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Occurrence of Trypanosoma in Nile tilapia in Lake Victoria, Kenya

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Abstract

Oreochromis niloticus (Nile tilapia) and *Lates niloticus* (Nile perch) are the most abundant species and economically important fish in Lake Victoria. The former are omnivores and the latter are carnivorous. The carrier status of haemoparasites in fish was investigated in 22 randomly selected fish specimens, 12 *Oreochromis niloticus* (Nile tilapia) and 10 *Lates niloticus* (Nile perch). Live fish were bought from Homabay on the shores of Lake Victoria in Kenya. All the fish were bled by cardiac puncture using a 22 gauge needle. Thin blood smears were made, stained with Giemsa and observed under a light microscope. About 42% of Nile tilapia and 0% Nile perch were found to be infected with *Trypanosoma* spp. *Oreochromis niloticus* seems to be more susceptible to *Trypanosoma* spp. infection than the *L. niloticus*.

Key words: **Nile tilapia; Nile perch; Trypanosoma; Lake Victoria, Kenya**

Introduction

Oreochromis niloticus (Nile tilapia) and *Lates niloticus* (Nile perch) are the most abundant and economically important fish in Lake Victoria. *Oreochromis niloticus* are omnivores while *Lates niloticus* are carnivorous, respectively. The haemoparasite belonging to the genus *Trypanosoma* species have been reported to occur in Lake Victoria by Paperna (1996) in *Oreochromis variabilis (54%), O. esculenta (50%), Clarias gariepinus* and *Bagrus spp* (Paperna, 1996). *Oreochromis niloticus* infection has been reported in Lake George in Uganda but not Lake Victoria (Baker, 1961; Paperna, 1996). The parasite has a cosmopolitan distribution and it is found in both freshwater and marine fish (Hassan *et al.,* 2007; Smit *et al.,* 2000). The carrier status of haemoparasites in fish was investigated in 22 randomly selected fish specimens, 12 *Oreochromis niloticus* (Nile tilapia) and 10 *Lates niloticus* (Nile perch).

Materials and methods

The study study was undertaken in Homa Bay town (0° 31′ 0′ S, 34° 27′ 0′ E) on the shores of Lake Victoria in Kenya. The fish were bought from fishermen and obtained alive at the landing site on October 2009. The blood was collected by cardiac puncture using a 22 gauge needle. Thin smears were made from the blood samples, air dried and fixed in absolute

methanol for five minutes. The smears were then stained with phosphate buffered Geimsa in the laboratory and examined under □100 objectives under oil immersion microscope (Leitz Orthoplan, Germany). The images were captured by a digital camera (Sony DSC-W190). The parasites were identified based on their morphology (Paperna, 1996; Smit *et al*., 2000). The *Trypanosoma* were characterized by tapering anterior and posterior ends and faintly stained flagella **(Figure 1).**

Data were entered in MS Excel and later exported to Instat® (Instat+ for windows, 2004) for descriptive statistics. The prevalence of the hemoparasite was defined as the total number of fish infected with the parasite divided by the number of fish examined (Margolis *et al.,* 1982). A critical probability of 0.05 was adopted throughout as a cut-off point for statistical significance between groups compared. The parasite distributions were described using prevalence and intensity (Ford, 1988). Prevalence was calculated using the formulae:

$$\textbf{Prevalence } \% = \frac{\textbf{Number of fish with parasite}}{\textbf{Total number of fish analyzed}} \times 100$$

Infection intensity was calculated using the formula:

$$\textbf{Infection intensity} = \frac{\textbf{Total number of occurences of parasite}}{\textbf{Number of fish infected with parasite}} \times 100$$

Results and Discussion

The *Lates niloticus* has a mean total body weight of 875 ± 307 grams, mean total length of 43.7 ± 4.0 cm while Nile tilapia (*Oreochromis niloticus*) had a mean total weight of ±56 grams and mean total length of 32.42 ± 7.3 cm. The haemoparasites were found in *O. niloticus* and none in *L. niloticus. Oreochromis niloticus* had a prevalence of 50% and an intensity rate of 140% (Table1).

Table 1. Number of trypanosome infected fish and prevalence rates in *O. niloticus* and *L. niloticus*

Fish species	Number of fish sampled (n)	Number of fish infected (x)	Parasites observed	Prevalence x/n (%)	Intensity
Oreochromis niloticus	10	5	7	50	140
Lates niloticus	12	0	0	0	0

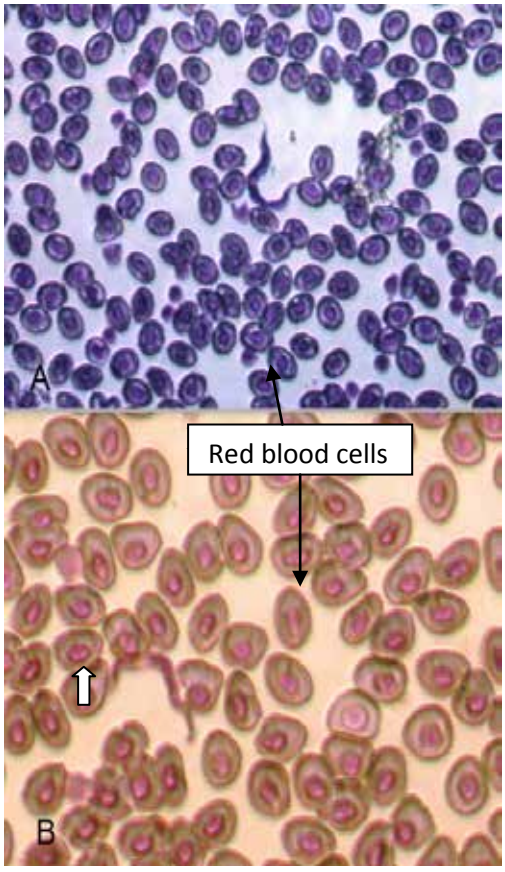

Figure 1. Trypanosoma with a pale staining eosinophilic flagellum, pointed anterior and a blunt posterior [black and white arrow, magnification x 100 (A) and x400 (B)] in Giemsa-stained blood smears from *Oreochromis niloticus*.

There are 184 species of Trypanosomatids assigned to fish in the genus *Trypanosoma. Trypanosoma* have a single flagellum and a single disc shaped kinetoplast. Infections in most species of fish are transmitted by leeches (Paperna, 1996). Even though the sample size was small, the prevalence rate of *O. niloticus* obtained in this study mirrors the 54% of *Oreochromis variabilis* and 50% of *O. esculenta* in Lake Victoria. *Oreochromis niloticus* in Lake George had a 20% infection rate (Baker, 1960 and 1961). There was a 50% prevalence rate of infection in the *O. niloticus* and 0% prevalence in *L. niloticus*. No infection has ever been reported in the *L. niloticus* by any researcher. The *L. niloticus* tend to be found deeper in the lake (Munyaho, 2004) and hence the hypothesis that the *L. niloticus* are shielded from excessive pollution by dilution effect than *O. niloticus* which are found in the shallower waters. Stress and presence of leeches close to the shore could cause the *O. niloticus* to be more susceptible to Trypanosoma infection compared to *L. niloticus*. The differences in diet, feeding sites and genetic make-up of the two species (possibly making *L .niloticus* have inate immunity) can also contribute to the different degrees of infectivity.

There is a need to study the effect of the Trypanosomes in fish as they have been reported to cause various degrees of damage in fish. Some of the physiological effects seen are loss of enzymatic activity of serum alkaline phosphatase levels in fresh water species of *Cirrhina mrigala* and the shark *Wallago attu* (Tandon and Chandra, 2004). In sculpins infected with *T. murmanensis* showed decreased haemotocrit, haemoglobin and proteins levels (Khan *et al., 1980).* Islam and Woo (1991) reported anaemia in fish as a result of erythrocyte haemolysis and blood haemodilution. According to Lom and Dykova (1979), an experimental infection with *Typanosoma danilewskyi* caused extensive damage to haemopoietic tissue in goldfish *(Carassius auratus).* Infected fish are listless, emaciated and have sunken eyes (Bunkley-Williams and Williams, 1994). The *O. niloticus* were found to have more histopathological lesions than *L. niloticus* (Kamundia *et al*., 2010).

Conclusions and recommendations

There is a possibility that *O. niloticus* could be more susceptible to *Trypanosoma* infection than the apparently resistant *L. niloticus* due to many factors including environmental influences. One of the environmental influences could be pollution which was apparent in Homa Bay along the lake shore. Detailed studies are needed to compare the haemoparasite infection between the species, between polluted and clean sites and the various age groups of fish on a larger sample size and also study the effect of the parasites on fish.

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