminth parasitic fauna of two freshwater fishes *Oreochromis niloticus* and *Clarias gariepinus* was carried out from August 2016 to January 2017. A total of 242 fish samples comprising of 117 *Oreochromis niloticus* and 125 *Clarias gariepinus* of different weights and length groups were collected from Jibia earth dam, Katisina state, Nigeria and subjected to parasitological examination. The overall prevalence of infection recorded in the two fish species was 38.43%. *Clariasgariepinus* recorded the highest prevalence of infection of 46.40%. Helminth parasites recovered were mainly the trematode: Neascussp, nematodes: *Procamallanus laevionchus* and *Contracaecum* sp, cestodes: *Polyonchobothrium clarias*, *Bothriocephalus aegyptiacus*and *Proteocephalus glanduliger* and acanthocephalan: *Neoechinorhynchus rutili*. Helminthic infections were recorded in the skin, stomach and intestine though majority of infection was found in the intestine. The result showed that the prevalence of infection increased with increase in the hosts size (length and weight), and infection was independent of fish sex. Infection of the helminth parasites was more prevalent in the dry season than the rainy season. No significant difference in the percentage of parasitic infection in relation to the size, sexes and season ($p>0.05$) was recorded; however, significant difference ($p<0.05$) exist in infection rate between the two species examined. Most of the parasites were recovered from the intestine, with a few from skin and stomach, therefore, removal of these fish parts and thorough cooking of fish before consumption will ensure human safety.

Keywords: jibia, katsina, helminth parasites, oreochromis niloticus and clariasgariepinus.

I. Introduction

Due to higher biological value of fish (high protein retention, assimilation, low cholesterol content, and safety), it has continued to be important in the diet of humans in tropical Africa and different parts of the world (Akinsanya, 2015). Fish accounts for more than 40% of the protein diet of two-thirds of the global population (Bichi and Yelwa 2010). As population has grown, incomes have increased and nutritional benefits of fish have become better known, demand for fish has increased. In recent times, there has been a tremendous increase in the development of fish farming and culture due to increase need for animal protein. In Nigeria, there is an estimated 12.5mha of freshwater surface area of lakes, reservoirs and ponds which are capable of producing 521,000 metric tons of fish but these have not succeeded in attaining fish food sufficiency (Biu *et al*., 2014).

Parasite is an important group of pathogen causes infection and diseases of fish both in freshwater and marine environments (Chandra, 2006). Parasitic infection causes production and economic losses through direct fish mortality, reduction in fish growth, fecundity and increase in the susceptibility of fish to diseases (Salawu*et al*., 2013). Parasitic infestations are therefore becoming threats for fish health management and aquatic crop production (Chandra, 2006).

With the increasing interest in aquaculture, a considerable amount of information is available on helminth fauna of freshwater fishes. In Nigeria, most studies on fish parasites have been carried out in southern part; however, literature from the northern part is scanty. The present study was therefore undertaken to investigate the helminth parasites from two freshwater fish species, *Oreochromis niloticus* and *Clarias gariepinus* inhabiting Jibia earth dam of Katsina state, Nigeria.

II. Materials and Methods

a) Study Area

Jibia dam is located in Jibia local government area of Katsina state. Jibia lies between latitude 13° 05' N and 7° 13' E and longitude 13° 09' N and 7° 23' E. It has a total human population of 169,748 and total land mass of about 1,037km^2. The dam lies on the coordinates 13° 04' 18' N and 07° 15' 06' E. It has a height of 23.5m, a length of 3,660m and a total capacity of 142million m^3 (Figure 1).

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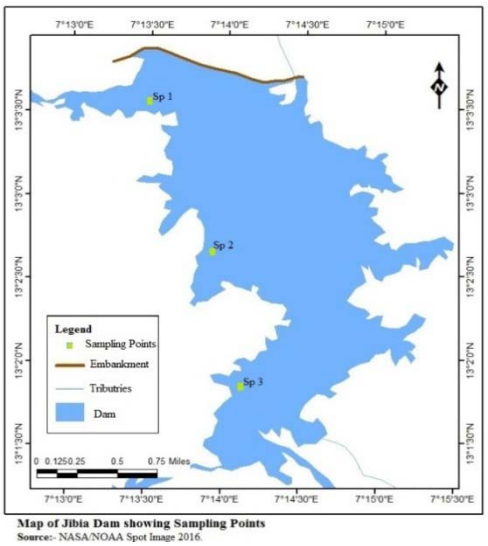

Map of Jibia Dam showing Sampling Points
Source:- NASA/NOAA Spot Image 2016.

Figure 1: Map of Jibia Dam showing the sampling Points

b) Samples Collection

From August 2016 to January 2017, a total of 242 randomly selected fishes comprising of 117 *Oreochromis niloticus* and 125 *Clarias gariepinus* of different weights and length groups were collected from three different sampling points with the assistant of local fishermen and examined. Sample collections were done in the morning between 06:00 to 08:00am. Water from the dam was added to the samples before being transported to the Biological science laboratory of Umaru Musa Yar'adua University Katsina in aerated plastic containers.

c) Morphometric Study

At the laboratory, the fishes were given serial number and then fish morphometric (measuring of weight and length) prior to dissection was done. Using transparent ruler, the total length of each fish was taken from the tip of the snout (with the mouth closed) to the extended tip of the caudal fin while the standard length was obtained by subtracting the length of the caudal fin from the total length and recorded to the nearest 0.5 centimetre (cm). After draining excess water, the weight (w) of the same fish was obtained to the nearest 0.1g using a weighing balance (Scout Pro SPU202). Sex determination of the fish species was done by visual examination of the anal opening for the presence of papilla just before the anal fin is indicative for a male species while the absence of the papilla indicates a female species. This was consequently confirmed by the presence or absence of testis or ovaries during dissection (Akinsanya, 2015).

d) Examination of fish for parasites

As examination progresses, dead fishes were removed and examined immediately while the live ones were kept in a plastic aquaria containing water from the dam, and examined subsequently. Lived fishes were killed by cervical dislocation to ease examination (Ajala and Fawole, 2014).

e) Ectoparasites

The entire external body surfaces of a freshly caught fish was thoroughly examined for ecto-parasites using hand lens. Mucous scrapings from dorsal part of the body of fish, lateral and tail ends were placed on clean glass slide, with a drop of saline added and were examined under x10 and x40 objective lenses of compound microscope. A small section of the affected body surfaces were cut and placed in aqueous formalin for 30 minutes. The mixture was shaken vigorously to dislodge relaxed helminthes. The operculum of fish was cut open with scissors and gills were exposed. Gill arches and gill filaments were placed in different Petri dishes containing normal saline and were observed with hand lens, dissecting and compound microscope for parasites (Biu*et* al., 2014; Okoye*et al*., 2014).

f) Endpoarasites

Fish samples were placed dorso-ventrally on dissecting board and fixed to prevent movement. The body cavity was opened with the aid of scissors and the mesentery and connective tissues, connecting loops of the gut and the liver were cut and the organs separated. The gut was then stretched out, placed in a large Petri dish and cut into four regions (oesophagus, stomach, intestine and duodenum). Each section was then placed in a separate labeled dish. The separated gut sections were opened by longitudinal incision to expose the inner surface which was washed with very little quantity of distilled water into labelled test tubes. A drop of the residue was placed on the slide, and observed under x10 and x40 objectives of dissecting microscope for the various parasites. This was repeated until the entire residue was examined (Bichi and Yelwa 2010; Ajala and Fawole, 2014).

g) Isolation and Identification of Helminth Parasites

Most of the parasites were recognized by their wriggling movement on emergence from their host. Parasites were picked with Pasteur pipette and forceps. Parasites obtained were counted, labeled with the serial number of the fish and placed in physiological saline overnight to allow them stretch and relax; they were then fixed and stained using acetocarmine and lactophenol. Identification of the isolated parasites to species level was done by comparing observed parasites using keys provided by Yamaguti, (1959 and 1961), Gibson, (1996) and Barson and Avenant-Oldewage, (2006)

h) Statistical Analysis

The relationships between factors such as length, weight, sex, species and season were obtained using Analysis of Variance (ANOVA). All statistical analysis were done using Graph Pad Instat Software, 2016. Values equal to or less than 0.05 ($p \leq 0.05$) were regarded as significant.

III. Result

Of 242 samples of both *O. niloticus* and *C. gariepinus* examined in the study area, 93(38.43%) were affected by different helminth parasites. Out of 125 *C. gariepinus* examined, 58(46.4%) were affected by the parasites. However, of the 117 *O. niloticus*, 35(29.91%) were affected by the helminth parasites and infection was found to be statistically significant ($p<0.05$) between the species examined. Worm burden was high in *C.gariepinus* with one hundred and fifty (150) helminth parasites isolated than *O. niloticus* with ninety one (91) isolated parasites in both single and mixed infections (Table 1). During the present study, three species of cestodes (*P.clarias*, *B.aegyptiacus* and *P.glanduliger*), two species of nematodes (*P.laevionchus* and *Contracaecum* sp) and one specie each of trematode (*Neascus*sp) and acanthocephalan (*N.rutili*) have been isolated. The parasites infected two fish organs (Intestine and stomach). *P.clarias*, *B.aegypticus* and *P.glanduliger* were found in the in the intestine of *C.gariepinus*. Larval stages of *Contracaecum* sp and *N.rutili* was found in the intestine of the both fish species whilst of *P.laevionchus* occurred either in the intestine or stomach region of *C.gariepinus* and only in the intestine of *O. niloticus*. (Table 2). Table 3 shows the prevalence of helminths in relation to sex of the two fish species. In this study, prevalence of infection was found to be independent of fish sexes and the differences obtained were not statistically significant ($p>0.05$). Infection was high in dry season than the rainy season in both fish species, but no seasonal variation in prevalence was observed between the two seasons ($p>0.05$) (Table 4). Relationship between host size (length and weight) and percentage of infection are shown in Table 5 and 6. Fish between the total length group of 22-25cm in *O. niloticus*and 35-39cm in *C.gariepinus*were more parasitized than fish of other length class (Tables 5). Infection was more pronounced in fish of the weight class 161-180g in both fish species examined (table 6), although association of host size and infections were not statistically significant in this study.

Table 1: Overall Percentage of Infection in the study areas

Host	No. Examined	No. Infected	Prev. (%)	Total No. of Parasites recovered	Intensity
O. niloticus	117	35	29.91	91	2.6
C. gariepinus	125	58	46.40	150	2.5
Total	242	93	38.43	241	2.59

Prev. = Prevalence

Table 2: Parasites Distribution in organs of *O. niloticus* and *C. gariepinus* in the study areas

	O. niloticus (N=117)		*C. gariepinus* N=125)		
Parasites	Skin/fin	Intestine	Skin/fin	Intestine	Stomach
Trematode					
*Neascus*sp	09(7.69%)		09(7.2%)	-	-
Cestode					
B. aegyptiacus		-	-	08(6.4%)	
P. clarias	-	-	-	11(8.8%)	-
P.glanduliger		-	-	05(9.6%)	-
Nematode					
P. laevionchus	-	17(14.53%)	-	19(15.2%)	05(4.0%)
*Contracaecum*sp	-	15(12.82%)	-	14(11.2%)	-
Acanthocephalan					
N. rutuli	-	07(5.98%)	-	06(4.8%)	-
Total	09(7.69%)	39(33.33%)	09(7.2%)	63(50.4%)	5(4.0%)

Table 3: Sex and infection of Helminth parasites in the study area

	O. niloticus			Host	*C. gariepinus*	
Sex	No. Examined	No. Infected	Prev. (%)	No. Examined	No. Infected	Prev. (%)
Male	51	19	37.35	73	33	45.21
Female	66	16	24.24	52	25	48.08

Prev. = Prevalence

Table 4: Seasonal occurrence of Helminth parasites in the study area

	O. niloticus			Host	*C. gariepinus*	
Season	No. Examined	No. Infected	Prev. (%)	No. Examined	No. Infected (%)	Prev.
Rainy	71	16	22.54	60	22	36.67
Dry	46	19	41.30	65	36	55.38

Prev. = Prevalence

Table 5: Relationship between total length and percentage of infection in *O. niloticus* and *C. gariepinus* in the study area

Length (cm)	*O. niloticus*			Host	*C. gariepinus*	
	No. Examined	No. Infected	Prev. (%)	No. Examined	No. Infected (%)	Prev.
10-13	05	-	-	-	-	-
14-17	56	15	25.	-	-	-
18-21	39	12	30.77	36	13	36.11
22-25	17	08	47.06	47	21	44.68
26-29	-	-	-	26	14	53.85
30-33	-	-	-	09	05	55.55
35-39	-	-	-	07	05	71.43

Prev. = Prevalence

Table 6: Relationship between weight and percentage of infection in *O. niloticus* and *C. gariepinus* in the study area

Weight (g)	*O. niloticus*			Host	*C. gariepinus*	
	No. Examined	No. Infected	Prev. (%)	No. Examined	No. Infected	Prev. (%)
41-60	13	02	15.38	22	08	36.36
61-80	24	05	20.83	35	15	42.86
81-100	39	11	28.21	26	12	46.15
101-120	29	09	31.03	17	08	47.06
121-140	10	07	70.0	19	11	57.89
141-160	01	-	-	04	02	50.0
161-180	01	01	100	02	02	100

Prev. = Prevalence

IV. Discussion

The overall prevalence of 38.43% observed in the present study was low particularly when compared to the 60.23% reported by Olofintoye (2006), 59.2% reported by Oyedinekeet *al*., (2010) and 56.4% reported by Amaechi, (2014). It was however high when compared with the 18.70% reported by Biu and Nkechi (2013) and 18.5% by Ogbeibuet *al*., 2014. It is worthy to note that infection rates vary from one region to another and that a number of factors like endemicity, availability of intermediate host, susceptibility of a definitive host, amongst others, determine to a large extent the rate of infection (Biu and Akorede, 2013). *C. gariepinus* had the highest prevalence of 46.40%. The highest prevalence of parasites in *C. gariepinus* may be due to several factors which include feeding habit and diet of fish, habitat, immuno - competence of the fish, as well as the

behavioral pattern of the fish (Eyo *et al*., 2014). Different helminth parasites belonging to different groups namely; two nematodes (*P. laevionchus* and) three cestodes (*P.clarias*, *B.aegyptiacus* and *P. glanduliger*) and one each of one trematode (*Neascus* sp) and acanthocephalan (*N. rutuli*) were observed in this study. The occurrence of these parasites in the study area was not surprising as they have been reported previously from the same species or related species elsewhere (Uruku and Adikwu, 2017). Majority of the parasites recovered were found in the intestine with very few in the stomach and skin/fin. The high prevalence recorded in the intestine in this study cannot be unconnected with the findings of Dan-kishiya *et al*., (2013) who reported higher number of parasites in the intestine than the stomach and attributed it to several factors among which, was the presence of digested food or due to the greater surface area presented by the intestine. Similarly, Bichi and Yelwa, (2010) also reported high prevalence of helminth parasites in the intestine than the stomach and argued that regional localization in the gut can be attributed to several factors, such as Hydrogen ion concentration, chemotactic response as well as food reserve. Nematodes were recovered from both the stomach and intestine, whereas the cestode and acanthocephalan showed preference for the intestine. This could be due to the fact that nematodes have relatively developed alimentary canal and could easily move around any area of the host alimentary canal to feed on digested and semi-digested food (Kawe *et al*., 2016).

In this study, infection was found to be independent of fish sexes. The high prevalence of parasitic infestation in males than the females *O. niloticus* in this study agrees with the reported work of Anosike *et al.,* (1992) and Oniye *et al.,* (2004) who reported high prevalence of infection in male fish than the female. The highest prevalence of male than female fishes observed in this study may be as a result of difference in reproductive investment by male and female fish, immuno -suppression by steroid hormone during spawning, competition for mate and cost of territorial defense (Eyo *et al*., 2014). Contrary to the aforementioned, the higher prevalence of infection obtained among female fishes of *C. gariepinus* agrees with the findings of Emere and Egbe (2006), Ayanda (2009) and Omeji *et al* (2011), who reported higher parasitic infection in female fishes and attributed it to the physiological state of the females, as most gravid females could have had reduced resistance to infection by parasites. In addition, their increased rate of food intake to meet their food requirements for the development of their egg might have exposed them to more contact with the parasites, which subsequently increased their chance of being infected. Variations obtained in parasitic infection among the sexes of fish studied were not significant ($P>0.05$) implying that higher infection rates in either the male or female were simply by chance (Biu and Akorede, 2013). The high prevalence of infection obtained in dry season in this study agrees with the report of Fawole and Akinsanya, (2010), but disagrees with the findings of Bichi and Bizi (2002). Seasonal variation in the occurrence of these parasites may be attributed to reduce in water volume, resulting in much contact between the parasites and fish, thus leading to a relatively higher prevalence in the dry season (Uruku and Adikwu, 2017). In relation to size (weight and length) it was observed in this study that the percentage infection increased with increasing size. Similar observations were reported by Ayanda (2009), Olurin and Samorin, (2006), Mohammed *et al*., 2009, and Oniye *et al*., 2004 that the longer and heavier the fish was, the greater the susceptibility to parasitic infection. This could be due to the fact that bigger fish cover wider areas in search of food than the smaller ones and as a result, they take in more food and this could expose them more to infestation by parasites.

V. Conclusion

In conclusion, the report would not have succeeded in identifying all the parasites that may likely be found on the studied fishes. It is therefore, recommended that follow up surveys on the lifecycle of the major parasites should be done at certain intervals in order to identify any change in the trends of possible fish parasites that could affect the fish populations. Some of the helminthes isolated are of zoonotic potential, thus, removal of the intestine and thorough cooking of fish will ensure humans safety even when they consume infected fish.

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