PREVALENCE OF MONOGENEA TREMATODES IN DIFFERENT DEVELOPMENTAL STAGES OF *Clarias gariepinus* IN DELTA STATE, NIGERIA

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ABSTRACT

Monogenea trematodes are ectoparasitic worms of numerous species including the two super – genera (Dactylogyrus and Gyrodactylus). They infect freshwater organisms, primarily fishes. They are harmless at low infestation, but heavy infestations cause wounds and gills hypertrophy which compromises respiratory functions. Out of 231 fish examined in this study, a total of 72 specimens were infected with an overall prevalence of monogenea trematodes infections of 31.17%. Dactylogyrus sp. was recorded in juveniles, post juveniles, and adults with a total prevalence of 23.6%. No Dactylogyrus sp. was found in fry and fingerlings. The total prevalence of 76.39% was recorded for Gyrodactylus sp across all stages. Gyrodactylus sp. infected the gills of all the stages in different frequencies, juvenile recorded the highest and fry the least. Dactylogyrus sp were found more on the skin of adult Clarias gariepinus than the gill. The water quality parameters recorded were pH, dissolved oxygen, ammonia, water and atmospheric temperatures.

Keywords: *Gyrodactylus, Dactylogyrus, Clarias gariepinus, parasites, infections.*

INTRODUCTION

Nigeria is endowed with numerous potential culturable species of freshwater fishes such as *tilapia zilli, Oreochromis niloticus*, *Heterobranchus sp*. *Cyprinus carpio*, *Clarias gariepinus*, etc. One of the most resistant fish species widely accepted and highly cultivated is *Clarias gariepinus.* Among all vertebrates, fish are the most parasitized organisms being prone to different pathogenic attack (Ashade *et al.*, 2013, Omeji *et al.,* 2013).

Monogeneans are ecto or endoparasites principally parasitizing the skin, gill and gill chambers, buccal cavity and sometimes the uterus and body cavity of mammals, reptiles, amphibians, mollusk and fish. They are believed to be endoparasites in nature but subsequently adapted to an ectoparasitic way of life. (Malmberg, 1990; Whittington, 1998).

The impact of infestation depends on the size, mobility and mode of attachment of the parasite (Borucinska *et al.,* 1993). In the natural environment, most parasites species rarely cause infection unlike in culture conditions especially intensive fish culture where parasites become pathogenic, sometimes causing severe epizootic outbreaks (Schaperclaus, 1991). During the spawning season in Israel, heavy infestations of *Dactylogyrus vastator on* carp fry caused mass mortality both in an indoor hatchery and nursery ponds (Paperna, 1963a). In Carp populations studied, heavy infection of *D. vastator* also caused 90% loss (Golovina *et. al.,* 1988).

Moreover, the infection of *D. vastator* in the gills of carp fry induces severe hyperplasia of the gill filament epithelium thereby causing intense proliferation of the respiratory epithelium of the gills which impairs respiratory function and seems to be the cause of great mortality (Paperna, 1963b, 1963c). *D. lamellatus* induces epithelial proliferation and caused wounds on gill filaments where it is attached to grass carp (Molnar, 1972). *Gyrodactylus* infections usually caused epidermal hyperplasia with a zone of degradation and excessive mucous production leading to pale skin. Frequent infection on fish species causes skin and scale sloughing and hyperaemia (Cone *et. al*., 1988, Heggberget *et al.,* 1982). Monogenean infections thereby expose the host to secondary infections of bacteria and fungi. (Cusack *et al.*, 1985)

MATERIALS AND METHODS

Two hundred and fifty (250) cultured *Clarias gariepinus* were collected at random from 50 different farms in Delta State. Five fish were collected in each farm based on the stock of the farmers at the time of visit to erode bias. Fish samples were collected into appropriate containers using scoop net for fingerlings and juveniles while drag and hand net for adult fish with the relative volume of water added. The sampled fish were taken to the laboratory for parasites observations. Water quality parameters recorded were pH, ammonia, atmospheric and water temperatures and dissolved oxygen using pH meter, Lamotte Kit and digital meter (HI9146) respectively.

Examination of fish specimen for parasites observation

Parasitological analysis was carried out on the skin and gill of the fish samples for monogenea trematodes. The surface of the individual skin was scraped along the entire length using coverslip. The content was placed on the slide with the cover slip slid vertically to spread the content homogeneously and viewed under a microscope at x10 and x40 magnification.

The operculum slit was raised with forceps to expose the gills. A portion of the gill was cut with scissors and placed on the slide. A drop of distilled water was added, then viewed under a microscope at x10 and x40 magnification.

RESULTS

A total of two hundred and thirty – one *Clarias gariepinus* were examined for parasitological investigation of monogenea trematodes while nineteen specimens were dead prior to laboratory analysis (Table 1). Out of 231 fish examined, a total of 72 specimens were infected with an overall prevalence of monogenea trematodes infections of 31.17% (Table 2). The *Dactylogyrus sp*. and *Gyrodactylus sp* were relatively restricted to the skin and gills respectively across the fish developmental stages (Table 5)

Dactylogyrus sp. was recorded in juveniles, post juveniles and adults with a total prevalence of 23.6%. No *Dactylogyrus sp.* was found in fry and fingerlings. The total prevalence of 76.39% was recorded for *Gyrodactylus sp* across all stages of the fish with 24 juveniles, 15 post juveniles and 11 adults of fish being infected while fry recorded the least. Mixed infestations of *Dactylogyrus sp* and *Gyrodactylus sp* were found in adult (1), post juveniles (2) and juveniles (2) with total prevalence of 6.92% (Table 3). Heavy *Dactylogyrus sp* were recorded in 23.53% adults affected and *Gyrodactylus sp* heavily infected juveniles (9.23%), post juveniles (3.08%) and adults (6.15%) respectively (Table 4). *Dactylogyrus sp.* infected the skin more than the gills while *Gyrodactylus sp* infected the gills more than the skin. *Gyrodactylus sp.* was found more in the gills of juveniles (23) followed by post juveniles (15). The highest number of adults recorded infestation of *Dactylogyrus sp* was on the skin (Table 5).

physico – chemical parameters of pond water were recorded (Table 6). The results of the water parameters from the sampled farms varied widely. Ammonia ranges between 0.2 and 3.5mgl^{-1} with a mean of 2.31mgl^{-1}. The mean value for dissolved oxygen and pH were moderate with 7.33mgl-1 and 6.06 respectively. The results of both atmospheric and water temperature were high.

Table 1: Frequency of sampled *Clarias gariepinus* examined for monogenea trematodes

	Fry	Fingerlings	Juveniles	Post Juveniles	Adults	Total
Dead	0	2	8	6	3	19
Live	5	28	77	54	67	231
Percentage Examined	100	93.33	90.59	90	95.71	92.4

Table 2: Infections of monogenea trematodes in relation to developmental stages of *C. gariepinus* in Delta State

	Fry	Fingerlings	Juveniles	Post Juveniles	Adults	Total
No Examined	5	28	77	54	67	231
No Infected	1	4	28	21	18	72
Percentage of Infection	20	14.28	36.36	38.89	26.87	31.17

Table 3: Frequency of monogenea trematodes in farmed *C. gariepinus* in Delta State

Parasites	Fry	Fingerlings	Juveniles	Post Juveniles	Adults	Percentage
Dactylogyrus Sp.	0	0	4	6	7	23.61
Gyrodactylus Sp.	1	4	24	15	11	76.39
Combined	0	0	2	2	1	6.94

Table 4: Intensity of monogenea trematodes on farmed *Clarias gariepinus* in Delta State

Parasites	Fry			Fingerlings			Juveniles			Post Juvenile			Adults		
	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L
Dactylogyrus Sp.,	-	-	-	-	-	-	-	-	2	-	-	6	4	-	5
Gyrodactylus Sp.,	-	-	1	-	-	4	6	-	20	2	-	17	4	-	11

L – Low (1 – 5), M – Medium (6 – 10), H – Heavy (≥ 10)

Table 5: Infected organs by monogenea trematodes in developmental stages of *Clarias gariepinus* in Delta State

Parasites	Fry		Fingerlings		Juveniles		Post Juveniles		Adults	
	Skin	Gills	Skin	Gills	Skin	Gills	Skin	Gills	Skin	Gills
Dactylogyrus Sp.,	-	-	-	-	3	-	4	2	5	2
Gyrodactylus Sp.,	-	1	-	4	-	23	2	15	5	11

Table 6: Physico – chemical parameters of sampled farmed *Clarias gariepinus* in Delta State

Water Parameters	Min	Max	Mean
pH	1.34	8.0	6.06 ± 0.09
NH_3 (mgl^{-1})	0.2	3.5	2.31± 0.71
Dissolved Oxygen (mgl^{-1})	0.42	20.33	7.33± 2.25
Atm. Temp. (^oC)	20.9	39.1	33.32 ± 5.09
Water Temp., (^oC)	27.4	39.5	31.27 ± 2.12

DISCUSSION

The prevalence of mongenea trematodes was 23.61 and 76.39 for *Dactylogyrus sp* and *Gyrodactylus sp* respectively (Table 3). The results indicated that *Gyrodactylus sp.* infection was greater than *Dactylogyrus sp.*, probably because the former is live bearing (viviparous), sometimes having up to 4 generations in one organism (Noga, 2010) making them highly prolific with short generation time. The latter is oviparous, requiring that the eggs produce hatch and develop before infecting a host. The juveniles were the most susceptible followed by the post juveniles and adults while fry was greatly less susceptible to *Gyrodactylus sp*. Both fry and fingerlings were not infected with Dactylogyrus sp but the highest number of adult fish was infected. Fry are reared under strict hygiene, mostly indoor, and are less likely to suffer heavy monogenean infestation.

The intensity of monogenea trematodes shifted principally from the organs of specificity in almost all the fish specimens examined (Table 5). *Gyrodactylus sp*. infected the gills of all the stages in different frequencies with juvenile having the highest and fry the least which is in contrast, to report of FAO 1996. About 90 – 95% gills infected with monogenea trematodes were pale. *Dactylogyrus sp* was found on the skin of Juveniles, post juveniles and adults more than the gills. The result is in contrast to the report of Balaji *et al.*, 2013 on carp species in which monogenean trematodes (*Dactylogyrus sp*. and *Gyrodactylus sp*.) caused less harm unless they associated with another group of parasites for severe damage thereby causing retarded growth and mortality of the fish host. Monogenea trematodes infestations were heavy on juveniles (*Gyrodactylus sp.*) and adults (*Dactylogyrus sp*) respectively (Table 4).

CONCLUSION

In conclusion, this study reveals the infections of monogenea trematodes on different developmental stages of *Clarias gariepinus* in Delta State. The rate of infection skewed from the principal target of parasitic attack. The indication is that monogenea trematodes (*Gyrodactylus sp* and *Dactylogyrus sp.*) could conveniently infect gills and/or skins of their fish host successively especially *Clarias gariepinus*. Improved aquaculture management practices would be recommended to foster a hygienic environment for the healthy growth of the fish.

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