Histopathological study on the parasitised visceral organs of some fishes of Lekki Lagon, Lagos, Nigeria

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Abstract

The histopathological study of the parasitised tissues of some fishes of Lekki Lagon was undertaken. The fishes examined for gastrointestinal helminth infections are *Parachanna obscura*, *Synodontis clarias*, *Heterotis niloticus* and *Chrysichthys nigrodigitsatus*. The histopathology of the fish tissues shows different pathological conditions. There was mucosal oedema, haemorrhage with haemosiderosis in some tissues examined while there was moderate focal lymphocytic infilterations of the myocardium of the heart in one of the fish species. Hyalinisation and calcification of blood vessel walls and numerous haemosiderotic nodules were seen in the liver. There was however, no significant pathological changes observed in some of the fish species. [Life Science Journal. 2007; 4(3): 70 – 76] (ISSN: 1097 – 8135).

Keywords: histopathology; visceral organs; helminth parasites; Lekki Lagon

1 Introduction

Histopathology is the microscopic study of tissuesues affected by disease. The procedures adopted for the preparation of material for such studies are known as histological or histopathological techniques. Fish diseases constitute one of the most important problems and challenges confronting fish culturists. In Nigeria, there have been reports of helminth parasite infections in freshwater fishes from a few localities.

Akinsanya and Hassan (2002a) and (2002b) recovered *Clinostomum marginatum* from Cichlid fishes purchased at Eleiyele River, Ibadan, Nigeria. Akinsanya and Otubanjo (2006) also recovered three cestodes and one nematode from Clarias gariepinus obtained from Lekki Lagon, Lagos, Nigeria. Awachie (1965) found acanthocephala mostly *Rhadinorhynchues horridus* and the trematode *Euclinostomum* in fishes from River Niger. The cestodes *Polyonchobothrium polypter* and *Callodistomum diaphanum* were recorded in fishes from River Galma in Zaria by Shotter and Medaiyedu (1977). Fish in intensive culture are continuously affected by environmental fluctuations and management practices such as handling, crowding, transporting, drug treatments, undernourishments, fluctuating temperatures, and poor water quality. All of these factors can impose considerable stress on the homeostatic mechanism of fish, rendering them susceptible to a wide variety of pathogens.

Kurochkin (1984, 1985) estimated that at least 30,000 species of helminths had already been described from marine animals. Such freshwater fish are also heavily infected with a variety of helminth it can be assumed from Kurochkin's estimates, that at least 30,000 species are already known from fish. The importance of parasitological studies in the development of fisheries potential of freshwater habitats cannot be overemphasised.

2 Materials and Methods

2.1 Study area

Lekki Lagon supports a major fishery in Nigeria. The lagoon is located in Lagos State, Nigeria and lies between longitudes 4º 00' and 4º 15' E and between latitudes 6º 25' and 6º 37' N. It has a surface area of about 247 km² with a maximum depth of 6.4 m; a greater part of the lagoon is shallow and less than 3.0 m deep. The Lekki Lagon is part of an intricate system of waterways made up of lagoons and creeks that are found along the coast of South-West-

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ern Nigeria from the Dahomey border to the Niger Delta stretching over a distance of about 200 km. It is fed by the River Oni discharging to the North-eastern and Rivers Oshun and Saga discharging into North-western parts of the lagoon.

Lekki Lagon experiences both dry and rainy seasons typical of the southern part of Nigeria. The vegetation around the lagoon is characterized by shrub and raphia palms, *Raphia sudanica* and oil palms, *Elaeis guneensis*. Floating grass occur on the periphery of the lagoon while coconut palms *Cocos nucifera* are widespread in the surrounding villages. The rich fish fauna of the lagoon includes *Heterotis niloticus*, *Gynmnarchus niloticus*, *Clarias gariepinus*, *Malapteruru electricus*, *Synodontis clarias*, *Chrysichthys nigrodigitatus*, *Channa obscura*, *Mormyrus rume*, *Calabaricus calamoichthys*, *Tilapia zilli*, *Tilapia galilae*, *Hemichromis fasciatus* and *Sarotherodon melanotheron* (Kusemiju, 1981). Figure 1 shows map of Lekki Lagon, Lagos, Nigeria.

Figure 1. Map of Lekki Lagon.

2.2 Collection and examination of specimens for parasites

A total of nine hundred and eighty randomly selected fishes consisting of *Parachanna obscura* (340), *Heterotis niloticus* (18), *Synodontis clarias* (362) and *Chrysichthys nigrodigitatus* (360) were obtained from Lekki Lagon, Lagos, Nigeria. The fishes were caught by dragnets. The period of collection was from early 2003 to late 2005. The fresh specimens were immediately examined for helminth parasites. The weights were taken with the aid of the digital weighing balance while the standard and total length of the fishes were measured using a metre rule. The fishes were dissected and the alimentary canals were removed and cut into parts in physiological saline for parasite recovery. The intestines were further carefully split open longitudinally to aid the emergence of the gastrointestinal helminth parasites. The worms were recognised by their wriggling movements on emergence. The infected guts were removed and fixed in Bouins fluid for 7 hours. They were later preserved in 10% of phosphate buffered formulation. The recovered helminth parasites were fixed in 70% alcohol. They were counted and recorded.

2.3 Identification of parasites

All the recovered gastrointestinal helminth parasites were sorted out into their various groups (cestodes, trematodes, nematodes and acanthocephala). The parasites were preserved and fixed in 70% alcohol. The parasite samples were transferred to vials, thoroughly sealed and labelled with code names. The vials were sent to the Natural History Museum, United Kingdom, for detailed identification to species level.

2.4 Histopathology techniques

Before making a permanent preparation of the fish tissues they were fixed in Bouin's fluid for six to seven hours and later transferred to prevent dissolving of cells by enzymatic action from within themselves, to prevent post-mortem decomposition, that is, putrefaction due to bacteria invasion, to harden the tissue so that they do not disintegrate on subsequent treatment, to enable the tissue cells resist the varying osmotic pressures of the different reagents to be subsequently applied and to render the cell resistant to shrinkage during subsequent processing. The dehydration of the tissues took place in increasing concentrations of alcohol (70%, 95% and then twice in absolute alcohol at 30 minutes duration).

Tissues were impregnated in molten paraffin wax three times and later embedded in molten paraffin wax and allowed to solidify. The blocked tissues were sectioned at 4 – 5 microns floated into precoated slides and dried. The sections were later stained which colour the nucleus and eosin stains which colour the cytoplasm of the cell. The stained tissues were washed off in tap water and the over stained ones destained in tissues were finally mounted using DPX mountant and dried. They were later examined under the microscope and their photomicrographs taken.

3 Results

3.1 Fish fauna profile

A total of nine hundred and eighty specimens (980) of fishes of Lekki Lagon, Lagos, Nigeria, collected between October 2003 and May 2005 and were subjected to parasitologic investigations. The fishes examined were *Parachana obscura* (340) in the family Channidae, *Synodontis clarias* (362) in the family Mochokidae, *Heterotis niloticus* (18) family Osteoglossidae and *Chrysichthys nigrodititatus* (260) in the family Bagridae. Table 1 shows fish species examined from the study site with the intensity of infections.

In *Parachana obscura*, the intensity of infection was low, having a total gastrointestinal helminths of twenty-two (22). *Heterotis niloticus* had a total helminths of fourteen (14). In *Chryschthys nigrodigitatus*, seventy-eight (78) helminths were recovered from the intestine of the fish species. The highest intensity of infection was observed in *Synodontis clarias* with six hundred and seventy-eight (678) helminths recovered from the intestine of the fish species.

Table 1. The fish species examined from the study site

Fish species	*n*	Intensity of infections
Parachanna obscura (Channidae)	340	22
Heterotis niloticus (Osteoglossidae)	18	14
Synodontis clarias (Mochokidae)	362	78
Chrysichthys nigrodigitatus (Bagridae)	260	678

3.2 Helminth infections of the fish species

Four main groups of parasites namely, Acanthocephala (1 species), Nematoda (4 species), Cestoda (4 species) and Trematoda (3 species) were encountered during the course of this study. Mixed infections in the fishes were also observed. Table 2 shows gastrointestinal helminths recovered according to fish species. The results show that *Parachanna obscura* was infected with a trematode, *Clinostomum metacercaria* and two Nematodes, *Proca mallanus*(spirocamallanus) and Contracaecum species. *Chrysichthys nigrodigitatus* was infected with a cestode.

Proteocephalus species, an aspidogastrid trematode, *Aspidogastrea africanus*, and a nematode, *Paracamallanus cyathopharynx*. No seasonal variation in parasite intensity was observed. The low prevalence of parasite is possibly related to the randomness of infection.

Heterotis niloticus was infected with three kinds of gastrointestinal helminth parasites. In the liver, a trematode, *Brevimulticaecum heterotis* was recovered, while *Tenuisentis niloticus*, an acanthocephala, and *Sandonella sandoni*, a cestode, were recovered from the intestine.

Synodontis clarias was infected with two kinds of gastrointestinal helminth parasites. Two cestodes, *Proteocephalus* species and *Wenyonia* species were recovered from the intestines.

A nematode, *Raphidascaroides* species was also recovered from the intestine of *Synodontis clarias* (Table 2 showing the helminth parasites recovered from the fish species).

Table 2. Helminth parasites of the fish speciess

Fish species	Helminth parasites
1. *Parachanna obscura*	*Clinostomum metacercaria* (Trematode) *Procamallanus* species (Nematode) *Contracaecum* species (Nematode)
2. *Chrysichthys nigrodigitatus*	*Proteocephallus* species (Cestodes) *Aspidogastrea africanus* (Trematode) *Paracamallanus cyathopharynx* (Nematode)
3. *Heterotis niloticus*	*Brevimulticaecum heterotis* (Trematode) *Tenuisentis niloticus* (Acanthocephala) *Sandonella sandoni* (Cestode)
4. *Synodontis clarias*	*Proteocephalus* species (Cestode) *Wenyonia acuminata* (Cestode) *Raphidascaroides* species (Nematode)

3.3 Fish tissues histopathology results

The microscopic study of tissues affected by the helminth parasites revealed different pathological conditions.

In *Synodontis clarias*, there was no significant pathological change observed. Figure 2 shows the normal section of the intestine of the fish species.

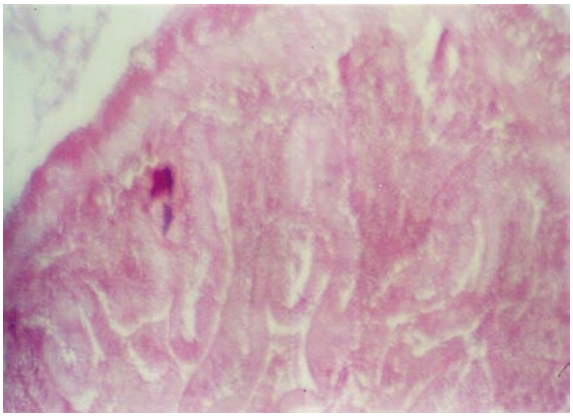

Figure 2. Normal section of *Synodontis clarias* stomach.

Parachanna obscura recorded different pathological conditions in the liver and the intestine. The section through the liver of the fish species shows deep basophilic staining of blood vessels wall and calcification of hepatic blood vessels (Figure 3).

Figure 4 shows numerous haemosiderosis observed in the intestine of *Parachanna obscura*: Mucosal oedema with haemorrhage was also observed in the parasitised intestinal wall of *Parachanna obscura*. Numerous haemosiderosis nodules were also observed in the liver of the fish species (Figure 5).

Moderate focal lymphocytic infiltrations of the myocardium were observed in the heart of *Chrysichthys nigrodigitatus*. There was no significant pathological change observed in the intestine of the fish species. Figure 6 shows the section through the heart of *Chrysichthys nigrodigitatus*. There was no significant pathological change observed in the other fish species. Figure 7 shows mucosal edema with haemorrhage in the intestinal wall of *Parachanna obscura*.

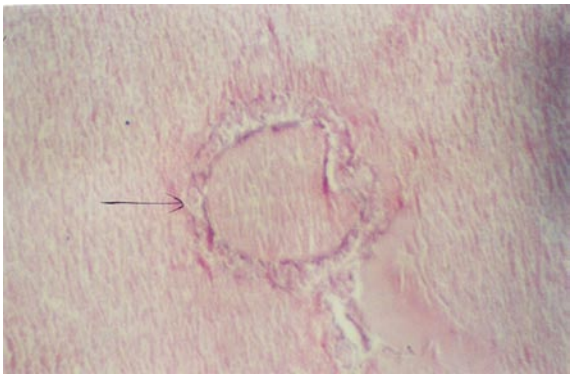

Figure 3. Deep basophilic staining of blood vessel wall. Arrow: Calcification of hepatic blood vessels in *Parachanna obscura.*

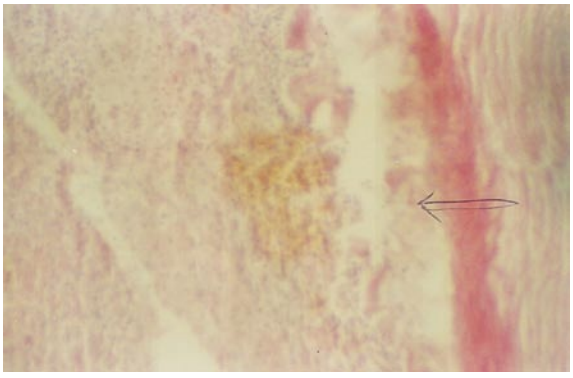

Figure 4. Haemosiderosis in *Parachanna obscura* intestine.

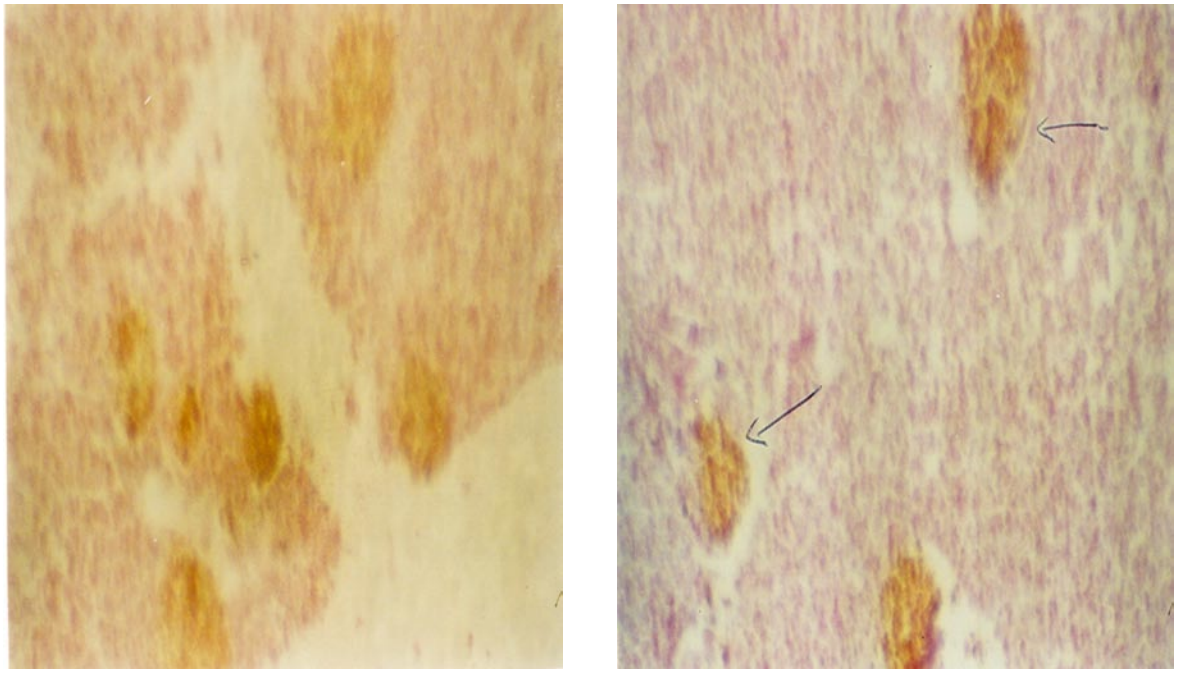

Figure 5. Numerous haemosiderotic nodules in the liver of *Parachanna obscura*.

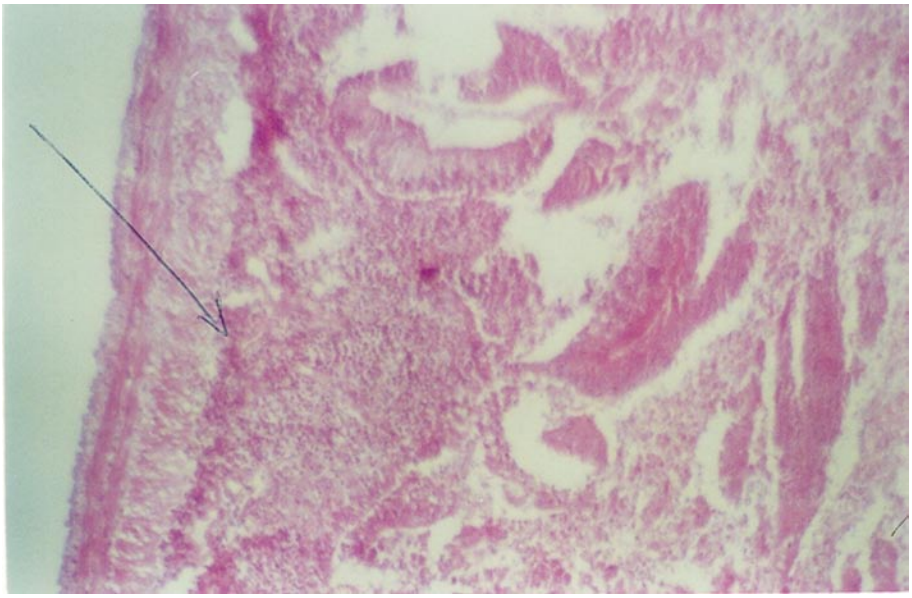

Figure 6. Lymphocytic infiltration of the interstitium of the heart of *Chrysichthys nigrodigitatus.*

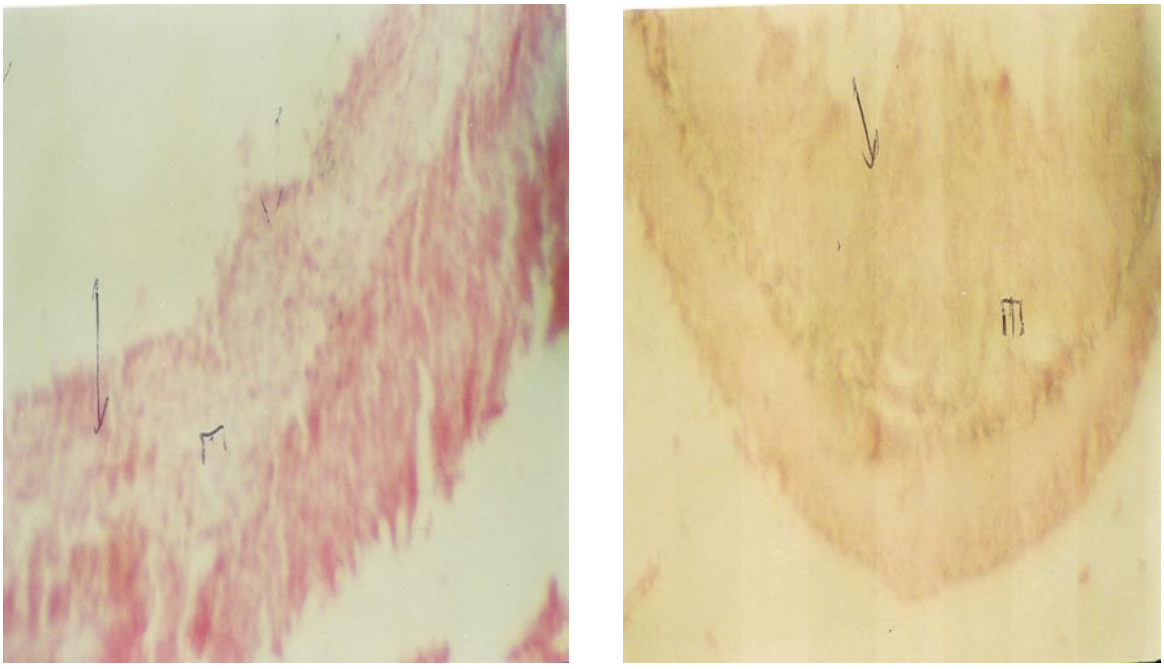

Figure 7. Mucosal edema with haemorrhage in the intestinal wall of *Parachanna obscura*.

4 Discussion

The histopathology study on the parasitised visceral organs of some fishes of Lekki Lagon, were undertaken. All the different groups of helminth parasites were recovered from the different organs of the fish species. Adult trematodes infecting the digestive tract of fish are considered harmless, even when their numbers are high.

In this study, there was no significant pathological change observed in the parasitised organs as a result of trematode infections.

Trematodes of the digestive tract are often very com-

mon and numerous (Khalil, 1960; Ukoli, 1969). Van As and Basson (1984) reported that metacercarial infections were found in fish in all studied inland water bodies in Africa and the Near East. *Clinostomum metacercarial* were reported in *Parachanna obscura* of Lekki Lagon, Lagos, Nigeria. The clinical effects of infection of this cyst are not obvious.

Beverly-Burton and Khalil (1963) reported that the presence of metacercarial in some sensitive organs in Clarias species does not necessarily imply a debilitating impact on the fish, even at relatively high infection loads, and despite visible structural damage. Akinsanya and Hassan (2002a) also reported the presence of *Clinostomum marginatum* (Yellow grub) metacercarial from Cichlids purchased at Eleiyele River, Ibadan, Nigeria. Paperna and Lengi (1963); Yekutiel (1985) reported that the large (0.5 – 0.8 mm in diameter) and numerous cysts of *B. levantinus*, established in muscles of young cichlids, induce severe body deformities. Hoglund (1991) established the fact that the cercariae penetrate via the skin and gills. Trout infection with *Apatemom gracilis* resulted in fibrogranulomatosis of the epicardium and failure in *in-vitro* pumping performance (Tort *et al*, 1987; Watson *et al*, 1992).

Sommerville (1982) also reported that pronounced inflammatory response and focal haemorrhages accompanies penetration and early migration of metacercarial. The inflammatory reaction predominated by infiltrating macrophages, is particularly intense around unencysted migrating metacercariae and preceded the eventual enclosure in a fibrous capsule of the encapsulating metacercaria (Yekutiel, 1985).

In this study, cestode parasites were recovered from some of the fish species. Banhawy *et al* (1975) reported degenerative changes in gut wall, liver and pancreas of *Synodontis schall* as a result of *Wenyonia virilis* infection. This is not in agreement with the present study, where there was no significant pathological changes observed in *Synodontis clarias*. *Wenyonia* species, one of the cestodes reported in this study, is common in Nigeria freshwater fishes. It has been reported by Ukoli (1969), Ugwuzor (1987), and Okaka (1991).

Infections by nematode parasites in this study did not produce significant pathological conditions. This is in agreement with the work done by Paperna (1964), Khalil (1969), Mashego and Saayman (1980) and Boomker (1982). They reported that infections by Camallanids (*Paracamallanus cyathopharynx* and *Procamallanus laevionchus*) in Clarias species did not produce any pathogenic effects in spite of the firm attachment by their buccal capsule to the stomach mucosa of the fish species. Little harm is also caused by the species of *Rhabdochona* or *Spini tectus*, which are common in the intestine of fish of all families (Paperna, 1964; Khalil, 1971).

In *Parachanna obscura*, numerous haemosiderosis were observed in the intestine and liver of the fish species. Haemosiderosis damaged the normal cellular architecture of the affected organs. Haemossiderosis results from the damaged of blood vessels and bleeding in the affected organs. It is a rare manifestation in fish which has not been reported so far. Dey *et al* (1986) reported heavy deposition of haemosiderin pigments in the liver and ovary of Indian major carp, *Catla* and Chinese silver carp, *Hypophthalmichthys molitrix* suffering from dropsy. Histopathological investigations revealed structural abnormalities such as disruption of normal chordal arrangements of the liver cells and their degeneration and necrosis and also damage of blood vessels in the ovary. They also reported that the deposition of haemosiderin pigments in both healthy and diseased specimens of *Catla* may probably have some relevance with the poor gonadal maturation of the fish. Haemosiderosis occurs in the form of brown intracellular granules which gives an intensely positive Prussian blue reaction.

Tenuisentis niloticus is the only thorny-headed worm recovered in *Heterotis niloticus* from this study. Pathogenic effects of acanthocephalans are due to attachment of the adult parasite in the digestive tract and also to the encapsulation of larval stages in the tissues. The extent of damage is proportional to the depth of penetration of the proboscis. There was no significant pathological change observed in *Heterotis niloticus* as a result of *Tenuisentis niloticus* infection. Acanthocephala infections are negligible when parasites are attached to the epithelial mucosa only. Further studies are still required on the invertebrate fauna of Lekki Lagon in order to ascertain the intermediate hosts of these helminth parasites.

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