ISSN: 2347-5129
IJFAS 2014; 1(6): 208-212

www.fisheriesjournal.com
Received: 06-05-2014
Accepted: 07-06-2014

Sidney Nzeako
Department of Animal and Environmental Biology, Faculty of Biological Sciences, College of Natural and Applied Sciences, University of Port Harcourt, Nigeria.

Arinze Uche
Centre for Marine Pollution Monitoring and Seafood Safety, University of Port Harcourt.

Helen Imafidor
Department of Animal and Environmental Biology, Faculty of Biological Sciences, College of Natural and Applied Sciences, University of Port Harcourt, Nigeria.

Abraham Ngozi
Department of Microbiology Technology, School of Science Laboratory Technology, University of Port Harcourt.

Correspondence:
Sidney Nzeako
Department of Animal and Environmental Biology, Faculty of Biological Sciences, College of Natural and Applied Sciences, University of Port Harcourt, Nigeria.

Endoparasitic fauna of *Chrysichthys nigrodigitatus* (Lacepede, 1802) in the new Calabar river, Choba, Rivers State, Nigeria

Sidney Nzeako, Arinze Uche, Helen Imafidor, Abraham Ngozi

Abstract
A study on the endoparasitic fauna of 50 species of Chrysichthys nigrodigitatus in the New Calabar River was implemented. 50 specimens were examined in the laboratory for endoparasites using the formol-ether concentration method. The study revealed a low parasitic prevalence of seven (7) endoparasites found in the internal organs (heart, kidney, liver and gastrointestinal tracts). The intestine had the highest 4(40.0%) parasites, followed by the heart 3(30.0%), the liver 3(30.0%) and the kidney was parasite free. Sex related pattern of infection ($p>0.05$) showed that the females had more infection 9(90.0%) than the males 1(10.0%) and was attributed to physiological preference of parasites. However, the size class related prevalence showed an increase in parasitic infections in bigger specimens than the smaller ones, depicting that there was multiple infections as the fish moved about and grew bigger. Although no zoonotic parasites were found, it is advisable to properly cook the fish before consumption.

Keywords: Endoparasites, *Chrysichthys nigrodigitatus*, zoonotic parasites.

1. Introduction
Chrysichthys nigrodigitatus (Lacepede, 1802), also known as silver catfish, occurs in Africa, including Nigeria. They belong to the Bagridae family and are native to Africa. The fish is common in the Niger Delta where it is a valued source of protein and constitutes the dominant commercial catch of artisanal fishermen [4, 22]. *C. nigrodigitatus* has an omnivorous feeding habit which exposes it to a variety of parasites which negatively impact on its health and due to its place in the daily diet of humans in Africa, zoonotic infections arising from ingesting raw fish, knowingly or unknowingly, could cause serious problems [15, 17, 21]. The fast growing need to culture fishes for protein consumption for the teeming populace of the developing countries has made it necessary to intensify studies on the parasitic fauna of the African freshwater fishes [4, 29]. Infected fish species manifest numerous symptoms including; anaemia, lesions, ulcers, skin and fin rot, distended stomach, blockage of the intestine, pop-eye, immune-suppression, retarded growth, loss of appetite, depressed reproduction, emaciation and loss of organ [2, 13, 24, 28].

Protein is a major component of animal composition and is required in the diet for the formation and repair of tissue, alongside many other functions. Parasitic diseases of livestock and fish constitute a major threat to the rearing of these useful organisms, reducing the amount of animal protein available for people globally [6, 8].

Parasites are microscopic organisms that infect other organisms and derive nutrients from them for survival. Parasites are common in various water bodies and attack virtually every part of the organisms present in the water bodies. Parasites of fish can be grouped into ectoparasites and endoparasites and in serious infestations, coupled with poor environmental conditions, death can occur, leading to a decrease in fish stock available for consumption. Other economical effects of parasites on fish include; reduced market value which results in financial loss to the farmers [6, 11]. The increased demand for fish as a safe source of animal protein to humans has necessitated the evaluation of the status of parasitic fauna in fish species in Nigerian inland waters.

1.1 Fish-Borne Parasitic Zoonoses

The behaviour of humans has a pivotal role to play in the macro- and micro-epidemiology of emerging or re-emerging parasitic zoonoses. Changing demographics and the concomitant alterations to the environment, climate, technology, land use and changes in human behaviour, converge to favour the emergence and spread of parasitic zoonoses. The recent unprecedented movements of people, their animals and their parasites around the world, introduce and mix genes, cultural preferences, customs, and behavioural patterns. The increasing proclivity for eating meat, fish, crabs, shrimp and molluscs as raw, undercooked, smoked, pickled or dried facilitates a number of parasites [16, 10].

The objective of this study is to investigate the prevalence of endoparasitic helminths of *C. nigrodigitatus* in the New Calabar River, the internal organs affected by endoparasites, the most abundant species of the endoparasites, the effect of sex and size on the prevalence of endoparasites, and the zoonotic parasites available in *C. nigrodigitatus.*

2. Materials and Methods

2.1 Study Area

The study area, is the New Calabar River which lies between longitude 006° 53' 53.086"E and latitude 04° 53' 19.020"N in Choba, Rivers State, Nigeria (Figure 1.1). However, the entire river course is situated between longitude 7° 60'E and latitude 5° 45'N in the coastal area of the Niger Delta and empties into the Atlantic Ocean. The river houses an abattoir, poultry, a fabrication company and a weekly market. A slight cluster of houses can be seen close to its bank where toilets and bathrooms are also created close to the river bank. Dredging and fishing activities are still ongoing alongside numerous other human activities. All afore mentioned pollute the water body in varying degrees. The New Calabar River region has an annual rainfall between 2000 -3000 mm [1] and is a rare tidal freshwater body.

2.2 Collection of Fish

Fifty (50) freshly caught freshwater fish (*Chrysichthys nigrodigitatus)* were sampled using the Stratified Random Sampling, where the third fish from every four would be selected [18, 25]. In the field, identification of fish samples was done using a guide by Idodo-umeh [14].

The morphometrics was carried out in the laboratory while the fish samples were still alive [23].

2.3 Fish Dissection and Collection of Internal Organs

The fish was laid on its back on a dissecting board and the belly was cut open using a scissors which was inserted through the urogenital opening and a slit was made up to the operculum. The internal organs (gastrointestinal tract, heart, liver and kidney) were carefully extracted and placed in properly labelled sterile bottles filled with normal saline, pending further investigation [30].

2.4 Examination of the Gastrointestinal Tract

The bottle containing the gastro-intestinal tract was emptied into a petri dish and was examined using x10 hand lens. After the examination, the gastro-intestinal tract was cut open starting from the rectum and was spread out before carefully scraping the entire wall to dislodge any parasite present. The contents were allowed to mix with the normal saline. The gastro-intestinal content was then processed for microscopic examination using the formol-ether concentration method [30, 3, 25].

2.5 Examination of the Heart

The bottle containing the heart was emptied into a watch glass and the heart was examined using x10 hand lens. After the examination, the heart muscle was severed to allow the heart contents (blood trapped inside the heart) to flow out and mix with the normal saline which was then examined microscopically [30].

2.6 Examination of the Liver

The liver was examined using x10 hand lens for the presence of epithelia parasites. After the examination, the liver was macerated to allow the contents to flow out and mix with the normal saline which was then examined microscopically [30].

2.7 Examination of the Kidney

The kidney was examined using x10 hand lens for epithelia parasites. After the examination, the kidney was macerated to allow the contents to flow out and mix with the normal saline which was then examined microscopically [30].

2.8 Data Analysis

The data obtained would be analyzed using Measures of Central Tendency and Analysis of Variance (ANOVA)

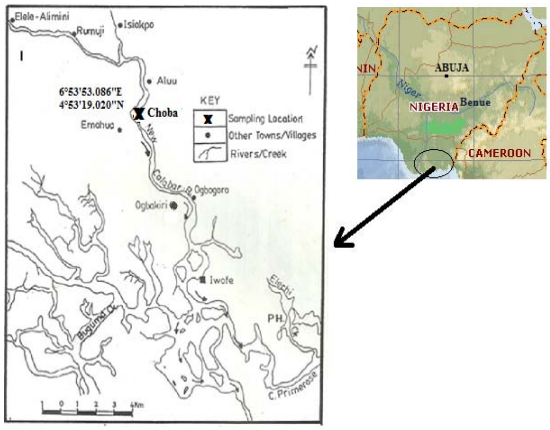

Fig 1.1: Map View of the Study Area and the location of the study area in Nigeria

3. Results

3.1 Parasitic load in relation to fish Standard Length (SL)

Table 3.1 shows the prevalence of endoparasites of *C. nigrodigitatus* from the New Calabar River. A total of 50 fish samples were examined and an overall infection of 10(20.0%) were recorded. The study showed that infection increased as size increased. The 301-400 mm size class had the highest infection rate of 1(25.0%), followed by the 201-300 mm size class 8(20.0%) and 101-200 mm size class had the least 1(16.7%) infection rate.

Sex related prevalence showed that the females had a higher infection rate of 9(90.0%) out of the 24(48.0%) females examined. The 301-400 size class had the highest infection rate of 1(50.0%), followed by the 201-300 size class which had 7(38.8%) infection rate and the 101-200

size class had 1(33.3) infection rate. However, the males had a total of 1(10.0%) out of the 26 (52.0%) males examined. There was a single infection of 1(4.8%) which occurred in the 201-300 size class.

Table 3.1: Parasitic load in relation to fish Standard Length (SL)

PARASITIC LOAD						
Size Class (SL - mm)	Population Examined	Females Examined (%)	Number Infected (%)	Males Examined (%)	Number Infected (%)	Overall Infection (%)
0-100	0	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
101-200	6	3(50.0)	1(33.3)	3(50.0)	0(0.0)	1(16.7)
201-300	40	19(47.5)	7(36.8)	21(52.5)	1(4.8)	8(20.0)
301-400	4	2(50.0)	1(50.0)	2(50.0)	0(0.0)	1(25.0)
Total (%)	**50(100.0)**	**24(48.0)**	**9(90.0)**	**26(52.0)**	**1(10.0)**	**10(20.0)**

SL = Standard Length

3.2 Specific Parasites in *Chrysichthys nigrodigitatus* of New Calabar River

Table 3.2 shows the specific parasites in 100 examined *C. nigrodigitatus* in New Calabar River. Ten (10) parasites extracted belonged to the following groups: cestodes, trematodes, acanthocephalans, nematodes and protozoa. The females had a total of 9(18.0%) parasites extracted from the infected specimens of which the cestodes had the highest 3(33.3%) prevalence, the trematodes, acanthocephalans and protozoa had 2(22.2%) prevalence each, while the nematodes 0(0.0%) prevalence. While in the males, a single infection of 1(2.0%) which occurred in the 201-300 mm size class. A trematode occurrence of 1(100.0) was extracted from the males.

Table 3.2: Specific Parasites in *Chrysichthys nigrodigitatus* of New Calabar River

Size Class (SL - mm)	**Total Examined**	**Parasites Specificity**												
		Male					**Total**	**Female**					**Total**	**Overall Infection (%)**
		Ts	**Cs**	**As**	**Ns**	**Ps**	**Infec-tion (%)**	**Ts**	**Cs**	**As**	**Ns**	**Ps**	**Infec-tion (%)**	
0-100	0	-	-	-	-	-	0	-	-	-	-	-	-	**0(0.0)**
101-200	6	-	-	-	-	-	0	1	-	-	-	-	1	**1(16.7)**
201-300	40	1	-	-	-	-	1(2.5)	1	2	2	-	2	7	**8(20.0)**
301-400	4	-	-	-	-	-	0	-	1	-	-	-	1	**1(25.0)**
Total (%)	**50**	**1(100.0)**	**0(0.0)**	**0(0.0)**	**0(0.0)**	**0(0.0)**	**1(2.0)**	**2(22.2)**	**3(33.3)**	**2(22.2)**	**0(0.0)**	**2(22.2)**	**9(18.0)**	**10(20.0)**

SL=Standard Length Ts=Trematodes Cs=Cestodes As=Acanthocephalans Ns=Nematodes Ps=Protozoans

3.3 Site related prevalence of endoparasites of *Chrysichthys nigrodigitatus*

Table 3.3 shows site related prevalence of endoparasites in the sampled fishes, which indicated an overall infection of 10(20.0%). The intestine had the highest total parasite occurrence of 4(40.0%), next to the heart and liver which had 3(30.0%) each and the kidney had no parasites. The 301-400mm size class had the highest infection rate of 1(25.0%), followed by the 201-300 mm size class 8(20.0%) and 101 200mm size class had the least 1(16.7%) infection rate.

Table 3.3. Site related prevalence of endoparasites of *Chrysichthys nigrodigitatus*

Size Class (SL - mm)	**Number Examined**	**Sites Of Infection**								
		Heart		**Kidney**		**Liver**		**Intestine**		**Overall Infection (%)**
		F	**M**	**F**	**M**	**F**	**M**	**F**	**M**	
0-100	0	-	-	-	-	-	-	-	-	0 (0.0)
101-200	6	-	-	-	-	1	-	-	-	1 (16.7)
201-300	40	2	1	-	-	2	-	3	-	8(20.0)
301-400	4	-	-	-	-	-	-	1	-	1(25.0)
Total (%)	50(100.0)	2(20.0)	1(10.0)	0(0.0)	0(0.0)	3(30.0)	0(0.0)	4(40.0)	0(0.0)	10(20.0)

4. Discussions

The study was carried out to investigate the parasitic load of 50 specimens of *C. nigrodigitatus* in lower New Calabar. Seven (7) parasites were extracted, which include: *Tetrochetus coryphaenae, Thelohanellus piriformis, Neoechinorhynchus rutili, Silurotaenia siluri, Biacetabulum appendiculatum, Atalostropion sp.* and *Tetraonchus monenteron. Biacetabulum appendiculatum, Thelohanellus piriformis* and *Neoechinorhynchus rutili* were the highest (2) occurring parasites in the liver and intestine, while the other species all had a single occurrence. The trematodes (*Tetrochetus coryphaenae, Atalostropion sp.* and *Tetraonchus monenteron*) were the highest occurring parasites, followed by the cestodes (*Biacetabulum appendiculatum* and *Silurotaenia siluri*) and then the acanthocephalans (*Neoechinorhynchus rutili*) and protozoans (*Thelohanellus piriformis*) were the least.

However, the intestine had the highest 4(40.0%) number of parasites, followed by the heart 3(30.0%) and the liver 3(30.0%) and a 0(0.0%) infection in the heart (Table 3.3). This agrees with the studies by Obano and Odiko, [19] and Chanda *et al.*, [9]. The large amount of food intake by the fish can also be an underlying factor to the high prevalence of parasites in the intestine.

An overall prevalence of 10(20.0%) was observed in all specimens (Table 3.1) with the females having more infection 9(90.0%) than in the males 1(10.0%). This contradicts the investigations by Awharitoma and Okaka, [5] and Sikoki *et al*., [25], who reported a higher overall prevalence of parasites and more infections in males than females. However, Obiekezie and Enyenihi, [20] and Ekanem *et al.*, [12] agree with the findings of this study. The low parasitic prevalence in the examined fishes could be attributed to the relatively high sanitary condition of the river brought about by its tidal effect that reduces the concentration of pollutants in the river and the location of the river from the main residential areas. The connection to the Atlantic Ocean may also influence its salinity periodically making the river not very suitable for freshwater parasites [27] and the potadromous nature of *C. nigrodigitatus* which prevents them from staying in an area long enough to ingest many prey that might have a high parasitic load.

The increased parasitism in females (18.0%) than in males (2.0%) was not statistically significant ($p>0.05$) and this follows other studies [26, 25] which reported higher endoparasites in female samples than the male counterparts. This infection pattern may also be due to physiological preference to host specific factors as stated by Sikoki *et al.*, [25].

The size class related prevalence showed an increase in parasitic infections in bigger specimens than the smaller ones (Table 3.1). The 301-400mm size class had the highest 1(25.0%), followed by the 201-300mm size class at 8 (20.0%) and the least 1(16.7%) was the 101-200mm size class. This is a widely accepted pattern of parasitic infection in fishes [7, 12, 19, 25]. This may be attributed to the possibility of repeated infection as the fish grew older.

5. Conclusion

The endoparasitic fauna of *Chrysichthys nigrodigitatus* in New Calabar River is relatively low. However, it has been ascertained that despite the occurrence of parasites in fish, consuming properly cooked fish has never been known to harm humans; therefore the need for proper cooking of fish cannot be overemphasized as cooking destroys all parasitic diseases present in fish.

6. Acknowledgment

We wish to thank the staff of parasitology laboratory and hydrobiology laboratory in Animal and Environmental Biology Department, Faculty of Biological Sciences, University of Port Harcourt, Nigeria. Our profound gratitude also goes to the Centre for Marine Pollution Monitoring and Seafood Safety, University of Port Harcourt.

7. References

1. Abowei JFN. Aspects of the Fisheries of the Lower Nun River. Ph.D Thesis, University of Port Harcourt, 2000, 248.
2. Ajayi SA, Fabivi JP, Umo I. Clinical *Anaplasmosis* and *Babesiosis* in Friesian Cattle. World Animal Review 1983, 36-68.
3. Al Mofarreh MA, Al Akwaa AM, Hasan, SW, Al Mofle IA. Formol-Ether concentration Method in the Diagnosis of Active *Schistosoma mansoni* in patients with detectable IHA. Saudi J Gastroenterol 2000; 6:157-160.
4. Arawowo GAA. Conservation of the Freshwater Finfish fauna of Nigeria. Ayo publishers Limited, Lagos, 1993, 97-103.
5. Awharitoma AO, Okaka CE. Observations on the Cichlid fishes in Ikpoba River and their parasitic infections. Nigerian Journal of Parasitology 1999; 20:129-137.
6. Awharitoma AO, Okaka CE. Parasites of fishes from Ikpoba River and Ogba River fish farm. Nigerian Journal of Applied Science 2000; 22:355-362.
7. Bello-Olusoji OA, Aderiye BK, Borede AA, Oyekanmi FB. Ectoparasitic Studies of Pond Cultured and Wild Tilapias. International Journal of Fisheries and Aquaculture 2011; 3(12):225-230
8. Bichi AH, Ibrabim AA. A survey of ecto and intestinal parasites of *Tilapia Zilli* (Caervias) in Tiga Lake, Kano, Northern Nigeria. Bayero Journal of pure and Applied Science 2009; 2(1):79-82.
9. Chanda M, Paul M, Maity J, Dash G, Gupta SS, Patra BC. Ornamental fish (*Carassius auratus*) and related parasites in three districts of West Bengal, India. Chron. Young Sci. 2011; 2:51-4.
10. Dorny P, Praet N, Deckers N, Gabriel S. Emerging food-borne parasites. Veterinary Parasitology 2009; 163:196-206.
11. Edema CU, Okaka CE. A preliminary study of parasitic infections of some fishes from Okhuo River Benin city, Nigeria. International Journal of Biomedical and Health Science 2008; 4:120-135.
12. Ekanem AP, Eyo VO, Sampson AF. Parasites of landed fish from Great Kwa River, Calabar, Cross River State, Nigeria. International Journal of Fisheries and Aquaculture 2011; 3(12):225-230.
13. Food and Agricultural Organization of the United Nations, FAO. *Trypanosomosis*. Animal Zootechnica, http://www.faolex.fao.org. Access day: February, 2014.
14. Idodo-Umeh G. Freshwater fishes of Nigeria; Taxonomy, Ecological notes, Diet and Utilization.

Idodo-Umeh publishers Limited, Benin City, 2003, 107-108.
15. Ikomi RB. Niger Delta Eco-Region, The Fish Hot Spot – Challenges and Prospects (29th Inuaugural Lecture). S.E. 21, 55, 2012. DELSU
16. Macpherson CN. Human behaviour and the epidermiology of parasitic zoonoses. Journal Int J Parasitol 2005; 35(11-12):319-31
17. Nelson JS. Fishes of the World. John Wiley and Sons, Inc., 2006.
18. Neville H, Sidney S. Stratified Sampling Techniques. Coventry University. http://nestor.coventry.ac.uk/~nhuny/meths/strati.html. Access day: January, 2014.
19. Obano EE, Odiko AE. Endoparasites of some culturable fish species in Ogba River, Benin City, Nigeria. Nig J of Appl Sci 2004; 22:341-343.
20. Obiekezie AI, Enyenihi UK. *Henneguya chrysichthyi sp*. Novv. (protozoa: Myxozoa) from the gills of estuarine catfish Silver Catfish (Lacépède). (Pisces: Bagridae) in Nigeria. J Afr Zool 1988; 102:33-42.
21. Okaeme AN. Helminthes fauna of the Tilapia of Lake Kainji in pre and post impoundment condition. J Aqua Trop 1991; 6:1-8.
22. Omeji S, Solomon SG, Iduga ES. A comparative study of the common protozoan parasites of C. gariepinus from wild and cultured environments in Benue. J Parasitol Research 2011.
23. Ostrander GK. The Laboratory Fish. Academic Press, San Diego, California, 2000, 133-141.
24. Paperna I. Parasites, infections and diseases of fishes in Africa: An update; CIFA Technical paper 31 food and agriculture organization (FAO), Rome. http://www.faolex.fao.org. Access day: January, 2014.
25. Sikoki FD, Nzeako SO, Nchege B. Evaluation of Nematode Parasitemia in *Oreochromis niloticus* from lower New Calabar River, Port Harcourt, Niger Delta, Nigeria. Intl J Sci Research in Environ Sci (IJSRES) 2013; 1(10):263-267.
26. Thomas JD. A comparison between the helminthes burdens of male and female brown trout, *L. salmotrutta* from natural population in the River Teify, West Wales. Parsitology 1964; 54:263-272.
27. Wogu MD and Okaka CE. A comparative study of the gastrointestinal helminth parasites infection of fresh and brackish water fishes from Warri River, Southern Nigeria. International Multi-disciplinary Journal Ethiopia 2012; 6(2):25.
28. Woo PTK. Fish Diseases and Disorders: 2: Non-Infectious Disorders Cabi Series, 2011.
29. Yadav BN. Fish and fisheries. Daya Publishing House, Delhi, India, 2000, 92-94.
30. Zdenek L. Methods for the Diagnosis of Fish Diseases. Amerind Publishing Company PVT. Ltd. New Delhi, 1977, 1-135.