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Isolation, Identification and Prevalence of Parasites on *Oreochromis niloticus* from Three Selected River Systems

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ABSTRACT

The prevalence of protozoan and helminthic parasite species occurring on and in the internal organs of *Oreochromis niloticus* was studied. Twenty samples of a mixture of adult and juvenile individuals of *Oreochromis niloticus* were randomly obtained from fishermen landing at the jetties of Epe water side, Ikorodu (Odoguyan) river and brackish water (Makoko), between September and October, 2009 during a period of low rainfall. Samples were eviscerated and the parasites were excised, identified and species of parasites were counted. Most of the parasites encountered were of the Protozoa, monogenea, Digenea, Cestoda and Nematoda groups. The infestation was predominantly by *Nematoda* sp. and followed by protozoan species. Protozoan parasites like *Trichodina* sp. and *Ichthyobodo* sp. were found to be prevalent, in varying magnitude, in most of the fish samples without clear age discrimination. The study reveals that the prevalence of parasites infestation increases with increasing length, size and age of the fish host and different parts of the fish.

Key words: Parasite, identification, fish selected river, Lagos, protozoan species

INTRODUCTION

Fish is a food consumed by many species, including humans, the word fish refers to both the animal and to the food prepared from it. Three quarter of the earth surface is covered by water, so fish has been an important part of the diets of human in almost all continents of the world. Fish is a cheap and important source of protein; it contains lipids, minerals and vitamins. Fish occupies several different levels of the aquatic food chain and makes up more than 40% of the world vertebrate species. Fish interacts with the various levels of food chain and influence the structures of lakes, streams and estuaries since, they are usually restricted to a particular mode of life related to their food source and reproductive requirement. Many fish species have been found to harbor protozoan and plenty of helminth parasites on their skin and/or under their scales (George, 2002). Parasitology is an area of study that describes the evolution of parasites and their life-cycles-this function enhances its ability to complement activities in the study of the pathology as well as, control of the major tropical diseases of humans and their livestock. Also, parasitology strikingly describes and explains the diversity of parasites in the warm tropical regions of the world and the frightening levels of debilitation and misery they cause (Anderson and May, 1979). Fish parasites have logically received greatest attention in past researches. Parasites are organisms that inhabit, at a time during their life-cycles, the body of another larger animal, thereby causing various

diseases (George, 2002). Fish is also prone to attack by a variety of microorganisms, just like other animals, especially those rich in protein. These microbial infections are caused by organisms which are referred to as parasites. Fish parasites could be as a result of density of stocking, poor condition of farming, lack of proper husbandry and stress (George, 2002). This study would serve as baseline data for further research works that have to do with the distribution of fish parasites from these water bodies.

MATERIALS AND METHODS

Three water bodies in Lagos were chosen for the collection of adult and juvenile samples of the *Oreochromis niloticus* for the isolation and identification of parasites found on them and within their organs.

The three water bodies are Epe water site (a brackish water), Ikorodu (a fresh water) areas of Lagos State that are connected by the Ogun river as well as the network of Lagos Lagoons.

Sample collection: Twenty samples of a mixture of adult and juvenile individuals of *Oreochromis niloticus* were obtained weekly for six weeks from fishermen landing at the jetties of these towns already identified. Sample collections and immediate excision of parasites were carried out between the months of September and October, 2009, during a period of low rainfall.

Materials: Light microscope, dissecting kit, a pair of scissors, wash-glass, petri-dishes, glass slides, cover slips, paint brush, saline water, alcohol, acetic acid solution and Wright-Giemsa stain.

Methodology: Isolation and identification of parasite groups-protozoa, monogenea, digenea, cestoda and nematoda, from fish was done as described by Roberts (1978).

RESULTS AND DISCUSSION

Table 1-4 show the raw values of various parasites populations in the experimental water bodies during the study period and they are the sources of values presented in Table 5 and 6.

Table 5 presents parasites' populations in the experimental water bodies as the experimental period progressed and shows a comparison among the values, using percentages and these reveal that brackish water was more infested with parasitic organisms than the freshwater bodies, this can be attributed to the fact there is a denser population around the Makoko water body, relative to those of the two other locations (Epe and Ikorodu), besides, brackish water bodies suffer more from pollution than fresh water bodies, especially where the brackish water is surrounded by a dense population, this is similar to the observation of Osineye *et al.* (2009).

Table 6 reveals that parasitic infestation of water bodies increases with advancing dry season-rainfall does a lot of cleansing to water bodies. Volumes of waters decrease with advancing dry season, thus increasing the population of parasitic organisms per unit volume of water, as recorded by Osineye *et al.* (2009).

The essence of constant surveillance of food-borne parasites and their epidemiological distribution can never be over emphasized in developing countries such as Nigeria. This is more so when literacy level and awareness of basic hygiene and methods of limiting the spread of these food-borne parasites are low. Fish remains one of the most highly sought after food items in many Nigerian dishes. It then remains very important that epidemiological surveys of the parasites borne

Table 1: Prevalence of parasite species found on *Oreochromis niloticus* in week 1

	EPE		Ikorodu		Makoko		Overall total	
Class	Count	%	Count	%	Count	%	Count	%
Protozoa								
Chilodonella sp.	0	0.0	1	2.9	1	2	2	1.9
Ichthyophthirius multifiliis	1	4.4	1	2.9	1	2	3	2.8
Trichodina sp.		2	8.7	7	20.6	15	29.4	24
22.2								
Epistylis sp.	2	8.7	1	2.9	1	2	4	3.7
Ichthyobodo sp. (Costia)	1	4.4	2	5.8	3	5.9	6	5.6
Monogenea	-	-	-	2.9	2	3.9	3	2.8
Gyrodactylus	0	0.0	1	-	-	-	-	-
Macrogyrodactylus sp.	0	0.0	0	0	0	0	0	0.0
Dactylogyrus sp.	1	4.4	2	5.8	3	5.9	-	-
Digenea							6	5.6
Clinostomum marginatum	3	13.0	1	2.9	0	0	-	-
Heterophyes sp.	0	0.0	0	0	0	0	4	3.7
Cestoda	-	-	-	0	0	0	0	0.0
Diphyllobothrium latum	0	0.0	0	-	-	-	-	-
Bothriocephalus sp.	1	4.4	3	8.8	5	9.8	0	0.0
Nematodes	-	-	-	2.9	1	2	9	8.3
Camallanus sp.	4	17.4	1	-	-	-	-	-
Capillaria sp.	3	13.0	8	23.5	10	19.6	6	5.6
Eustrongylides sp.	1	4.4	1	2.9	1	2	21	19.4
Trichuris sp.	0	0.0	0	0	0	0	3	2.8
Philometra sp.	0	0.0	0	0	0	0	0	0.0
Contracaecum sp.	4	17.4	5	14.7	8	15.7	0	0.0
Total	23.0	100.0	34	100.0	151	100.0	108	100.0
Relative percentage	21.9		31.5		47.2		100	

Table 2: Prevalence of parasite species found on *Oreochromis niloticus* in week 2

	EPE		Ikorodu		Makoko		Overall total	
Class	Count	%	Count	%	Count	%	Count	%
Protozoa								
Chilodonella sp.	1	4.5	1	2.8	0	0.0	2	1.8
Ichthyophthirius multifiliis	1	4.5	1	2.8	1	1.9	3	2.7
Trichodina sp.	5	22.7	15	41.7	20	37.7	40	36.0
Epistylis sp.	1	4.5	1	2.8	1	1.9	3	2.7
Ichthyobodo sp. (Costia)	1	4.5	1	2.8	1	1.9	3	2.7
Monogenea								
Gyrodactylus	0	0.0	2	5.5	4	7.6	6	5.4
Macrogyrodactylus sp.	0	0.0	0	0.0	0	0.0	0	0.0
Dactylogyrus sp.	1	4.5	1	2.8	1	1.9	3	2.7
Digenea								
Clinostomum marginatum	3	13.6	1	2.8	1	1.9	5	4.5
Heterophyes sp.	0	0.0	0	0.0	0	0.0	0	0.0

Table 2: Continue

	EPE		Ikorodu		Makoko		Overall total	
Class	Count	%	Count	%	Count	%	Count	%
Cestoda								
Diphyllobothrium latum	0	0.0	0	0.0	0	0.0	0	0.0
Bothriocephalus sp.	1	4.5	1	2.8	2	3.8	4	3.6
Nematodes								
Camallanus sp.	1	4.5	2	5.5	4	7.6	7	6.3
Capillaria sp.	5	22.7	8	22.2	15	28.3	28	25.2
Eustrongylides sp.	1	4.5	1	2.8	1	1.9	3	2.7
Trichuris sp.	0	0.0	0	0.0	0	0.0	0	0.0
Philometra sp.	0	0.0	0	0.0	0	0.0	0	0.0
Contracaecum sp.	1	4.5	1	2.8	2	3.8	4	3.6
Total	22	100.0	36	100.0	53	100.0	111	100.0
Relative percentage	19.8		32.4		47.8			

Table 3: Prevalence of parasite species found on *Oreochromis niloticus* in week 3

	EPE		Ikorodu		Makoko		Overall total	
Class	Count	%	Count	%	Count	%	Count	%
Protozoa								
Chilodonella sp.	1	4.2	1	3.1	1	2	3	2.7
Ichthyophthirius multifiliis	0	0.0	1	3.1	3	6	4	3.6
Trichodina sp.	5	20.8	8	25.0	12	24	25	22.7
Epistylis sp.	1	4.2	1	3.1	1	2	3	2.7
Ichthyobodo sp. (Costia)	0	0.0	1	3.1	1	2	2	1.8
Monogenea								
Gyrodactylus	1	4.2	1	3.1	2	4	4	3.6
Macrogyrodactylus sp.	0	0.0	0	0	0	0	0	0.0
Dactylogyrus sp.	1	4.2	1	3.1	2	4	4	3.6
Digenea								
Clinostomum marginatum	3	12.5	1	3.1	0	0	4	3.6
Heterophyes sp.	0	0.0	0	0	0	0	0	0.0
Cestoda								
Diphyllobothrium latum	0	0.0	0	0.0	0	0	0	0.0
Bothriocephalus sp.	1	4.2	2	6.3	4	8	7	6.4
Nematodes								
Camallanus sp.	1	4.2	2	6.3	4	8	7	6.4
Capillaria sp.	4	16.7	7	21.9	10	20	21	19.1
Eustrongylides sp.	1	4.2	0	0.0	2	4	3	2.7
Trichuris sp.	0	0.0	0	0.0	0	0	0	0.0
Philometra sp.	0	0.0	0	0.0	0	0	0	0.0
Contracaecum sp.	5	20.8	6	18.8	8	16	19	17.3
Total	24	100.0	32	100.0	50	100	110	100.0
Relative percentage	21.8		29.1		45.5			

by many of the popular fish species in our markets and landing sites, as arranged by the choice of Epe water-side, Ikorodu and Makoko, be adequately studied and well documented. It is therefore,

Table 4: Prevalence of parasite species found on *Oreochromis niloticus* in week 4

	EPE		Ikorodu		Makoko		Overall total	
Class	Count	%	Count	%	Count	%	Count	%
Protozoa		2.9	1	2.2	1	1.9	3	2.2
Chilodonella sp.	1	-	-	-	-	-	-	-
Ichthyophthirius multifiliis	1	2.9	0	0.0	1	1.9	2	1.5
Trichodina sp.	10	28.6	25	55.6	20	37.0	55	41.0
Epistylis sp.	0	0.0	1	2.2	1	1.9	2	1.5
Ichthyobodo sp. (Costia)	1	2.9	1	2.2	1	1.9	3	2.2
Monogenea		2.9	1	2.2	0	0.0	2	1.5
Gyrodactylus	1	-	-	-	-	-	-	-
Macrogyrodactylus sp.	0	0.0	0	0.0	2	3.7	2	1.5
Dactylogyrus sp.	1	2.9	1	2.2	1	1.9	3	2.2
Digenea		2.9	0	0.0	1	1.9	2	1.5
Clinostomum marginatum	1	-	-	-	-	-	-	-
Heterophyes sp.	0	0.0	0	0.0	0	0.0	0	0
Cestoda		0.0	0	0.0	0	0.0	0	0
Diphyllobothrium latum	0	-	-	-	-	-	-	-
Bothriocephalus sp.	1	2.9	2	4.4	4	7.4	7	5.2
Nematodes		2.9	1	2.2	1	1.9	3	2.2
Camallanus sp.	1	-	-	-	-	-	-	-
Capillaria sp.	10	28.6	5	11.1	12	22.2	27	20.0
Eustrongylides sp.	2	5.7	1	2.2	1	1.9	4	3.0
Trichuris sp.	0	0.0	0	0.0	0	0.0	0	0.0
Philometra sp.	0	0.0	0	0.0	0	0.0	0	0.0
Contracaecum sp.	5	14.3	6	13.3	8	14.8	19	14.2
Total	35.0	100.0	45	100.0	54	100.0	134	100.0
Relative percentage	26.1		33.6		40.3			

Table 5: Comparison of degree of parasitic infestation among the three water bodies

Period	EPE	Ikorodu	Makoko	SEM
Parasite population as experimental period progressed				
Week 1	23.0^{c}	34.0^{b}	51.0^{a}	1.27
Week 2 Sept. 2009	22.0^{c}	36.0^{b}	35.0^{c}	1.29
Week 3	24.0^{c}	32.0^{b}	50.0^{a}	1.20
Week 4 Oct. 2009	35.0^{c}	45.0^{b}	54.0^{a}	0.97
Comparison among the values (%)				
Week 1	21.9^{c}	31.5^{b}	47.2^{a}	0.78
Week 2 Sept. 2009	19.8^{c}	32.4^{b}	47.8^{a}	0.81
Week 3	21.8^{c}	29.1^{b}	45.5^{a}	0.69
Week 4 Oct. 2009	26.1^{c}	33.6^{b}	40.3^{a}	0.32

Means with different superscripts within a row are significantly different at $p<0.05$

a shortcoming that fish is not included in food items and living organisms that are quarantined and adequately monitor across border. This study is very important first step towards proper wild fish stock management and the control of many of the human diseases caused by some of the fish borne disease causing agents.

This study showed a preponderance of some protozoan parasites for a given tilapia species host at some sampling location than for others.

Table 6: Comparison of degrees of parasitic infestation among the four periods of study

Water bodies	Week 1	Week 2	Week 3	Week 4	SEM
Parasite infestation					
EPE	23.0^{b}	22.0^{b}	24.0^{b}	35.0^{a}	0.21
Ikorodu	34.0^{b}	36.0^{b}	32.0^{b}	45.0^{a}	0.10
Makoko	51.0^{a}	53.0^{a}	50.0^{a}	54.0^{a}	0.01
Comparison among the values (%)					
EPE	21.9^{b}	19.8^{b}	21.8^{b}	26.1^{a}	0.01
Ikorodu	31.5^{b}	32.4^{a}	29.1^{b}	33.6^{a}	0.03
Makoko	47.2^{a}	47.8^{a}	45.5^{a}	40.3^{b}	0.05

Means with different superscripts within a row are significantly different at $p<0.05$

The study showed that *Trichodina* sp. was very prevalent and abundant, all the tilapia species bone *Trichodina* sp. at all the locations throughout the study period. While there is no categorical evidence that *Trichodina* does not cause any humanly known disease, the fact that their method of attacking fish host skin and causing dermal erosion may indicate other kind of secondary impacting pathogens that may predispose man to novel diseases, this is in clear agreement with previous studies carried out by Albaladejo and Arthur (1989).

According to Paperna (1980) the cichlids, harbour majority of the infection which include the adult digenea infecting different tissues of the body; trematode metacercaria of the family clinosomatidae encysting in tissue and adult monogenea of the families, Dactylogyridae and Gyrodactylidae infecting the gills and the skin, a similar observation was made in this study, where trematodes were located in the gills and skin of tilapia species. Kabata (1985) and Paperna (1996) also reported excessive mucus secretion, epithelial proliferation and dermal erosion of fin fish association with the pathology of *Gyrodactylus* sp.

This shows that it could be easy to identify fish samples with compromised dermal tissues that may bear *Gyrodactylus* sp. and avoid them during market purchases in order to prevent human transmission of possible infection.

Clinostomum marginatum, *Bothriocephalus* sp., *Camallanus* sp., *Capillaria* sp., *Eustrongylides* sp. and *Contracaecum* sp. were found parasitizing *Oreochromis niloticus*, this observation agrees with the findings of Paperna (1980) and Awachie (1966).

Nematode parasites were found in the intestines of the fish host as earlier observed by Okaka and Omoigberale (2002), who recorded nematode as the most common parasites infecting 18.6% of the fish population.

During this study, it was also observed that adult fishes have more susceptibility to parasitic infections than juveniles and this corroborates the finding of Torres *et al.* (1979) who reported that the longer and bigger the fish, the greater the susceptibility to parasitic infections.

RECOMMENDATIONS

It is recommended that this study be continued and widened for greater number of fish species as are found in many Nigerian diets. For the control of parasites in fish culture system, the following recommendations are made:

- The lining of ponds with slaked line (for areas that have acidic condition), before stocking
- Early detection of signs of parasitic problems by constant surveillance and observation of the behaviour in rivers and reservoirs

- Removal of weeds and various types of vegetation to ensure that parasites such as leeches and snails (intermediate hosts) of digenean flukes are kept under control
- Training of competent scientists to manage all commercial fish farms and reservoirs
- The control of fish density, selective cropping and prompt removal of infected fish to avoid rapid spread to other fishes

CONCLUSION

The economic impact of these parasites on fish as an article of trade from our inland and coastal waters in comparison to their endemic nature in fish culture system would lead to better policy decision on how to protect Nigeria's aquatic resources. This all the more important when one considers the expected hostile reactions of European countries to the important fish and fish products from Nigeria based on heavy parasitic infestation in the absence of any scientific study quantifying and controlling it. Therefore, the ultimate solution to most of these problems lies in "prevention is better than cure". A total and comprehensive knowledge of the biology of host-parasite relationship within the culture system is therefore, imperative.

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