CSCanada
Management Science and Engineering
Vol. 14, No. 1, 2020, pp. 9-13
DOI:10.3968/11548

ISSN 1913-0341 [Print]
ISSN 1913-035X [Online]
www.cscanada.net
www.cscanada.org

The Prevalence of Gill Parasites of *Clarias* Species Sold in Jalingo Market in Taraba State, Nigeria

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Received 23 April 2020; accepted 7 June 2020
Published online 26 June 2020

Abstract
The gills of 80 specimens of *Clarias* species randomly purchased from the fresh fish market in Jalingo, Taraba State were examined for gill parasites. 39 (48.75%) of the fish were infected by two species of parasites: a monogenean, *Macrogyrodactylus congolensis* (47.5%) and a protozoan, *Henneguya* sp. (7.5%). Gill infections were observed in fish of lengths 36.5-44.5cm (66.7%); 21-27cm (60%). The highest prevalence of infection (66.7%) was observed in fish that weighed 40-105g; however male fish were observed to have higher prevalence of infection (65%) than females (61.53%).

Key words: Gill; Parasites; *Clarias*; Monogenean; Prevalence; Protozoan

Wanmi, D. A., Chintem, D. G. W., Njilmah, J. A., & Achilus Francis, A. (2020). The Prevalence of Gill Parasites of *Clarias* Species Sold in Jalingo Market in Taraba State, Nigeria. *Management Science and Engineering*, *14*(1), 9-13. Available from: URL: http://www.cscanada.net/index.php/mse/article/view/11548 DOI: http://dx.doi.org/10.3968/11548

INTRODUCTION
Fish is one of the most important sources of protein available to human and other fish-eating animals in the tropics. According to the Food and Agricultural Organization (FAO) of the United Nations, fish accounts for more than 40% of the protein diet of two-thirds of the global population.

Most Nigerians rely on fish as their main source of protein. Fish not only provide food for immediate consumption but people rely directly or indirectly on fishing for their economic survival. Furthermore, well processed fish products from the tropics have a ready market in developed countries and are thus good foreign exchange earners (Eyo, 2001).

In Africa, 18% of animal protein intake comes from fish (William et al., 1998). While in Nigeria, fish constitute about 40% of animal protein intake and can be as high as 80% in riverine areas (Olatunde, 1992 & 2004). Fish is rich in thiamine, riboflavine, vitamins, A, D, E and K, minerals and polyunsaturated fatty acids, which are essential for healthy living. The absence of these minerals and vitamins in diets may result in life-threatening consequences (Eyo, 2001). Fish are highly recommended because of their essential fatty acids. Among other advantages of fish, its exploitation contributes about 5% of Nigeria's Gross Domestic Product (GDP) providing jobs for fishermen, boat builders, hook manufactures, trap producers, and fish mongers.

Parasitic infections have been implicated as the cause of low yield and reduction in wholesomeness and quality, which affect their productivity and economic returns (Okaeme, 2000) freshwater fish can serve as definitive, intermediate or paratenic host in the lifecycles species of protozoan, metazoans and crustacean parasites the parasites usually affect the marketability of commercially produce fish thus raising public health concern especially in areas where raw or smoked fish are eaten (Hoffman and Bauer, 1972; Paperna, 1996). In fish farming or aquaculture, some parasites may be highly pathogenic and contribute to high fish mortalities and economics loss, while in natural system they may threaten the abundant and diversity of indigenous fish species (Mashego, 2001). A large number of parasites invade the body surface or internal organs of fish, many of which can be transmitted to humans and other fisheating animals (Duijin, 1973), parasites associated with fish in their habitat, interfere with physiological functions and cause morbidity, mortality

and economic losses in global fish production(Reed et al.,1967).

In Nigeria, the parasite fauna of freshwater fish has been studied by a number of workers including: Okeri (1965), Aderounmu and Adneniye (1973), Onwulaii and Mgbamena (1987), Nwuba, (1987) Aken'Ova (1999) Yakubu *et al*., (2002), and Oniye et al. (2004),

Clarias species are economically important and are commonly cultured in Nigeria. Their gill is an organ of respiration so they constitute some of the vital organs of fish. Parasites of the gills may seriously interfere with respiratory function, leading to serious physiological problems in fish. The specific objectives of this study are to determine the abundance and composition of the parasites on the gills of *Clarias* spp. And the effect of size, weight and sex of the fish on the parasites.

1. MATERIALS AND METHODS

1.1 Sample Collection

Eighty (80) live specimens of *Clarias* species were bought from Jalingo market in Taraba State and transported in a plastic container to the Department of Science Laboratory Technology of the Taraba State Polytechnic, Jalingo Campus.

1.2 Identification of Fish

Two species of *Clarias* used during this study, are described as follows.

1.3 Family Claridae

1.3.1 *Clarias anguillaris* **(Linnaeus, 1758):**
Has pelvic fins nearest to the tip of the snout than to the base of the caudal fin. The colour is variable, but it is usually dark grey on the sides, almost black on the back and the belly is white. The tail generally has a few small black spots in an irregular pattern, but this is more marked in young and medium sized specimens. Gill rakers are rather few, between 14-40.

Figure 1
Clarias anguillaris

1.3.2 Clarias gariepinus (Burchell, 1822), Teugels, 1982
This is generally considered to be one of the most important tropical catfish. It has four pairs of unbranched barbels. The skin is generally darkly pigmented on the dorsal and lateral parts of the body. The colour is uniformly marbled and changes from greyish olive to blackish according to substrate. Gill rakers are numerous (20 - 100)

Figure 2
Clarias gariepinus

1.4 Measurement and Weighing of Fish

1.4.1 Measurement

The total and standard lengths of the fish were measured to the nearest millimeter using a meter rule. The total length was taken from the tip of the snout to the extreme end of the caudal fin and the standard length from the tip of the snout to the end of the caudal pedicle.

1.4.2 Weighing

The total weight was taken to the nearest gram using a weighing balance.

1.5 Sex Determination

The external and internal reproductive structures were used to determine the sex of fish. Males are characterized by the presence of a papilla situated roughly between the pelvic fins, this structure is absent in females. To be certain, two testes were identified in males when the abdomen was slit open, and two ovaries were identified in the case of females.

1.6 Dissection and Examination of the Gills

The gills were dissected out from the branchial chamber with a pair of scissors and placed in a Petri dish containing distilled water. The four gill arches on each side of the opercula were separated, so that each gill arch was in a Petri dish containing distilled water. The gills were examined using a dissecting microscope. Parasites found during the examination were counted and their positions recorded.

1.7 Treatment of Parasites

Any helminths recovered were fixed in hot water, and then preserved in 5% formalin. They were labeled with their autopsy numbers, date of collection, locality, host identity, site in host and at least the phylum of the parasites.

2. IDENTIFICATION OF PARASITES

2.1 Staining

The preserved worms were washed in distilled water to remove the fixative then stained overnight in a very weak solution of Mayer's acid haematoxylin in a cavity block. The parasites were rinsed with distilled water, destained in 0.5% hydrochloric acid for 20 minutes, rinsed again in distilled water and neutralized in 0.5% ammonia solution for 20 minutes to stop the action of the acid. They were then dehydrated in a graded series of alcohol (30%, 50%, 70%, 90%) and finally absolute alcohol for 20 minutes each.

Absolute alcohol was gradually replaced with xylene after which the worms were then left to clear in pure xylene for about 30 minutes. The cavity block was kept covered during processing to avoid rehydration from the atmosphere. The cleared worms were then mounted on microscope slides in thinned Canada balsam.

2.2 Statistical Analysis

Chi-square, correlation and odd ratio was used to analyze any relationship between the mean intensity of infection and length, weight and sex of fish.

3. RESULTS

On the whole, Eighty (80) specimens of *Clarias* were examined for gill parasites; 59 (73.75%) were *Clarias anguillaris,* 20 (25%) *Clarias gariepinus*. The largest *C. anguillaris* had a standard length of 41.0cm, *C. gariepinus* 31.5cm. 20 male and 39 female *C. anguillaris*, 7 male and 13 female *C. gariepinus*, and one female *C. galmaensis* were examined. Out of the 80 fish examined for gill parasites 39, were infested by the monogenean *Macrogyrodactylus congolensis* and the encysted protozoan *Henneguya* sp. with overall prevalences of 47.5% and 7.5% respectively.

Table 1
Infection of *Clarias anguillaris* **with** *Macrogyrodactylus congolensis* **according to length**

Class length (cm)	No of fish examined	No of fish infected	No of parasites	Prevalence (%)	Mean intensity
18.5-26.6	30	9	12	30	1.3
27.5-35.5	26	17	25	65.4	1.5
36.5-44.5	3	2	8	66.7	4

(r = + 0.881, P = 0.313)

Clarias anguillaris in the class length 36.5 – 44.5 had the highest prevalence of 66.7%; those in the class length 27.5 – 35.5 had a prevalence of 65.4% and those that were 18.5 - 26.5 had a prevalence of 30%. Statistical analysis (correlation) showed no significant difference in the infestation of the gill filaments by class length (p = 0.313).

Table 2
Infection of *Clarias gariepinus* **with** *Macrogyrodactylus congolensis* **according to length**

Class length (cm)	No of fish examined	No of fish infected	No of parasites	Prevalence (%)	Mean intensity
14-20	6	3	7	50	2.3
21-27	10	6	17	60	2.8
28-33	4	1	2	25	2

(r = - 0.678, *P* = 0.526)

Clarias gariepinus in the class length 21–27 had the highest prevalence of 60%; those in the class length 14 – 20 had a prevalence of 50% and those in the class 28-33cm had a prevalence of 25%. Statistical analysis (correlation) showed that there was no significant difference in the infestation of the gill filaments by class length (P = 0.526).

Table 3
Infection of *Clarias anguillaris* **with** *Macrogyrodactylus congolensis* **according to weight**

Body weight(g)	No of fish examined	No of fish infected	No of parasites	Prevalence (%)	Mean intensity
10-100	45	18	40	35.5	1.19
160-300	9	8	14	88.9	1.75
310-340	2	2	4	100	2.00

r = (+0.982, P = 0.123)

C. anguillaris that had weight 310-340g had the highest prevalence (100%) and fish that weighted 160 – 300g had the higher prevalence (88.9%) while fish that weighed 10–100g had the lowest prevalence of 35.5%. Statistical analysis showed that there was no significant difference between infestation by weight of *Clarias* (p= 0.123)

Table 4
Infection of *Clarias gariepinus* **with** *Macrogyrodactylus congolensis* **according to weight**

Body weight(g)	No of fish examined	No of fish infected	No of parasites	Prevalence (%)	Mean intensity
40-105	12	8	12	66.7	1.5
110-175	7	2	2	28.57	1
180-245	1	0	0	0	0

(r = -0.997, *P* = 0.053)

C. gariepinus that had the weight 40 – 105g had the highest prevalence 66.7% and the fish with weight 110–175g had a prevalence of 28.57%, while the fish with weight 180-245g had the lowest prevalence (0%). Statistical analysis showed that there was no significant difference between the prevalences of fish species according to weight.

Table 5
Comparative infestation of the gills of C. *anguillaris with Macrogyrodactylus congolensis* **according to sex**

No of fish examined	No of fish infected	No of parasites	Prevalence of infection (%)	Mean intensity
20	13	17	65.00	7
39	15	31	38.45	24

(Chi^2 =34, *P* <0.001) Odd ratio = 3

Infestation of the gill shown above was higher in male fish (65%) than female fish (38.45%). Statistical analysis odd ratio showed a significant difference in the infestation of the gill by sex (OR = 3).

Table 6
The infestation of *C. anguillaris* **by** *Henneguya* **sp. according to sex.**

No of fish examined	No of fish infected	No of parasites	Prevalence of infection (%)	Mean intensity
20	4	8	40	16
39	0	0	0	39

(Chi^2 = 34, *P* < 0.001)

Infestation of the gills shown above was higher in male fish (40%) than the female fish (0%). Statistical analysis (odd ratio) showed a significant difference in the infestation of the gill by sex (OR = 0).

Table 7
Infestation of the gills of *C. gariepinus* by *Macrogyrodactylus Congolensis* according to sex.

No of fish examined	No of fish infected	No of parasites recorded	Prevalence of infection (%)	Mean intensity
7	2	1	28.75	5
13	8	26	61.53	5

($Chi^2 = 35$, $P < 0.001$) Odds ratio = 1.25

Infestation of the gill shown above was higher in female fish (61.53%) than in male. (28.75%). Statistical analysis (odds ratio) showed a significant difference in the infestation of the gill by sex (OR = 1.25).

Table 8
Comparative infestation of the gills *C. gariepinus* for cyst of *Hennyguya* Spp according to sex

No of fish examined	No of fish infected	No of parasites	Prevalence of infection (%)	Range	Mean intensity
7	1	2	14.28	2	6
13	0	0	0	0	13

($Chi^2 = 35$, $P < 0.001$)

Infestation of the gill shown above was higher in male fish (14.28%) than in female fish (0%). Statistical analysis (odds ratio) showed a significant difference in the infestation of the gills by sex. (OR = 0).

DISCUSSION

The gill parasites recovered in this study have previously been reported by Aken'Ova (1999), in Taraba State. In addition to the two parasites recovered here, two copepods, metacercariae of a digenean, a protozoan and bivalve glochidia were reported by Aken'Ova (1999), but in fish from River Galma and Makwaye and Borno Lakes. In this study, the highest prevalence of parasite infestation of the gills of *Clarias* species was observed in *Clarias anguillaris* with class length 36.5-44.5cm. This implies that the infestation increases with an increased in host size. It may also suggest some level of immunity in older fish, as a result of earlier exposure to the parasites regardless of the increase in the surface area of the gill which provide greater surface area for attachment of parasites in this group of fish However, statistical analysis showed no significant difference between the infestations of *Clarias anguillaris, C. gariepinus*.

Body weight in respect to gill parasite infestation in this study showed that *C. anguillaris* with body weight ranging from 310 – 340gm had the highest prevalence (100%).

Just as in the case of infestation by fish length, an increase in weight did not correspond with the highest prevalence of infection. There was no significant correlation between weight of fish and prevalence of infection.

Of the 3 *Clarias* species examined males were more heavily infected than females. This might be due to the fact that more male fish than females were examined; statistical analysis however, showed that there was a significant difference in infestation between sexes suggesting that they were both unequally susceptible to infestation and that physiological differences between the sexes may be responsible for the disparity in infestation.

The cysts of *Henneguya* spp. of various sizes were found on the gills they were diagnosed by microscope examinations for their contents for the presence of the typical spores. Such spores are characterized by the presence of one or four polar capsules which contain a spiral filament (Paperna, 1980). Though the prevalence was 7.5%), this parasite may constitute a threat to the survival of the fish in the wild. *Henneguya* has been reported to cause circularity dysfunctions and respiration problem in *Cyprinus carpio*. (Kalavati and Narashim) (1985 Rukyani, 1990).

CONCLUSION

Clarias species on sale in Jalingo market in Taraba State are infested with the monogenean *Macrogyrodactylus congolensis* and the protozoan *Henneguya* sp.

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