PARASITES OF *Oreochromis niloticus* (Trewavas) IN ELEYELE DAM, IBADAN, NIGERIA

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ABSTRACT
A survey on parasites of Oreochromis niloticus (tilapia) was carried out in Eleyele dam, Ibadan south west Nigeria. Standard parasitological procedures were applied in the study. Of the one thousand four hundred and eighty (1480) fish specimen examined, one thousand and sixty eight (1068) representing 72.16% were infested with different parasites. The parasites include Clinostomum piscidium, Trichodina sp., Myxosoma sarigi, Acanthugyrus tilapiae, Ichythobodo necator, Cichlidogyrus sp., Myxobolus sp., Cystacanthus tilapiae and Hirudinea species. Thirty seven percent (37%) of infested fish were mixed infestation while sixty three percent (63%) were infested by single parasite species. Seasonal pattern of parasites infestation was evident, the least infestation was recorded in September (47.62%) which is the peak of rainy season while the highest prevalence occurred in May (93.73%) the beginning of rainy season. An increase in the prevalence of parasite was also observed with an increase in total length of fish indicating the acquisition of parasite with age. However, there is no significant difference in the prevalence of parasitic infestation (P > 0.05) among the various size groups. This study on the parasites of feral O. niloticus will help in developing adequate control measures for the parasites in tilapia fish farming.
Keywords: disease outbreak, fish culture, parasite spectrum, intermediate host.

INTRODUCTION

Disease outbreak often depends on many contributing factors, which may include changes in the environment, the host and even the pathogen itself (Paperna, 1991). Problems associated with the culture of fish include infectious diseases, toxicity, stress due to poor water quality and general management practices and parasitic infestation. Parasites of fish constitute one of the major factors limiting fish production from both culture and capture fisheries. Like other animals, their reproduction, growth, appearance and general well-being are hampered by helminths and other parasites as they are usually potential source of discomfort (Rottmann *et al.*, 1992). With the increased interest in fish culture, there has been an increased interest in parasites of freshwater fish and diseases associated with them. The presence of parasites in fish is of concern to fish farmers as well as to the consumers. This is because the occurrence of adult parasites and migrant larvae in fish flesh has low aesthetic appeal to consumers and is of potential public health significance (Smith, 1984).

Freshwater tilapia, *Oreochromis niloticus* can be infested by a wide spectrum of parasites with difference in diversity and intensity of infestation. Various parasites are associated with *O. niloticus* in the wild and culture environment, where they cause morbidity, mortality and economic losses in aquaculture practices in the world (Subashinghe, 1995). The presence of parasite is to a high extent, determined by the status of the final host in a given area and by the availability of intermediate hosts as well (Moser and Cowen, 1991). For instance, the occurrence of digenea may be limited by the distribution of snail (the intermediate host). The habitats that are overgrown with bushes and trees also enhance development of parasites (Leong and Holmes, 1981). Aquatic birds and piscivorous aquatic animals are also known to act as either vertebrate intermediate or permanent host of various helminth parasites of fish. Most trematodes of fish have their primary host as aquatic birds (Meyer and Olson, 1975). Parasitological studies on wild *O. niloticus* can therefore contribute to increasing the accuracy of disease monitoring and management in tilapia farming.

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MATERIALS AND METHODS

The parasitological studies of *O. niloticus* in Eleyele dam, Ibadan, Nigeria were conducted between November 2008 and October 2009. Wild adult *O. niloticus* specimens were purchased from fishermen and fishmongers at Eleyele dam. The fish specimens were caught with either cast net or gill-nets. A total of one thousand four hundred and eighty (1480) specimens were obtained. The specimens were collected twice monthly and transported to the parasitology laboratory of the Faculty of Veterinary Medicine, University of Ibadan. The weight of each fish sample was measured to the nearest (g) while both total and standard lengths were measured to the nearest (cm). Thereafter, the samples were examined for the presence of parasites. The skin fins and gills were examined using hand lens (Williams and Jones, 1994). The gills were removed, separated into arches and examined under dissecting microscope between 10 and 30 X magnification. The fish were dissected and the intestines removed from each fish and then cut open longitudinally and examined for parasites. The muscles, liver and kidney of each fish were dissected out and left in physiological saline for 10 minutes, then examined for parasites (Soliman *et al.*, 2004). The different parasites seen were identified by the use of standard texts such as Soulsby (1982) and Parpena (1996), counted in situ and recorded. The prevalence and the mean intensity of the parasites on the host (*O. niloticus*) were determined by standard procedures described by Margolis *et al.* (1982). Relative abundance of each parasite is the total number of the parasite species divided by total number of all parasites recovered in a host multiplied by 100. Data was analysed by descriptive statistics of frequency, percentages, means and standard deviation. Correlation coefficient and student's t-test were employed to test for significance. Mean differences with $p<0.05$ were considered statistically significant. Relevant physico-chemical parameters such as water temperature, dissolved oxygen and pH of the dam water were monitored twice monthly. Water temperature was measured with a laboratory thermometer while dissolved oxygen was determined by titremetic Winkler method. pH was measured with pH meter (model 3153).

RESULTS

The total length of fish specimen used for the study ranged from 11.4 cm to 23.1 cm (mean, 17.3 cm) while the standard length ranged from 9.2 cm to 15.3 cm (mean, 12.9cm). The weight ranged from 80.6 g to 196.4 g (mean, 120.7 g). Seventy two percent of the total fish specimens examined were observed to be infested with different parasites. The intensity of infestation ranged from 3 to 28 parasites per host.

The following parasites were found to infest *O. niloticus* in Eleyele dam; these include *Clinostomum tilapiae, Trichdina* sp., *Myxosoma sarigi, Acanthugyrus tilapiae, Ichthyobodo necator, Cichlidogyrus* sp, *Myxobolus* sp., *Cystacanthus tilapiae* and *Hirudinea* species (leech). The infested fish showed mixed infestation in 37% of cases while 63% were infested only with single parasite. The highest prevalence was shown by *Cichlidogyrus* species (27.27%) followed by Clinostomum *tilapiae* (23.64%). The lowest prevalence (1.81%) was obtained for the leech (*Hirudinea* species) as shown in table 1. *Cichlidogyrus* species, a monogenetic trematode was found mainly on the gills while *Clinostomum tilapiae* a digenetic trematode was found on the skin, opercula region and the body cavity of the fish. The *Hirudinea* species (leech) was found mainly on the skin and gills.

Table 1: Parasite fauna of *Oreochromis niloticus* in Eleyele dam, Ibadan, Nigeria

Species	Occurrence	Prevalence (%)	Intensity	Mean intensity	Abundance
Clinostomum tilapiae	350	23.64	1-20	4.73 ± 1.22	0.236 ± 0.07
Trichodina sp.	215	14.53	1-12	4.69 ± 1.20	0.145 ± 0.06
Myxosoma sarigi	81	5.45	2-3	3.33 ± 1.00	0.055 ± 0.06
Acanthogyrus tilapiae	188	12.73	1-5	1.93 ± 0.68	0.127 ± 0.04
Ichthyobodo necator	256	17.27	1-17	4.77 ± 1.25	0.173 ± 0.08
Cichlidogyrus sp.	404	27.27	1-17	4.79 ± 1.05	0.272 ± 0.08
Myxobolus sp.	377	25.45	1-12	3.36 ± 0.91	0.055 ± 0.05
Cystacanthus tilapiae	94	6.36	1-10	2.43 ± 0.85	0.064 ± 0.04
Hirudinea sp.	27	1.81	1-2	1.05 ± 0.20	0.018 ± 0.02

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Also evident from the study is the fact that prevalence of parasite infestation increased with increase in fish size. The smallest sized fish samples with total length of 10.0 to 12.0 cm has the least prevalence (52.88%) while the biggest sized fish samples with total length of 22.0 to 24.0 cm has the highest prevalence of 88.12% infestation as shown in Table 2. Though the result shows increase on the level of infestation with increase in size of fish, statistical analysis (t-test) showed no significant difference (P > 0.05) among the various groups.

Table 2: Size classes of *Oreochromis niloticus* and relative prevalence of parasite infestation

Size class (cm)	Number examined	Number infected	Prevalence (%)
10.0-11.9	220	116	52.88
12.0-13.9	190	107	56.52
14.0-15.9	240	165	69.00
16.0-17.9	208	148	71.11
18.0-19.9	187	157	83.75
20.0-21.9	231	195	84.57
22.0-23.9	204	180	88.12
TOTAL	1480	1068	72.16

Correlation coefficient (r) = 0.964; t-test (t) = 0.376; p = >0.05

The result also showed seasonal pattern in the parasite infestation. The least prevalence (47.62%) of parasite infestation occurs in September which incidentally is the peak of the rainy season. In March and April, which is the hot dry season of the year, *O. niloticus* were infested with a very high parasites load. The peak of parasite infestation in the study (93.75%) was recorded in May which is the beginning of the rainy season. By June and July, parasite prevalence and intensity remained high. The prevalence and intensity started declining from late August as seen in Table 3.

Table3: Monthly prevalence of parasite infestation in *Oreochromis niloticus*

Month	Number Examined	Number infected	Prevalence (%)
January	122	89	72.95
February	120	99	82.5
March	116	102	87.93
April	130	118	90.77
May	128	120	93.75
June	118	106	85.59
July	130	94	72.30
August	128	67	52.34
September	126	60	47.62
October	130	69	53.07
November	110	70	63.64
December	122	74	60.66
TOTAL	1480	1068	72.16

The mean physico-chemical parameters of Eleyele Dam water at different months of the study period were shown in Table 4. Mean monthly water temperature ranged between 26.8 ± 1.73 °C and 32.3 ± 1.90 °C. The mean dissolved oxygen ranged between 3.85 ± 0.26 mg/l and 5.65 ± 0.39 mg/l, while the pH value ranged between 6.4 ± 0.47 and 7.2 ± 0.60. The highest temperature of 32.3 °C was recorded in April while the lowest temperature of 26.8 °C was in December. It was observed that the shores of the dam were overgrown with grasses and trees in which roasted different species of birds. Snails and other mollusks were also observed within the shoreline.

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Table 4: Mean physico-chemical parameters of Eleyele Dam water (November 2008 – October, 2009)

Months	Mean Temperature (°C)	Mean Dissolved Oxygen (mg/l)	Mean pH
January	27.6 ± 1.56	5.70 ± 0.32	6.7 ± 0.50
February	30.8 ± 1.93	4.25 ± 0.24	7.0 ± 0.53
March	30.2 ± 1.90	5.10 ± 0.32	6.4 ± 0.47
April	32.3 ± 1.90	5.25 ± 0.20	7.2 ± 0.54
May	29.9 ± 1.87	4.65 ± 0.39	6.9 ± 0.51
June	28.4 ± 1.51	4.82 ± 0.26	7.2 ± 0.60
July	28.0 ± 1.75	4.76 ± 0.23	6.8 ± 0.50
August	27.3 ± 1.89	5.12 ± 0.30	7.0 ± 0.53.
September	28.5 ± 1.65	3.85 ± 0.26	7.1 ± 0.48
October	29.2 ± 1.58	4.56 ± 0.31	6.8 ± 0.45
November	28.6 ± 1.72	5.24 ± 0.27	7.0 ± 0.62
December	26.8 ± 1.60	4.68 ± 0.33	6.9 ± 0.56

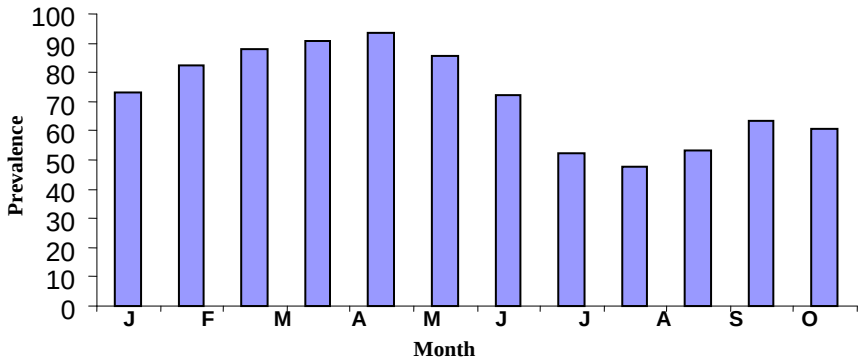

Fig.1: Monthly prevalence of parasites infestation of *Oreochromis niloticus*

DISCUSSION

The Eleyele dam has a large body of water rich in nutrients and supporting a profuse growth of grasses and trees. People living in Eleyele town dump their refuse on the shore which is invariably washed into the dam by run-off water. Invertebrates particularly snails and earthworms were abundant on the shore line. Different fish species constitute the resident population but the tilapia family particularly *O. niloticus* were dominant in the commercial catches of fishermen. On the shore of the dam, there were trees hosting a number of birds that excrete directly into the water. The birds predate on snails and fishes. This development is favourable for propagation of a number of parasites which may account for the high incidence of parasites obtained in the study. Similar findings were reported by Auta *et al*., (1999) and Ugwuzor (1987). Interaction between fishes and terrestrial birds and mammals influences the parasite fauna of freshwater fishes (Molnar *et al*., 1974; Cone and Anderson, 1977). This interaction is reflected in this study by the presence of large numbers of larvae helminths in tilapia, most of these larvae mature in birds. *Clinostomum tilapiae* is a parasite of herons and some other fish eating birds (Ukoli, 1984). The large numbers of piscivorous birds and mammals frequenting the water, the presence of suitable snail intermediate host and suitability of fishes as food for birds may be responsible for high prevalence of infestation of parasites in the fish.

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The seasonal patterns in parasite incidence and intensity obtained in the study may be related to the environmental factors. The effect of physico-chemical factors like oxygen concentration and water temperature as well as biotic factors like host species behaviour, migration and immunity are important in parasite infestation (Balling and Pfeiffer, 1997). A study has shown that the temperatures are highest in March just before the rainy season and lowest in December/ January at the peak of the cool dry season (Henderson, 1973). In the present study, the highest temperature was recorded in April while the lowest was in December. According to Osineye *et al.* (2009), volumes of waters decrease with advancing dry season, thus increasing the population of parasitic organisms per unit volume of water. In natural environment, the population of parasites must be in a state of dynamic change leading to the considerable variations of incidence and intensity which can be observed from month to month. The seasonal changes in intensity and infestation pattern of the parasites may be associated with seasonal availability of intermediate host, infective stages or favourable aquatic environment for respective parasite development and establishment. The high incidence of infestation during dry season in this study may be due to reduced water level and concentration of the infective stages. Oniye and Aken'ova, (2002) recorded lowest mean intensities in July and August. Where incidence and intensity are observed to be the same for a long period, there must have been a state of dynamic equilibrium where the effects of reproduction, growth and mortality interact to give the observed stability of population (Chubb, 1977).

CONCLUSION

The fact that the result showed an increase in parasite incidence and intensity with increase in the total length of fish demonstrates the possibility of acquisition of parasite with age. This result is in agreement with Mierzejewska, *et al*, (2004). Oniye *et al*. (2004) while working on the parasites of *Clarias gariepinus* observed an increase in prevalence and intensity of infection with an increase in size of the fish. The effect of parasite on the fish host are myriad, these include; the growth of parasite in the body cavity of fish causes a significant nutritional demand, creating higher metabolic rates in infested fish and increased feeding motivation (Giles, 1987). Furthermore, the presence of parasite in fish causes pathological changes in the internal organs of host which may lead to the death of young fish especially. Parasites can also affect reproduction in fish. Myxobolus infestations parasitize the ovarian mesenteries which may prevent the germinal epithelium from producing ovarian follicles thus inhibiting the egg from growing into maturity (Anyanwu, 1983). Landsberg (1985) described Myxobolus from the kidney, ovary and spleen of *O. niloticus* cultured in Israel.

In earlier study, Royce (1972) disclosed that the presence of parasites generally pose serious problem to fish. The high prevalence of parasite in the fish population studied is enough to retard growth and production of *O. niloticus.* It is envisaged that this study will stimulate interest in the development of suitable control measures against identified parasites, with ultimate aim of boosting fish production by culture.

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