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Prevalence of Ecto-parasites in African catfish (*Clarias gariepinus*, Burchell, 1822) from Lumi Fish Farm Gezawa LGA, Kano State, Nigeria

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Abstract
Artisanal fishermen and fish farmers in Nigeria's inland and coastal waterways are concerned about parasitism of fish and fisheries. This worry stems from parasite-induced financial losses and adverse health effects that show up as low fish productivity, low marketability of captured fish, decreased protein availability, and fewer job opportunities as a result of prospective investors' lack of interest in aquaculture. Additionally, parasites can result in physiological harm including immunomodulation, cell proliferation, destructive behavioural reactions, altered growth, and reproductive damage, as well as mechanical harm such the fusion of gill lamellae and tissue replacement. To ascertain the prevalence of fish ectoparasites of Clarias gariepinus and the risk factors associated with them, the current study

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was conducted from April to June 2024 at Lumi fish farm in Gezawa LGA, Kano State, Nigeria. Ninety fish samples in all were taken from Lumi Fish Farm and analysed. The samples were divided by sex and identified before being sent live to the Federal University Dutsin-Ma, Katsina State Fish Biology Laboratory for further analysis. There were 31 male and 59 female fish samples among the 90 samples obtained from Lumi Fish Farm. Fish parasites isolated and shown to be prevalent in Clarias gariepinus collected from Lumi fish farm include Gyrodactylus spp. 1 (5.89%) and Tricodina spp. 16 (9411%). In conclusion, parasites of economic significance invaded Clarias gariepinus from Lumi fish farm. The results imply that the parasite infections that have been identified may have a negative impact on Clarias gariepinus and, if left unchecked, may spread to humans who eat the fish. Therefore, it is advised that residents around the reservoir refrain from engaging in activities that might increase the parasite burden. Additionally, in order to prevent zoonotic infections, Instead of being eaten, the fish organs that are removed from the study area should be discarded.

Keywords: *Clarias gariepinus*, Ectoparasite, Infections, Lumi fish farm, Prevalence**.**

INTRODUCTION

The most readily available and reasonably priced source of animal protein for the typical Nigerian family has been fish (Liverpool-Tasie *et al*., 2021). According to Abdel-Gaber *et al*. (2015), a variety of adult helminth nematodes, acathocephalans, and aspidogastreans infected fish from freshwater environments in Africa. Additionally, the invasion of parasites limits fish farmers by causing large fry and fingerling mortality, especially in culture systems (Abdel-Gaber *et al*., 2015).

In addition to affecting commercially valuable populations, parasites have the potential to cause changes in fish species numbers and size composition. Ectoparasites reside on the exterior of the host, on the surfaces of the gills, mouth, skin, and fins (Bula *et al*., 2023). Fish are mostly externally parasitised by protozoa, crustaceans, and monogenic trematodes (Overstreet, 2021). Crustaceans belong to the phylum Arthropoda, which also includes insects, arachnids, and many other species. All arthropods have segmented bodies, jointed limbs, and hard exoskeletons or shells. Crustaceans are a broad category. Crabs, lobsters, crayfish, prawns, krill, barnacles, copepods, ostracods, and other free-living, parasitic, or sedentary creatures are among the more than 45,000 species of the subphylum crustacean that are known to exist. Copepods are prevalent among them. In fact, free-living larval stages of many parasitic species constitute a component of the food chain (Williams & Bunkley-Williams, 2019). The majority of freshwater parasite crustaceans are visible to the unaided eye because they adhere to their host's gills, body, and fins. Aquarium and pond fish frequently have copepods or small crustaceans as parasites on their gills, which show up as white patches. The fish dies from anoxia once its gills get clogged (Pleizier and Brauner, 2024). Branchiura, Copepoda, and Isopoda are the three primary categories of parasitic crustaceans that impact commercially significant aquaculture species; the majority of these parasites are external (Gelan and Kebede, 2023). Compared to copepods, branchuria and isopod parasites are comparatively bigger in both sexes (Boxshall and Hayes, 2019). There are several parasitic crustaceans that live in fresh, brackish, and salt water all around the planet (Klimpel *et al*., 2019).

In the tropics, fish parasite infections are especially significant. A common survival strategy for parasites is to coexist in balance with their host (Overstreet, 2021). However, parasite infections may spread quickly and cause significant mortality in situations where hosts are overcrowded, like in fish farms or aquariums (Imran *et al*., 2021). It happens when human activity and intervention affect the environment, such as pollution, which changes the natural distribution of their parasite populations, even if this is often not the case in wild natural aquatic habitats (Sures *et al*., 2023).

The main objectives of this research were to isolate, identify, classify and to determine the parasitic infection and prevalence of ecto-parasites in African catfish (*Clarias gariepinus*) in Lumi fish farm Gezawa LGA, Kano state, Nigeria.

MATERIALS AND METHODS

Study area

The Local Government Area of Gezawa is located in Kano State, Nigeria. The geographic coordinates of Gezawa Local Government are between 12.22°N and 12.33°S and between 10.00°N and 10.00°E. The administrative hub of the Gezawa Local Government Area is the town of Gezawa. Its population was 282,069, and its area is 340 km², according to the 2006 census (Shawai *et al*., 2017).

Sample collection and identification of (*Clarias gariepinus*)

Fish samples were gathered over the course of three months from the chosen research location. The fish samples were taken from three separate Lumi fish farm Reservoir catch units. And for three months, eighteen fish were randomly selected every two weeks. A plastic container filled with water was used to transfer the live fish samples to the Fisheries laboratory at Federal University Dutsin-ma, Katsina State, for identification and analysis.

Identification of samples

Immediately on the field, fish were identified using the freshwater fish identification guide by Olaosebikan and Raji (2013).

Sexing of experimental fish

The sexes of the fish were determined by physical examination of the exterior features of the fish samples (urogenital system), with the male having an expanded and projecting genital papilla and the female having a circular opening papilla (Ahmed *et al*., 2021).

Measurement of experimental fish

Standard methods outlined by Ramos *et al*. (2023) were used to measure the weight using a top loading sensitive weighing balance and the standard length (cm) using a metre rule.

Examination of samples for Ecto-parasites

The external surface (skin and fins) was examined using a light microscope. After being taken out, the gills were placed in different petri dishes and examined for parasites using a hand lens. Parasites were gathered and preserved in buffered formalin so that they could be identified and processed further.

Parasite Prevalence and Intensity Estimation

Prevalence of parasite infection

The prevalence of parasites infection was calculated using the model (Akinsanya *et al*., 2008).

$$\text{Prevalence } (\%) = \frac{No\ of\ fish\ host\ infectedx100}{\text{Total no.of fish host Examined}} \quad -1$$

Prevalence Based on Sex

The prevalence of parasites infection based on sex of fish was estimated using (Goselle *et al.*, 2008)

Prevalence (%) $=\frac{No.of\ a\ particular\ sex\ of\ fish\ infected\ \ x\ 100}{Total\ no.of\ particular\ sex\ of\ fish\ examined}$ -2

Intensity of Parasite

The intensity of parasites was estimated using model (Goselle *et al.,* 2008)

Intensity = $\frac{Total\ no.of\ parasite\ species\ in\ a\ sample\ of\ fish\ Examined}{\text{No.of fish host infected}}$ -3

Data Analysis

Prevalence and intensity of infection was calculated using simple percentage (%). Length range frequencies in relation to prevalence within the samples analysed. The dependence of infection on sex statistically determined using chi-square analysis and T-test.

RESULTS

Table 1: Prevalence of Ecto-parasites in Relation to the ponds

PONDS	Number examined	Number Infected	Prevalence (%)
A	30	6	20.00
B	30	4	13.34
C	30	2	6.66
Total	**90**	**12**	**13.34**

Table 2: Prevalence of Ecto-parasites in Relative to Sexes

Sex	Number examined	Number infected	Prevalence (%)
Male	31	3	9.68
Female	59	9	15.26
Total	**90**	**12**	**13.34**

Table 3: Prevalence of Ecto-parasites in relation to Texa of Parasites

Parasites	Texa group	No of parasites	Prevalence (%)
Trichodina spp	Protozoans	16	94.11
Gyrodactylus spp	Monogeans	1	5.89
Total		**17**	**100%**

Table 4: Prevalence of Ecto-parasites in sites of infections

Parasites	Skin	Gills	Fins
Trichodina spp	6 (35.30%)	9(84.00)	1
Gyrodactylus Spp	0	1(5.88)	0
Total	**6 (35.30%)**	**10 (58.82%)**	**1(5.88)**

Table 5. Prevalence of Ecto-parasites in Comparison to Length of Fish

Fish length (cm)	Number examined	Number Infected	Prevalence (%)
10-15.0	22	2	9.09
16-20.0	22	3	13.64
21-30.0	22	2	9.09
26-30.0	24	5	20.84
Total	**90**	**12**	**13.34**

Table 6. Prevalence of Ecto-parasites in relation Weight

Fish Weight (grams)	Number examined	Number Infected	Prevalence (%)
10-30	18	1	5.55
41.60	15	1	6.66
60-80	14	2	14.28
101-140	13	4	30.76
141-200	30	4	13.33
Total	**90**	**12**	**13.34**

DISCUSSION

The total incidence of 12 (13.34%) was recorded among the 90 experimental samples obtained and examined from three (3) distinct ponds at Lumi Fish Farm Gezawa LGA, Kano state, Nigeria. The studied samples from Pond C had the lowest percentage of infestation 2 (6.66%), but *Clarias gariepinus* from Pond A had the comparatively highest amount of parasitic fauna (20.00%) among the experimental samples taken from the three ponds followed by the Pond B (13.34%). Out of the 90 experimental fishes that were acquired from Lumi Fish Farm in Gezawa LGA, 31 were male and 59 were female. The rate of infection in the male African catfish sample fish was 3 (9.68%), whereas the rate in the female sample fish was a somewhat higher 9 (15.26%). Gezawa LGA's Lumi fish farm provided some of the African catfish used in the trial. The tested fishes under inspection had a total of 17 parasite worms, with Gyrodactylus species accounting for 1 (5.89%) and Trichodina species for 16 (94.11%), which is the largest parasitic infection. Out of 90 sample from Lumi fish farm Gezawa LGA were infected with *Trichodina spp* and *Gyrodactylus spp* on the skin, gills and fins. *Trichodina spp* infested 6 samples in the skin, 9 samples in the gills and 1 sample in the fins while *Gyrodactylus spp* infected 1 (5.88) .

Experimental samples of fish obtained from Lumi fish farm Gezawa LGA indicated that African catfish with a length of 26-30.0cm harboured more parasites 5 (20.84%), followed by 16-20.0cm 3 (13.64), followed by 21-30.0cm 2 (9.09), and lastly followed by 10-15.0cm 2 (9.09). Experimental fish samples gotten in from Lumi fish farm Gezawa LGA showed that African catfish with a weight of 141-200g harboured more worms 4 (13.33%) shadowed by 101-140g 4 worms (30.76%), followed by 60-80g 2 (14.28%), followed by 41-80g 1 (6.66) and then finally shadowed by the lesser ones 10-30g 1 (5.55%).

The fishes' vulnerability to parasite invasion is noteworthy. Fish species, the type of water they live in, and specific water quality indicators like dissolved oxygen concentration, elevated organic matter content, etc. all influence this observation. Additionally, unfavourable ecological conditions make fish more susceptible (Nababa *et al*., 2023). According to Nababa *et al*. (2023), the relationship between biotic and abiotic elements dictates how parasitism varies in various aquatic habitats. In good environmental conditions, fish species seldom ever get ill or infected. The resistance of fish to infection and parasite establishment may be altered by abiotic variables like warmer water. Poor environmental circumstances can affect the occurrence of parasites, as demonstrated by Sadauki *et al*. (2023). Because of their varied reactions to such anthropogenic pollution, parasites have drawn more attention from parasite ecologists as biological markers of environmental contamination brought on by human activity (Mehana *et al*., 2020). The survey's findings showed that the ectoparasites found in this Bagrus bayad from Zobe reservoir, Dutsin-Ma, Katsina, Nigeria, were protozoans and monogeans. Trichodina species are protozoans, while Gyrodactylus species are monogeans. These results show that three research sample areas contain the parasite protozoan Trichodina species. According to the previously cited data, Trichodina species have been found in fish raised in enclosures, fishponds, and natural waterways in Nigeria, Kenya, Uganda, and Ethiopia (Sadauki *et al*., 2023b; Bako and Sadauki, 2024). Fish may be vulnerable to the simple spread of parasites between invertebrates and fish intermediate hosts due to their habits. Monogeneans are host and size specific across their range and have a direct life cycle without intermediary hosts (Sadauki *et al*., 2023b). According to Sadauki *et al*. (2023b), monogeneans may be alive on their fish's (host) skin, scales, fins, lip folds, nases, branchiostegal tissues, and gills. The total incidence of fish parasites in the current study was found to be 23.15%. This result contradicts a prior research that found a 50.92% prevalence rate in the Dutsin-Ma region. The overall prevalence of external parasites in this investigation was found to be 23.15%. Notably, the two most important ecto-parasitic worms found in these results were *Trichodina spp*. (68.00%) and *Gyrodactylus spp*. (32.00%). The results of Areda *et al*. (2019) and Sadauki *et al*. (2023b) also support this discovery. They found that the greatest prevalence rates of *Trichodina spp*. in cultivated systems were found in Yemlo and Wonji fish ponds, with prevalence rates of 56.67% and 46.70%, respectively. Moreover, a similar prevalence of 34.6% for Trichodina species was reported in Uganda (Mitiku *et al*., 2018).

CONCLUSION

Protozoans, as well as monogeanes, were detected to be the highly predominant categories of parasites in fish species *B. bayad* as well as the inspection revealed that Protozoans helminth had a larger load than monogeans. Fish weight and length were shown to be related to the occurrence of parasitic worm invasion, with larger and heavier fish showing the highest susceptibility to helminthic infection. Environmental factors, such as how farmers dispose of their waste and excrement, were also linked to the prevalence of parasitic worms in the Zobe reservoir. Based on the findings of this study, it is recommended that fish aquaculturists in the Lumi fish farm region take steps to prevent the discharge of faeces and garbage into the farm. This might be accomplished by establishing suitable waste management policies and procedures. To reduce the impact of these parasites on fish, particularly those reared in culture ponds, and increase production, effective control methods and excellent cooking techniques should be implemented. To prevent the spread of zoonotic illnesses like Cryptosporidium spp., catfish should be properly cooked before ingestion. Finally, more research is required to determine the efficacy of various treatment approaches for tracking helminthic infections in fish populations on the farm and in other comparable aquatic environments.

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