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Parasitic Infection in the Freshwater Snails, *Pila ovata* and *Lanistes varicus* (Gastropoda: Ampullariidae)

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ABSTRACT: A total of 1181 freshwater ampullarid snails (apple snails) comprising 973 *Pila ovata* and 208 *Lanistes varicus* were examined for parasitic stages. These snails were collected from fourteen locations in Bayelsa, Edo and Delta states. *Pila ovata* was the more abundant apple snail in the study areas. Ninety (9.3%) of the *Pila ovata* and 23 (11.1%) of *Lanistes varicus* were infected with parasitic stages. Infection rates in the snails from the various sampling locations showed a least value of 1.7% and the highest value of 16.9%. The same types of parasitic stages were isolated from both species of apple snails and included ciliates, nematode larvae, sporocysts, rediae and cercariae. Two types of cercariae, xiphidiocercariae and amphistome cercariae, were isolated from the snails. However, the two types of cercariae did not occur in the same snail host. Further investigations are on to obtain adult stages of the parasites from in vivo cultures for identification of the parasites.

Keywords: Parasitic infection; Freshwater snails; *Pila, Lanistes.*

Introduction

Lanistes and *Pila*, are freshwater shellfishes commonly known as Apple snails belonging to the family Ampullariidae (Pain, 1961). Pila and Lanistes are found mainly in tropical and subtropical freshwater of Africa and Asia. They are found in the Southern Nigeria mostly during the rains (Yoloye, 1994). Apple snails prefer lenthic water bodies, occurring in ditches, swanps, flood plains, ponds, lakes and rivers. These snails possess lungs and gills, hence they are able to adapt to oxygen-poor water conditions. The presence of operculum in addition to the lung increases their ability to survive period of droughts. They are able to bury themselves into substrate, decrease body metabolism and enter a period of dormancy until environment conditions become more favourable during the rains.

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Apple snails are of numerous economic importance to man. They mainly serve as an important source of animal protein. They are delicacies in different parts of Africa and Asia. They also play an important role in the transmission of some trematode, nematode and protozoan parasites commonly found in man and livestocks (Smyth, 1994). Rysavy *et al* (1974) reported the presence of *Echinostoma revolutum* cercaria in *Pila ovata*. Apple snails act as bio-agent by predating on some medically important snails such as *Bulinus* sp and *Biomphalaria* sp, which serve as intermediate hosts for human schistosomiasis (Apple Snail Website, 2005).

In this study, we examined Pila ovata and Lanistes varicus for infection with helminth parasites, to determine the prevalence of these parasites and the role of these snails in their transmission.

Materials and Methods

Collection of Snails

Apple snails (mostly market derived) were collected from fourteen localities in Southern Nigeria. In Edo State snails were collected from Agenebode, Iguobazuwa, Ikoro, Ikpoba, Obazuwa, Oke, Ovia, Ozigolo and Siluko; others were Odumomo in Kogi State, Ughelli and Aladja in Delta State, Bayelsa and Rivers States. Snails were collected both in the dry and rainy seasons and brought to the laboratory to be examined for parasitic infections.

Examination for Parasitic Infection

All snails were examined using the shedding and crushing methods. In the shedding method, each snail was isolated in a specimen bottle about half filled with dechlorinated water overnight. While in the crushing method, each snail was de-shelled by cracking and dissected to separate the various organs, which were teased out and examined separately in 0.72% saline solution under a dissecting microscope. Parasites found were recovered from the medium using Pasteur pipette. Isolated parasites were washed in saline and preserved in 3% formol-saline or in 70% alcohol.

Identification of Parasitic Stages

Preserved parasites were measured and identified using the protocol of Smyth (1994). The parasites were then photographed with a digital camera attached to Nikon Binocular microscope.

Encystment Experiments

Twenty cercariae were transferred to plastic containers (holding 1 tadpoles per container), water weeds and fish fingerlingS (1 per container) at room temperature (27^{o}C). After 6 hours, 24 hours and 48 hours, tadpoles, water weeds and fish fingerlings were examined for metacercariae..

Results

Snails were collected from thirteen rivers and a fish pond as shown in Table 1. 82.4% of the apple snails collected and examined, were *Pila ovata* while 17.6% were *Lanistes varicus*. 9.6% of the snails were infected and 79.6% of theses snails were *Pila ovata* while 20.4% were *Lanistes varicus*. Prevalence of infection for *Pila ovata* was 9.3% and 11.1% for *Lanistes varicus*. Prevalence of infection in the snails from the various locations (Table 1) shows a least value of 1.7% in snails from Ozigolo river and hghest value of 16.9% for those from Oke river.

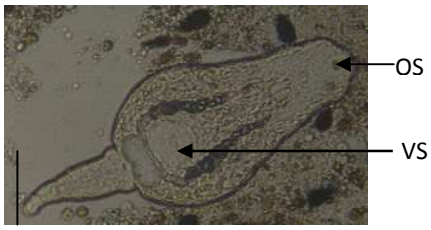
Parasites isolated include mostly trematode larvae, nematode larvae, ciliates, leeches and mites. The trematode larvae (Plates A, B, C, D) comprised sporocysts, rediae and cercariae. Two types of cercariae including xiphidiocercariae (Plate D) and amphistome cercariae (Plate B) were found during the study. Both types of cercariae occured in *Pila ovata* and *Lanistes varicus*, respectively. The two types of cercariae were also recovered from snails collected from Obazuwa, Ovia and River State. Only amphistome cercariae was recovered from snails collected from Ikpoba river while only Xiphidiocercariae infected snails from Ozigolo river. No infections were recovered in

snails from Aladja, Bayelsa, Odumomo, Siluko and Ughelli, fish pond. Generally, xiphidiocercariae were the most prevalent trematode larvae with an average body length of 314µm, average tail length of 156µm and average total length of 470µm (range 348µm to 581µm). The occurrences of other parasitic infections are as shown in Table 1.

Table 1: Prevalence of Parasites in *Pila ovata* and *Lanistes varicus*

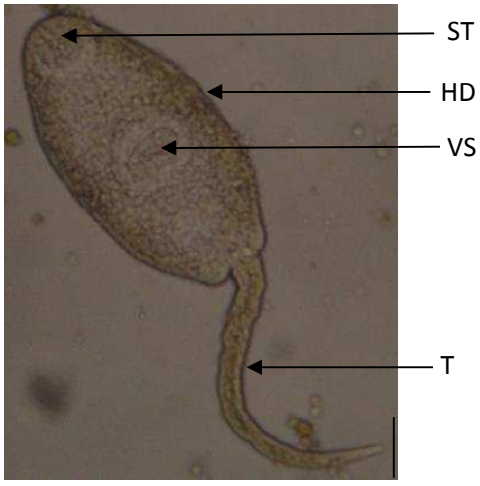
Snail species	Sampling site	Number examined	Number infected (%)	Parasites isolated	Prevalence (%)
Pila ovata	Obazuwa river	466	62 (13.3)	Sporocysts	10.6
				Rediae	0.23
				Amphistome cercariae	27.2
				Xiphidiocercariae	58.8
				Nematode larvae	0.04
Pila ovata	Ikpoba river	134	13 (9.7)	Rediae	15.6
				Amphistome cercariae	78.2
				Mites	5.2
Lanistes varicus	River state	50	2 (4.0)	Sporocysts	12.3
				Rediae	2.6
				Amphistome cercariae	15.6
				Xiphidiocercariae	43.2
				Ciliates	70.0
Lanistes varicus	Oke river	110	18 (16.4)	Sporocysts	15.2
				Xiphidiocercariae	55.2
				Leeches	16.3
				Mites	10.0
Lanistes varicus	Iguobazuwa	14	1 (7.1)	Leeches	13.4
Pila ovata	Oke river	65	11 (16.9)	Rediae	27.4
				Nematode larvae	38.6
				Mites	25.2
Pila ovata	Ikoro river	34	-	-	
Pila ovata	Ozigolo river	60	1 (1.7)	Xiphidiocercariae	100
Pila ovata	Agenebode river	90	-		
Lanistes varicus	Agenebode river	34	2 (5.9)	Sporocysts	80.7
				Rediae	18.4
Pila ovata	Ovia river	54	3 (5.6)	Sporocysts	14.8
				Rediae	2.6
				Amphistome cercariae	20.6
				Xiphidiocercariae	50.4
Pila ovata	Siluko river	11	-		
Pila ovata	Odumomo	5	-		
Pila ovata	Ughelli fishpond	25	-		
Pila ovata	Bayelsa	11	-		
Pila ovata	Aladja	18	-		
Total	*Pila ovata*	973	90 (9.3)		
	Lanistes varicus	208	23 (11.1)		
Overall total		1181	113 (9.6)		

A



B

C



D

Legends to Plate:

Larval trematodes occurring in Apple snails: A. redia of amphistome cercariae; B. amphistome cercariae; C. Sporocyst of Xiphidiocercariae; D. Xiphidiocercariae

Scale bar.A,B,C,D = 0.1mm

Abbreviations: HD, head; OS, oral sucker; T, tail; ST, stylet; VS, ventral sucker

Discussion

This study has revealed the presence of two species of apple snails *Pila ovata* and *Lanistes varicus* in a number of freshwater bodies in Souhtern Nigeria with *Pila ovata* being the most abundant apple snail. The low infection rates of 9.3% for *Pila* and 11.1% for Lanistes recorded in this study are in accordance with previous reports (Malek, 1975, Mattison *et al.*, 1995; Toledo *et al*., 1998). Sousa (1992) attributed such low infection rate in natural snails populations to direct consequence of high rate of parasite-induced mortality. However, low infection rate could be due to low parasite pressure simply making contact between miracidia and snails a rare event.

The predominant parasites found in the snails were trematode larval stages. Snails generally are known intermediate hosts of trematode infections of man and domestic animals (Smyth, 1994). Aquatic snails including *Pila* and *Lanistes* spp have previously been reported to serve as intermediate hosts in trematode life cycles (Olsen, 1974).

Size of snails appears to have no influence on snail infection as both large and small snails alike had equal chances of infection. However, other studies have shown that bigger snails, which are much older, had more parasites as they have more space for larval growth and differentiation (Dawood, 1970; Hodasi, 1972).

The observed occurrence of two types of cercariae, amphistome cercariae and xiphidiocercariae in these apple snails implies two different trematode species utilize these snails as intermediate hosts in the localities. These trematodes are however yet to be identified. Noteworthy however is that Pila species are already known to serve as intermediate hosts of *Echinostoma anguestitestis* and *E. ilocanum*, which have been known to infect humans (Radomyos *et al*., 1994; Yu *et al*., 1994).

The observation in this study that most of the parasitic stages occurred in the hepatopancrease is in agreement with previous reports of Lucius *et al*., (1981). Our observation that the prevalence of infection in these snails was higher in the dry season has been previously observed by other studies for other snails (Loker, *et al*., 1981; Chingwena *et al*., 2002). Increased in infection during the dry season could be attributed to reduced water volumes in the habitat, which in turn led to increased frequency of contact between miracidia and snail intermediate hosts.

The occurrence of nematode larvae in apple snails collected from two of the sampling locations is worthy of note as Cazzaniga, (2002) also reported the presence of nematode larvae in freshwater ampullariid snails as the curse of angiostrongyliasis due to metastrongylid nematode infections in humans in South East Asia and Pacific Islands. Confirmed cases of this disease have also been reported in West Africa (New *et al*., 1995). The occurrence of mites in some of the snails examined is an indication that these snail also act as host to these arthropods. Gledhill (2002) identified water mites isolated from *Lanistes libycus* as *Dockordia cockarum* and reported that this was the first water mites species from the family hygrobatidae to be reported as a parasite of freshwater mollusc. The presence of leeches, body fluid, suckers in apple snails is suggestive of precautionary measures during processing of the snails. Adult stages of the trematode parasites obtained from invivo cultures will help for concrete identification of these parasites being investigated.

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