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Shell morphology of some freshwater snails of the Family Ampullariidae from paddy fields in Fanchan, Dawakin kudu, local Government area of Kano state, Nigeria

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Abstract: The morphology of the shells of different large fresh water snails collected from Fanchan paddy fields in July and August at the heights of the rainy season was studied in order to identify the snails. The family Ampullariidae comprises all the 150 snail species. We found the majority of the snails attached to rice plants and manually collected them. Morphometric readings were taken using a digital vernier caliper. Their heights range from 13.1 to 66.8mm. Fadama has the highest average shell height (48.92 mm). Fanchan Right has the lowest average (33.11 mm) while Fanchan Left has 40.31 mm. Fadama recorded the highest values for shell height, shell width, spire height, aperture length, and aperture width. Fanchan obtained the lowest value for all these morphometric characters. The researcher plotted the bar chart using Power BI, displaying the average shell height and shell widths for the three snail collection locations. These results might reflect differences in environmental conditions, nutrition availability, or other factors that affect shell growth at the different locations. More research on these snails is needed for proper identification and control strategies.

Keywords: Ampullariidae, Freshwater habitat, paddy fields, Morphometry, Fanchan
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INTRODUCTION

It is a well-known fact that water bodies harbour freshwater snails that serve many purposes in the ecosystem. Throughout the world, snails, gastropod molluscs, inhabit various habitats such as rain-fed pools, ponds, drainages, dams, lakes, and streams [1]. The freshwater snail family Ampullariidae includes nine extant genera (Hayes et al., 2015; Cowie, 2015). Ponder and Warén (1988), Ponder and Lindberg (1997), and Simone (2004) reported that four genera of the family Ampullariidae occur in West Africa and are associated with swamps, slowly flowing rivers, and streams; some species occur in seasonal waters that dry out for many months. Three of these genera, *Pomacea, Pila,* and *Marisa*, have been labelled as invasive in places where they have been introduced (Joshi, 2017), destroying rice plants and in the process causing low yields. Apple snails exhibit a wide range of sizes, with reports of P. maculata's shell reaching a maximum dimension of 17 cm (Cowie et al., 2006). However, according to Simone (2004), adults of *P. curumim* rarely grow larger than the size of *P. urceus* (Müller, 1774) hatchlings, which is 10.5 mm on average (Burky, 1974; Simone, 2004). This work aims to determine the characteristic shell dimensions of *Ampillariidae* snails collected from paddy fields in Fanchan. There is a dearth of information on Ampullariidae snails of Nigerian origin.

MATERIALS AND METHODS

Study Area

The researcher conducted this study in Fanchan, located in the Dawakin Kudu local government area of Kano State, Nigeria, which is adjacent to a portion of the River Hadia. The Fanchan locations are located at latitude 11°46'13.3"N and longitude 8°42'43.7", with a mean altitude of 440.27 m above sea level. Dawakin Kudu L G shares boundaries with Kumbotso Local Government to the north, Gezawa Local Government to the north, Warawa Local Government to the east, Wudil Local Government Area to the south, Bunkure Local

Government Area to the south, and Kura Local Government Area to the south. Dawakin Kudu Local Government Area falls within Kano Central, as well as the Sudan savanna agro-ecological zone of Nigeria (Kutama *et al.,* 2010). The area has a tropical climate, characterized by two distinct seasons: the dry and rainy, with hot temperatures during the dry season and cool temperatures during the rainy season. The district .

experiences cold, dry hamarttan winds from November to February. Generally, the rains start in April and end in October. The area has tropical grassland (savannah). The people of this area (Fanchan) are Hausa and Fulani, and most of them are farmers and fishermen. They cultivate sorghum, millet, rice, groundnuts, cowpeas, maize, sugar cane, and vegetables. During the dry season, they use water from the River Hadejia for irrigation

Figure 1: Map of Dawakin kudu local government area showing the study areas

Snail collection

The researcher searched for snails fortnightly between December 2023 and August 2024 from 10 a.m. to 1 p.m. in three different Fanchan bearing rice farms at the river's (River Hadejia) bank and its environs. We collected snails by handpicking from the rice farms and surrounding areas in July and August. We transported the snails to the biological science laboratory of the Nigeria Police Academy, Wudil, using a plastic container filled with local water, washed them, and then grouped them for morphometric measurements. These measurements included shell height, width, aperture height, width, spire length, and so on.

Statistical Analysis

Statistical Analysis It was checked with XL Miner Analysis Toolpak, an add-in for Microsoft Excel, to see if the differences in the average shell heights and widths between locations were significant among the snail samples. Power BI was then used to make a bar chart that showed the averages of shell heights and widths for three of the places where the samples came from

RESULTS

All the one hundred and fifty (150) large freshwater snails collected belong to the family Ampullariidae and are from paddy fields. When the apex is uppermost, the shell coils to the right, and the opening, called the aperture, is to the right. The shell's color ranges from yellowish brown to dark brown, frequently adorned with spiral bands, and is closed by a brown and purplish calcareous and horny operculum. The body is yellowish, although some are brown. There are two pairs of long and tapering tentacles, gills, and a lung. The measurements on the shell revealed that Fadama was home to the snail with the highest height (66.8 mm), while Fanchan right was home to the snail with the shortest height (13.1 mm). The widths are between 60.1 and 12 mm. We collected twenty snails in Fadama, and the mean shell height is approximately 48.92 mm.

The variance (152.79) indicates there is a high degree of variability in shell height measurements within this group. We collected forty-three snails in Fanchan Right. The mean shell height of 33.11 indicates that the mean shell height in Fanchan Right is smaller compared to Fadama, at 33.11 mm. Variance (101.52) shows less variability than Fadama, but still a substantial amount of spread. This location has a lower mean shell height and somewhat lower variability compared to Fadama, meaning the samples in this group tend to be shorter on average, and there's less fluctuation between individual measurements. In Fanchan Left, the ANOVA focusses again on shell height with eighty-seven snails, a mean shell height of about 40.31 mm, and variance 120.96 shows moderate variability, higher than Fanchan Right but lower than Fadama. This location has a higher mean shell height than Fanchan Right but lower than Fadama, and the variability is also moderate. This indicates that shell height is largest in Fadama and smallest in Fanchan Right, possibly suggesting differences in environmental conditions affecting shell growth.

Figure .2: Some representatives of snails collected in Fanchan

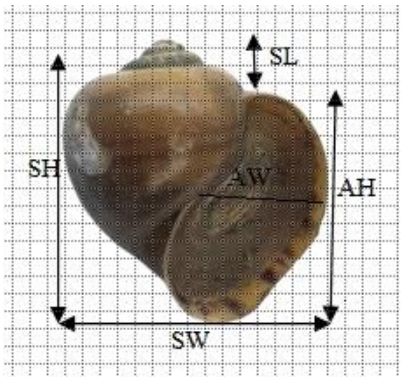

Figure 3: Measurements made on shells of Ampullariidae snails

Table 1: Locations and measurement ranges of five characters on Ampullariidae snails

Morphometric characters	Fadama (20)	Fanchan; right (43)	Fanchan left (87)
SH	27.3 -66.8	13.1- 55.1	17.1 -61.3
SW	23 – 60.1	12 -50.1	14.9 -57.5
AH	20.6 -48	9.8-41	13.6 -48.9
AW	12.4 – 33	6.4-23.8	7.5-27.1
SL	5.5-18.5	2.8-16	3.6-17.3

All measurements in mm: SH, shell height; SW, shell width; AH, aperture height; AW, aperture width; SL, Spire length. No. of snails in parenthesis.

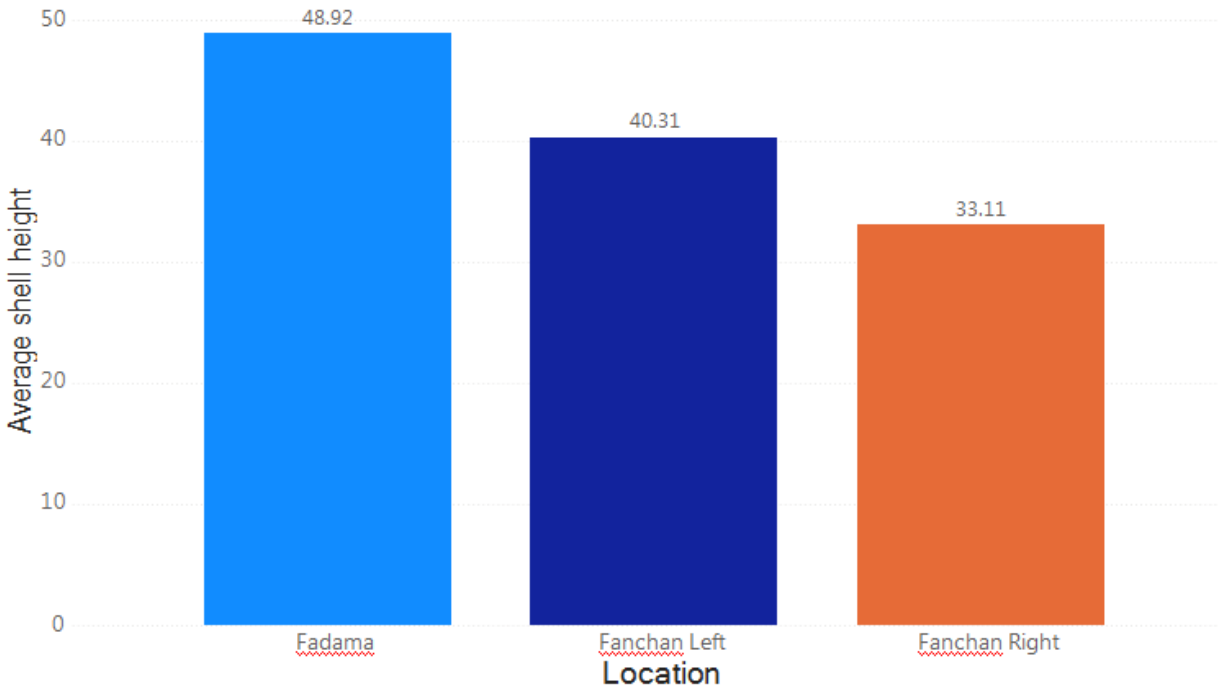

Figure 4: Relationship of shell height and location

DISCUSSION

There is a need for identification of snails because of the role they play in the environment, snail identification is necessary. It is not known whether these snails are natives or not natives since there are no previous records of snail investigations or reports in the study area. Kano (Duwa, 2018) first reported it, but did not conduct a morphometric study on the collected snails. The collected snails have the same morphological characteristics as some snails reported elsewhere as invasive apple snails (Josh, 2017). Only after conducting molecular studies can we name the snails. The absence of any other snail family indicates that these snails are invasive, likely displacing other snail species. The discovery of their attachment to rice plant roots indicates their consumption of rice plants, potentially leading to a decrease in crop yield. We used shell character metric measurements to analyze potential variations among three populations of Ampullaeiidae snails from Fanchan's paddy fields. By contrasting overall features of shell measurement, morphometric studies can differentiate Mulluscan species (Stone, 1998). This study did not focus on any specific genera because no identification studies have been conducted yet. The only identifying factor is their large size, colour, and dexterity. This study lacks a group specification because it's the first time researchers have taken and reported morphometric measurements of ampullariidae snails from Nigeria, without identifying the snails. Estebenet and Martin, 2003; Rawlings *et al*., 2007 have reported many intraspecific differences for *Pomacea* spp.

CONCLUSION

There has been no report of snails with morphomeric values as high as those obtained in the present study in Kano State or Nigeria in general. Fadama recorded the highest values for shell length, shell width, aperture length, aperture width, and spire height and width. Fanchan recorded the lowest value for all these morphometric characters. These findings are critical in raising awareness about the presence of these freshwater snails, their impact on rice farms, and developing a control strategy.

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