Occurrence of the genus *Eustrongylides sp*. Parasite (Nematoda: Dioctophymatidae) in *Chrisichthys macropogon* and *Synodontis clarias* from Lower River Benue

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Abstract

Occurrence of parasites of the genus *Eustrongylides sp*. (Nematoda: Dioctophymatidae) in *Chrisichthys macropogon* and *Synodontis clarias* from Lower River Benue in Makurdi, Benue State, Nigeria was investigated. Of the 50 *S. clarias*, 28.00% were infested with 113 *Eustrongylides sp.*, while the stomach accounted for 20.35% of the parasite load, intestine had 79.64%. 56.00% parasite prevalence and 0.56 parasite intensity were recorded for *S. clarias.* In addition, of the 50 *C. macropogon*, 21.00% were infested with 57 *Eustrongylides sp.*, while the stomach accounted for 22.81% of the parasite load, intestine had 77.19%. 42.00% parasite prevalence and 0.42 intensity were recorded for *C. macropogon*, respectively. Variation in percentage parasite infestation between male and female *S. clarias* and *C. macropogon* existed, being more in female *S. clarias* (60.18%) than the male (39.82%). On the contrary, percentage parasite infestation was more prevalent in male C. *macropogon* (64.91%) than the female (35.09%).

Keywords: Parasites, *Eustrongylides sp., Chrisichthys macropogon, Synodontis clarias,* Lower River Benue, Nigeria

Introduction

Changes in food habits/tastes in recent years has led to a tremendous increase in the consumption of raw fish and less cooked fish products and this new tendency has increased the risk of exposure of the consumer to parasitic hazards (Ljubojevic et al., 2015; Ferrantelli et al., 2014). Nematodes of the genus Eustrongylides can be the causative agent of a zoonotic disease that includes infections by nematodes having larval stages in aquatic hosts. The nematodes cause damage to the hosts by depriving them of digested food and by feeding on host tissues, sera, or blood. In some cases, direct mechanical damage results from them fixing to host tissues and developing or migrating in them (Paperna, 1996). Among fish nematodes, Eustrongylides infection has attracted considerable attention as it has been reported in various regions of the world and these nematodes exhibit a great potential for transmission and pathogenicity (Sattari, et al. 2007, Moravec, et al. 2003). *Eustrongylides sp* are pathogenic parasites of piscivorous birds transmitted through two intermediate hosts: aquatic oligochaetes and fish (Measures, 1988). In fish, these parasites are conspicuous as long, red, coiled individuals located in the body cavity or embedded in the muscle (Overstreet, 2003). Unencysted larvae of these parasites migrate under the skin and in the muscles, causing extensive inflammation and necrosis. Encystation occurring in the viscera organs causing severe pathologic changes in the adjacent tissue. Hence, to maximize productivity and to reduce fish mortality due to diseases and parasites, continuous evaluation of the physiological status of the fish is essential in the fishery sector.

Eustrongylides spp. has been recognized as zoonotic parasite (Narr et al., 1996) that may pose a public health risk to consumers. More recently, the European Commission established that food business operators must ensure that fishery products have been subjected to a visual examination with the purpose of detecting visible parasites before being placed on the market (European

Commission, 2005). Recently, the first recorded presence of *Eustrongylides sp*. in Italy was reported in the muscle of European perch fish caught from lake Trasimeno (Dezfuli et al., 2015). The aim of this study was to assess the prevalence of *Eustrongylides sp*. in *Chrisichthys macropogon* and *Synodontis clarias* from Lower River Benue in Makurdi, Benue State, Nigeria in order to support the existence of the emerging problems regarding the presence of Eustrongylides in these fish products, whose consumption is increasing as a result of consumer demand within the State.

Materials and Methods

Sample collection and preparation

A total of 100 fish samples comprising of 50 samples each of *Chrisichthys macropogon* and *Synodontis clarias* were caught from Lower River Benue State, Nigeria on monthly catches by local fishermen for a period of four months using different centimetre mesh sizes of gillnets

Fish samples were identified using Field Guide of Nigerian Freshwater Fishes (Revised Edition) by Olaosebikan and Aminu (2013). The sexes of the fish samples were determined by examination of their papillae. The total and standard lengths of each fish sample were measured in centimetres (cm) using a meter rule, while the weight were measured in grams (g) using an electronic weighing balance. All fish samples were transported to the Fisheries Laboratory, University of Agriculture, Makurdi for parasitic analysis.

Examination of Fish Samples for *Eustrongylides sp.*

Examination of fish samples for *Eustrongylides sp.* was carried out using the techniques of Bich and Dawaki (2010). The cavity of each fish was opened ventrally with a pair of scissors and the internal organs such as stomach and intestine were removed and examined for *Eustrongylides sp.* The stomach and intestine of each of the fish was dissected and the alimentary canals were removed and cut into parts in physiological saline (0.9ml) for parasite recovery. The stomachs and intestines were further carefully split open longitudinally to aid the emergence of the

parasites. Contents of the stomachs and intestines were further washed into the Petri-dish containing the saline solution. One to two drops of the preparation were placed on slide covered with slips and observed at × 100 magnifications under phase contrast microscope.

Determination of Parasitic prevalence and Mean Intensity

Parasitic prevalence and mean intensity were calculated using the formulae according to Ezewanji, *et al.*, (2005) as thus:

$$\text{Prevalence \%} = \frac{\text{Numberoffish infected}}{\text{numberoffish examined}} \text{ x } 100$$

$$\text{Mean Intensity} = \frac{\text{Total Number of Parasites}}{\text{Number of fish infested}}$$

Statistical analysis

The prevalence (%) and mean intensity were analyzed according to Bush *et al.* (1997). The relationships between factors such as host sex, weight, total length, parasitic location and parasitic infestation were obtained from pooled data using analysis of variance (ANOVA). All statistical analysis were done using SPSS version 17.0the length-weight relationship that were determined statistically using Microsoft word excel apart from .

Results

Results of the parasite prevalence and intensity of *S. clarias* and *C. macropogon* used for the study are shown in Table 1. Of the 50 *S. clarias,* 28.00 were infested with *Eustrongylides sp.* 22 were not infested with any parasite. Of the infested fish samples, while the stomach accounted for 20.35% of the parasite load, intestine had 79.64%. 56.00% parasite prevalence and 0.56 intensity were recorded for *S. clarias.* In addition, of the 50 *C. macropogon,* 21 fish samples were infested with *Eustrongylides sp* while 29 were not infested. Of the infested fish samples, while the stomach accounted for 22.81% of the parasite load, intestine had 77.19%. 56.00% parasite prevalence and 0.42 intensity were recorded for *C. macropogon,* respectively.

Table 1. Parasite Prevalence and intensity of *S. clarias* and *C. macropogon*

S. clarias						***C. macropogon***					
Parasite	**No. of infested fish**	**% parasite**				**Parasite**	**No. of infested fish**	**% parasite**			
		Prevalence	**Stomach**	**Intestine**	**Intensity**			**Prevalence**	**Stomach**	**Intestine**	**Intensity**
E. sp	28	56.00	20.35	79.64	0.56	*E. sp*	21	42.00	22.81	77.19	0.42

Results of the Percentage parasite infestation of male and female *S. clarias* and *C. macropogon* are presented in figure 1. Variation in percentage parasite infestation between male and female *S. clarias* and *C. macropogon* existed. Female *S. clarias* had higher percentage parasite infestation (60.18%) than the male (39.82%). On the other hand, male C. *macropogon* had higher percentage parasite infestation (64.91%) than the male (35.09%).

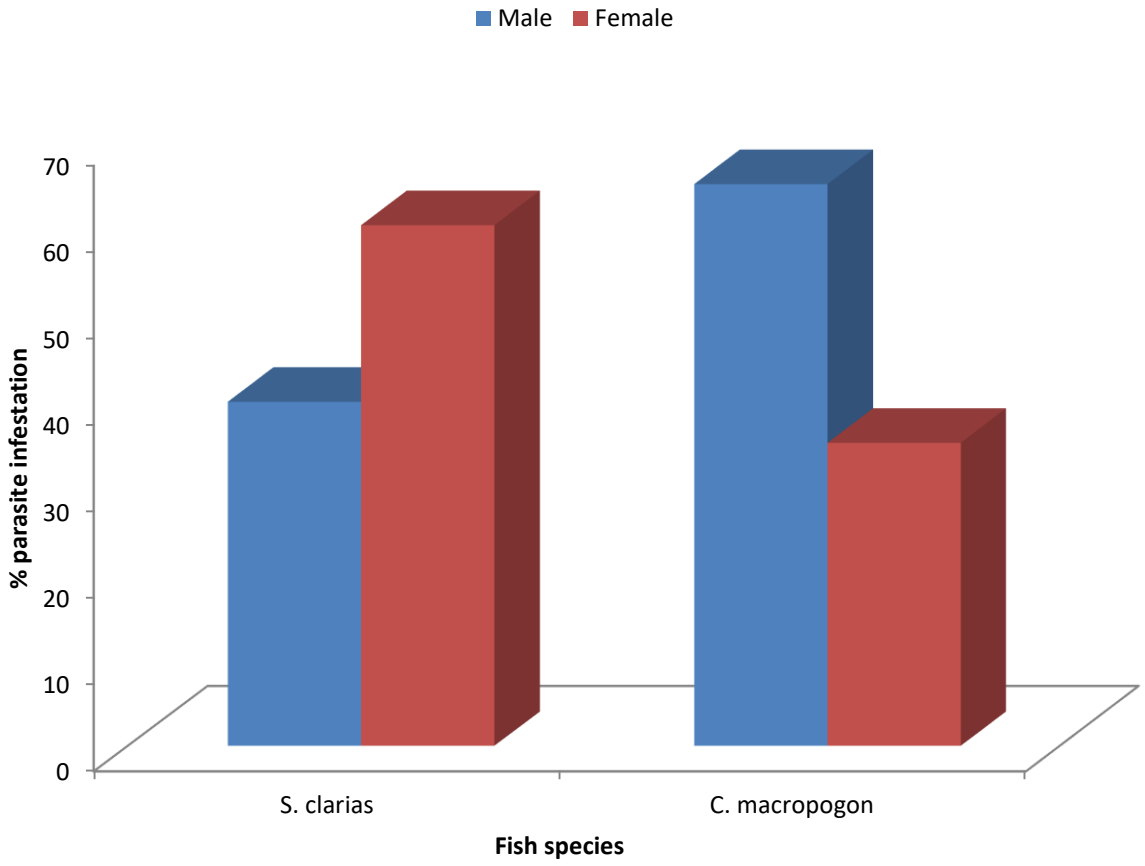

Fig. 1 Percentage parasite infestation of male and female *S. clarias* and *C. macropogon*

Results of the Percentage parasite infestation according to range in Length (cm) of *S. clarias* and *C. macropogon* are presented in Figure 2 while figure 3 shows the results of the percentage parasite infestation according to range in weight (g) of *S. clarias* and *C. macropogon.*

Of the range in length, highest percentage parasite infestation for *S. clarias* (34.51%) was recorded for 34.51cm while 47.37% parasite infestation was recorded for *C. macropogon* in the length group between 28.1-33.00cm.

Of the range in weight, highest percentage parasite infestation for *S. clarias* (25.66%) was recorded for 50.10-76.00g while 50.88% parasite infestation was recorded for *C. macropogon* in the weight group between 154.10-206.00g.

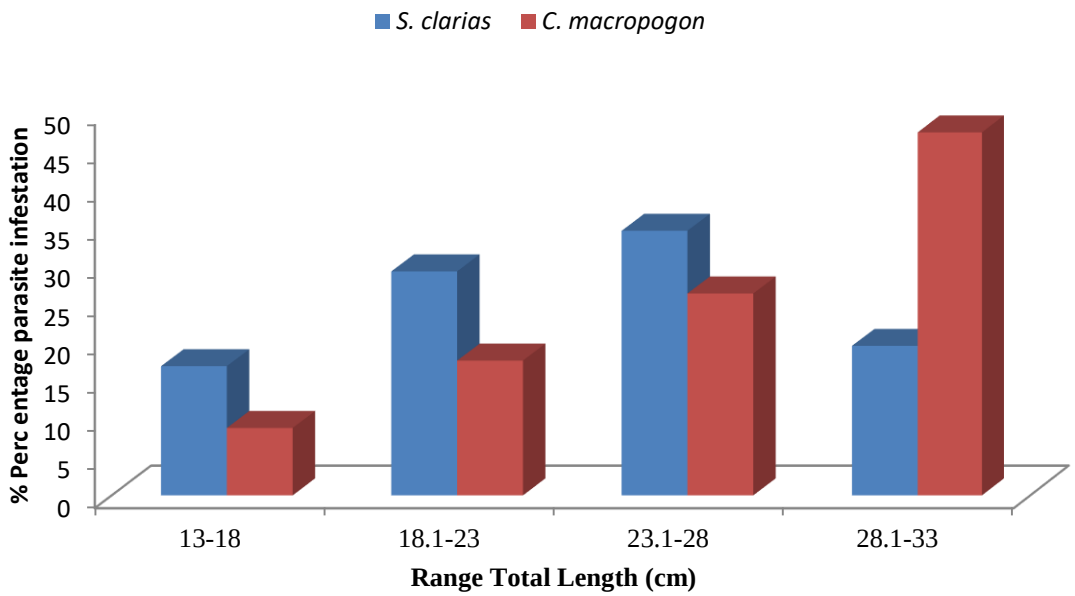

Fig. 2: Percentage parasite infestation according to range in Length (cm) of *S. clarias* and *C. macropogon*

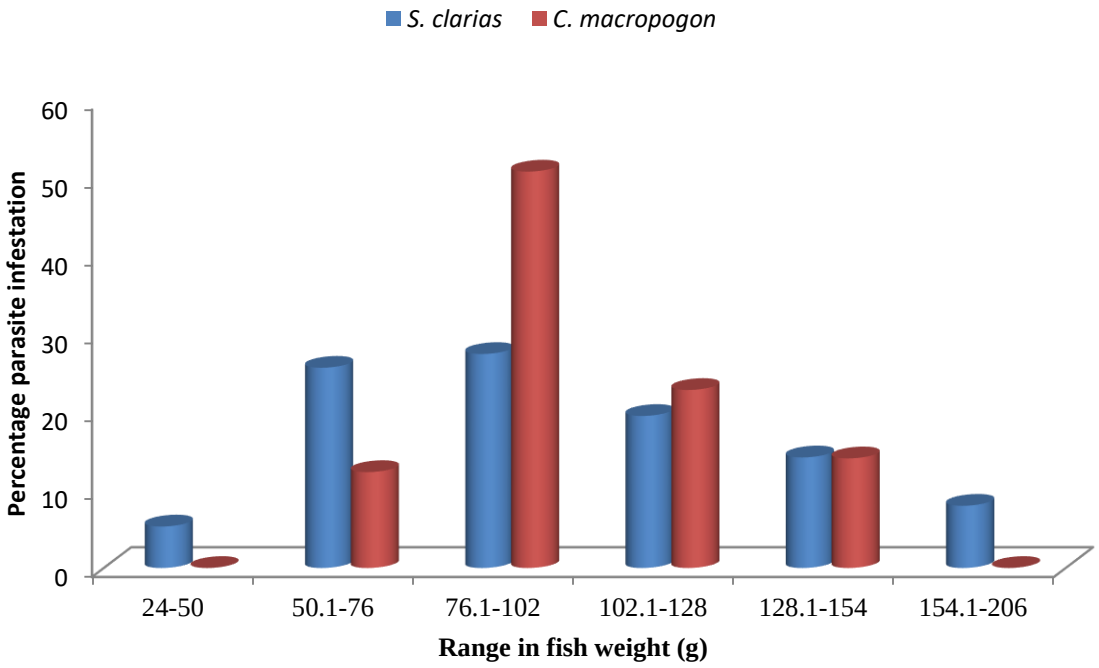

Fig. 3: Percentage parasite infestation according to weight range (g) of *S. clarias* and *C. macropogon*

Discussion

The overall prevalence of parasites (56.00%) and (42.00%) recorded for *S. clarias* and *C. macropogon* in this present study were higher compared to 32.9% prevalence recorded for fishes from Warri River, Delta State, Nigeria (Vincent *et al.,* 2014). Also, the prevalence were higher compared with records by other investigators in the rivers from the same region who reported overall parasite prevalence of 17.1% in the Osse River, 6.9% in the Okhuo River and 3.3% in the Great Kwa River (Edema *et al.,* 2008; Ekanem *et al.,* 2011).

However, the overall prevalence of parasites recorded for *S. clarias* in this study agrees with the overall prevalence of parasites recorded for fishes in the Niger River at Illushi, Edo State, a

Niger Delta area in Nigeria (Oyedineke *et al.,* 2010). These variations in the rate of parasitism could be attributed to abiotic and biotic conditions of the environments where the studies were carried out. Thompson and Larsen (2004) had made similar observation. Unfavourable conditions may offset fish physiology favouring parasite infestation and invasion. Rohlenova et al. (2011) has reported that unfavourable temperature may alter fish physiology including immune function favouring parasite invasion. Pollution of the fish environment also contributes to parasitizing of fish significantly (Kelly *et al.,* 2010). The relatively high prevalence of parasites in the examined fish in this study may be attributed to the relatively high pollution of the Beue River, Nigeria. This agrees with the reported work of Aghoghovwia, (2011) and Olele (2012).

The high prevalence of *Eustronngylides* parasite may be attributed to the presence of appropriate intermediate host (Nmor *et al.,* 2004), trophic linkage with the fish (Lagrue *et al.,* 2011) and efficiency in transmission of parasite to fish host (Iyaji *et al.,* 2009). It is important to note that even though *S. clarias* had parasite prevalence of 56.00%, its prevalence may not represent the exact prevalence of parasite in *S. clarias* in the Benue River because only one specimens of this fish species was encountered during the fish collection. The highest prevalence of parasites in *S. clarias* may be due to several factors which include feeding habit and diet of the fish (Rolbiecki, 2006), habitat (Koskivaara, 1992), immuno-competence of the fish (Folstad and Karter, 1992), as well as the behavioural pattern of the fish. Feeding on gastropods, worms, crustaceans and detritus by *S. clarias* may facilitate infection by parasites (Lagrue *et al.,* 2011).

The higher percentage parasites recorded in the intestine of the fish samples compared to the stomach could be due to the higher nutritional content in the intestine which might have probably

led to the parasites' preference, restriction and abundance in this part of the fish samples. This observation agrees with the reported work of Akinsanya *et al.,* (2008).

Parasitism in fish has been reported to be sex biased, with males suffering greater susceptibility. This sex linked parasitism has been explained as resulting from difference in reproductive investment by male and female fish (Skarstein *et al.,* 2001; Simkova *et al.,* 2008). Immuno-suppression by steroid hormone during spawning in males has been suggested as a major factor contributing to the greater susceptibility of males to parasite invasion (Folstad and Karter, 1992). Other factors suggested include competition for mate (Folstad and Karter, 1992) and cost of territorial defence (Reimchen, 2001). In agreement with the aforementioned observations, parasite prevalence obtained in the present study for male *C. macropogo* (60.18%) was higher than in females (35.09%) but contrary to the aforementioned observations, parasite prevalence obtained in the present study for female *S. clarias* (60.18%) was higher than in males (39.82%). The observed higher parasite prevalence in females may be suggestive of difference in ecological requirements between male and female fish (Iyaji *et al.,* 2009) and greater susceptibility of oviparous females to parasite (Simkova *et al.,* 2008). However, the present observed difference in parasite prevalence according to sex was not significant ($p>0.05$). The non-significant difference in parasite prevalence stratified by sex supports an earlier observation by Akinsanya *et al.* (2007) who recorded a non-significant ($p>0.05$) difference in the infection rate of male (37.7%) and female (35.5%) of *Malapterurus electricus* in Lekki Lagoon, Lagos State, Nigeria. In Bagauda Fish Farm, Kano, female *Clarias gariepinus* had higher occurrence of both the gill (20.7%) and gastrointestinal tract (34.6%) of parasites than that of the gill (11.8%) and gastrointestinal tract (23.6%) of males, although the difference was not significant ($p>0.05$) (Bichi and Yelwa, 2010). Similarly, a non-significant difference ($p>0.05$) in the infection rate of

females and males of four fish species (*Puntius schwanenfeldii*, *Puntius gonionotus*, *Hampala macrolepidoata* and *Notopterus notopterus*) examined at Tasik Merah, Perak, Peninsular, Malaysia have been reported (Rahman and Saidin, 2011).

Variation in percentage parasite infestation among the length and weight range of the fish samples existed. The highest percentage parasite infestation recorded in the length groups of 23.1-28.00cm and 28.1-33.00cm and weight groups of 50.10-76.00g and 76.10-102.00g for *S. clarias* and *C. macropogon* could be attributed to the random sampling that might have favoured more fish samples in these length and weight groups of the fish samples than the other groups. This agrees with the reported work of Omeji *et al.*, (2011).

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