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Incidence of Parasites of *Clarias gariepinus* (Burchell, 1822) Caught from Lake Alau, Maiduguri, Borno State, Nigeria

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ABSTRACT
The incidence of parasites of *Clarias gariepinus* from Lake Alau was investigated in this study. The incidence and intensity of infection of endoparasites based on the sex of *Clarias gariepinus* revealed that of out the one hundred (100) samples of *Clarias gariepinus* examined, 31% were infected, with females having a lower incidence rate of 27.5% than the male with 38.7% ($p \leq 0.05$).The incidence of endoparasites in relation to the total length of *Clarias gariepinus*. revealed that length groups of 32.5 - 36.4 and 36.5 – 40.4 cm had a significantly ($p \leq 0.05$) higher incidence of 60.9% and 66.7% compared with length groups of 24.5 – 28.4 and 28.5 – 32.4 cm with 21.2% and 23.1% respectively, the length group of 20.5-24.4cm had an incidence of 0%. The incidence of endoparasites in relation to the body weight of *Clarias gariepinus* revealed that weight groups of 331-380 and 381-430 grams had a significantly ($p \leq 0.05$) higher incidence rates of 70%, and 100% compared with other body weight groups considered. The incidence of endoparasites in relation to the standard length of *Clarias gariepinus* revealed that standard length groups of 33.5 – 35.4, 29.5 – 31.4 and 31.5 – 33.4 cm had a significantly ($p \leq 0.05$) higher incidence of 60.0%, 61.5% and 75.9% compared with other standard length groups considered. The incidence of endoparasites in relation to their taxonomic group revealed a higher incidence for *Cestoda* (58.1%) compared with *Nematoda* (22.6%) and *Trematoda* (19.4%) ($p \leq 0.05$). The incidence rates of haemoparasites and endoparasites based on their species revealed that haemoparasites were *Hemogregarina* with 61%, *Babesiosoma* with 9.7% and *Trypanosoma* with 3.2% ($p \leq 0.05$). The cestode *Diphyllobothrium* had an incidence of 25.8%, the nematode *Contracaecum* had 25.8% and the trematode *Crepidostomum* had 9.7% ($p \leq 0.05$). In conclusion, *Clarias gariepinus* from Lake Alau are afflicted by several parasites that are of economic importance.

Keywords: Incidence, Endoparasites, *Clarias gariepinus*, Lake Alau, Maiduguri, Nigeria

INTRODUCTION

Fish as cheap and important source of protein do contains lipids, minerals, oils and vitamins. The most common fish available in Nigeria are the catfish species of *Clarias gariepinus* and *Clarias angularis.* The sharp mouth catfish, *Clarias gariepinus* (Burchell, 1822) is widely distributed in Africa (Skelton, 2001; Barson, 2004) occurring mainly in quiet waters, lakes and pools but may also occur in fast flowing rivers (Ayanda, 2009). It is highly priced in Nigeria either as smoked, dried or fresh (Imam and Dewu, 2010), and are an excellent species for aquaculture and biological research (Hoffman and Prinsloo, 1996).

In most parts of the world, fish production is mainly from the wild. As the world's population grows, fish resources are being depleted at an increasing rate as a result of environmental degradation, over

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harvesting, and water pollution; thus fish production could no longer meet the demand the of stakeholders in aquaculture. This industry has also been plagued by the problem of overcrowding, poor environmental conditions and pollution which often results in reduced immunity of fish and higher susceptibility to parasites and diseases (Murray, 2005; Al-Murjan and Abdullahi, 2008). Various parasites are associated with *Clarias gariepinus* in the wild and cultured environment where they cause morbidity, mortality and economic losses in aquaculture practice in various parts of the world (Olofintoye, 2006).

In Africa, a checklist of helminth parasites of freshwater fishes has been published by Edema *et al.*, (2008) and various reports also exist from different countries of Africa, highlighting on intensities, prevalence, epidemiology and pathology of such parasitic infections. According to Hussein *et al*. (2012), the *Clarias*harbor majority of the infections which include the adult *Digenea* infecting different tissues of the body; trematodemetacercaria of the family *Clinostomidae* encysting in tissues; and adult *Monogenea* of the families *Pousopothocotylidae*, *Dactylogyridae* and *Gyrodactylidae* infecting the gills and skin. However, another report by Edema *et al*. (2008) recorded that *Clarias* infections with adult trematodes were rare. According to him, the adults and larvae of cestodes, nematodes and acanthocephalans occur in the intestine. There is also an appreciable documentation of parasite fauna of *Clarias gariepinus* in Nigeria. One of the earliest reports in Nigerian inland waters concerning fish parasites was that of Olurin and Somorin, (2006) preliminary information on the parasites in the Kanji reservoir. They observed that not many fishes were infected. However, in a similar study by Allumma and Idowu (2011) in Maiduguri, Nigeria heavy parasitic infection of fish species was observed.

Borno State has water bodies and most of the population is involved in fish production. So with the information that parasites affect fish production, it is important to know the prevalence of these parasites. Thus, this study was designed to determine the incidence of ecto, endo and haemo parasitic infections of *Clarias gariepinus* obtained from Lake Alau in Maiduguri, Nigeria.

MATERIALS AND METHODS

Study area

The lake Alau was created by damming river Ngadda about 22 km from Maiduguri along Bama road. It is located between latitude 13^{o}N and 14^{o}N and longitude 12^{o}E and 13^{o}E with a total surface area of 56 km^{2} located in the North east zone. The climate is Sahelian with two (2) distinct seasons, a rainy season with mean annual rainfall of about 600mm from July to October. Lake Alau has maximum depth of 10m with an effective storage capacity of 54,000 ha. Very low temperature ranging from 26^{0}C-29^{0}C occurs during the cold harmattan period while very high temperatures ranging from 46^{0}C-48^{0}C occurs during the dry harmattan period (Chad Basin Development Authority, CBDA, 1984).

Field sampling

A total of 100 fish specimen caught by fishermen from the lake Alau were used in this study between January and March, 2013. Sampling was carried out on the main landing site and fish were transported to the Faculty of Veterinary Medicine, Parasitology Laboratory, University of Maiduguri, for identification and examination.

Identification of *Clarias gariepinus*

The experimental fish were identified as described by Teugels, (1986). They have an elongated body, a soft rayed dorsal fin extending to or nearly to the caudal fin base, a soft rayed anal fin extending from just behind the anus to the caudal base, pectoral fins each with a serrated anterior bony spine, head depressed, covered largely by firmly sutured, surface sculptured bony plates forming a protective helmet, four pairs of flagellate barbells (nasals, maxillaries, inner and outer mandibular), air breathing organs derived from the 2nd and 4thepibranchialis within a super branchial chamber.

Sexing of fish

Sexing of fish was done by physical observation of the urogenital papillae. It is long or distended in male while in the female it is round and reddish in the matured ones. Also visual observation of the gonads in male and ovaries in the female is confirmatory (Imam and Dewu, 2010).

Measurement of fish

The standard length was measured with a meter rule while the weight was measured using top loading sensitive weighing balance (Model: Mettler Toledo).

Examination of samples for ectoparasites

The external surface (skin and fins) was placed under a light microscope for examination. Gills were cut out and placed into separate Petri dishes and observed with hand lens for parasites. Parasites were collected and fixed in buffered formalin for further processing and specimen identification (Paperna, 1996).

Examination of samples for endoparasites

The fish 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 was most abundant for the parasites. Each section was placed into Petri dishes containing 0.9% normal saline. The emergence of any worm was easily noticed by its wriggling movement in the saline solution under a microscope. Some of the worms attached to the walls were carefully removed with the aid of forceps or needle and cleansed with buffered formalin. Cestodes and trematodes were stained with borax carmine, and nematodes cleared overnight with lactophenol, and examined under a light microscope (Teugels, 1986; Paperna, 1996).

Examination of samples for haemoparasites

Blood samples were collected by cutting the veins close to the head and taking thin blood impression smears on a glass slide, air dried and stained with Giemsa for 1 hour, rinsed with buffer solution 7.2, air dried and examined for blood parasites at × 100 magnification of the light microscope.

Statistical analyses

Data obtained were expressed as simple percentile incidence (%) and intensity of infection expressed as the percentage of infected fish divided by 100.Variation among sex, weight, and length based incidence rates were determined using analysis of variance (ANOVA). Values equal to or less than 0.05 ($p \leq 0.05$) were regarded as significant (Graph Pad Instat Software, 2003).

RESULTS

Table 1 shows the incidence and intensity of infection of endoparasites based on the sex of *Clarias gariepinus* Out of one hundred (100) samples of *Clarias gariepinus* examined, 31 were infected with female having a lower incidence rate of 27.5% than the male with 38.7% ($p \leq 0.05$).Table 2 shows the incidence of endoparasites in relation to the total length of *Clarias gariepinus.* Incidence rates of 66.7%, 60.9%, 23.1% and 21.2% were observed in the total length groups of 36.5-40.4, 32.5-36.4, 28.5-32.4 and 24.5-28.4 cm respectively, the total length group of 20.5-24.4 cm had an incidence of 0% ($p \leq 0.05$).

Table 1: Incidence and intensity of infection of endoparasites based on the sex of *C. gariepinus*

Sex	No. of examined	No. infected	Parasite burden	Intensity of infection
Male	31	12(38.7)	12	0.39
Female	69	19(27.5)	22	0.28
Total	100	31(31.0)	34	0.31

Table 2: Incidence and intensity of endoparasites based on the total length of *C. gariepinus*

Total length (cm)	No. of fish examined	No. infected	Total No. of parasites	Intensity of infection
20.5-24.4	12	0	0	0.0
24.5-28.4	33	7(21.2)	8	0.21
28.5-32.4	26	6(23.1)	6	0.23
32.5-36.4	23	14(60.9)	15	0.61
36.5-40.4	06	4(66.7)	5	0.67

Table 3 shows the incidence of endoparasites in relation to body weight of *Clarias gariepinus*. Incidence rates of 100%, 70%, 50%, 36.4%, 15.8%, 5.9% and 11.5% were observed in weight groups of 381-430, 331-380, 281-330, 231-280, 131-180, 181-230 and 81-130 grams respectively ($p \leq 0.05$).

Table 4 shows the incidence of endoparasites in relation to standard length of *Clarias gariepinus*. Incidence rates of 75.0%, 61.5%, 60.0%, 34.8%, 31.0%, 20.0%, 20.0% and 15.2% were observed in the standard length groups 31.5 - 33.4, 29.5 - 31.4, 33.5 - 35.4, 27.5 - 29.4, 25.5 - 27.4, 23.5 - 25.4 and 21.5-23.4 cm respectively. The standard length group of 19.5 - 21.4 cm had 0% incidence.

Table 5 shows the incidence of endoparasites in relation to their taxonomic group. A higher incidence was recorded in Cestoda (58.1%) compared with Nematoda (22.6%) and Trematoda (19.4%) ($p \leq 0.05$).

Table 6 shows the incidence rates of haemoparasites and endoparasites isolated. Haemoparasites were *Hemogregarina* with 61%, *Babesiosoma* with 9.7% and *Trypanosoma* with 3.2% ($p<0.05$). The cestode *Diphyllobothrium* had an incidence of 25.8%, the nematode *Contracaecum* had 25.8% and the trematode *Crepidostomum* had 9.7% ($p \leq 0.05$).

Table 3: Incidence and intensity of endoparasites based on the weight of *C. gariepinus*

Body weight	No. of fish examined	No. of fish infected	Total No. parasites	Intensity of infection
81-130	26	3(11.5)	3	0.12
131-180	19	3(15.8)	4	0.16
181-230	17	1(5.9)	1	0.59
231-280	22	8(36.4)	8	0.36
281-330	14	7(50.0)	7	0.50
331-380	10	7(70.0)	9	0.70
381-430	2	2(100.0)	2	1.0

Table 4: Incidence and intensity of infection of endoparasites based on the standard length of *C. gariepinus*

Standard length(cm)	No. of fish examined (%)	No. of fish infected	Total No. of parasites	Intensity of infection
19.5-21.4	2	0	0	0.0
21.5-23.4	33	5(15.2)	6	0.15
23.5-25.4	10	2(20.0)	2	0.20
25.5-27.4	10	2(20.0)	2	0.20
27.5-29.4	23	8(34.8)	8	0.35
29.5-31.4	13	8(61.5)	8	0.62
31.5-33.4	4	3(75.0)	4	0.75
33.5-35.4	5	3(60.0)	4	0.60

Table 5: Frequency distribution of endoparasites of *C. gariepinus*

Parasite taxa group	No. of fish examined (%)	Total No. of parasites	Location in the fish
Cestoda	18(58.1)	19	intestine
Nematoda	7(22.6)	9	intestine
Trematoda	6(19.4)	6	intestine

Table 6: Species – wise incidence of parasites of *C. gariepinus*

Parasites isolated	No (%) of fish infected
Haemoparasites:	
Hemogregarina	19(61.3)[a]
Babesiosoma	03(9.7)[b]
Trypanosoma	01(3.2)[c]
Cestoda:	
Diphyllobothrium	08(25.8)[d]
Nematoda:	
Contracaecum (larvae)	08(25.8)[e]
Trematoda:	
Crepidostomum	03(9.7)[f]

Column values with different superscripts are statistically significant at $p < 0.05$. **Note**: Blood and intestinal samples were examined for each fish.

DISCUSSION

In this study one hundred (100) samples of *Clarias gariepinus* were examined for parasites out of which 31% were infected. This finding though different from those by Hussen *et al*. (2012), of 34.70% in wild population of *Clarias gariepinus*, and Oniye *et al*. (2004) of 19.17%, reaffirms infection in catfish. Females also had a significantly ($p<0.05$) lower incidence rate of 27.5% than the male with 38.7%. This contradicts Hassan *et al*. (2010), who reported an insignificant difference in infection rates between male and female of *Clarias gariepinus.* However, Emere, (2000), reported difference in the incidence of infestation between male and female fish which may be due to differential feeding either by quality or quantity of food eaten or as a result of different degrees of resistance and infection. Emere and Egbe, (2006), also reported that due to physiological status of female fish, most gravid females could have reduced resistance to infection by parasites.

This study also revealed that the intensity and incidence of infection increased with increasing length, size, and weight of *Clarias gariepinus.* These findings are similar with the findings of Robert (2000), Mohammed *et al*. (2009), Bichi and Dawaki (2010) and Allumma and Idowu, (2011) who stated that these parameters are synonymous to age, and that the higher infection rate in adults than young may be because of longer duration of time the older fish were exposed to the agents in the environment. This increases their chances of acquiring the parasites with time. Robert (2000), reported that longer fish provides greater surface area for infection than smaller fishes, while Bichi and Dawaki (2010), also reported increase in the abundance of parasites with host size, and Mohammed *et al*. (2009), reported that prevalence was found to increase as the fish grows and could be attributed to the longer time of exposure to the environment by body size.

In this study, three classes of helminthes namely *Cestoda* (58.1 %,) *Nematoda* (22.6%) and *Trematoda* (19.4%) ($p<0.05$) were isolated. This could result to huge losses in fish productivity as cestodes and nematodes are reported to interfere with the absorption of nutrients in the intestine of fish and may reduce food intake. The metabolites produced by some of these parasites could adversely affect vital systems of the fish (Bichi and Yelwa, 2010).

In conclusion parasitic infection of fishes could be prevented by separating infected fishes from the healthy ones and treating them. Awareness should be given on methods of avoiding overcrowding, eliminating intermediate or definitive host of the parasites through occasional surveillance and treatment. With the increase in aquaculture, it is also essential to have facilities and sources for diagnosis, and treatment of fish diseases generally in Northern Nigeria.

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