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OCCURRENCE OF HELMINTHS ON *CLARIAS GARIEPINUS* (AFRICAN CATFISH) CAUGHT IN SELECTED POINTS ALONG RIVER KADUNA, NIGERIA

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ABSTRACT
Fish is an important source of food and income to many developing countries, parasites usually affect the marketability of the commercially produced fish, thus raising public health concern especially in areas where raw or smoked fish is eaten. The study is aimed at assessing the prevalence of helminths in fish sold in selected catching point along river Kaduna. A total number of eighty [80] African Catfish were randomly purchased from fishermen along River Kaduna [Malali and Kabala Doki] on weekly basis from June – December, 2018.The samples were subjected to examination for helminth parasites using standard parasitological techniques. The result shows that out of eighty [80] examined, 15[35.0%] and 11[27.5%] were infected at Malali and Kabala Doki respectively. Larger fish weighed between 601-1000g had the highest prevalence 11[45.4%)] and 2[50%] in Malali and Kabala Doki respectively. The standard length ranges between 31-50cm from Malali and Kabala Doki had 5[50%] and 3[60%] prevalence respectively. Female sample have the highest prevalence in Malali 8[38.1%] and Kabala 7[31.8%].The helminth parasites recorded are cestode having two [2] different species [*Polyonchobothrium* sp. and *Bothriocephalus* sp.], others include *Paracamellamus* sp. [Nematode] and *Heterophase* sp. [Trematode]. Endoparasites recorded the highest number of parasite with stomach having [10] and small intestines [12] in Kabala and Malali area respectively. The statistical analysis showed no relationship between ecto and endo parasites infection. More helminth parasites were recovered from the intestine (17) than the gills and skin (03). Females were infected more with 31.8 and 38.1% than the males with 22.2 and 31.6% in Kabala Doki and Malali catching points respectively. Further research is recommended on a large scale to ascertain the level of damage on the histopathology of the tissues and organs of infected fish.

Keywords: Prevalence, Helminths, *Clarias gariepinus*, Malali, Kabala Doki, Kaduna.

INTRODUCTION

Fish is an important source of food and income to many people in developing countries [F A O, 2004]. In Nigeria fish provides rich sources of protein and the flesh of fish is readily digestible and utilizable by the human body, which make it suitable as complementary sources of protein in region of the world with high carbohydrates diet (FAO, 2006). Due to global population expansion, demand for high quality animal protein especially from aquatic source is on the increase. The aquaculture production is therefore needed to meet the high demand in the whole world, especially as the capture fisheries resources are declining due to over fishing, habitat destruction and pollution (Dunham *et al.,* 2001). Fish provides a comparatively cheap source of animal protein for man and his livestock and attention is now being focused on fish production, both from natural water and aquaculture (Coche *et al.,* 1994; Khalil & Polling1997; Komatsu and Kitanishi, 2015). It is highly priced in Nigeria either as smoked, dried or fresh.

In Nigeria the level of awareness of the impact of disease to aquaculture is lacking as revealed (Kolndadacha *et al.,* 2007). Parasitic diseases of fish are very common all over the world and are of particular importance in the tropics [Roberts *et al.,* 2009]. Some of these parasites have been discovered to have zoonotic potential, thereby making them of public health importance and may be highly pathogenic and contribute to high mortalities and economic loss, while in natural systems they may threaten the abundance and diversity of indigenous fish species (Mashego, 2001). Various parasites are associated with *C. gariepinus* in the wild and cultured environment causing morbidity, mortality and economic losses in aquaculture practice in various parts of the world (Subasinghe, 1995; Biu and Akorede, 2013). There is an increasing awareness of the importance of parasitic diseases as one of the major factors militating against fish farming (Paperna, 1996; Keremah, and Inko-Tariah, 2013).

Parasitic diseases of fish, many of which are free-living in the aquatic environment. Typically, no intermediate host is required by the parasite to complete its life cycle (direct). Consequently, they build up to very high numbers when fish are crowded commonly in culture systems, causing weight loss, debilitation, and mortality. The five most common groups of protozoans are ciliates, flagellates, myxozoans, microsporidians, and coccidians (Klinger and Francis-Floyd, 2002). The increased potential for infecting humans with a fish parasite is more common for endoparasites since tapeworms and roundworms can be passed to humans through consumption of undercooked or raw fish unlike ectoparasites (Hoffman, 1998). Examples of these groups of parasites are species of trematodes, cestodes, nematodes, and protozoans. There are two peak seasons of the disease, from March to June and then fall from September to October (Plumb, 1999). Fish is an important source of food and income to many people in developing countries (FAO, 2004). In Nigeria fish provides rich sources of protein and the flesh of fish is readily digestible and utilizable by the human body, which make it

suitable as complementary sources of protein in region of the world with high carbohydrates diet (FAO, 2006). Due to global population expansion, demand for high quality animal protein especially from aquatic source is on the increase. The aquaculture production is therefore needed to meet the high demand in the whole world, especially as the capture fisheries resources are declining due to over fishing, habitat destruction and pollution ([Dunham *et al.,* 2001). Fish provides a comparatively cheap source of animal protein for man and his livestock and attention is now being focused on fish production, both from natural water and aquaculture (Coche *et al.,* 1994; Khalil & Polling1997; Komatsu and Kitanishi 2015). It is highly priced in Nigeria either as smoked, dried or fresh.

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MATERIALS AND METHOD

Study Area

The research was carried out in Malali and Kabala Doki, along river Kaduna in Kaduna North LGA. Kaduna is located within the latitude of 10˚50′ and longitude of 7˚50′. The vegetation is of Sudan Savannah, characterized by scattered short trees, shrubs and grasses. The soil is mostly loamy to sandy type and a substantial amount of clay is also found. It covers a land of 46,053km^2 with a population estimated at 6,113,505 million people (NPC, 2006).

Sample Collection/ Experimental Design

Eighty [80] fish sample of *Clarias gariepinus* of different size were purchased from local fishermen in two selected catching points along River Kaduna [Malali and Kabala Doki] and transported using 25 litres plastic container with water of the river to the Post Graduate Laboratory, Department of Biological Sciences, Kaduna State University, Kaduna. The fish samples were purchase in batches for four [4] months from July – October 2018, in the morning from 7 to 10am every day to avoid stress due to temperature change (Adebisi, 1981).

Sample Identification

The identification of the fishes was done based on the external factors as described by (Idodo-Umeh, 2003). Total length was taken from the tips of the snout to the extreme end of the caudal fin and standard length from the tips of the snout to the end of caudal peduncles using ruler calibrated in centimeter [cm]. Fish samples were weighed to the nearest gram using electric weighing balance and the sexes of the fishes were identified by visual examination of the urogenital system.

Dissection and Examination for Parasite

The fishes were immobilized by cervical dislocation for easy handling prior to dissection on a dissecting board. The fishes were dissected through the abdomen by making a longitudinal slit on the ventral surface from the anus to the pectoral fins level using a surgical blade.

Ectoparasites Examination

The gills and skins of the fish were screened in the laboratory for ectoparasites, pathological examination, skin ulcer and lesion using hand lens. Skin smear was made with scalpel blade as described by (Emere and Egbe, 2006]. The scalped samples of mucus together with the tissues were placed on the Petri-dish containing 3mls of 0.9% saline solution and stirred using a mounted pin (Emere and Egbe, 2006). Three drops of the aliquot were placed on a clean slide and covered with a cover slip prior to examination under 10× and 40× objectives of the compound microscope. Gills examination was achieved in a similar way using anatomical needle according to (Emere and Egbe, 2006).

Endoparasites Examination

The stomach and intestine of the fish were cut open with a sterile pair of scissors and surgical blade to expose the organs; content of the organs was washed into the Petri-dish containing 3mls of saline solution. 3 drops of the mixture were placed on the slide and covered with cover slip and mounted under compound microscope for endoparasites observation.

Identification of Parasites

The content of each section was examined for parasites under a dissecting microscope. Parasites found were counted, fixed and preserved in 10% formalin and identified (Frimeth, 1994).

RESULTS

Out of the eighty fish samples examined in Kabala Doki and Malali, forty each from the catching points gave 27.5 and 35.0% respectively indicating the prevalence of parasites in the samples (Table 1).

Table 1: Prevalence of helminths associated with African catfish caught at Kabala Doki and Malali along River Kaduna, Kaduna.

Location	Number examined	Number infected	Prevalence (%)
Kabala Doki	40	11	27.5
Malali	40	14	35.0
Total	80	25	

In relation to weight of fish, those with weight range of between 600- 1000g tend to have higher parasites load as compared to those with lower weight of 200 – 400g 45.5 &25.0% and 22.2 &37.5% respectively (Table 2).

Table 2: Incidence of helminths in relation to weight of African catfish caught at Kabala Doki and Malali along River Kaduna

Weight range(g)	Locations			
	Kabala Doki		Malali	
	No Examined	No Infected (%)	No Examined	No Infected (%)
200 – 400	09	2 (22.2)	09	2 (22.2)
401 – 600	15	4 (26.7)	16	6 (37.5)
601 -800	12	3 (25)	11	5 (45.5)
801 – 1000	04	2 (50)	04	1 (25)
Total	40	11	40	14

There is a relationship between the sizes of the fish samples and the prevalence of the helminthes parasites, the bigger the fish the more parasites recovered. In Kabala Doki, those within the size range of 30 - 40cm had 27% while that from Malali had 50%, indicating increase in size with increase in number of the parasites recovered (Table 3).

Table 3: Incidence of helminths in relation to size variation of African Catfish caught in Kabala Doki and Malali along River Kaduna.

Standard length range (cm)	Locations			
	Kabala Doki		Malali	
	No examined	No infected (%)	No examined	No infected (%)
20 – 30	24	5 (20.8)	28	9 (32.1)
31 – 40	11	3 (27.3)	10	5 (50.0)
41 – 50	05	3 (60.0)	02	0 (00.0)
Total	40	11	40	14

The helminthes parasites recovered in relation to gender among the fish samples showed little differences with the female having more of the parasites compared to the male in both the catching points (Table 4).

Table 4: Incidence of helminths parasites in relation to gender of African catfish caught in Kabala Doki and Malali along River Kaduna

Gender	Locations			
	Kabala Doki		Malali	
	Number of fish examined	Number of Fish Infected (%)	Number of Fish examined	Number of Fish infected (%)
Male	18	4 (22.2)	19	6 (31.6)
Female	22	7 (31.8)	21	8 (38.1)
Total	40	11	40	14

The different species recovered from the fish samples were of the classes Cestoidea, Trematoda, and Nematoda(Table 5).

Table 5: Parasites species recovered in African catfish caught in Kabala Doki and Malali along river Kaduna and their classes.

Parasites	Class of Parasites
Bothriocephalus sp.	Cestoda
Heterophyse sp.	Trematoda
Paracamellanus sp.	Nematoda
Polyonchonthrium sp.	Cestoda

Table 6: The number of parasites in relation to affected organs of African catfish caught in Kabala Doki and Malali along River Kaduna.

Parasites	Organs			
	Skin	Gills	Small intestine	Stomach
Bothriocephalus sp.	0	0	6	4
Heterophyse sp.	3	0	0	0
Paracamellanus sp.	0	0	11	0
Polyonchonthrium sp.	0	0	0	13
Total	3	0	17	17

DISCUSSION

The result of the research shows that the overall assessment of helminth parasites associated with African Catfish in River Kaduna (31.25%) (Table 1) which is contrary to other researchers in Nigeria such as Zakari (2007), (Dan-kishiya *et al*., 2013) in Gwagwalada. Dan-kishiya, Oboh and Usman (2013) recorded a prevalence rate of 59.8%; Salawu *et al.,* (A2013) reported a prevalence rate of 75%; Onwuliri and Mgbemena (1987) reported a prevalence of 63.0% in wild population of *C. gariepinus* and 59.8% in cultured *C. gariepinus* in Jos, Plateau State. This indicate that the environment (River Kaduna) was not favourable to the helminthes parasites as previous reports showed that helminths are generally found in all freshwater fishes, with their prevalence and intensity dependent on factors of parasite species, their biology, host and its feeding habits, physical factors and hygiene of the water body, and presence of intermediate hosts where necessary (Chandra, 2006;. Martinez-Aquino, and Anguillar- Anguillar, 2008; Doreen *et al.,* 2009; Shukerova *et al.,* 2010; Hussen *et al.,* 2012).

Table (2) shows that bigger fishes were observed to have higher rate of parasites than the smaller ones, which could be due to the fact that bigger fishes cover wider areas in search of food than the smaller ones and as a result, they take in more food than the smaller ones and this could expose them more to infestation by parasites. It may also be due to the larger surface areas of their bodies which provided enough spaces for the parasites. This result goes in line with the reported works of (Omeji *et al*., 2010) at Benue State who reported higher rate of protozoan parasites in bigger C. *gariepinus* and *Heterobranchus longifilis* than the smaller ones and (Anosike *et al*. 1992) in River Kaduna, also reported higher rate of protozoan parasites in bigger *Synodontis* and *Clarias* than the smaller ones.

Fish samples with higher size variation (Table 3) recorded significantly higher helminths prevalence compared to smaller size variation in both catching points. This result agrees with (Akinsanya et al., 2007) work in Lekki lagoon, Lagos, that the low level of immunity in the smaller sized fish could explain the high prevalence of helminthosis, but contradicts work in Asa dam Ilorin and (Olurin and Samorin, 2006) work in Owa stream who observed that the longer the fish, the greater the susceptibility to parasite infection, as adult fish consumes a great variety of foods and exhibit a great variety of feeding styles, hence the correlation of prevalence of parasitic infections with fish length which in turn corresponds to fish age (Richard, 2008; [Hussen *et al.,* 2012).

An increase in size is a reflection of increase in length and weight, which is hereby considered as a measure of age. Therefore, the juvenile fish had no parasite compare to the sub-adults and adults that had higher prevalence as infestation increased with age of fish. This was attributed to change in diet from weeds, seeds, phyto- and zooplanktons as juveniles to insect larvae, snails, crustaceans, worms and fishes as adult is attained (Anosike *et al.,* 1992).

In this study, table (4) shows that more females were infected than male in both the catching areas (Kabala Doki and Malali). However, there are inconsistent explanations in literature as regards the relationship between sex and prevalence, indicating a positive correlation and others showing the converse as reviewed by (Olurin *et al.,* 2012). Nonetheless, (Emere, 2000) reported differences in the incidence of infestation between male and female fish, and attested it to differential feeding either by quantity or quality of food eaten, or as a result of different degrees of resistance or infection. (Emere and Egbe 2006) Also reported that, due to the physiological state of the female, most gravid females could have reduced resistance to infection by parasites.

Table (4) shows that three (3) groups of helminth parasites identified which comprised, Nematoda, Cestoda and Trematoda. The nematodes, *Procamallanus laevionchus,* the cestode, *Polyonchobothrium clariae* and *Bothriocephalus* sp., and the trematodes *Heterophyidae* sp. were recovered. This is in conformity with other researchers in Nigeria such as (Dan-kishiya and Zakari, 2007) who identified the Cestoda, Nematoda and Trematoda, in wild *C. gariepinus* in Gwagwalada, Abuja. (Salawu *et al.,* 2013) Recorded the nematode *Procamallanus laevionchus* and the cestode *Polyonchobothrium* sp. in the digestive tracts of *Clarias gariepinus* from Ogun River and Asejire Dam in south-west Nigeria. (Aliyu and Solomon, 2012) Also reported the nematode *Procamallanus laevionchus* and the cestode *Polyonchobothrium clariae* in *C. gariepinus* from lower Usman Dam, Abuja. (Yakubu *et al.,* 2002) Found *C. gariepinus* infected by *Procamallanus laevionchus* in River Uke, Plateau State.

The helminth parasites recovered in the present study, cestodes showed maximum prevalence recovered from intestine (Table 6), and these results agreed with the results obtained by (Biu and Akorede, 2013) and (Eyo *et al.,* 2012) who reported that the high infection of *C. gariepinus* by cestode parasites could be due to the ingestion of eggs, copepods and mollusks which serve as intermediate hosts of the larval stages of the cestodes. The rate of parasites infestation on gills of *Clarias gariepinus* in River Kaduna was observed to be low 3(3.75%) which is in contrast with the work of (Emere, and Egbe, (2006) that reported prevalence of 12.17% in River Kaduna.

Table (7) shows that small intestine and stomach are the preference regions of attachment of helminth parasites which agrees with the earlier work of (Goselle *et al.,* 2008) and few others who showed that helminths have preference for region of attachment in the alimentary canal of fish. The distribution of gastrointestinal helminth parasites in the fishes showed a clear preference for the intestine and stomach as sites of attachment which could be attributed to the availability of food in these regions. The highest prevalence of parasites in the intestine implies that it is a more preferred predilection site; this could be due to the favourable conditions that enhance their survival (Owolabi, 2008). Similar finding was reported by (Auta*, et al.,* 1999; Emere, 2000; Aliyu and Solomon. 2012).

Conclusion

The prevalence of 7.5 and 35.0% of helminth parasites were recorded in the present study. Variation in prevalence of helminth parasites in relation to sizes was shown among the fish measuring 20- 30, 31 – 40, 41 – 50cm. Bigger fishes showing 27.3 and 50.0% than the smaller ones 20.8 and 32.1% respectively. More helminth parasites were recovered from the intestine and stomach (17) than the gills and skin (03). Females were infected more with 31.8 and 38.1% than the males with 22.2 and 31.6% in Kabala Doki and Malali respectively in both catching points. Further research is recommended on a large scale to ascertain the present findings. Histopathological studies of the tissues and organs of infected fish is recommended.

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