EGG AND HATCHLING CHARACTERISTICS OF TWO SPECIES OF GIANT AFRICAN LAND SNAIL, *Archachatina marginata* (Swainson) AND *Achatina achatina* (Linn)

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ABSTRACT
The rapid destruction of the natural habitat of snails means that to address the protein deficiency in our diets, the captive rearing of snails must be emphasized. Two species of snails, *Archachatina marginata* and *Achatina achatina* were thus compared for both eggs and hatchability characteristics. The objectives of this work were to discover the species with better eggs and hatchling characteristics. The experiment was carried out at the Forestry and Wildlife Research Farm, Delta State University, Asaba Campus. 27 breeder snails each of *A. marginata* and *A. achatina* species with average weight of 300 and 280 g respectively were purchased from the University of Ibadan Research Farm in Oyo State and were taken care of intensively. The breeder snails used for the experiment were distributed randomly in baskets filled with loamy soil to the depth of 10-15 cm; they were fed with different diets- pawpaw leaf, water leaf, cabbages and water melon, for 12 weeks. The parameters measured were weight, length and width of eggs, weight of hatchling, length of hatchling and aperture length of hatchling. The results of the experiment showed that there were significant differences ($p<0.05$) between the species-*A. marginata* and *A. achatina* in parameters such as weight of eggs, width of eggs, weight of hatchlings, length of hatchlings and the aperture length of hatchlings. In all the parameters measured *A. marginata* did better than *A. achatina* (except in incubation period) and is therefore recommended to farmers.

Key words: *Archachatina*, *Achatina*, hatchlings, cabbages, water melon.

INTRODUCTION
Snail belongs to the phylum Mollusca. It is bilaterally symmetrical in shape; an invertebrate with a soft body and slippery skin. Its body is made up of exoskeleton. Snail is one of the largest invertebrates. There are different types of snails: some are aquatic while others are terrestrial. Land snails are commonly said to have originated in Africa and are currently widely distributed in Japan, India, Island, Australia, and South East Asia. (AFFA, 2001) Examples include *Achatina achatina, Archachatina marginata*.

They are mostly found in humid tropical forest. Snails are most active at night (nocturnal animals) while they hide and rest in the day time. Snails move at a proverbially slow speed. They produce mucus to aid locomotion by reducing friction, and the mucus also helps to protect them from mechanical injury and sharp objects. They move by gliding along on their foot which is lubricated with mucus (Martin, 2000).

Snail meat contains a high level of protein, iron and amino acid needed by man for proper growth and development. It is low in fat and commands a high demand. The population of snail has gone down as a result of deforestation, clearing and burning as well as agricultural practices and indiscriminate snail hunting (Ejidike, 2002; Agbogidi et al., 2008). Snails are hermaphrodites and can be found in the wild as well as around houses. Snails are generally regarded as herbivorous because they feed primarily on vascular plants (Raul and Barker, 2002) such as beans, peanuts, cucumbers, potatoes (raw or cooked melons, lettuce, and cabbage etc. Snails reproduce rapidly laying as many as 100 to 400 eggs in a single season.

The giant snail is rich in many important

nutrients. Its meat tastes good, is tender, highly nutritious and a good source of protein (Imevbore and Ademosun, 1988). The consumption of fresh giant snails keeps the body strong, healthy and enhances beauty (Ayodele and Asimalowo, 1999). The dry matter consists of protein of high quality with high content of lysine, leucine, isoleucine and phenylalanine, which makes snail meat comparable with conventional animal protein sources. Protein ranges in snail from 20.7% to 20.8% compared to that of guinea pig (11.9%), poultry (20.2%), fish (20%), cattle (17.5%) and sheep (15.7%) (Wosu, 2003). Okafor (2001) reported the chemical composition of snail as follows: Moisture (78.8%), crude protein (18.28%), ether extract (1.82%), crude fibre (0.07%), ash (1.57%), NFE (4.95%), calcium (160.5 mg/100 g), magnesium (30.3 mg/100 g) and iron (12.2 mg/100 g).

Snails have also been found to possess many medicinal values. Serotonin is a substance secreted in the snail's body and when deficient in the human brain causes abnormality of behavior. This can be used in the maintenance of normal behaviour after depression (Bruger and Mitchell, 1979). Bowman and Rand (1980) also reported that Parkinson's disease which results in uncontrollable movement of some body parts as a result of imbalance between dopamine and acetycholin in the body may be overcome by serotonin. Consumption of snails has been found to promote fertility and helps to cure sterility in women. It is also an excellent antidote against hypertension and a good source of iron (Okafor, 2001). Adeyeye (1996) showed that snail meat is rich in calcium, phosphorus and copper while the shell is particularly high in calcium which makes it a good substitute for oyster shell in the preparation of poultry feeds. Omole et al. (1999) reported that snail meat has a low lipid content which is half of that present in beef, broiler meat, mutton and about one eight of that present in pork. Moreover, the viscera and shell which represent about 40% of the snail weight could be recovered for feeding monogastric animals (OCADEP, 1993).

In Nigeria, snails serve as a significant and essential part of the daily diet of the Kalabaris, Itsekiris, Yorubas and many other coastal tribes all over the world. Snails constitute the major and cheapest source of protein in Nigeria (Ademolu et al., 2004). Snail is a very good source of protein which boosts and complements the protein intake of people (Ademosun and Omidiji, 1999; Etengeng, 2001; Okonta and Agbogidi, 2011).

Objectives of the study

This study was undertaken to determine:

1. The species with a better egg laying ability.
2. The species with least incubation period and better hatchability rate.

MATERIALS AND METHODS

The experiment was carried out at the Department of Forestry and Wildlife, Delta State University Asaba Campus, with Longitude O6° 14` N and Latitude 06° 4` E. Its temperature is high during the dry season and has rainfall of 1500-2000 mm. It is located in the Rain Forest ecological zone (Asaba Meteorological Bulletin, 2013).

Twenty seven breeder snails of *Achatina Achatina* species and twenty seven breeder snails of *Archachatina marginata* species were procured from the University of Ibadan Research Farm, Oyo State. The experiment was carried out intensively for their eggs characteristics. Perforated baskets made of plastic were used as housing. They were eighteen in number. Each basket is rectangular in shape. The baskets were filled with loamy soil. Each basket housed three (3) snails. The size of the basket was 42 × 28 × 20 cm^3. Varied feeds were given to the snails- pawpaw leaf, waterleaf, cabbages and watermelon. The baskets were cleaned regularly every day. Leftover feeds and droppings were removed before fresh feed were introduced. The soil in the baskets was changed once every week. The following parameters were measured during the period.

Clutch number:- This was a measure of the number of times eggs were laid during the period of the experiment.

Clutch Size:- This was a measure of the number of eggs in a clutch.

Egg weight:- The initial egg weight was taken the day the eggs were laid with the use of a sensitive weighing balance; thereafter, the weight was taken at two weeks interval.

Egg Length:- The initial egg length was taken the day the egg was laid with the use of micrometer screw gauge; thereafter, the length was measured every two weeks.

Egg Width:- The initial egg width was measured the day the egg was laid with the use of micrometer screw gauge; thereafter, the width was measured every two weeks.

Incubation period:- This was recorded as the time it took the eggs to hatch.

Percentage hatchability:- This was measured using the formula,

$$\frac{\text{Total number of eggs hatched}}{\text{Total number of eggs laid}} \times \frac{100}{1}$$

$$\frac{Nh}{NI} \times \frac{100}{1}$$

Data collected were subjected to Analysis of variance (ANOVA) and significant means were separated using the least significant difference (LSD) at 0.05 level of probability. Data on incubation and hatchability characteristics were analyzed using frequency counts and percentages.

RESULTS AND DISCUSSION

The results of the analysis as indicated in Table 1 showed that there were significant differences in terms of the weight of eggs and the width of eggs in favour of *A. marginata*. The length of the eggs and clutch sizes were not significantly different even though *A. achatina* laid more eggs than *A. marginata*. Since the snails were fed the same feed materials, it is safe to conclude that the differences observed in the weight and width of eggs might just be inherent. The difference in the size of the egg is consistent with the observations made by Ayodele and Asimalawo (1999). The results in Table 2 show that there are significant differences in the weight, shell length and aperture length of the hatchlings in favour of *A. marginata* and that the number of eggs hatched is not significantly different in both *A. marginata* and *A. achatina*. Table 3 showed that hatchability was better (100%) in *A. marginata* which laid fewer (33) eggs, but hatched all. *A.achatina* in 24(16-32) days performed better than *A. marginata* in 31(21-41) days in terms of period of incubation. This agrees with the observations made by Akintomide (2004).

Table 1. Egg characteristics of *A. marginata* and *A. achatina.*

Species	Clutch size	Weight of egg	Length of egg	Width of egg
A. marginata	11.00^{ns}	2.06^{a}	14.05^{ns}	11.91^{a}
A. achatina	14.75^{ns}	1.69^{b}	10.48^{ns}	7.71^{b}

Means with different superscripts are significantly different ($P < 0.05$).

Table 2. Hatchling characteristics of *A. marginata* and *A. achatina.*

Species	Clutch size	Weight of egg	Length of egg	Width of egg
A. marginata	11.00^{ns}	1.46^{a}	11.55^{ns}	10.56^{a}
A. achatina	14.25^{ns}	1.35^{b}	8.22^{ns}	6.12^{b}

Means with different superscripts are significantly different ($P < 0.05$). Means with the superscript ns are not significantly different ($P > 0.05$).

Table 3. Incubation and hatchability characteristics of *A. marginata and A. achatina.*

Species of snail	Incubation in days	No. of eggs hatched	No. of eggs laid	Hatchability (%)
A. marginata	31 (21-41)	33	33	100
A. achatina	24 (16-32)	30	40	75

In Nigeria today, the availability of Giant Africa Land Snail is increasingly reduced by the anthropogenic activities of man which destroy the snail's habitat. There is a possibility that in no distant time, there might just not be any snail for one to consume. This will make it impossible for Nigeria to increase their average protein intake which is on the low side anyway. It is obvious that even snail poachers now spend more time with little or no success story to tell. Report by people suggests that at one time, Giant African Land Snails were abundant and could be picked from anywhere including people's garden. But nowadays, it is no longer so because of activities such as hunting, destruction of natural habitat by deforestation, burning and increasingly widespread use of agricultural pesticides. Intensive rearing of giant African land snails would therefore help in no small measure to satisfy the demand for the meat and ensure the survival of the species.

Conclusion

This paper studied the egg and hatchling characteristics of two species of giant African land snails, *A. marginata* and *A. achatina*. The results showed that *A. marginata* performed better in terms of weight of eggs, width of eggs; weight of hatchlings, shell length of hatchlings and aperture, length of hatchlings. It also had a better hatchability rate of 100%. Thus, the researcher concludes that *A. marginata* performed better than *A. achatina* and therefore recommends it to snail farmers for culture.

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