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ASSESSMENT OF PHENOTYPIC TRAITS OF *Archachatina marginata suturalis* SNAILS IN THE DERIVED SAVANNAH ZONE OF OGUN STATE, NIGERIA

***ALUKO, F.A., ADESINA, E.A., AKANJI, A.M., AWOJOBI, H.A., ADELEKE, G.A. AND APATA, E.S.**
Department of Animal Production, Olabisi Onabanjo University, P. M. B. 0012, Ayetoro, Ogun State, Nigeria
*Corresponding author: deolaaluko@gmail.com

Abstract
Snails are crawling exo-skeleton invertebrate animals. African snails can live for ten years but generally live in 3 – 7years in captivity. In this study the phenotypic traits of Archachatina marginata suturalis was assessed. A total of 163 snails were purchased at three main markets each Local Government Area of the derived Savannah Zone of Ogun State. Data collected include: Distance between suture (DBS) 1st and 2nd, DBS 2nd and 3rd, DBS 3rd and 4th, Shell Length (SL), Shell Width (SW), Shell Mouth Thickness (SMT), Aperture Length (AL), Aperture Width (AW), Shell Mouth Thickness (SMT), Live Weight (LW). The mean distance between (DBS) the 1st and 2nd suture is 1.23±0.23cm. The mean DBS 2nd and 3rd is 0.61±0.13cm. The mean SL and SW is 10.34±2.01cm, 5.06±0.19cm respectively. The mean AL and AW is 3.72±0.70cm, 5.72±0.72cm respectively. The mean SH is 4.25±2.01cm. The mean LW is 109.8±81.7g. Snail live weight is positively correlated with all the body parameters. SLW is positively and highly significantly correlated with SH (0.387), AW (0.299), shell width (0.291). SLW is highly positively correlated with SMT (0.667). The prediction power is more with the snail height (52.7), DBS 2nd & 3rd (81.7). These findings should be considered in improvement programme to increase the meat yield of this strain of snail.

Key Word: *Archachatina marginata suturalis, Snail height, shell mouth thickness, suture*

Introduction

Heliciculture or heliculture is the process of raising land snails specifically for human use, either to use their flesh as edible escargot, or more recently, to obtain snail slime for use in cosmetics. Snails belong to a group of Invertebrates (*Mollusks)*, most carry a shell, other members of the group includes; the Slugs, Mussels, Squids and Scuttle fish (Cobbinah *et al*., 2004). They are cold blooded animal, sensitive to change in atmospheric humidity (A.H) and temperature (T). When temperature or humidity is not to their liking, they go into dormancy (Cobbinah *et al*., 2004). The snail retracts its entire body inside the shell, sealing off the opening with a white Calcareous layer to prevent water loss from the body (Cobbinah *et al*.,

2004). Snails are crawling exo-skeletal invertebrate animals that possess fluid instead of blood. In a typical African setting, snails are fetched in the wild by young boys, girls and adult men and women either for immediate family consumption or for sale, if found in large quantities. However, due to environmental destruction, deforestation and bush burning, all of which has reduced the population of snails in the wild to the barest minimum, this lead to the introduction of scientific snail farming technique in the last decade. Snails are the largest group of molluscs constituting the largest animal group next to arthropods (Omole *et al*., 2007). Snails are fascinating creatures that are fairly easy to keep as pet and require little attention. African snails can live for ten years but generally live in 3-7 years in captivity, so they live longer than hamster and guinea pig. Native snails can live for 15 years. The rate of reproduction is higher during the wet season and they often lay their eggs in the dry season. Their eggs are laid inside the soils and covered up with soils. They are harmless to animal and people entirely, cheap to house, maintain, feed and rarely suffer from illness and even show outward sign of being unhappy with their condition allowing you to react before they die (FAO, 2013). *A. marginata* is the largest of the *Archachatina* snails as found in West Africa. It appears to be a mainly terrestrial snail, natively, these species does not cause any appreciable damage. *Archachatina marginata* has evidently been dispersed by humans or agencies in West Africa, having recently invaded the South-Western parts of Ghana. It has also been introduced to Annobon and Sao Tome (Anon., 2015). *Archachatina* is also known as African giant snails and are found mostly in West African States, alongside *Achatina, achatina balteata, fulica* which are indigenous to East Africa (Kenya, Tanzania). They are large snails growing usually or generally to about 20cm and a live weight of 500g, with which frequencies depend on climate duration, and duration of rainy season (Oyenuga, 1968). *Archachatina marginata* has a bulbous shell with brown stripes and a wide apex. The foot is usually brown to black color (Akinnusi, 1998). *Archachatina marginata* variety *suturalis* has a fairly marked, with numerous chestnut-brown or pale brown vertical streaks, stripes, zigzag lines or blotches on a straw-yellow background. Medium sized to fairly large but usually more slender and with a narrower body-whorl than the typical form being usually about 110mm long and possibly higher (148mm) as suggested in a French study. There is some evidence that *suturalis* eggs are easier to hatch than the nominate race "*marginata*" and "ovum". This may be due to *suturalis* being found in one of the temperate (most) zones in Africa, off the west coast. The temperature there may mean that eggs in captivity do not haveto be uniformly warm as is known to be in the case of "ovum" in particular. They can be found in West Africa (Anon. 2015).

Udoh *et al*. (2012) reported a mean live weight of 4.73g for *Archachatina marginata*, and it has the highest edible portion of 0.43 compared with *Achatina achatina* and *Achatina fulica*. Shell length has high heritability value in the black skinned *Archachatina marginata* (Okon and Ibom, 2012). Medium heritability value was recorded for mouth

length, shell length, shell width, mouth length in the black skinned and white skinned (albino) strains and low heritability values were obtained for body weight and mouth width in the black and white skinned snails (Okon and Ibom, 2012). During aestivation in snails, the ionic and organic contents in the tissues were increasing (Ajayi *et al.,* 2012). Analysis of the haemolymph during aestivation revealed that Lipid and calcium concentrations were decreasing while protein and phosphorus concentrations were increasing (Ajayi *et al*., 2012). Snails fed with 15% inclusion of *Centrosema pubescence* leaves have higher number of egg laid, high fertility and hatchability (Oyeagu *et al*., 2015). A phenotypic correlation between body weight and slaughtered yield is a measure of processing efficiency and is an important factor in marketing cost. Breeders will therefore be interested in the heritability of these traits and their genetic and phenotypic correlations (Ibom *et al.*, 2015). There was a positive and highly significant associations between body weight and all the dimensional shell parameters (shell length, shell width, mouth length, mouth width) (Ibom *et al*., 2015). Etta *et al*. (2015) recorded a mean body weight of 135.250g in *A. marginata*. They observed a positive and strong relationship between body weight and body width, body length. Aluko, and Adisa (2014) reported that the Snail live weight is highly positively correlated with the distant between 1st and 2nd suture (0.889), 3rd and 4th (0.879), 2nd and 3rd (0.851), 4th and 5th (0.846) Sutures in *A. marginata* and 2nd and 3rd Suture (0.718), 1st and 2nd (0.697) Sutures in *A. achatina*. They further stated that the parameter that most significantly determines snail live weight is the distance between 4th and 5th Suture in *A. marginata.* Live weight was positive and highly correlated with aperture width and snail height in *A. fulica* (Aluko *et al*., 2017). Live weight is determined more by aperture width in *A. fulica* (Aluko *et al*., 2017). Ibom *et al*. (2017) stated that a positive correlated exist between body weight, shell length, shell width, aperture length and aperture width with age in the black and white skinned *A. marginata*. They further stated that increments in the evaluated traits of hatchlings of cross bred and pure bred of the black-skinned parents increased slowly from hatch to four and five weeks of age but increased sharply from eight to ten weeks of age. The body weight of juvenile pure black-skinned and cross bred *A. marginata* Snails with 2 and 3 whorl can be determined more by shell length, shell width, shell mouth length and shell mouth width (Okon *et al*., 2017). The aim of this study is to assess the phenotypic traits of *Archachatina marginata suturalis* by taking the body measurements.

Materials and Method

The experiment was carried out at the Teaching and Research Farm of Olabisi Onabanjo University, Ayetoro, Yewa North in Ogun State, Nigeria. Ayetoro lies on the latitude 7° 15′N and longitude 3°3′E in a deciduous/derived savannah zone of Ogun State. Climate is sub-humid tropical with annual rainfall of 1,909.3mm. A total of one sixty three (163) *A. marginata suturalis* was used for this study. Eleven Local government areas in the derived savannah zone of Ogun State were visited. 14 – 15 animals were purchased at three main markets in

each local government. Animals were adjusted to cage and reared on *Talinum triangulare* and pawpaw leaves for a period of 3 – 5days in plastic cages. Quantitative measurements were taken on each snail and recorded. The quantitative measurement include: Distance between suture (DBS) 1st and 2nd, DBS 2nd & 3rd, DBS 3rd & 4th, Shell Length (SL), Shell Width (SW), Snail Height (SH), Aperture Length (AL), Aperture Width (AW), Shell Mouth Thickness (SMT), Live Weight (LW). Snail height was measured by placing the snail on the laboratory table, a ruler was placed at the apex of the snail standing vertically and another ruler was placed horizontally at the back of the snail on the pointed whorl, at the point the horizontal ruler meets the vertical ruler gives the height of the snail which was recorded. Data were analysed using Genstat (Payne *et al*., 2009) package which include mean, correlation and regression.

Result and Discussion

The mean distance between (DBS) the 1st & 2nd suture is 1.23± 0.23cm in *A. marginata suturalis* (Table 1). The mean distance between the 2nd & 3rd suture is 0.61± 0.13cm.The mean distance between the 3rd & 4th suture is 0.36± 0.80cm.The mean shell length is 10.34± 2.01cm. The mean shell width is 5.06±0.19cm. The mean Aperture length is 3.73± 0.70cm.The mean aperture width is 5.72±0.72cm (Table 1). The mean snail height is 4.25± 2.01cm.The mean shell mouth thickness is 0.15± 0.05mm (Table 2). The mean live weight is 109.8± 81.7g (Table 2). The snail live weight is low but positively correlated with all the body parameters. Live weight is positively and highly significantly correlated with shell height (0.387), Aperture width (0.299), shell width (0.291), Aperture length (0.263), shell length (0.248) and distance between 2nd & 3rd suture (0.224) (Table 2). The snail live weight is highly positively correlated with shell mouth thickness (0.667) (Table 2) Most body parameter pair were highly positively correlated (Table 2). The value was positively and highly not significant at ($p>0.05$) for most of the variables, but was positively and highly significant for one of the variable. The equation were also negatively and highly not significant at ($p>0.05$) for two of the variable but was negative and highly significant for one variable (distance between 1st & 2nd suture). The parameter that could most significantly determine the live weight is snail height (52.7) and distance between suture 2nd & 3rd (81.7) (Table 3). The mean snail live weight in the study is higher than the report obtained by Aluko and Adisa (2014). This may be done to strain, age and environmental (Habitat, feeding, season) effects. In this study snail live weight is positively and highly significantly correlated with the distance between 2nd & 3rd suture agrees with Aluko and Adisa (2014). The strength of the body parameter in live weight determination is for snail height in this study disagrees with Aluko *et al*. (2014) who stated shell width in their study.

Table 1: Means and standard deviation (cm) of body parameters of *A. marginata suturalis*

Parameters	Mean	Parameters	Mean
	n 163		n 163
DBS 1&2	1.23± 0.23	SH	4.25± 2.01
DBS 2&3	0.61± 0.13	AL	3.73± 0.70
DBS 3&4	0.36± 0.80	MW	5.72± 0.72
SL	10.34± 2.01	SMT	0.15± 0.05mm
SW	5.06± 0.19	LW	109.8± 81.70g

Table 2: Correlation of Body Parameters in *Archachatina marginata suturalis*

	DBS 1&2	DBS 2&3	DBS 3&4	Al	Aw	Sh	Sl	Smt	Sw	Lw
DBS 1&2										
DSB 2&3	0.689**									
DSB 3&4	0.096	0.003								
Al	0.543**	0.497**	0.030							
Aw	0.374**	0.363**	0.008	0.274**						
Sh	0.520**	0.494**	0.064	0.534**	0.667**					
Sl	0.567**	0.466**	0.181*	0.588**	0.454**	0.567**				
SMt	0.236**	0.263**	0.062	0.234**	0.242**	0.222**	0.225**			
Sw	0.505**	0.489**	0.028	0.615**	0.573**	0.732**	0.593**	0.202*		
Lw	0.137	0.224**	0.014	0.263**	0.299**	0.387**	0.248**	0.667	0.291*	

Table 3: Regression analysis of *A. marginata suturalis*

Parameters	Estimate B	Standard Error	Significant
Distance between suture 1&2	-78.6	40.2	0.002
Distance between suture 2&3	81.7	67.8	0.052
Distance between suture 3&4	1.92	7.70	0.804
Shell length	2.09	4.35	0.631
Shell width	-7.2	14.2	0.613
Snail height	52.7	20.7	0.012
Aperture length	16.0	12.5	0.201
Aperture width	12.1	11.9	0.311
Shell mouth thickness	-68.0	126.0	0.589

Conclusion

Archachatina marginata suturalis may bring out a higher yield in terms of weight under better and suitable conditions of rearing. This body parameters has set a baseline data in the improvement of this strain of snail. It is therefore recommended that these findings should be considered in improvement programme to increase the meat yield of this strain of snail.

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