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Spatial Distribution of Fresh Water Snails in Erinle Reservoir Dam, Olorunda Local Government Area, Osogbo, Osun State, Nigeria

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ABSTRACT

Distribution of freshwater snails were investigated in the three communities bordering Owala/Erinle Reservoir in Olorunda and Odo-Otin local government areas of Osun State, Nigeria using GIS between May 2008-April 2009 for 12 months. A total of five aquatic snail species namely *Bulinus globosus*, *Biomphalaria pfeifferi*, *Lymnaea natalensis*, *Potadoma freethi* and *Soapitia dageti* were found in the reservoir. Geographical coordinates of the villages and sampling sites were obtained using Global Positioning System (GPS). Each of the snail species was found in all sites investigated although *Bulinus globosus* was more abundant sites of intense human contact activities. Generally the number of *B. pffeifferi*, *S. dageti* and *B. globosus* showed a unimodal seasonal trend while the number of *P. freethi* and *L. natalensis* followed no discernible seasonal patterns. Factors identified as affecting total and seasonal distribution of snail include rainfall, ambient temperature, relative humidity and aquatic macrophyte in the reservoir.

Keywords: Schistosomiasis, *Bulinus globosus*, *Biomphalaria pfeifferi*, *Lymnaea natalensis*, *Potadoma freethi*, *Soapitia dageti*

INTRODUCTION

Schistosomiasis is a chronic and debilitating disease of tropical communities where people make unprotected contact with cercariae infected water bodies [1,2]. The control requires an integrated intervention targets at the various points in the life cycle of the parasite. Snail intermediate host is one of the focal point of the target control, which is aimed at reducing the problem of schistosomiasis transmission in any area. Therefore a good understanding of snail ecology is required to achieve a successful control of the snail intermediate host thus enhancing an effective and rapid reduction in transmission of schistosomiasis.

Snail control is very important approach for reducing the problem of schistosomiasis in endemic areas. It has therefore been used to achieve considerable reduction in schistosomiasis transmission in many communities [1,3]. Snail control involved efforts directed at the number of snails. It is generally, effective and rapid means of reducing transmission, because the likelihood of infection depends on the number of infected snails in a site. Snail control can be achieved through environmental, chemical and biological control [4].

MATERIALS AND METHODS

The study involved sampling in four sites, two in Oba-Ile and Ilie. All the four sites were sampled for snails once every month using Hairston drag scope supplemented by a manual search for 30 persons-minute for snail attached to boats, bamboo fish trap, submerge stones and aquatic macrophyte, all snail found were put in pre-labeled containers with perforated lids sorted and identified to species or general and counted to determine the number of each species/general per site according to Ofoezie et al. [4].

Samples of the aquatic macrophyte were collected and taken to the Herbarium of Obafemi Awolowo University for

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identification. A total of about 35 species were collected sorted and classified into marginal, submerged, floating and herbs species.

Study area (Figure 1)

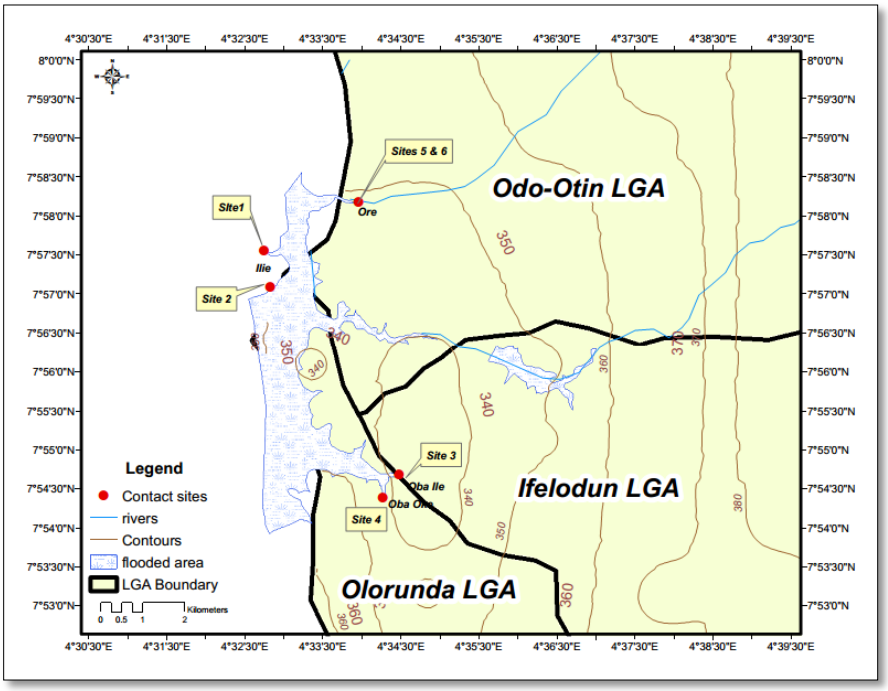

Figure 1. Freshwater snail sampling sites in the study communities.
S_1- Ilie, S_2- Ilie, S_3- Oba-Ile/Oba-Oke, S_4- Oba-Ile/Oba-Oke, S_5- Ore, S_6-Ore

RESULTS

A total of 5503 snails comprising 492 (8.9%) *Biomphalaria pffeifferi*, 40 *L. natalensis*, 4412 (80.2%), *Sopitia dageti*, 510 (9.3%) *Bulinus globosus* and 49 (0.9%) *Potadoma freethi* were collected from two sites investigated in Ilie and two sites investigated in Oba Ile during the twelve monthly sites visits. Thus, the lake is predominantly inhabited by *S. dageti* a prosobranch snail belonging to the Hydrobidae family and least *L. natalensis*, a pulmonate snail proportionally the three pulmonate snail species (*B. pfefferi*, *L. natalensis* and *B. globosus*) found in the lake constitute about 18.9% of the total number of snail encounter. Out of these *B pfeifferi* and *B. globosus* constitute over 18.2%. These snails were found in all sites investigated, although proportionally, they were more abundant in sites at Ilie and is at Oba Ile **(Table 4)**. Snail distribution in relation to aquatic macrophyte.

Snail sampling

Checklist of snail species and their abundance in the study communities: A total of 3,535 snails comprising of five snail species were found in the six human water contact sites in twenty four months (June 2008-May 2010). There were 690 (20.4%) *Bulinus globosus*, 47 (1.37%) *Potadoma freithi*, 480 (2.80%) *Lymnaea natalensis*, 480(14.4%) *Biomphalaria pfeifferi* and 2,182 (60.66%) *Soapitia dageti* **(Tables 1 and 2 and Plates 1-5)**.

Table 1. Checklist of snail species in the study communities.

Snail Species	Order	Family	Authority
Bulinus globosus	Hygrophila	Planorbidae	Moleret,1866
Biomphalaria pfeifferi	Pulmonata	Planorbidae	Krauss,1848
Potadoma freithi	Pulmonata	Thiarinidae	Gray,1831
Lymnaea natalensis	Pulmonata	Lymnaeidae	Krauss,1848
Soapitia dageti	Pulmonata	Bilhyniidae	Binder,1961

Table 2. Abundance of snail species from the six study sites (June 2008-May 2010).

	SNAIL SPECIES						
	***B. globosus* %**	***B. pfeifferi* %**	***L. natalensis* %**	***S. dageti* %**	***P. freithi* %**	**Total**	**%**
ILIE							
S1	120 (13.5)	121 (13.4)	20 (2.2)	625 (70.2)	9 (1.0)	895	25.30
S2	130 (16.4)	99 (12.5)	16 (2.0)	500 (62.9)	10 (1.3)	795	22.48
Total	250	220	36	1125	19	1690	45.00
OBAOKE/OBA-ILE							
S3	198 (30.8)	80 (12.5)	17 (2.6)	339 (52.8)	08 (1.2)	642	18.16
S4	134 (30.7)	60 (13.8)	15 (3.4)	220 (50.5)	07 (1.6)	436	12.33
Total	332	140	32	559	15	1078	30.49
ORE/EKO-ENDE							
S5	107 (23.0)	65 (13.9)	17 (3.7)	268 (57.6)	08 (1.7)	465	13.15
S6	101 (25.1)	55 (13.7)	11 (2.7)	230 (57.2)	05 (1.2)	402	11.37
Total	208	120	28	498	13	767	24.52
Total	790	480	96	2182	47	3535	
% of Overall Total	20.4	14.01	2.80	61.66	1.37	100	100

Plate 1. *B. globosus* found in the study communities.

Plate 2. *P. freithi* found in the study communities.

Plate 3. *L. natalensis* found in the study communities.

Plate 4. *B. pfeifferi* found in the study communities.

Plate 5. *S. dageti* found in the study communities.

Temporal and spatial variation of snail species: The monthly variation of the mean number of *B. pfeifferi*, *B. globosus*, *P freethi*, *S. dageti* and *L. natalensis* are shown in **Figure 2**. The figure shows a general trend in the pattern of temporal variation which is common in all species. Generally the number of *B. Pfeifferi* increased from June with three peaks in October 2008, June/July and October 2009 while *B. globosus* increased from June with two peaks in November 2008 and October 2010, before declining to lower values in the succeeding months. **Figure 3** shows that freshwater snail is found in all the study communities whether situated on high or low contour areas. The abundant snails found in the study area are as shown in **Figure 4** along the flooded areas in the study communities surrounded by forest. The list of the 26 aquatic macrophytes found at the six HWCA sampling sites.

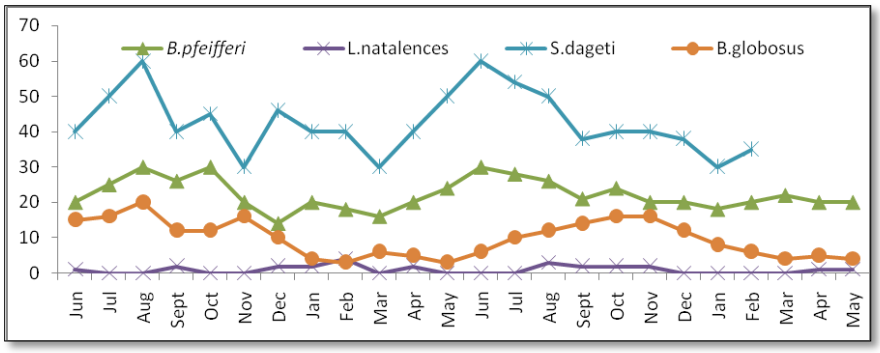

Figure 2. Monthly variation in the abundance of freshwater snails.

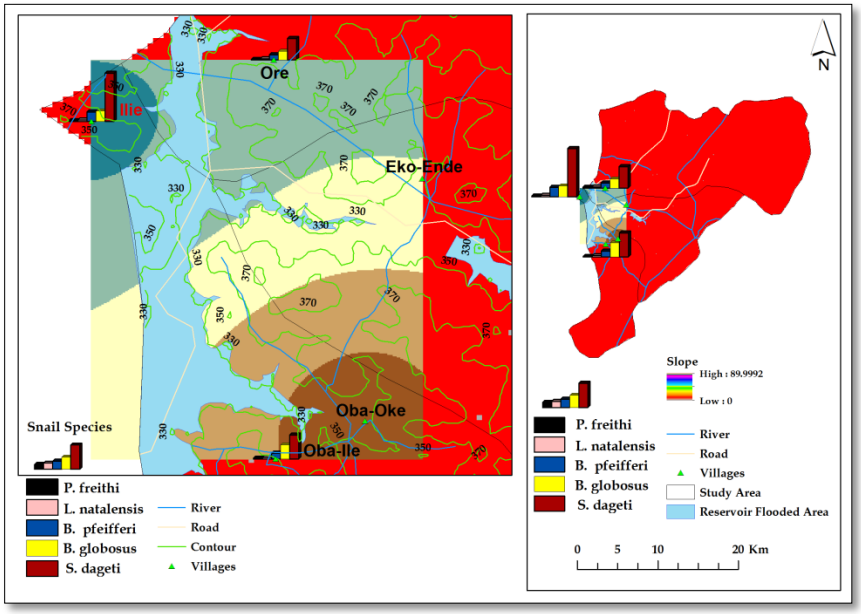

Figure 3. Map of the study communities showing the pattern freshwater snail species in relation to contour.

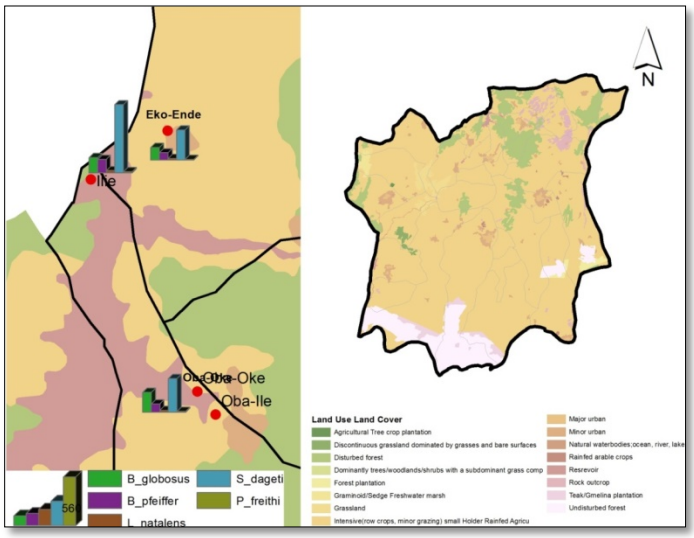

Figure 4. Map of the study communities showing the pattern freshwater snail Species in relation to LU/LC.

A total of 27 aquatic macrophyte species were found in the four sampling sites **(Table 3)**.

Table 3. List of aquatic macrophytes in the four sites.

Family	Botanical name
Euphorbiaceae	*Achornea cordifolia*
Asteraceae	*Agerantum conizoides*
Poaceae	*Acroceros pizoinioides*
Amaranthaceae	*Alternanthera senssili*
Asteraceae	*Aspilila Africana*
Poaceae	*Cynodon dactylon*
Papilioanaceae	*Demodium giganticum*
Asteraceae	*Edipla prostate*
Asteraceae	*Emilia coccinia*
Onaceae	*Ludwigia erecta*
Poaceae	*Panicum maximum*
Poaceae	*Paspalum polysachum*
Cyperaceae	*Fuirna umbrellata*
Cyperaceae	*Cyperus digitatus*
Araceae	*Pistia strotioites*
Azollaceae	*Azolla africanous*
Poaceae	*Paspalum planter*
Malvaceae	*Sida corymbosa*
Malvaceae	*Urena lobata*
Asteraceae	*Vernoma* spp.
Malvaceae	*Sida corymbosa*
Malvaceae	*Urena lobata*
Poaceae	*Pentadon pentadrus*
Poaceae	*Polygorum lanigerum*
Poaceae	*Impatiens irvingii*
Typhaceae	*Typha australis*

DISCUSSION

The study reveals a general trend in the pattern of temporal variation of freshwater snails which is common to all the species. There is a gradual decrease in number of *B. pfeifferi* in January but increase begins from the month of May. This period (January) represents the peak of dry season in the south-western part of Nigeria where *L. natalensis* do not follow a particular pattern. Generally, there is an increase in the member of snail as the rain increases and visa-vice [1,5].

The most important determinants of the population dynamics of snails are temperature and rainfall [6]. The optimal temperature for snail development and survival is around 25°C. Above 30°C snail mortality increases, and thermal death occurs at 40°C. However, snails are less sensitive to low temperatures than schistosome parasites in snails. The seasonal variation of snail species observed for most species in this study agreed with the trends reported in streams and ponds in Ibadan, Western Nigeria [4] and in Opan Reservoir [6]. Generally, the trends in density variation of *B. pfeifferi*

and *Soapitia dageti* were bimodal and conformed with the classical work of Ofoezie [4].

The variation in the population of these species in Owalla/Erinle was seasonal, increasing from the onset of rainy season to its peak during the dry season. These observations were similar to other studies reported from different parts of West Africa. It is noteworthy that *B. globosus* is the only intermediate host for *S. hematobium* infection and its density was focal and seasonal. This study also confirmed the snail macrophyte association as reported in the South West of Nigeria in Oyan Reservoir, *Impatiens irvigii* and *Paspalum obiculare* were associated significantly with *B. globosus*, *B. pfeifferi* was not found in the lake) [7-9]. In Owala/Erinle reservoir the strongest associations were recorded between *Paspalum conjugatum* and between *B. pfeifferi* and *Paspalalum orbiculare*. It should be noted that the importance and association of snails with aquatic macrophyte may vary from region or between water bodies and region. This study has provided useful information with regards to snail intermediate host distribution and other associated factors. Further investigations are required in snail ecology because not all the factors affecting snail intermediate host have been exhausted. It has also provided useful information upon which further investigation and sustainable intervention control target could be based in communities. The trend has serious implications for human health and overall outcome of control programmes in the study communities and the region at large [10-12].

CONCLUSION

This study identified the presence of five aquatic snail species namely *Bulinus globosus*, *Biomphalaria pfeifferi*, *Lymnaea natalensis*, *Potadoma freethi* and *Soapitia dageti* were found in the reservoir. Factors identified as affecting total and seasonal distribution of snail include rainfall, ambient temperature, relative humidity and aquatic macrophyte in the reservoir. The prevalence of these snails is a function *S. hematobium* infections in the study communities; which has become a disease of public health importance since it was first discovered in the area by Adewumi et al. [13]. The present work has provided complementary baseline information, which will be useful for planning control measures against schistosomiasis.

This study has provided clear evidence of the link between: (i) Presence types, number and the pattern of distribution of snail intermediate host and other snails; (ii) Identified aquatic maprophytes at six HWC sites and their association with snails.

RECOMMENDATIONS

1. There is the need for continuous mapping using GIS/RS, health education, and provision of alternative sources of water, mass drug administration and freshwater snail control in the study communities.
2. There is need to put the necessary mitigating measures in place by carrying out an Environmental Impact Assessment before and after a dam is constructed for sustainable LU/LC pattern, less pollution towards sustainable growth.
3. The study calls for integrated approaches to promote prevention and control of schistosomiasis.

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