ECOLOGICAL STUDIES OF THE GASTROPOD FAUNA OF SOME MINOR TRIBUTARIES OF RIVER BENUE IN MAKURDI, NIGERIA

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ABSTRACT

Some tributaries of Benue river in Makurdi were surveyed for gastropod fauna between May and October 2004. The scoop net method was employed and complimented with hand picking technique. Four species of snails were encountered; Lanistes libycus (44.78 %), Melanoides tuberculata (21.86 %), Bulinus truncatus (22.03 %) and Potandoma species (11.33 %). ANOVA revealed no significant difference (P < 0.05) in distribution of snail species and physio-chemical parameters showed no striking disparity in the water bodies sampled. The predominant aquatic flora encountered were Ipomoea aquatica, Nymphaea lotus and Graminae species. The nutritional and medical implications of snail species encountered and observed human water contact pattern were discussed.

Keyword: Gastropod fauna, Ecology, Tributaries of River Benue

INTRODUCTION

Benue river is one of the two major rivers in Nigeria with many tributaries, at Makurdi; the capital of the state that derive its name from the river, many minor tributaries transverse the town. This network of freshwater system provide ideal habitat for freshwater snails. Some of these snails have no history of serving as intermediate host of any disease, others have been implicated in the transmission of many trematode diseases of man and livestock (Imafidon 1991, Emejulu *et al,* 1992, Okafor 1990, Agi and Okwuosa 2001 and Idris and Ajanusi 2002) Among the major diseases of which gastropod snails serve as intermediate hosts are: schistosomiasis, fascioliasis and paragonimiasis. Schistosomiasis is of the greatest public health importance with about 200 million people infected in 76 endemic countries worldwide and about 600 million are at risk of infection (WHO, 1993).

Studies of the ecology of these snails showing their distribution, diversity, abundance and habitat preference have been reported in many parts of Nigeria (Ndifon 1980, Obureke *et al,* 1987, Okafor 1990, Imafidon 1991, Idris and Ajanusi 2002, Agi and Okwuosa 2001). The tributaries of the Benue river in Makurdi has not been investigated for it's gastropod composition. Such studies are important as they tend to explain local distribution, habitat preference and rate of transmission of disease, which are necessary for snail control programme.

This study is intended to produce data on the distribution and abundance of gastropod molluscs in the tributaries of Benue river in Makurdi with emphasis on environmental and ecological factors affecting them.

MATERIALS AND METHODS

Study Area: The study sites were ten water bodies in Makurdi, a town that lies between latitudes $7^0$30`N and $7^0$45`N and longitude $8^0$30`E and $8^0$35`E covering an area of 16 km^2. The main drainage system is Benue river with other smaller tributaries transversing the town (Figure 1). Makurdi has Guinea savannah type of vegetation with annual rainfall of between 150 – 180 m and temperature of 26^0C-29^0C.

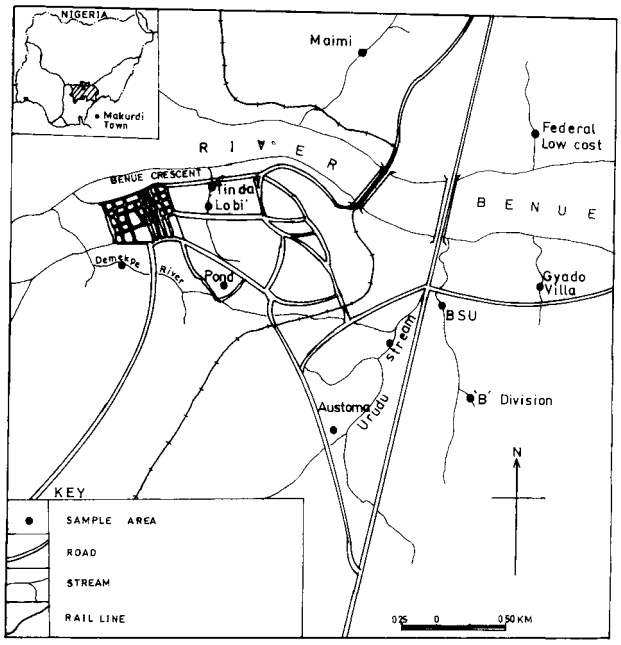

Figure 1: Map of Makurdi Township showing the tributaries of Benue river and sample sites. Source: *Benue land and Survey Department 1992*

The wet season spans from April – October while the dry season spans from November – March. Field trips were made to ten tributaries and sampled from May – October, 2004.

Sampling: The scooping net techniques and hand picking of snails were employed. Samples were collected with a long-handled snail sieve net (mesh size 3 mm – 4 mm) (Idris and Ajanusi 2002). Snails were often seen near the edges of slightly deep waters or lodging in plant materials. The sieve net was dragged through the water thereby collecting snails clinging to the aquatic plants. Where sieve net could not be used, snails were hand picked with gloved hands and placed in plastic specimen bottles. Aquatic plants to which snails were found clinging were collected and brought to the laboratory for identification. The sample period lasted for ten minutes at each sampled tributary.

Snails collected from each habitat were kept in separate labeled specimen bottles. The snails were preserved in 70 % alcohol for subsequent examination, identification and classification.

The physio-chemical parameters studied were: water temperature, pH, dissolved oxygen and water current (Agi, 1995). The water current was determined by noting the time a piece of cock moved through predetermined points. Water current below 2.0 ms^{-2} was regarded as slow while higher speed was regarded as fast flowing (Agi and Okwuosa 2001).

RESULTS

Four species of freshwater snails were encountered in the 10 water bodies sampled. The snails were *Bulinus truncatus*, *Melanoides tuberulata*, *Lanistes libycus,* and *Potandoma* species. *Lanistes libyscus* was the most abundant snail species (44.78 %) found in streams, ponds and gutter, followed by *Melaniodes tuberculata* (21.86 %) *Bulinus truncatus* (22.03 %) and *Pontandoma* species (9.33 %) (Figure 2).

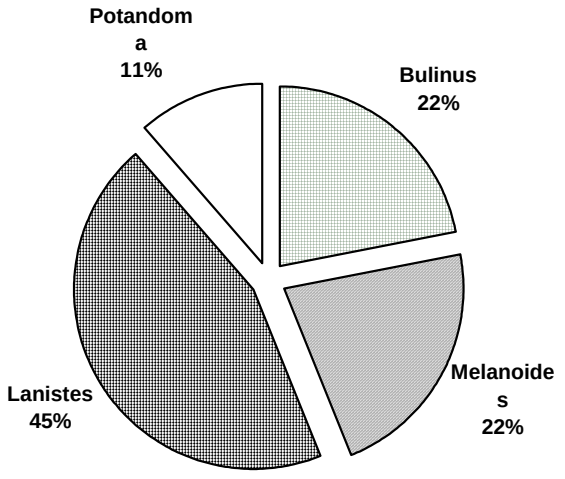

Figure 2: Cumulative abundance of snail species collected from Benue river tributaries

Snail occurrence and physio-chemical analysis for each habitat are presented on Table 1. The distribution and abundance of snails in relation to their habitat and characteristics are shown in Tables 2 and 3. Analysis of variance revealed no significant difference in the distribution and abundance of the snails at the different sample sites. There was a general fluctuation in the number of snails collected, it increased from May to August (where it peaked) and decreased thereafter until the end of study in October (Figure 3).

Some of the stream had rich vegetation cover with fallen leaves from surrounding trees providing detrital matter. Other streams were completely exposed to solar radiation, especially those that were more frequently patronized by residents.

Lanistis libycus was the only edible snail species encountered. It is generally consumed and sold in the market by the indigenous Tiv people. The other snail species like *Bulinus truncatus* is known to be of medical importance.

The aquatic flora of the habitats were identified as *Ipomoea aquatica, Nymphaea lotus, Mimosa pigra, Marselia* species, *commelina* species, *graminae* species and *Echinochloa pyramidilis. Ipomoea aquatica* was the most abundant.

DISCUSSION

The distribution and abundance of freshwater snails in tributaries of the Benue river may be attributed to the availability of food, shelter and oviposition sites. Water bodies rich in organic and silt matter are known to support thriving populations of macroinvertebrates because of reduction in water current and as such the substratum tends to make snails indistinguishable from their typical lentic habitat (Whitton, 1975). The favourable effect of vegetation on snail habitat preference was confirmed by the fact that most snails in their various habitats were attached to aquatic plants. Imafidon (1991), Obureke *et al,* (1987) and Amali (1988) had previously reported the influence of aquatic vegetation on distribution of snails of medical importance.

All the habitats had some type of aquatic vegetation sparsely distributed within or at the verge of the habitat. Snails were often seen clustering around vegetation or floating or submerged piece of wood or plant materials. Whitton (1975) and Obureke *et al.,* (1987) attributed the clustering of snails around plants to be due to high oxygen gradient produced by these plants.

One of the four snail species encountered (*Bulinus truncatus*) is a recognized intermediate host for schistosomiasis in Nigeria (Obureke *et al.* 1987; Imafidon, 1991; Emejulu *et al.* 1992; Agi and Okwuosa 2001). The distribution of this species is widely reported in Nigeria and elsewhere. They co-exist with other known schistosome snail vectors like *Bulinus globosus, Biomphalaria pffeifferi* and *Lymnea natalensis* and shed schistosome cercariae (Emejulu *et al.* 1992; Idris and Ajanusi 2002).

Table 1: Physio-chemical parameters and snail occurrence of the habitats

Habitat	Physio-chemical factors			Type of snail species				Current
	pH	T(^{0}C)	D0$_2$	*B.t*	*M.t*	*L.l*	*Pt*	Speed
Austoma	8.61	27.87	2.66	-	+	+	-	ST
B-Division	8.09	28.08	1.92	-	+	+	+	ST
BSU Gutter	7.49	27.45	1.74	+	+	+	+	SF
Demekpe	6.98	29.04	1.98	+	+	+	+	FF
Fed. Low cost	7.85	27.42	2.61	+	+	+	+	SF
Gyado villa	7.07	26.60	1.52	+	+	+	-	ST
Lobi Qtrs	7.83	26.48	1.21	+	+	+	+	FF
Mammy	6.66	28.01	1.51	+	+	+	+	SF
Tinda	7.51	27.11	1.81	+	+	+	+	FF
Urudu	7.76	27.76	2.66	+	+	+	+	SF

B.t = Bulinus truncatus, M.t = Melanoides tuberculata, L.l = Lanistis libycus, Pt = Pontandoma species, FF = fast flowing, SF = Slow flowing, ST = Stagnant, + = Snail present.

Table 2: Distribution of snail species in Benue river tributaries

Sites	Snail Species and number collected				
	Bulinus	***Melanoides***	***Lanistes***	***Potandoma***	**Total**
Austoma	-	23	68	-	91
B-Division	-	22	42	8	72
BSU Gutter	26	18	60	15	119
Demekpe	33	25	45	28	111
Fed. Low cost	38	30	37	8	113
Gyado	17	16	45	-	78
Lobi Qtrs	35	23	50	23	131
Mammy	30	13	42	6	91
Tinda	38	30	41	20	129
Urudu	37	56	90	20	195
Total	249	247	506	128	1130

Table 3: Distribution of snail species, characteristic of habitat and vegetative composition

Site No.	Name of site	Description	Water contact activity	Snail species	Vegetative composition
1	**Austoma**	Swamp area near Austoma filling station.	Rice cultivation domestic use Automobile washing	*Lanistes Melaniodes*	*Ipomoea, Nymphae, graminae.*
2	**B-Division**	Swamp area, (Fadama) near police B-division	Rice cultivation, fishing, snail collection.	*Lanistes Melanoides*	Same as above plus *marselia, commelina.*
3	**BSU Gutter**	Drainage gutter in front of BSU main campus	Rice cultivation, fishing, snail collection.	*Lanistes, Bulinus Melanoides Potandoma*	*Ipomoea*
4	**Demekpe**	stream	Domestic use snail collection, burnt brick making, rice cultivation	*Bulinus, Lanistes, Melanoides, Potandoma*	*Ipomoea Nymphae Graminae commelina*
5	**Fed. Low-cost**	Stream, runs through Federal low-cost estate, North Bank	Domestic use, irrigation, snail collection.	*Bulinus, Lanistes, Melanoides, Potandoma*	*Graminae Ipomoea Marselia*
6	**Gyado villa**	Pond	Domestic use, cement brick molding, snail collection, fishing.	*Bulinus, Lanistes, Melanoides, Potandoma*	*Ipomoea Nymphae*
7	**Lobi Qtrs**	Drainage gutter, runs through Lobi Quarters	Domestic use, sugar cane farming, snail collection	*Bulinus, Lanistes, Melanoides, Potandoma*	*Graminae Nymphae Ipomoea*
8	**Mammy**	Stream	Domestic use, snail collection Automobile washing, vegetables/Rice cultivation.	*Bulinus, Lanistes, Melanoides, Potandoma*	*Ipomoea*
9	**Tinda**	Stream, passes behind Tinda Hotel, culvert.	Automobile washing, sugar cane farming. Domestic use watering livestock.	*Bulinus, Lanistes, Melanoides, Potandoma*	*Graminae Nymphae Ipomea Marselia*
10	**Urudu**	Stream (Fadama)	Domestic use, Rice cultivation, fishing, snail collection	*Bulinus, Lanistes, Melanoides, Potandoma*	*Ipomoea, Nymphae graminae marselia.*

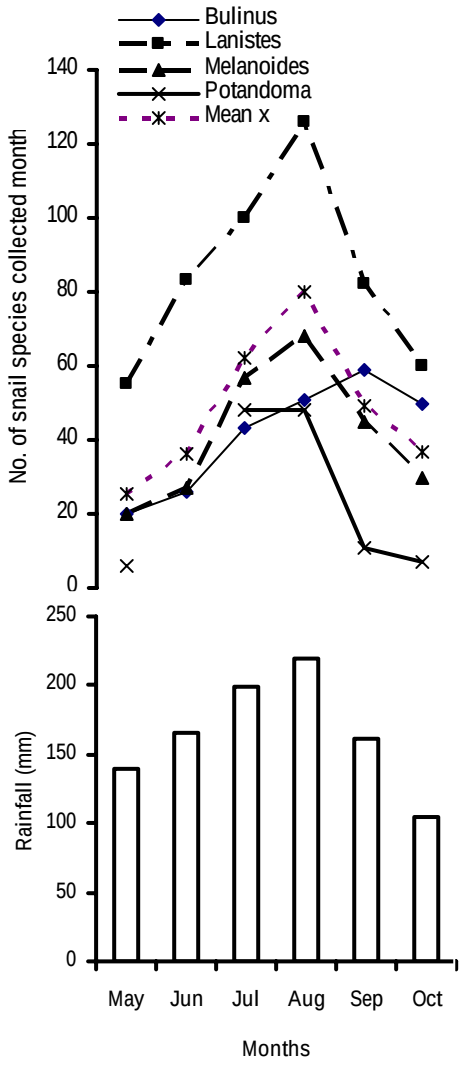

Figure 3: Monthly fluctuation of snail species collected in relation to rainfall in the study area

The wide distribution of *Bulinus truncatus* in these urban water bodies was therefore of epidemiological significance considering the intense water contact activities at the various points. Urinary schistosomiasis have been reported in Makurdi and other parts of Benue State (Amali, 1993; Okwuosa and Banke, 2001).

The dominant snail species encountered in this study was *Lanistes libycus*. They were encountered in all the habitats surveyed. Imafidon (1991) also reported that this species account for 25 % of snail species encountered during the ecological study of freshwaters in Ibadan, Southwestern Nigeria. *Lanistes* species are edible snail and are generally sold in the open markets in Makurdi during rainy seasons. Freshwater sails have become very important alternative source of animal protein as the prize of the more traditional animal protein sources have risen above the reach of many inhabitants. Snail farming is popular in southern Nigeria, however, not much has been heard of in the North. The general eatability of snail meat and the prospect of natural stocking for domestic and economic purposes may be further explored as an income-generator.

The coexistence of *B. truncatus* and *L. libycus* poses a great risk for snail collectors. This is a major pre-occupation for children and women during rainy seasons; this activity and other water contact activities predispose children and women to infection with schistosomiasis. Several epidemiological studies in Nigeria reported that these population group account for the highest prevalence rate (Amali, 1993; Akogun and Obidiah, 1996; Idris *and* Ajanusi*,* 2002; Okwuosa and Banke, 2001). The coexistence of these snail species makes execution of mollusicidal programme as suggested by Webbe (1987) and Akufongwe *et al.* (1995) difficult because of its obvious side effect on the edible snail species.

The snail population dynamic between the months of May to October was highly influenced by the rainfall pattern. This finding was consistent with that reported by Akufongwe *et al.* (1995). They attributed the marked increase of snail population at the onset of rain to the resumption of normal metabolic activities by snails that have successfully gone through period of adverse conditions. Cooper *et al.* (1992) observed that all snails surviving diapause produce large number of egg and cercariae once returned to water.

There were no striking disparities observed in the physio-chemical parameters of the investigated water bodies. Freshwater snails are known to exhibit high degree of tolerance and adaptation within a reasonable range of physio-chemical fluctuation (Imafidon, 1991; Agi and Okwuosa, 2001; Agi, 1995).

The outcome of this study has revealed that the tributaries of the Benue river are good habitat for freshwater snails. The physio-chemical qualities of these water bodies are conducive for optimum distribution and abundance of snail species. The coexistence of both edible and medically important snails calls for urgent awareness on the public health implications of this association.

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