CONFERENCE PROCEEDINGS, JANUARY 2025
Published by the Faculty of Science (FSC), FULafia
Print ISSN: 2354–3388 Online ISSN: 2315–7275 DOI: https://doi.org/10.62050/fscp2024.625

Gastro-intestinal Parasites of Some Cultured and Wild Fish Species in the Southern Part of Nasarawa State Nigeria

P. O. Aimankhu[1]*, E. D. Wordu[1], J. I. Maikenti[1], A. Ombugadu[1], H. O. Ahmed[1], S. A. Odey[1], S. O. Ayuba[1], A. A. Aliyu[1], M. A. Ashigar[1], V. A. Adejoh[1], V. A. Pam[1] & I. C. J. Omalu[2]
[1]Department of Zoology, Federal University of Lafia, Nasarawa State, Nigeria
[2]Department of Animal Biology, Federal University of Technology, Minna, Niger State, Nigeria
✉oseghaleaimankhu@gmail.com

Abstract: The ever-growing demand for animal protein to address the rising malnutrition indices of developing nations has led to the flourishing of the fishery and aquaculture industry. But the safety of these processed fish species which come from both wild and cultured sources has been of interest to researches for some time. A comparative assessment of the gastro-intestinal parasites of cultured and wild species of *Clarias gariepinus* and *Oreochromis niloticus* was therefore carried out in the Southern part of Nasarawa State. Microscopic examination of the guts of 90 fishes, comprising 60 *C. gariepinus* and 30 *O. niloticus* revealed the presence of helminths (cestodes, nematodes and trematodes), algae and some insect larvae. A total of 17 (18.88%) of *C. gariepinus* and 8 (8.88%) of *O. niloticus* were infected with gastro-intestinal parasites, giving an overall prevalence of 27.77%. Cultured *C. gariepinus* and *O. niloticus* were less infected with parasites than wild species with a statistical significance of P = 0.0034 in this relationship. Also, *C. gariepinus* were found to be more infected with parasites than *O. niloticus*. Different species of algae were found in *O. niloticus* while various stages of insect larvae were found in *C. gariepinus* only; an indication of their feeding habit and the niche they occupy in the aquatic ecosystem. *Trichinella* specie was found in some of the *C. gariepinus* examined, emphasizing its carnivorous tendencies.

Keywords: Comparative assessment, *Clarias gariepinus*, gastrointestinal parasites, malnutrition, *Oreochromis niloticus*

Introduction

Animal protein is considered to be complete source of protein because it contains all the essential amino acids needed for healthy growth and general survival of man, and fish is one source of this protein [1]. Insufficient intake of protein could lead to malnutrition especially in children and pregnant women [2]. Fish is therefore important in the diet of different countries especially in underdeveloped and developing nations where malnutrition is a major problem.

The natural environment of fish serves as a recipient to agricultural, domestic and industrial effluents and drainage, causing pollution in the water bodies which exposes fishes to danger of being infected by parasites. Similarly in the cultured environment, factors such as poor water quality, overstocking, irregular feeding, nutrient deficiency in feed, bushy and unhygienic pond environment and rough handling of fishes can promote infections and diseases in farmed fishes. Protozoans, cestodes, trematodes and monogenetic flukes are common parasites of fish which also promote secondary infection by other pathogens such as viruses, bacteria and fungi [3, 4]. They could affect fish in the wild and cultured environments. It is therefore important that the quality of fish for consumption should be put into consideration as some fish parasites have zoonotic potential, thereby making them of public health significance [5].

Although Fish is one of the richest and affordable alternatives to animal protein, consumption of parasite infested ones would be counter-productive. This study therefore provides a list of common gastro intestinal parasites associated with the most commonly consumed fish species in Nigeria; *Clarias gariepinus* (Cat fish) and *Oreohromis niloticus (Tilapia)* through a comparative assessment of parasitic infestation.

Materials and Methods

Study location

This study was carried out in five local government areas (Toto, Awe, Doma, Obi and Nasarawa) in Nasarawa State. Nasarawa State is located in the North Central region of Nigeria with a land area of 27,137.8 square kilometres. It shares borders with Kaduna State to the North, the Federal Capital Territory Abuja to the West, Plateau and Taraba States to the East and Benue and Kogi States to the South (Figure 1).

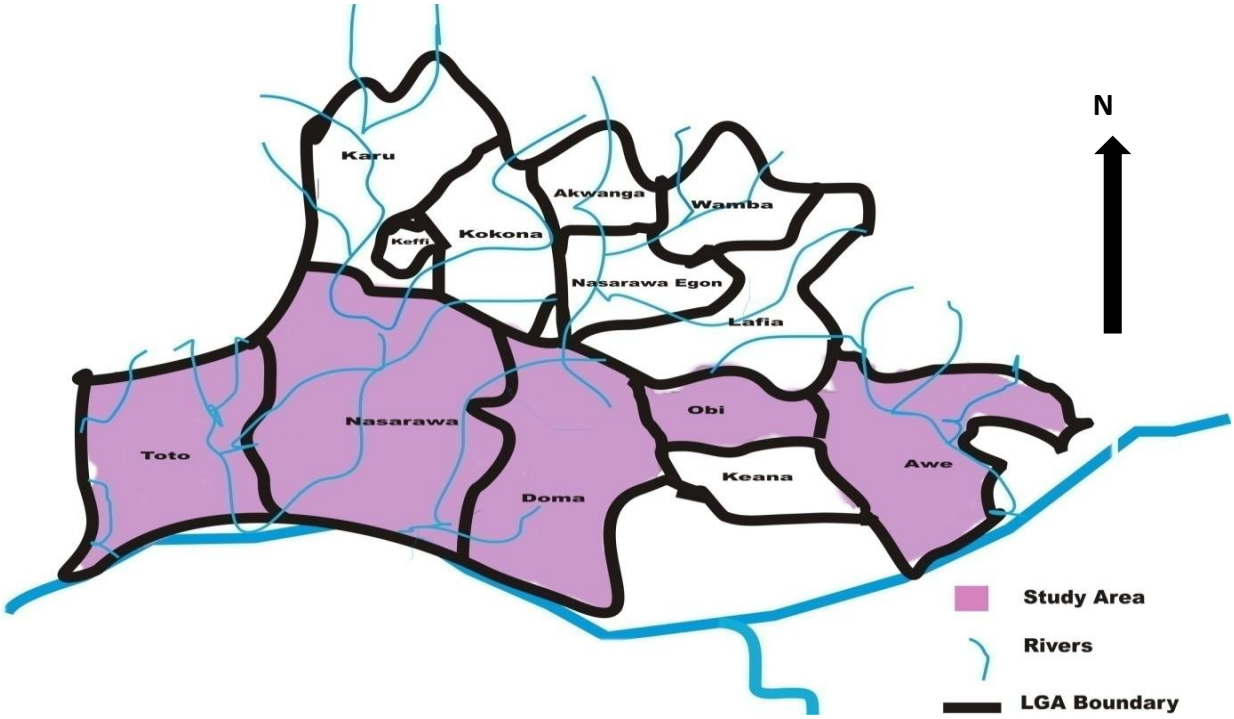

Figure 1: Map of Nasarawa State showing the study area

Sample collection

A purposeful sampling technique was adopted in the study. Wild fish samples were purchased from fish vendors and fishermen at landing sites, while the cultured fish samples were purchased from fish farms in the respective locations. Fish samples were collected from river Shafa Abakpa in Toto LGA, river Tunga in Awe LGA, Doma dam in Doma LGA and other fish landing sites in Obi and Nasarawa LGAs respectively; while the cultured fish were collected from selected fish farms in the respective LGAs between July and September, 2017. A total of 90 fish samples of *C. gariepinus* and *O. niloticus* were collected, transported in a 20-litre plastic container with water to Department of Zoology Laboratory, Federal University Lafia for dissection and microscopic examination of the gut content. Lengths and weight of fish samples were obtained using metre rule and Adam digital weighing balance (Adam equipment's Number: 17250) respectively.

Data analysis

Data obtained were expressed in simple percentages and analyzed using R Console software (Version 3.2.2). Proportions of gastrointestinal parasitic infestation between fish species, habitats and weight of fish were compared using Pearson's Chi-square test. The P-values < 0.05 were considered statistically significant.

Results and Discussion

Comparative assessment of parasitic infestation between wild and cultured *Clarias gariepinus* and *Oreochromis niloticus*

The overall prevalence of gastro-intestinal parasites of the sampled fish was 27.77%. The result showed that wild *C. gariepinus* and *O. niloticus* had the highest load of gastro-intestinal parasites at 53.51% and 42.7% respectively than cultured *C. gariepinus* (3.78%) and *O. niloticus* (0%). The parasites obtained were predominantly nematodes (20.2%), trematodes (16.1%), cestodes (60.6%) in *C. gariepinus* and algae (86.3) in *O. niloticus* as presented in Table 1.

Table 1: Distribution of parasites according to fish species and habitat

Fish species	No. of fish sampled	No. of fish infected	Parasites Observed					Total No. of parasites (%)
			Nematodes	Trematodes	Cestodes	Algae	Insect Larva	
Wild *C. gariepinus*	30	12(13.3)	20 (20.2)	16 (16.1)	60 (60.6)	0 (0)	3 (3.0)	99 (53.51)
Cultured *C. gariepinus*	30	5 (5.55)	2 (28.6)	0 (0)	5 (71.4)	0 (0)	0 (0)	7 (3.78)
Wild *O. niloticus*	15	8 (8.88)	8 (10.1)	0 (0)	2 (2.5)	69(86.3)	0 (0)	79 (42.70)
Cultured *O. niloticus*	15	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0.00)
Total	**90**	**25**						**185**

(χ^2= 13.644, df = 3, P=0.0034)

In *C. gariepinus*, the infection rate of the different parasites was in the order: cestode > nematode > trematode. This corresponds with the result of other researchers [6-8] who had the same result, but is in contrast with Yakubu *et al*. [9] who reported the highest infection rate by nematodes. On the other hand, wild *O. niloticus* had algae as the dominant parasite with the highest infection rate (86.3%), followed by nematodes (10.1%); there was no trematode seen. Cultured *C. gariepinus* also had the same type of parasites infecting them like those from the wild. However, there was no case of trematode infection in them as well. Cestodes and nematode occurred in both fish species. Cestodes were the dominant parasites (60.6%) in *C. gariepinus*, while algae (86.3%) were more dominant in *O. niloticus*.

The type of parasites seen in the guts of the sampled fish could be attributed to the feeding habit of the fish species or the niche they occupy in the aquatic ecosystem. Algae were found only in *O. niloticus*, (could be attributed to its vegetarian feeding habit) while the insect larvae were found in *C. gariepinus*; this may either be due to the larva being used as bait or the omnivorous feeding habit of *C. gariepinus*.

Furthermore, there was a statistically significant difference (P = 0.0034) between samples from the two habitats (environments); *C. gariepinus* from the wild had higher prevalence (13.3%) than the cultured (5.6%), while *O. niloticus* had a higher prevalence for the wild (8.9%) than cultured samples (0%). This was in agreement with the findings of Babiker [10] who reported that there was higher parasitic infestation in the wild than the cultured environment. According to Williams and Jones [11], the distribution of parasites varies from one habitat to another as a result of both biotic and abiotic factors. The low prevalence recorded from the cultured environment possibly suggests that there is a high pond maintenance practice and proper fish stocking ratio in the different fish farms.

Assessment of parasitic infection according to fish species

Clarias gariepinus was found to be more infected with parasites (18.9%), compared to *Oreochromis niloticus* (8.9) as shown in (Table 2).

Statistical analysis of the data shows that there was no statistical difference in the rate of gastro-intestinal infection between the two fish species (P = 0.057). The lack of variation possibly suggests that parasites do not have preference for a particular fish species.

Table 2: Assessment of parasite load among fish species

Fish species	No. of examined fish (%)	No. of infected fish (%)
Clarias gariepinus	60 (66.66%)	17 (18.9%)
Oreochromis niloticus	30 (33.33%)	8 (8.9%)
Total	**90**	

(χ^2 =3.597, df = 1, P = 0.057)

Table 3: Comparing load of parasitic infection in relation to weight in *Oreochromis niloticus*

Weight range	No. of fishes examined	No. of fishes infected (%)
40 – 80	18	4 (13.33)
81 – 120	5	-
121 – 160	3	-
161 – 200	2	2 (6.66)
201 – 240	2	2(6.66)
Total	**30**	**8**

(χ^2= 23.331, df = 4, P=0.00011)

Table 4: Comparing load of parasitic infection in relation to weight in *Clarias gariepinus*

Weight range	No. of fishes examined	No. of fishes infected (%)
50 – 100	14	7 (11.66)
101 – 150	15	1 (1.66)
151 – 200	17	4 (6.66)
201 – 250	5	2 (3.33)
251 – 300	5	2 (3.33)
301 – 350	4	1 (1.66)
Total	**60**	**17**

(χ^2= 15.799, df = 5, P=0.007)

Parasitic infection in relation to weight of fish species

The result showed that younger *O. niloticus* (40 – 80 g) were more infected with parasites (13.33%) than older ones (161 – 240 g) at 13.33% and 6.66% respectively as shown in Table 3. There was also a statistical significance (P=0.00011) in the infection rate in relation to weight of the fish.

This was however not different from that observed in *C. gariepinus* (Table 4) which showed a statistical significance (P=0.007) in the level of parasitic infestation between smaller and older species.

The fact that the prevalence of gastro-intestinal parasites in relation to weight for the two fish species show a statistical significance suggests that there is a preference of weight or size by parasites; which is in agreement with the findings of Balogun and Solomon [12] and Kawe *et al*. [13] who reported respectively that lighter fishes were more infected. However, this was in disagreement with the findings of Biu *et al*. [6] and Oniye *et al*. [14] who recorded that lighter *C. gariepinus* had less infection while heavier ones had more infection. This could be attributed to their change of diet from seeds, phyto and zoo planktons to insect larvae, snails, crustaceans and small fishes which could be intermediate hosts to these parasites.

Conclusion

Fish parasites bring about reduced nutritional value, zoonosis and economic losses to farmers not only through mortality but also from treatment of diseases, growth reduction during and after outbreak of disease. The presence of gastro-intestinal parasites in fish which remains a cheap alternative to animal protein and also a preferred delicacy for many Nigerian homes therefore signals that man could be at risk of infection after consumption of parasite infested fish.

The result obtained from this research show that gastro-intestinal parasites can infect any fish species as they do not have preference for a particular one. Furthermore, gastro-intestinal parasitic infection though higher in the wild, also infect fishes in the cultured environment. Therefore, fish for consumption must be well processed to eliminate these parasites and prevent public health concerns like Echinostomiasis.

There were a lot of parasites that could not be identified during this study. Due to the high cost of molecular analysis, it is recommended that a data bank of all parasites (including photographs and morphological features) discovered by researchers should be documented by all institutions of higher learning for easy access by young scholars.

Conflict of interest: We wish to state that there was no conflict of interest in carrying out this research. All citations are duly acknowledged in the references.

Acknowledgements: The authors wish to acknowledge the support of the Department of Zoology and the immense contribution from the laboratory staff, especially Mr Dogo Kajibia for his assistance through this research. Also appreciated is Prof. E. Omudu and Dr (Mrs) Akumbo of Benue State University, Makurdi and Prof. Okunsebor of Nasarawa State University Keffi for materials to assist in identification of the parasites

References

[1] Brown, M. R. D. (2016). Animal versus Plant Protein – What's the Difference? *Authority Nutrition*. An evidence-based approach. Accessed June 23, 2017 from https://authoritynutrition.com

[2] Yaqub, H. B. (1997). Earthworm and maggot meal as potential fish meal replacement. *Marine Fisheries Research Division*. Accessed December 10, 2016 from https://www.oceandocs.org/bitstreamm/1834/11268/1/paper1feed.pdf

[3] Murray, A. G. (2005). A Framework for understanding the potential for emerging diseases in aquaculture. *Prev. Vet. Med.* 67, 223-235.

[4] Bolorunduro, P. I. (2013). Prevention and Control of common diseases of fish in ponds. National Agricultural Extension and research liaison services Ahmadu Bello University, Zaria. *West Afr. Agric. Produc. Progr. (WAAP)*. Extension Bulletin No. 169, Fisheries Series, No. 9.

[5] Emere, M. C. & Egbe, N. E. L. (2006). Protozoan parasites of *Syndontisclarias* (a Freshwater Fish in River Kaduna). *BEST J.*, 3(3), 58-64.

[6] Biu, A. A., Diyaware, M. T., Yakaka, W. & Rita, D. J. (2014). Incidence of parasites of *C. gariepinus* (Burchell 1822) caught in Lake Alau, Maiduguri, Borno State, Nigeria. *Nig. J. of Fisheries and Aquac.*, 2(1), 74-80.

[7] Anosike, J. C., Omoregie, E., Ofojekwu, P. C. & Nweke, I. E. (1992). A survey of helminth parasites of *C. gariepinus* in Plateau State, Nigeria. *Journal of Aquatic Science*, 7, 39-43.

[8] Paperna, I. (1996). Parasites, Infections and Diseases of Fishes in Africa. *CIFA Technical paper, No.* 31, Food and Agriculture Organization, Rome.

[9] Yakubu, D. P., Omoregie, E., Wade, J. W. & Faringoro, D. U. (2002). Comparative study of gut helminths of *Tilapia zilli* and *C. gariepinus* from river Uke, Plateau State, Nigeria. *J. Aquatic Sci.*, 17(2), 137 – 139.

[10] Babiker, A. O. (2013). Comparative assessment of parasitic infestation of Tilapia and Clarias under natural and cultured environments in Khartoum State. Dissertation submitted in fulfillment of requirement for the Degree of Master of Science in Fish Technology. Sudan University of Science and Techn., College of Graduate Studies. *Sustainable Repository.* Accessed December 10, 2016, from https://repositorysustech.edu/handle/123456787/7209

[11] Williams, H. & Jones, A. (1994). Parasitic worms of fish. Taylor and Francis Bristol, UK, p. 593.

[12] Balogun, O. & Solomon, J. R. (2015). Prevalence of Endo parasitic infection of *C. gariepinus* fed chicken droppings. *African Journal of Environment, Pollution and Health*, 11, 26-33.

[13] Kawe, S. M., God's Power, R. O., Balarabe, M. R. & Akamiru, R. I. (2016). Prevalence of gastro-intestinal helminth parasites of *Clariasgariepinus* in Abuja, Nigeria. *Sokoto Journal of Veterinary Sciences*, 14(2).

[14] Oniye, S. J., Adebote, D. A. & Ayanda, O. I. (2014). Helminth parasites of *C. gariepinus* in Zaria, Nigeria. *Journal of Aquatic Sciences*, 19(2), 71-75.

Gallery of Some Parasites Found in the Study

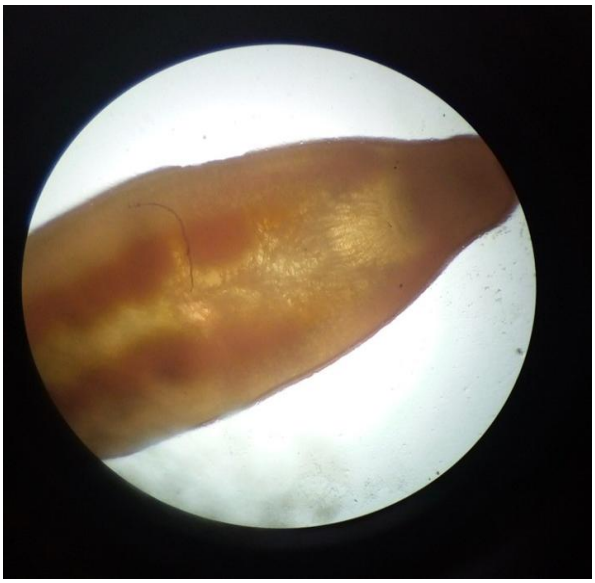

Plate 1: *Echinostoma* spp. (Trematode)

Plate 2: Juvenile *Camallanus* spp. (Nematode)

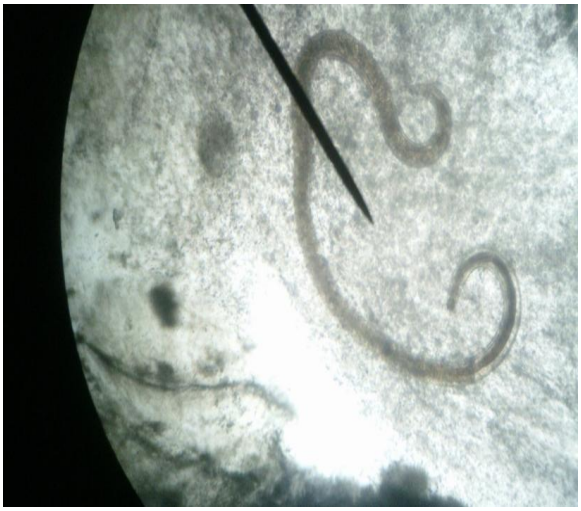

Plate 3: *Procamallanus* spp. (Nematode)

Plate 4: Larval stage of Dobson fly (Insect)

Plate 5: *Trichinella spp* (Nematode)

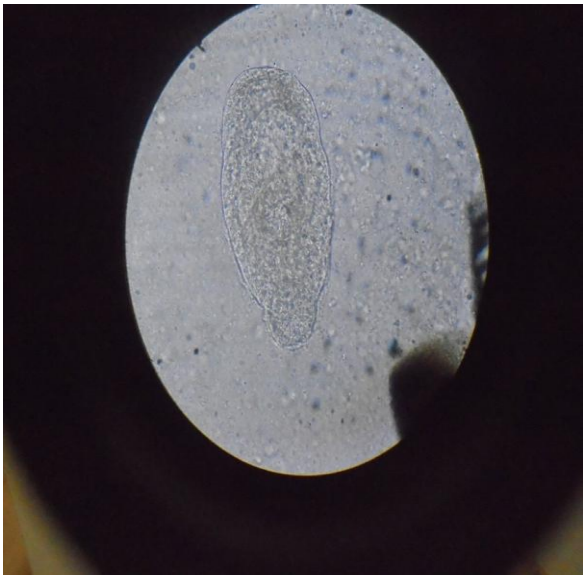

Plate 6: Egg of trematode