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Diversity and Abundance of Landsnails in Kwararafa University, City Campus, Wukari, Taraba State

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Abstract. *The diversity and abundance of terrestrial snail species within the Kwararafa University community was carried out in this study, highlighting their ecological significance and potential threats to their populations. A total of 740 snails were collected, with Achatina achatina being the most abundant species. Comparative analysis with previous studies revealed variations in species composition and abundance, possibly influenced by habitat differences. Soil nutrient analysis indicated correlations between snail abundance and calcium levels, suggesting the importance of soil composition in snail ecology. Low diversity and uneven distribution patterns were observed which were potentially attributed to human disturbances like urbanization. Recommendations include raising awareness about the ecological importance of snails, mitigating threats to their populations, and conservation efforts to prevent species from been endangered. Thapsia sp, a collected species, was identified as endangered, emphasizing the urgency for conservation actions. This study underscores the need for further research to document and conserve snail fauna across Taraba State communities.*

Key words: *Abundance, Conservation, Diversity, Endangered, Snail, Kwarafa University.*

INTRODUCTION:

Biodiversity is a key indicator of the health of any ecosystem as it describes the variation attainable in the ecosystem in terms of resources and species. Several factors have been identified as threats to global abundance and diversity of snail species: overexploitation, water pollution, flow modification, destruction or degradation of habitat, and invasion by exotic species with environmental changes superimposed on these factors [1].

Species diversity refers to the number of different species present in an ecosystem and the relative abundance of each species [2]. An ecosystem with poor species diversity may not function properly or efficiently. It is important to consider species richness and diversity because each species plays an important role and boosts ecosystem productivity.

Snails play a significant role in public and veterinary health as some serve as intermediate hosts of blood fluke trematodes and nematodes [3]. Studies in Zimbabwe have investigated *Bulinus tropicus* as a potential competitor snail for *Bulinus globosus* [4].

The major threat to the native land snail fauna include habitat loss and fragmentation as a result of anthropogenic activities such as intense land use, construction of roads, dams, plantations, pollution and spread of invasive species which reduce diversity and change community structure of land snails.

According to Lush [5], noise from vehicles affects most snail species in a negative way, causing them to flee from such areas. Lush [5] observation is in line with Mgbowo community because snails were not found near roads except at night when vehicle traffic was at minimum.

The environmental factors which were associated with variation in snail species composition are atmospheric temperature, litter depth, soil temperature, anthropogenic activities and relative air humidity. It is well known that snails depend on water or high humidity for an active life [6] being relatively susceptible to desiccation, which tends to restrict them [7]. Moist conditions are necessary for land-snail respiration and reproduction and for the production of mucus, which is vital for locomotion [8].

The factors contributing to invasive snail distribution in Wukari have not been thoroughly studied. This study aims to provide baseline information on the composition, distribution, and diversity of invasive and indigenous snails, including those of medical and/or veterinary importance, in Kwararafa University Wukari, Taraba State.

STUDY AREA

Kwararafa University, Wukari, Taraba state is a private University located at Wukari an ancient city that was for a while the headquarters of the historically famous Kwararafa Confederacy, the University officially changed its name from Wukari Jubilee to Kwararafa in Febuary 2012 to reflect the cultural and historical roots of the confederacy which at the zenith of its powers extended to modern Niger, Plateau, Kogi, Nasarawa and Benue states and FCT in the north central geo-political zone. Wukari is a Local Government Area in Taraba State, Nigeria and is situated at latitude 7.85^{o} North, longitude 9.78^{o} East and 152 meters elevation above the sea level in the northern part of Nigeria. The area is characterized by warm tropical climate with distinct wet and dry seasons, an annual average temperature of 26.8°C and 1205 mm of rainfall

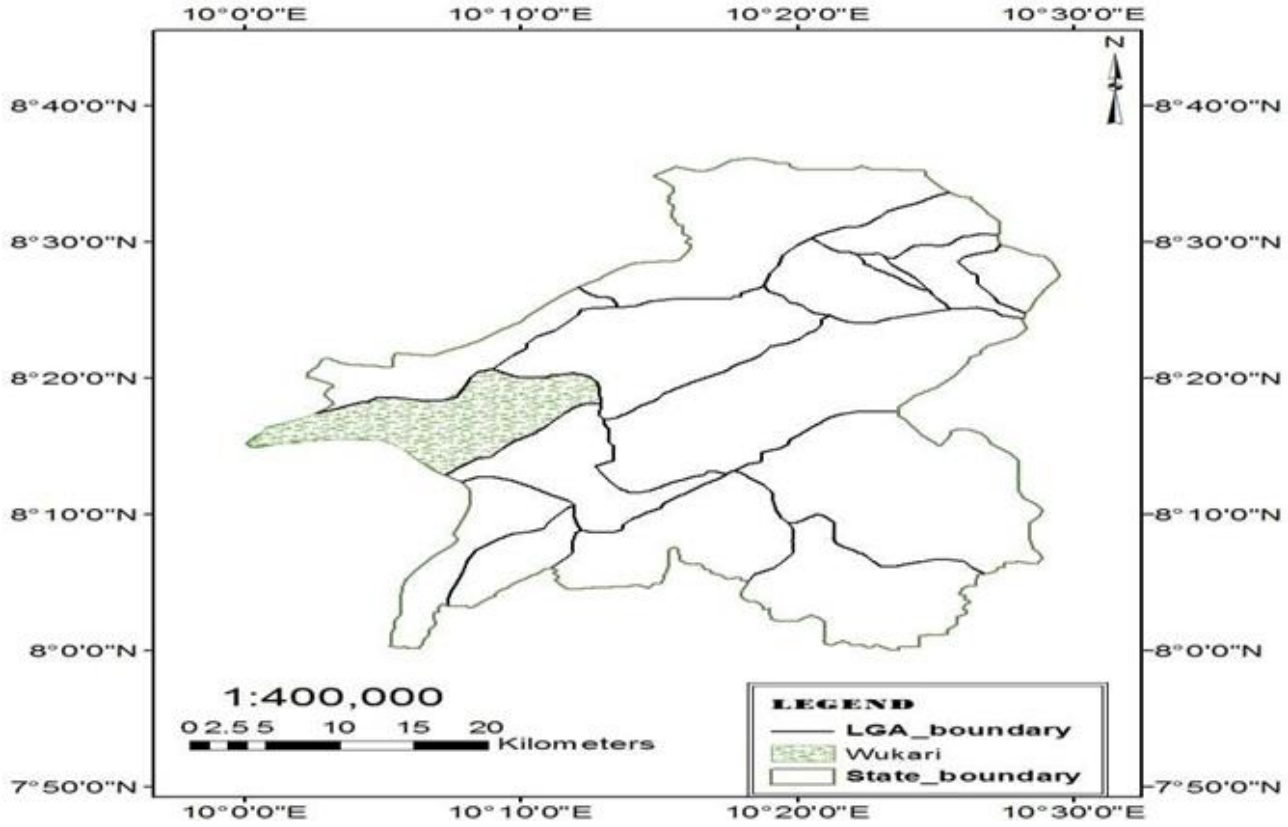

Fig 1: A Map of Taraba State showing the Study Area

SAMPLE COLLECTION:

Snails were collected from 10 plots in kwararafa University city campus using a combination of direct search and litter sieving techniques. It was carried out in the month of August 2023.

Snails from each plot were collected and place in separate universal bottles containing 70% ethanol that was pre-labeled, number of snails, collection date and location of sampling.

SNAIL IDENTIFICATION:

The snails were identified and classified mainly according to their shell characteristics. The snails were group into families according to Bouchet and Rocroi [9] and assign to possible genus or identifiable shells were assigned to species using late Prof. Chris Oke reference collection and leiden collection at the museum of Natural History, Leiden, the Netherlands.

All snails were catalogued and kept in the author's collection, which in the future will be lodged in the Biology laboratory department of biological sciences, Federal University Wukari Taraba

SOIL COLLECTION AND ANALYSIS:

Soil samples were collected to a depth of 6cm in the study area and were analyzed in Soil Science Department Federal University Wukari, Taraba State Nigeria. The soil was analyzed for soil moisture content, PH, Nitrogen, Phosphorus, Potassium, Sodium, Calcium, Magnesium and texture.

STATISTICAL ANALYSIS

Data generated from the field of study was subjected to statistical analysis using Statistical Package for Social Science (SPSS) Version 23 to determine the biodiversity indexes. The species abundance and diversity was statistically analyzed using Simpson's Diversity Index, richness and relative abundance to also quantify the level of species composition.

RESULTS

Table 1 showed the total number of Gastropods collected in Kwararafa University from 10 plots. *Limicoloria flamea* was found to be 95 while *Achatina sp* 468, *Curvella sp* 129, *Subulina sp* 46, and *Thapsia sp* 2 and Plot 1 had the highest number of species (105), followed by Plot 6 and Plot 9 which both had 103, while Plot 2 and Plot 4 had least number of species 41. Table 2 showed the abundance Percentage (%) of species collected from Kwararafa University, 3 families were identified. *Achatinidae had* 563 numbers of individuals with the percentage of 79%, *Subulinidae*, had 152 numbers of individual with 21%. *Urocyclidae*, had 2 number of individuals 2 (0.3%), Diversity, Evenness and Richness of species collected from 10 plots in Kwararafa University was shown in Table 3 and plot 3 was the most diverse with the value of 1.356 while the least diverse was plot 9 with the value of 0.219, the most even plot was also plot 3 (0.637). The richest plot was also plot 3 with the value of 0.95. Fig 2 shows a rarefaction curve indicating the diversity of the plots in the study. Plot 3 was the most diverse with a value of 1.356 followed by plot 1 with a value of 1.248. Table 4 showed the soil nutrient composition of the study area, the calcium content of the soil was 0.31%, Phosphorus was 14.5% and the Nitrogen content was 0.26%. The PH of the study area was 6.5 slightly acidic. Figure 3 showed the pictures of the snails gotten from the study during the research.

Table 1: Total Number of Gastropods collected in Kwararafa University, Wukari, Taraba state.

Family	Species of snail	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	Total
Achatinidae	*Limicoloria flamea*	7	10	21	8	18	9	1	11	4	6	95
	Achatina sp	36	26	25	19	30	65	43	63	98	63	468
Subulinidae	*Curvella sp*	39	3	8	14	7	29	10	7	-	12	129
	Subulina sp	23	2	12	-	-	-	-	-	-	9	46
Urocyclidae	*Thapsia sp*	-	-	1	-	-	-	-	-	1	-	2
Total number of individuals (N)		105	41	67	41	55	103	54	81	103	90	740
No. of species per plot		4	4	5	3	3	3	3	3	3	4	

Table 2: Percentage (%) Abundance of species collected from Kwararafa University

Family	No of *sp*	% of *sp*	No of individual	% of individual
Achatinidae	2	40	563	78.52
Subulinidae	2	40	152	21.20
Urocyclidae	1	20	2	0.28
Total	5		717	

Table 3: Diversity, Evenness and Richness of species collected from 10 plots in Kwararafa University

Variables	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10
Diversity (H)	1.2482	0.9717	1.3564	1.0423	0.9585	0.8603	0.5675	0.6782	0.2185	0.9291
Evenness (E)	0.23140	0.3152	0.6321	0.3214	0.4312	0.5631	0.3712	0.4371	0.4318	0.5379
Margalef Index (d)	0.6446	0.8078	0.9513	0.5386	0.4991	0.4315	0.5014	0.4550	0.4315	0.6667

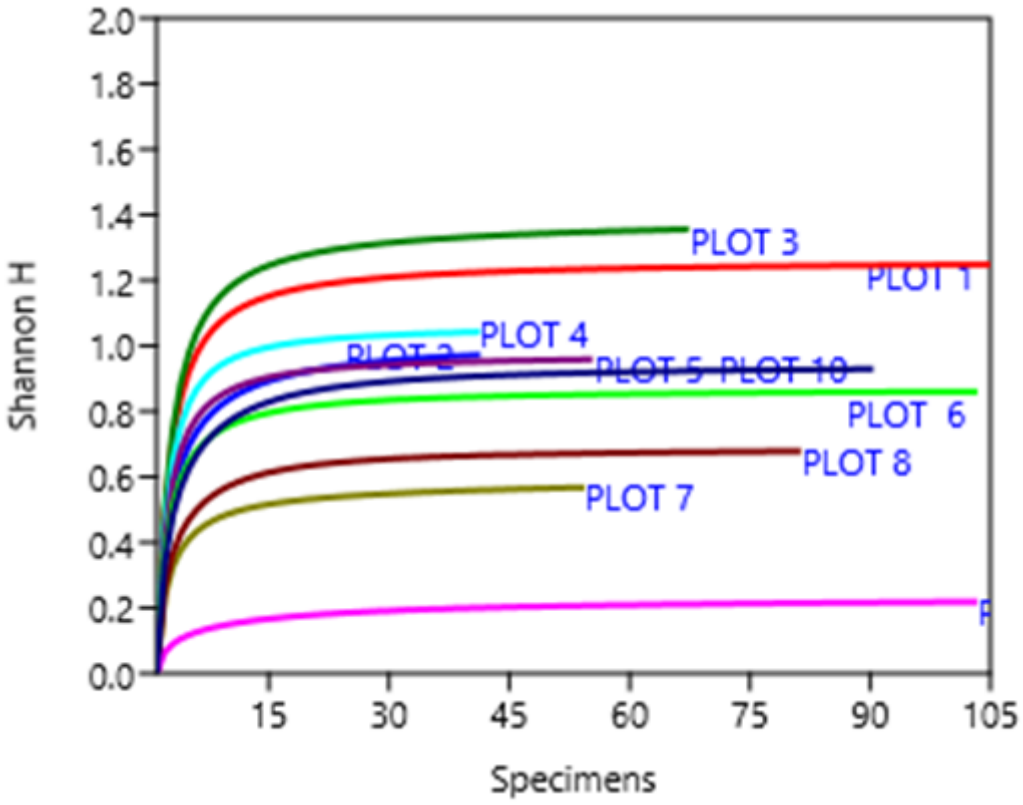

Fig 2: A rarefaction curve showing the extent of species distribution across the entire study area

Note: Rarefaction is unrealistic in its assumption of random spatial distribution of individuals.

Table 4: Soil Nutrient composition of the entire study area

Sample description	% sand	Texture class	% O.C	% O.M	% N	% P	% K	%Ca	Mg	pH:H_2O
ABD	69.60	Sandy loamy	1.26	2.17	0.26	14.45	1.64	0.31	0.60	7.50

KEY:

N - Nitrogen

K - Potassium

P - Phosphorus

Ca - Calcium

Mg – Magnesium.

O.c - Organic carbon

O.M - Organic Manure

pH:H2O - is a measure of how acidic/basic water is.

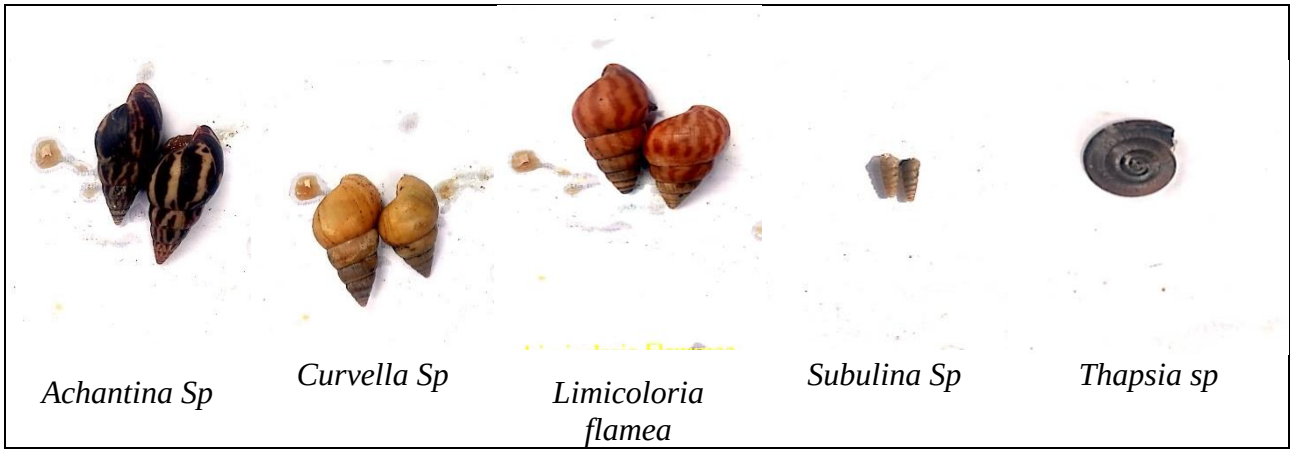

Figure 3: Pictorial presentation of Snail species collected from the study site

DISCUSSION:

The number of snails sampled in some plots of study differed when compared with other study areas. *A. achatina* was found predominantly across all the plots but most abundant in plot 9 with 98 individual species *Subulina sp* and *Thapsia sp* were not abundant in the entire present study. This is actually in line with Oke and Alohan [10] who in their study on land snail diversity in Okomu National Park; Edo State recorded *Subulina* sp as the most abundant species and identified *Thapsia* as a rare species. The abundance of *A. achatina* and others in the study could be as a result of the availability of food materials and favorable environmental condition.

An observation made by Rusieck [11] stated that snails preferred habitats rich in vegetation and moisture of which Kwararfa University bears good percentage of these features because such environments contain soil salts and nutrient such as Calcium Carbonate, which help in the formation of solid shells. A similar observation was made by Ademolu, *et al.* [12], where he identified *Thapsia sp* as one of the least abundant species in Nigeria, because of the species poor adaptive nature. The Simpson's index values of species diversity, richness and level of species distribution i.e evenness across the study area were seen to be less than 5 it is a clear notification that, the diversity of species in the study area is low along with uneven distribution pattern of snail species. This is an indication that it had low diversity and so, calls for urgent conservation measure as depicted by the result. The low diversity observed in the study could be as a result of human disturbances such as construction of residential buildings. Urbanization is a major cause of change in species diversity and richness [13].

The study has helped to identify the diversity of snails living within Kwararafa University community and their habitats. Thus, revealed that Kwararafa University Community has low snail diversity. This situation suggests an important need not only for serious effort at conserving Kwararafa University snail fauna but also for concerted effort at documenting the snail fauna of other communities in the Taraba State to enhance conservation and obviate extinctions of this valuable natural resource.

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