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Comparative Assessment of Growth Structure and Litter Size of Grasscutter (Thryonomys Swinderianus Temminck, 1872) Bred In Captivity

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Abstract
Cane rats under domestication and multiplication in Forestry Research Institute of Nigeria, Ibadan were assessed for their population growth, structure and analysis over a period of five years (2009-2013). On the basis of weight gain, fecundity and docility, thirty-two (32) female grass cutter were selected for reproduction. A buck (male) was provided with one to three does (females) for mating and the mating group continued to live together until pregnancy was observed. These animals were housed in floor hutches constructed with 6-inch hollow blocks. The off springs were monitored for sex ratios and population growth and data generated were subjected to analysis using both continuous statistics of percentages and inferential statistics of X^2. Continuous statistics results revealed that more cases of parturition occurred during rainy season than dry season probably due to high quality forage that is always available during the season but inferential statistics did not establish it Analysis also showed that more female grass cutter were produced than males on yearly basis but mortality affected more females than males probably because the stress of continuous parturition coupled with age may weaken their resistance against diseases and environmental fluctuations. Also, mortality figure was higher during wet than dry season, implying that the animals need more care and medical care during rainy season. These observations are subjects of further research.
Keywords. Cane rat, domestication, parturition, litter, sex ratio, mortality.

INTRODUCTION:

Over recent decades, global problems relating to degradation of natural resources and pollution have increased dramatically; natural resources are depleted by excessive use while deforestation; soil depletion are depleted and loss of biodiversity are some of the problems added to air and water pollution in creating negative impacts on the environment (Larijani, 2010; Krishnamacharyulu and Reddy, 2005).

Biodiversity loss occurs through agricultural development because of ever increasing demand for food by increasing population (Adekunle, 2005), uncontrolled forest fires, fuel wood collection, logging activities, urbanization, political unrest, war and erosion(Akinyemi *et al*., 2008)

A group of organisms of the same species living together in one environment at the same time forms a population; populations increase when new individuals are born or members immigrate, they decrease when members die or emigrate (Alarape and Ayodele, 2003). Population structure shows the numerical relationship between the sexes and individuals within it. On this reasoning, a rapidly expanding population has a pyramid with broad base because of the number of young ones while a stable population has a narrow based pyramid that tappers less sharply towards the top but that of a declining population has narrow base without tapering (Ayodele *et al.,* 1999).

Wildlife populations are environment-sensitive. Otegbeye and Otegbeye (2002) cited by Onyeanusi (2006) reported that honey bees disappeared from some farming communities in Katsina State of Nigeria when the trees on which the bees nested to produce honey were removed from the landscape. These situations of biodiversity loss therefore call for conservation under both in *in-situ* and *ex-situ* ways (Akinyemi *et al.,* 2008).Grass cutter domestication is one example of wildlife conservation especially when it is practiced under captivity (Mustafa and Onyeanusi, 2011).

The ultimate aim of grass cutter rearing in Forestry Research Institute of Nigeria (FRIN), Ibadan is domestication. Domestication of wild animals was started by an early man of pre-historic times when he came across orphan animals or when he had no need of slaughtering further because the immediate human need of meat was satisfied or when he came across animals in the wild by sheer chance (Onyeanusi, 2006). On this premise, Cole and Ronnings (1974) cited by Onyeanusi, (2006) defined domestication as a successful attempt by human beings to make an animal depend on them throughout its life for food, shelter, medication, protection from enemies and reproductive mates; logically, a tamed animal has learnt from experience (through domestication) that a man is not a source of danger but that of comfort to it. When a wild-caught animal is further bred in captivity based on desirable traits, taming merges into domestication indistinguishably (Onyeanusi, 2009).

Grass cutter is a rodent of which its meat is highly cherished in African countries due to its good taste and absence of cholesterol, Ajayi (1983) summarized the previous attempts to domesticate African wildlife as a

means of producing cheap source of protein within a short time. The need to negate the imminent extinction of grass cutter from the wild (by bush burning and urbanization) is inevitable through active manipulation of these animals in their habitats for the benefit of mankind (Akegbejo-Samsons, 1996), preservation, protection for restoration necessitating public interest in effective management for curbing hunger, providing employment and consequently reducing poverty not only in Nigeria but also Africa as a whole (Wikipedia, 2011). This paper compares the mortality and birth figures with sex under rainy and dry seasons of grass cutter under captivity.

MATERIALS AND METHODS

The study site was Forestry Research Institute of Nigeria (FRIN), Ibadan. Three lineages of experimental animals are kept for rearing for domestication purposes: FRIN breed, Lawole and Bamidele (the stocks that were acquired from farms which they were named after in Ibadan).

Thirty-two (32) female grass cutter were carefully selected and paired with 8 males for reproduction. Weight gain, fecundity and docility (for easy handling) were the criteria used in selecting males for mating while body maturity, good mothering ability and fertility/prolificacy were the factors on which the female grass cutter for mating were based. These animals were housed in floor hutches constructed with 6-inch hollow blocks. Each hutch has two equal compartments with a small passable hole in-between, carved at the lower side to aid animal movement when threatened, during the need for privacy, solitude or rest. Each hutch has a dimension of 0.70m by 0.50m by 2.0m experimental cages. Due to the polygynous nature of grass cutter a buck (male) was provided with one to three does (females) for mating and the mating group continued to live together unless pregnancy, maltreatment or aggression was noticed; then isolation/separation was done. The animals were fed twice daily with forage (*Pennisetum purpureum*) in the morning within 08.00 and 10.00 hours followed by a formulated concentrate feed , between 14.00 and 15.00 hours. Data on litter size, litter ratio and mortality were collected between 2009-2013. The obtained information was then coded and subjected to analysis using SPSS 15.0 statistical package.

RESULTS AND DISCUSSION

BIRTHS PER MONTH OF YOUNG GRASSCUTTERS

There were more births of young grass cutter during the dry season months in year 2009: out of 47 births, 28 (59.6%) occurred during dry season (November-February). All births were restricted to wet season (April-October) in all other years (2010-2013). The high figure recorded in the dry months of year 2009 could be due to high litter in January that year, a situation which could have happened by chance. On the average, the highest number of grass cutter births was concentrated in the rainy seasons of the five years of study (*Table 1*). This may be an extension of their ecological breeding strategy to ensure natural food abundance for their young (Dasman, 1981; Onyeanusi, 2006). Grass cutter can be produced on good quality forage alone though addition of other feed supplements will improve their reproduction rate (Biobaku,1992; Onyeanusi, 2006). However there was a steady decline in the litter size from 2009 (47%) to 2013 (4%). This situation could probably arise from ageing of the animals under rearing.

Table 1: Monthly Litter size of grasscutter in captivity at parturition in the years 2009 - 2013

		MONTHS											
Years	**Total**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
2009	47	15	7	-	-	-	-	5	-	5	9	4	2
2010	20	-	-	4	6	-	-	2	8	-	-	-	-
2011	14	-	-	-	-	-	-	6	5	3	-	-	-
2012	16	-	-	-	-	10	-	1	-	2	3	-	-
2013	4	-	-	-	-	-	4	-	-	-	-	-	-

Analysis of births using X^2

Variables	**Value**
df	11
X^2 – tab ($p \leq 0.05$)	19.675
X^2 – cal ($p \leq 0.05$)	270.733
Remark	Not significant
Std. Deviation	3.128
No of birth	100

Sex Ratio of young Grasscutter

The proportion of male to female grass cutters produced over 5 years (2009 – 2013) is shown in Table 2. Out of 100 animals used for the experiment, 44 females (44%) were born during wet season while 29 (29%) males were littered during wet season. However, during dry season, 15 females (15%) and 12 males (12%) were produced.

Altogether, 59 females (59.0%) 41 males (49%) were littered. Although there were more females than males in the experiment (Table 2), with the support of Figure 1 showing the production of male and female grass cutter on yearly basis. Observation from Figure 2 revealing that more females were produced than males within the first four years (2009 – 2012) but in the year 2013, equal ratio of male to female was observed is a healthy situation for any farmer/animal rearer because it is the females that will litter to produce the his or her profit.

Table 2: Sex Distribution of young Grasscutter Produced (males/ females)

	J	F	M	A	M	J	J	A	S	O	N	D
2009	7/8	5/2					2/3		2/3	5/4	-/4	1/1
2010			-/4	4/2		1/1		4/4				
2011						3/3		2/3	½			
2012					2/8		-/1		-/2	1/2		
2013						2/2						

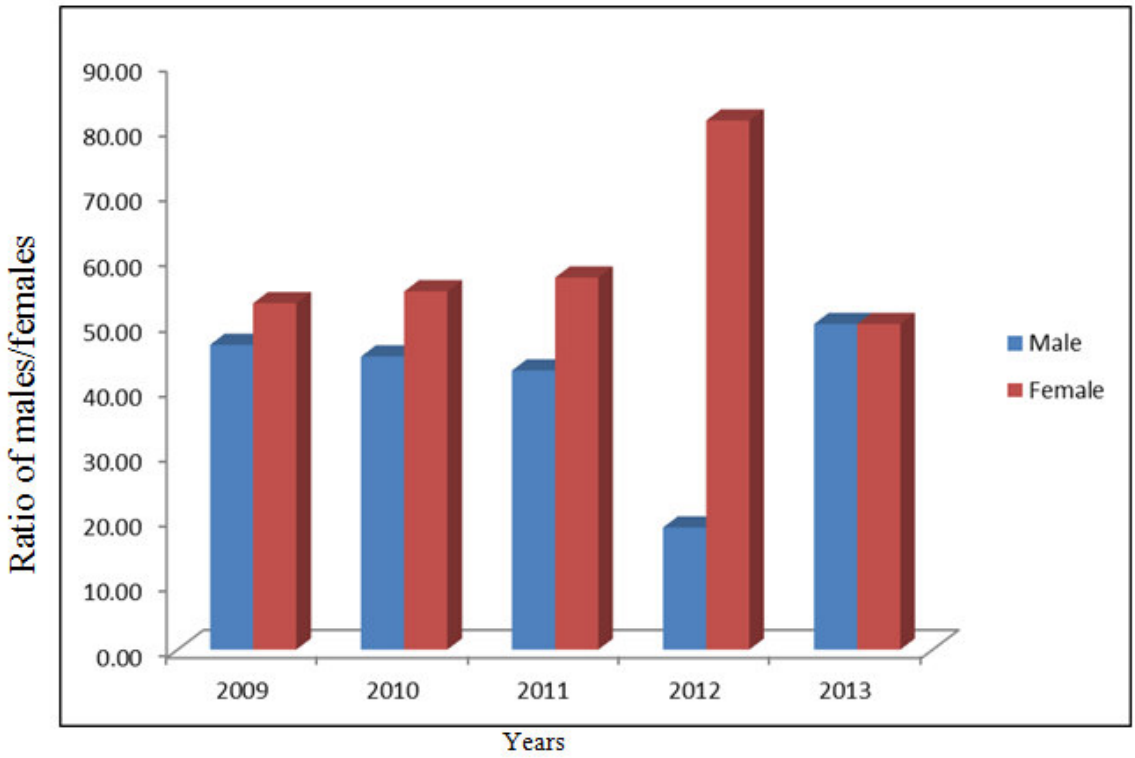

Fig. 1:Sex ratio of young Grass cutters (2009-2013)

Sex distribution of birth as analyzed under X^2

Variable	Male	Female
Mean	2	3
Variance	2.34	3.41
Observations	18	18
Pearson Correlation	0.28	
Df	17	
T-cal (p≤0.05)	0.1315	
T-tab (p≤0.05)	1.7396	
Remark	Not significant	

Mortality of Cane Rat in Captivity from 2009 – 2013

Mortality of the grass cutters in captivity is summarized in Table 6. Mortality was highest in the year 2011 (*Table 3).* Mortality affected more females than males in the study years, also the highest mortality of females occurred in July while that of males occurred in August (Table 4).This implies that they need more attention and medical care during rainy season. Highest mortality of females took place in the year 2013 (Figure 2).This might probably be associated with old age. It might also be due to regular stress of parturition because they litter twice yearly. It might also be due to birth breech and presentation of other parts than head during birth or a situation

where foetus cannot pass through the pelvic girdle of the doe when the foetuses were too big for it to deliver (Onyeanusi 2006). Although inferential statistics did not establish the mortality as significantly associated with the females, all the conditions described about birth circumstances could lead to weakened immunity of female cane rats especially where continuous parturition lowers body resistance to diseases.

Table 4 Sex Distribution of Dead Grass cutters in Months (male, Females)

Years	Month and Sexes											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
2009	-,5	-,1	2,1	1,1	-,-	1,1	1,3	-,-	-,-	-,-	-,-	-,-
2010	1,1	**-,-**	1,1	-,-	-,-	-,2	-,3	1,1	1,4	-,-	-,1	-,-
2011	3,2	1,-	-,1	-,-	-,-	-,1	1,2	2,2	-,-	4,2	-,2	1,1
2012	-,2	-,2	1,1	-,2	1,3	4,-	4,2	4,2	1,-	-,-	-,-	-,-
2013	3,-	1,-	-,-	-,-	-,-	-,-	6,1	1,4	-,-	-,-	-,-	-,-
Total	**7,10**	**2,3**	**4,4**	**1,3**	**1,4**	**5,4**	**6,11**	**8,9**	**3,4**	**4,3**	**-,3**	**1,1**

Inferential statistics of mortality and sex compared

Variable	**Male**	**Female**
Mean	1	1
Variance	1.11	1.09
Observations	59	59
Pearson Correlation	0.43	
Df	58	
T-cal (p≤0.05)	0.208642727	
T-tab (p≤0.05)	1.671552763	
Remark	Not significant	

Table 5: Mortality of cane rat in Captivity from 2009 – 2013

Years	Mortality in the year												
	J	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**Total**
2009	5	2	3	2	-	2	4	-	-	-	-	-	18
2010	2	-	2	-	-	2	3	2	5	-	1	-	17
2011	5	1	1	-	-	1	3	4	-	6	2	-	25
2012	2	2	2	2	4	4	-	6	-	-	-	-	22
2013	3	1	-	-	-	-	6	1	-	-	-	-	11

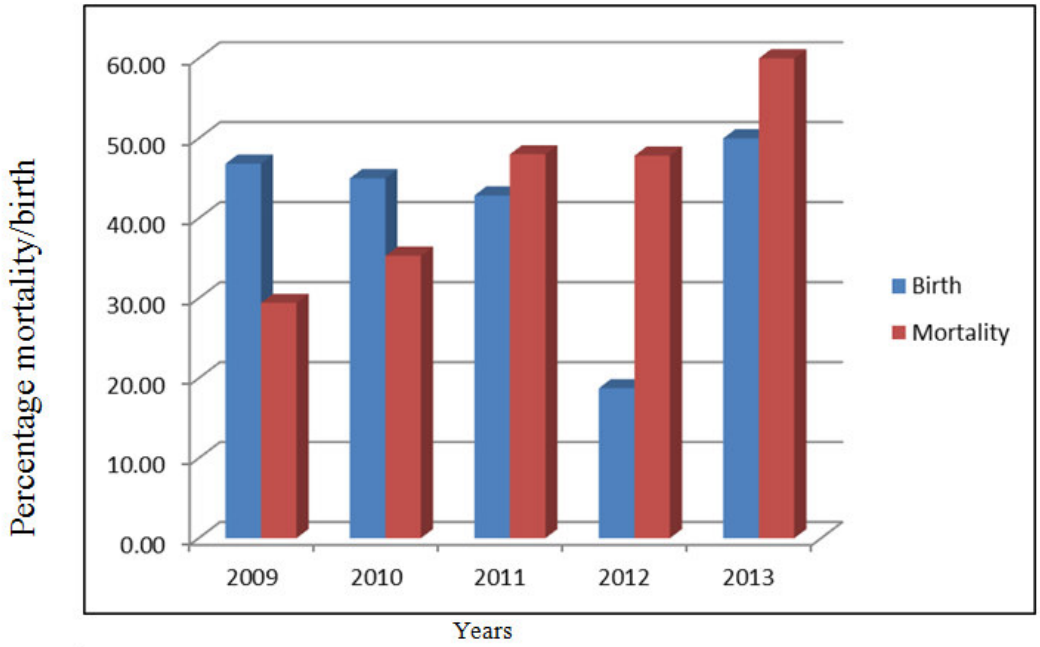

Fig. 2:Percentage of birth to mortality rates in males between 2009&2013

Monthly mortality Inferential statistics

Variables	Value
Df	11
X^2 – tab ($p \leq 0.05$)	19.675
X^2 – cal ($p \leq 0.05$)	54.800
Remark	Not significant
Std. Deviation	1.827
No dead	93

CONCLUSION

Grass cutters have not been fully domesticated in Nigeria but when nurtured very well in captivity, they can perform better than their counterparts in the wild on the basis of fecundity. This is partly due to the medical care they are subjected to, a situation which ensures that they live in good health conditions due to day to day management strategies application on their housing, food, water, protection from enemies and their reproductive mates.

Grass cutters under this study performed very well for the generation of a farmer's much-needed profit because of the production of more females than males in almost all the five years of survey. This research is therefore a preliminary observation in the achievement of full domestication of grass cutter which requires a long-term sustainable improvement research. This work is also part of long term research efforts to assess the behavioural actions, sex ratios and mortality pattern of grass cutter bred in captivity with the aim of producing fully domesticated and disease-resistant breeds.

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