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Ecology and endoparasite prevalence of fresh water snail (*Lymnaea luteola* hubendic 1951) in Benue state, Nigeria

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Abstract
Freshwater snails are commonly found in aquaria along with tropical fish and vary in different parts of the world. Studies on parasites association with fauna species are paramount to environmental health matters. The study examined the body weight and endo parasites prevalence of freshwater snails in Benue State, Nigeria. A total of 300 freshwater snails were sourced from the river (average of 50 from each) at three locations namely; Makurdi, Kastina-Ala and Ogbadibo (L.G.A) of Benue State. Body weight measurement and parasites isolation procedures was done accordance to standard methods. Data were analyzed using descriptive statistics and students t-test. Schistosomes were the main endo-parasites prevalent in the snails. The rate of parasites infection was high for all the locations. The result also revealed higher mean body weight (0.45kg) in snails from Makurdi. It was observed that snails with higher infection seem to have lower body weight. Result of ANOVA showed significant difference in body weight between snails of Makurdi and Ogbadibo compared to Makurdi and Katsina Ala. The parasite load was higher (34.42%) at Ogbadibo. It was observed also that snails with higher parasite load tend to have lower body weight. This was evident with snails obtained at Katsina Ala and Ogbadibo respectively. Adequate attention should be given towards control of the endo parasites especially for consumption.

Keywords: freshwater snails, endo-parasite, prevalence, river

Introduction

Freshwater snails are gastropod mollusks of the genus Lymnaea which inhabit almost all types of freshwater bodies ranging from small temporary ponds and streams to large lakes and rivers. Within each habitat, snail distribution may be patchy and detection requires examination of different sites. Moreover, snail densities vary significantly with the season. In general, the aquatic snail hosts of schistosomes occur in shallow water near the shores of lakes, ponds, marshes, streams and irrigation channels. They live on water plants and mud that is rich in decaying organic matter (Danielopol, 1992; Barbosa and Barbosa, 2014)[10, 8]. Some groups of snails that live in freshwater respire using gills, whereas others need to reach the surface to breathe air. In addition, some are amphibious and have both gills and a lung (e.g. Ampullariidae).

Many freshwater snails are of clinical and veterinary importance, serving as intermediate hosts of different helminthic parasites of both humans and animals (Abaje *et al*., 2012; Abdulhamid *et al.*, 2018) [2, 3]. The freshwater snails belonging to the Planorbidae family were mostly found to be the intermediate hosts of the highly infective trematode larvae of the genus *Schistosoma*, the causative agent of the disease schistosomiasis (also known as bilhaziasis). Majority of the snail intermediate hosts for human schistosomiasis belong to the three genera *Biomphalaria*, *Bulinus* and *Oncomelania* (Brant and Loker, 2013) [7]. The genera Biomphalaria and Bulinus are the intermediate hosts of *Schistosoma haematobium* and *Schistosoma mansoni* in Nigeria, respectively (Barbosa and Barbosa, 2014) [8]. The presence of snail intermediate host in an area is one of the major factors maintaining the transmission of schistosomiasis.

Freshwater gastropods are obligate primary intermediate hosts for many species of trematode parasites. Trematodes have a complex life cycle involving one or two (rarely three) intermediate hosts prior to infection of the definitive host. Infection occurs through ingestion of the eggs or penetration of the snail by free-swimming miriacidia. One or more intra-molluscan developmental stages may then be involved before the production of motile cercariae that leave the snail to infect the second intermediate or definitive host (Brown and Kristensen, 2018) [9]. Trematode infection usually results in parasitic castration of the snail host, may have important effects on gastropod population biology and life history and could contribute to the regulation of host populations at high prevalence (Brown and Kristensen, 2018) [9].

Prevalence of trematode infection generally increases with snail size (and age). There is considerable intra-specific variation in parasite prevalence in snail hosts. Thus, the need to examine its ecology and parasite prevalence in the study area.

Materials and methods

Study area

The study was carried out in three Local Government Area of Benue State. Benue State was created on 3rd February, 1976, with a land mass of 32,511 Km^2. The state lies between Longitude 6º - 10º East and Latitude 6º - 8º North (Fig. 1), situated mostly within the lower Benue from the South-eastern borderlands to the Cross River plains (Ityavyar *et al*., 2019) [11]. The River Benue is the major geographical feature from which the state derives its name. The River Kastina Ala and others like River Enumabia in Ogbadibo are important tributary of the Benue River. Benue State has the greatest stretch of the system in Nigeria with over 100 natural ponds and lakes. During the peak of the rainy season, the river is navigable up to Garoua in the Republic of Cameroon (Ityavyar *et al*., 2019) [11].

The climate is the tropical wet and dry type with rainy season spanning from April to October and dry season (November to March). Average annual total rainfall of approximately 1173 mm (Abah, 2012) [1] is recorded in the State. Temperature is generally high throughout the year, with February and March as the hottest months and varies from a daily maximum temperature of 34.1°C and a minimum of 28.2°C (Ologunorisa and Tor, 2006) [13]. The vegetation is the guinea savannah type.

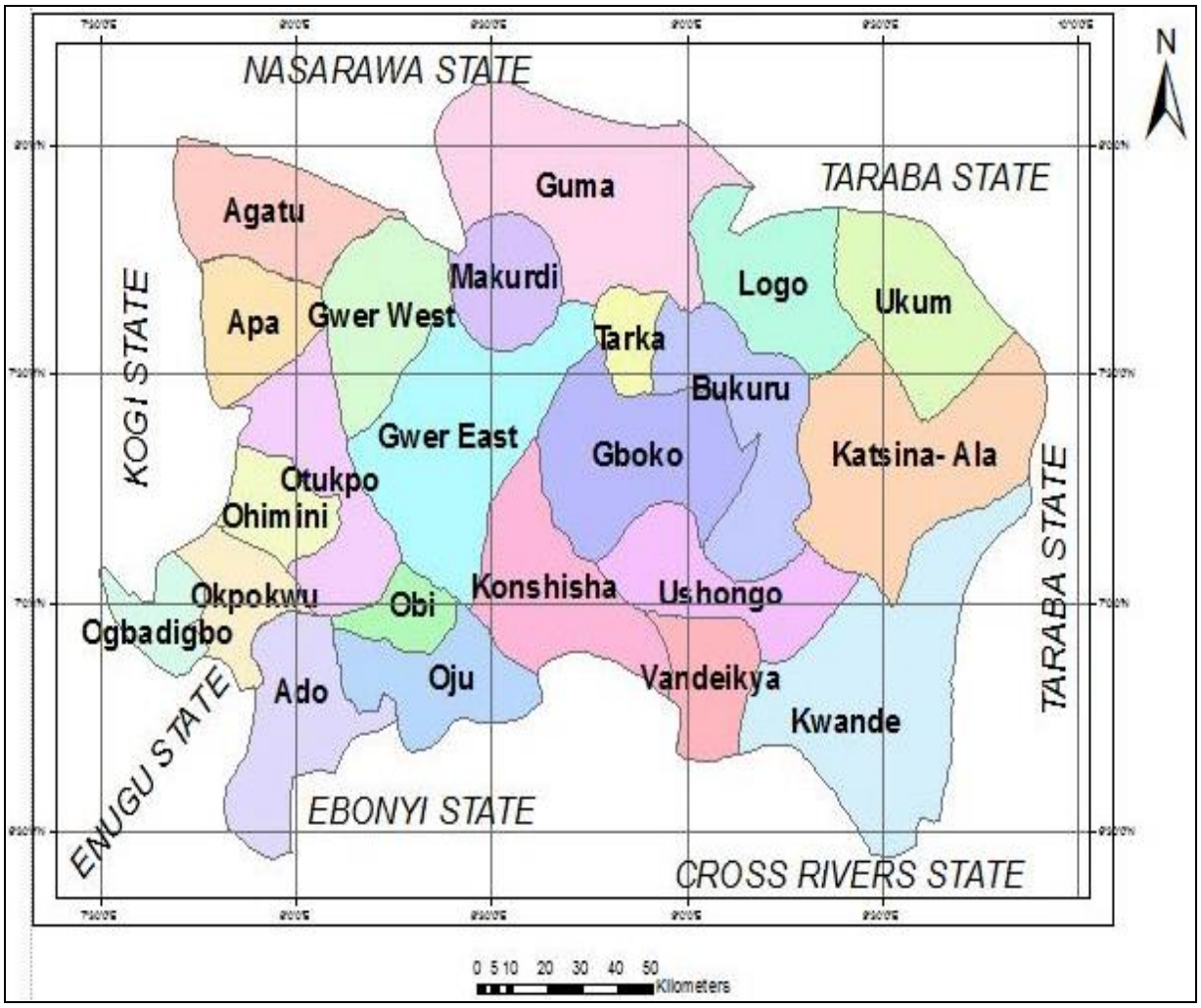

Fig 1: Map of Benue State (Babatimehin *et al*., 2015) [6]

Data collection and sampling procedure

The samples (Fresh water snails) were sourced from three different locations across the Zones in the state (Zone A- River Kastina Ala, Zone B- River Benue along Wadata and Zone C- River Enumabia Ogbdibo). All Samples were collected between June to August, 2021 with the aid of local fishermen recruited in all the study locations.

A total of 300 fresh water snails were collected, after which 50 samples from each of the three locations were selected for body weight and endo parasites evaluation. This was done by direct microscopic examination and feacal flotation technique. All laboratory procedures were undertaken at the Department of Fisheries, Joseph Sarwuan Tarka University, Makurdi and identification was done in the Department of Zoology laboratory parasitology unit.

Freshwater samples and experimental Techniques

Freshwater samples are presented in Plate 1 and body weight were weighted using electronic weighing machine.

Plate 1: *Lymnaea luteola*

Plate 2: Weighing of *Lymnaea luteola*

Data analysis

Data collected were analyzed using descriptive statistics and Student t-test. Values were considered statistically significant at $p<0.05$

Result

Endo-parasite, body weight and parasites load infestation

The main endo parasites identified in the fresh water snails was Schistosome (Plate 3). The number of fresh water snails examined for parasites were 50 per each location. The rate of parasites infection was high for all the locations. Higher body weight (0.45 kg) was obtained in snails from Makurdi. It was observed that snails with higher parasite infection rate had lower body weight. The ANOVA result showed a significant difference between samples collected from Makurdi and Ogbadibo but there was no significant difference in samples from Makurdi and Katsina Ala in terms of body weight.

The parasite load was higher (34.42%) at Ogbadibo. It was also observed that snails with higher parasite load tend to have lower body weight. This was evident with snails obtained at Katsina Ala and Ogbadibo respectively.

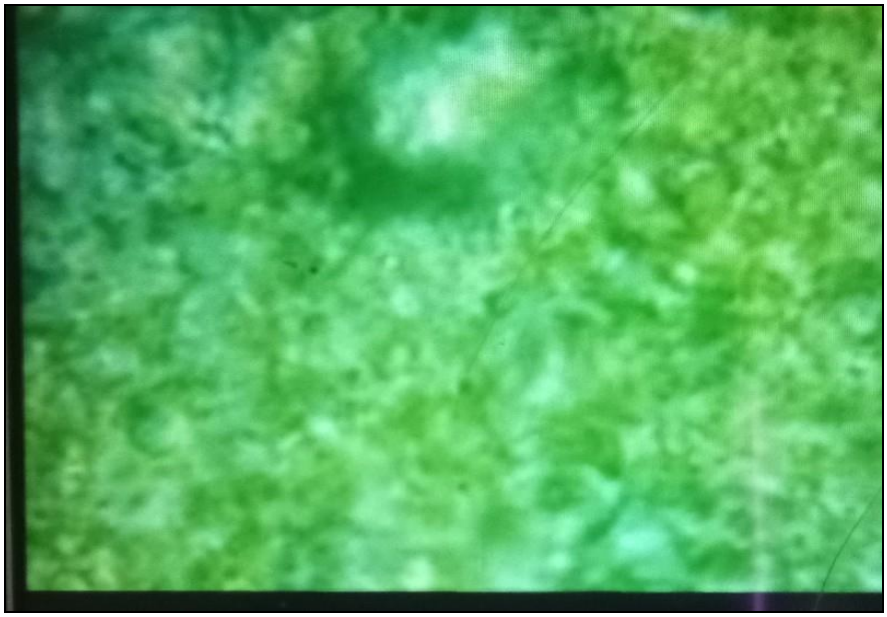

Plate 3: Schistosomes identified in fresh water snails

Table 1: Freshwater snails body weight, parasite infestation and load

Location	Number of Samples	Number infected (%)	Body weight (kg)	Parasite load (%)
Katsina Ala	50	41(82%)	0.3462^{ab}	33.08
Makurdi	50	40(80%)	0.4524^{a}	31.88
Ogbadibo	50	41(82%)	0.3158^{b}	34.42

Within the column, mean values with the same superscripts are not statistically significant at ($p<0.05$)

Discussion

The results showed high infection rate of water snails by parasites (Schistosomes) in the study area. This implied that fresh water snails gotten from the study locations were highly prone to parasites. It was observed from the study that, infection of snails was largely influenced by water quality and sanitation which might be largely due to water contact behaviour of local people.

Result of this finding is in line with the report of Akande and Odetol, (2013) [4]; Owiny *et al*. (2019) [14], who reported that snails play a vital role in the transmission of tremendous infections such as a zoonotic food-borne trematode infections caused by parasitic trematode. Fresh water snails are also an important vector of various parasite including the nematode *Angiostrongylus cantonensis*, which cause human *Eosinophilic meningitis* (Lu *et al*., 2011; Yang *et al*., 2013) [12, 15]. The presence of Schistosomes in the samples collected shows that water snails are possible intermediate host within the study area.

The prevalence of the infection among the studied snails may pose serious danger to human and animals within the study area except efforts are made to reduce contact between host and snails carrying the infective form of the parasites. The results of the study also agree with Anderson and May (1979) [5], who attributed the low prevalence of cercarial shedding among natural snail population to direct consequence of parasite induced host mortality.

The results on snail body weight gained or loss from different locations in the study area implies that, the parasites have a negative effect on their host probably affecting their host metabolism functions.

Conclusion and Recommendations

Freshwater snails harbour some parasitic and zoonotic disease that cause human's harm. Freshwater snails have been found to host schistosomes, responsible for schistomiasis in humans in this study. Also, snails with higher rates of infection had a considerably lower body weights compared to the others. Based on this finding, infection of snail was largely influenced by water quality. Therefore, proper sanitation is encouraged and lesser contact should be made with the water bodies so as to reduce infection. Also, adequate attention should be given towards control of the endo parasites especially for consumption.

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