Reproductive indices and performance of captive reared grasscutters (*Thryonomys swinderianus* Temminck)

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Abstract

Two male and 8 female grasscutters were severally observed and paired to characterize certain indices of reproduction as important requirements for successful propagation of the animal in captivity. Observations on some of the reproductive indices are reported. Grasscutter possesses some specialized stages of courtship and coitus that were not readily available for observation. Females openly showed no receptivity to all courtship moves by male. 71% of the mating exercises were however successful, resulting in 36 youngs from 9 litters, comprising 20 females and 16 males. Mean gestation length was 163.11 ± 1.58 days (Range 152-170 days). Litter size ranged from 2 to 7 ($X = 4.00 \pm 0.52$, $n = 9$). Baby grasscutters were born with eyes opened, body fully haired and teeth well developed and capable of inflicting painful bites. Mean birth weight of litters was 117.70 ± 34.08 g. Male birth weights were generally heavier ($X = 118.10 \pm 27.70$ g) than females ($X = 100.90 \pm 27.50$ g). Litter size and weight at birth were negatively correlated ($r = -0.42$) and not significant ($P > 0.05$). Breeding occurred in January, March, April, June, July, November and December. About 67% of the parturition occurred at night. Breeding success among other things affirmed the feasibility of commercial rearing of the grasscutter to supplement the prevailing inadequate animal protein supply in the country.

Keywords: Grasscutter, rearing, captivity, reproduction performance

Introduction

The exploitation of wildlife for the supply of bushmeat appears enormous from one section of the country to the other. Amubode and Agossa (1985) and Akiri (1985) clearly showed that bushmeat constitutes about 16% of total animal protein consumed in Nigeria while 20% was earlier reported for the rural communities (Ajayi, 1971). Irrespective of the percentage contribution, it is certain that there is a shortfall in their per-caput protein consumption of

Nigerians. Moreso, the shortage of protein ranks among the most serious contemporary problems, especially in the light of the effect of the protein malnutrition on intelligence and learning.

Recent advances in livestock production in Nigeria include the peri-urban goat production scheme, establishment of grazing reserves for transhumance pastoralists for various classes of livestock, incorporation of livestock production into Agricultural Development Projects (ADP)

and the establishment of Livestock Monitoring Evaluation and Co-ordinating Unit (LIMECU). Despite these measures, the problems of high feed cost, inadequate number of day-old chicks, expensive and impotent vaccines still constitute major stumbling block to increased production especially in the poultry industry.

It has long been suggested (FAO, 1970; Ajayi, 1971, 1974; Afolayan and Anadu, 1981; Mbah, 1989) that the shortage of animal protein in Nigerian can be ameliorated by improving the existing conservation programme of wildlife, particularly the domestication of rodents that are tractable, prolific and widely accepted to the public for consumption. Again, captive rearing of rodents and other species of manageable sizes in cages and enclosures might augment the bushmeat supply from the wild (extensive management), with attendant reduction of hunting pressure on the wild game.

Considerable efforts were put at the domestication of the grasscutter (Ajayi, 1972, 1975) because this rodent portends the potential that might produce much more protein in a given area than small ruminants at much less cost in terms of labour and habitat. Unfortunately, the improper understanding of the reproductive ecology of the grasscutter had constituted a major set back in the captive propagation of the rodent.

The studies reported here are part of a series of systematic investigations undertaken to describe reproductive indices in the grasscutter. An initial knowledge of the reproductive indices is a needed pointer to future husbandry practices that could enhance selections likely to affect the genotype and phenotype of captive bred grasscutter.

Materials and methods

Eight female and two male grasscutters selected from a group earlier captured and rehabilitated

for 32 days were earmarked for the breeding exercise. The giant rat breeding cages earlier designed by Ajayi (1974) were adopted for breeding the grasscutters. The adoption of this giant rat cage for the grasscutter was based on the fact that both the dimensions of the cage and the provision of facilities for cool temperatures as well as adequate ventilation are similar for both rodents.

The animals were served with food materials daily after all compartments of the breeding cage complex had been cleaned every morning and food leftovers completely removed. Food resources employed were elephant grass (*Pennisetum purpureum*) supplemented with maize grain and cassava. The cages and animal house floor were regularly disinfected with Savlon antiseptic. 25ml of water was served daily using water trough and the left-over determined the following morning.

Shortly before pairing, female grasscutter was weighed and introduced to the male. Pairing lasted for 21 days after which body morphology was used to isolate gravid grasscutter. In particular, the length of the teat was determined by using a combination of soft string and metre tape. A protractor from Helix mathematical sets was used to measure the angles between the distended teats and body of gravid and nursing females.

Mother-litter interaction and frequency of suckling were recorded by direct observation during 07.00-09.00h, 12.00-14.00h and 16.00-18.00h over a period of 14 consecutive days post parturition.

Other information recorded include gestation length, month of parturition, litter size, litter number, weight of litters, sex of litters. The information from captive bred grasscutter was also compared with those from gravid grasscutters that were killed by hunters.

Performance of grasscutters reared in captivity

Results

Mating and courtship behaviours

Coitus was observed on the 8th day after pairing in only one instance. The introduction of male into female cage resulted in agonistic attack leading to the death of the female in two instances. However, the introduction of female into male cage was peaceful, leading to a series of 'rituals' viz. As soon as the female was introduced to the male cage, the male rushed at her while the female ran up and down from one nesting chamber to the other for a period of about 3 minutes, after which the male ceased from running after the female. Thereafter, the female quietly settled down in a nesting chamber while the male tried as much as possible to get closer by smelling the genital area and initiating a mouth to mouth contact. This courtship behaviour was never reciprocated by the female grasscutter. Copulation occurred when the female raised her pelvic with the tail deflected to the left and coition occurred.

Gestation length

Gestation length generally ranged between 152 and 170 days ($X = 163.11 \pm 1.58$, $n=9$). Throughout the study period of 3 years, only 2 of the grasscutters littered twice within 12 months.

Pre and post parturition pattern/features of gravid grasscutters

In all cases, the grasscutters was met with her litters which were produced either at day-time or night-time. Six cases of parturition occurred before day break while three occurred during the day-time.

Slow movement and nervous outlook were observed for three consecutive days before parturition. In some cases, the heavily pregnant grasscutter made sporadic eerie-sound and the coat hair stood erect.

Table 1 shows the length and circumference of teat at different breeding stages. Nursing mother grasscutters recorded the longest teat length of 1.10cm and widest circumference of 1.4cm. The teat of a non-gravid female was flat, parallel to the body, pinkish at the tip and base, but dark gray at the mid-way. The teats of gravid and nursing female were distended, erected at an angle between 23° and 49° away from the body. The teats were either pinkish or reddish.

The length of teat was significantly ($P < 0.05$) larger in the nursing mother than in either the gravid or non-gravid grasscutter.

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Table 1 *Length and circumference of teat in female grasscutters*

State of grasscutter	Teat length (cm)	Circumference (cm)
Non-gravid	0.67 ± 0.02	0.66 ± 0.01
Gravid	0.72 ± 0.02	0.82 ± 0.01
Nursing mother	0.96 ± 0.04	1.19 ± 0.06

Table 2 *Breeding recording of grasscutters in captivity*

Id	Date paired	Date littered	GP	Litter size	Sex		Time of littering
					M	F	
X1	28/5/90	8/11/90	165	2	2	0	Night
X2	24/6/90	2/12/90	162	6	2	4	Day
X3	26/7/90	11/1/91	170	4	1	3	Day*
X5	5/11/90	22/4/91	169	4	2	2	Night
X3	19/2/91	29/7/91	161	4	2	2	Night**
X8	4/8/91	2/1/92	152	3	1	2	Night
X2	2/1/92	14/6/92	164	3	2	1	Day*
X2	18/7/92	21/12/92	157	3	1	2	Night**
X9	27/9/92	13/3/93	168	7	3	4	Night

GP = gestation period: M=Male, F= Female

Asterisks indicate animals that littered twice in a year.

Single asterisk shows first littering and

Double asterisks show second littering within the same year.

Litter size, physical features of litter birth weight

Table 2 shows the breeding records for male and female grasscutters paired for 21 days each. 71% of the pairing exercises resulted in copulation, pregnancy and parturition.

Litter size ranged from 2 to 7 ($X=4.00 \pm 0.52$, $n=9$) with a total of thirty six (36) young from 9 litters. The youngs were sexed into 20 females and 16 males (5:4). Baby grasscutter was fully haired, strong and firm for handling and examination. The teeth were well developed, strong and vicious enough to inflict

painful bites. Among the grasscutters deposited at bushmeat processing centers, 40 contained foetuses but these were not haired. Number of the immature grasscutters ranged between 2 and 11 ($X=4.30 \pm 0.24$, $n=40$).

Average data for 36 young grasscutters delivered in captivity shows the mean birth weight to be $117.70 \pm 34.0g$. The males ($X = 118 \pm 28.70g$) were generally heavier than the female ($X = 100.90 \pm 27.56g$) counterparts ($P < 0.05$). The correlation between litter size and weight at birth was negative ($r = -0.42$) and not significant ($P > 0.05$) (Table 3).

Table 3 *Correlation matrix total litter size, male and female litter size, total birth weight, mean male and female birth weight*

	Total litter size	Mean male litter size	Mean male weight	Female litter size	Mean female weight
Male litter size	0.53				
Mean male weight	-0.23				
Female litter size	0.91	0.28	0.08		
Mean female weight	-0.45	-0.38	0.49	-0.36	
Mean total weight	-0.42	-0.32	-0.97	-0.25	0.97

Performance of grasscutters reared in captivity

Table 4 shows the correlation matrix between litter size and litter weight of grasscutter. The relation for females was $r = 0.25$ ($P > 0.05$) while the males had a value of $r = -0.32$ ($P > 0.05$).

Mother-litter relationship

Breastfeeding was accomplished by the mother grasscutter lying sideways and at times the young sleep close to the mother without suckling. The young grasscutter, in addition to suckling, nibbled on whatever their mother ate.

There were instances when the young were carried with the teeth of the mother from one side of the cage to the other. However, whenever the cage was opened, the mother grasscutter escaped into the other section of the cage. Incidence of cannibalism occurred when the mother ate all the litter of four.

Baby grasscutter indulged in body hair eating from mother and cage mates. The hair eating behaviour was most pronounced when litter size was greater than 4.

Breeding seasons

Baby grasscutter were born in captivity between November and July of every year, although no birth was recorded in February and May (Table 4). Grasscutter with foetuses deposited at bushmeat processing centers were common between June and September, the higher number (90%) occurring in September.

Discussion

Values obtained from volume of water offered showed that grasscutter does not drink water. It was observed that films of water on leaves of elephant grass were licked in some cases. While it could be argued that this animal rely solely on the water content of food (elephant grass), it is possible that some of the water requirement is met from metabolic sources. There is indeed an aspect of water conservation shown in the dry pellet nature of the faeces. Amubode *et al.* (1985) stated that grasscutter is more of a uricotelic than ureotelic animal which favours the accumulation of left-over grass food in the form of deep litter. The

Table 4 Performance records of grasscutters reared in captivity

Months	Litter set	Average litter size	Sex		Sex ratio	
			No. of male	No. of female	% Male	% Female
January	2	3.5	2	5	29	71
February	-	-	-	-	-	-
March	1	7.0	3	4	43	57
April	1	4.0	2	2	50	50
May	-	-	-	-	-	-
June	1	3.0	2	1	67	33
July	1	4.0	2	2	50	50
August	-	-	-	-	-	-
September	-	-	-	-	-	-
October	-	-	-	-	-	-
November	1	2.0	2	0	100	-
December	2	4.5	3	6	33	67
Total	9	4.0	16	20	44	56

moisture content of elephant grass with which grasscutters were largely fed in this study, certainly, is high ranging between 69 and 82 percent. Ayeni (1975) observed that different volumes of water are required by individual animals for the maintenance of normal growth and this is reflective to their ability to economise water. The water requirements of an animal can be supplied in part from food, and water consumed voluntarily, from water metabolized from food and water formed within the body as a result of tissue oxidation (Ayeni, 1975).

The courtship behaviours observed are similar to those reported by Mensah and Baptist (1986). Although female grasscutters showed no receptivity to courtship moves by male, mating success was repeatedly achieved, since almost all pairing resulted in pregnancy. The lack of the full knowledge of the complex mating stages and processes was probably responsible for inability of grasscutter to breed at the domestication unit before now. Females certainly accepted coitus mostly during limited periods, otherwise there would have been no breeding at all.

Grasscutter possesses some specialized stages of courtship and mating that were not available for observation. This observation may not be unconnected with the report that some female rodents will only allow males to approach and mount them during a brief period of receptivity around the time of ovulation (Long and Evans, 1922). A reasonable degree of control on mating is therefore possible on the detection of oestrous. Long and Evans (1922) also reported that sexual activity in many reaches a crescendo at night. Michael *et al.* (1967) and Keynes (1981) also in their mating study of rhesus monkey observed that mounting of female by the male was never haphazard, but would result from series of initial movements by the male such as courtship postures,

mounting attempts or clasping, and from individual movements by the female, such as presentation and invitational gestures.

The length, colour and angle of teat erection relative to chest and abdomen is very important for determining whether the female grasscutter is gravid or not.

In this study, mean gestation length of 163 days was obtained. This is quite different from the 120 days reported by Halternorth and Diller (1977) and Amubode (1991) and 152 days by Mensah and Baptist (1968). Variation in the number of days for grasscutter pairing is a major source of difference but animal adaptability to captive environment usually result in changes of the physiological phenomena, which probably manifested in longer gestation length than hitherto reported.

Despite the difference in gestation length of grasscutter reported from various laboratories, it is possible for the grasscutter to litter twice in a year as was observed twice in this study. It is possible that the longer gestation length resulted in greater birth weight of 118g than the 100g obtained by Amubode (1991). With an average of 6.26 ± 1.79 g body weight gain per day, it will be more advantageous to the grasscutter farmer if parturition occurs earlier than the 163 days.

The mean litter size of 4, birth weight of 188g obtained in this study are similar to the earlier reports of Ajayi (1971), Asibey (1974), Afolayan and Anadu (1981), Mensah and Baptist (1986) And Amubode (1991). However, this study established that litter weight decreased with increases in the litter size. This correlation did not in anyway influence the growth performance of the baby grasscutter during the first months of life.

Performance of grasscutters reared in captivity

The eating of body hairs by baby grasscutters could be likened to incidence of parakeratosis in pigs. Parakeratosis usually result from calcium and zinc imbalance in the diet of pigs. It is therefore possible that salt lick containing a fair concentration of calcium and zinc may eradicate the eating of hairs by baby grasscutter.

Conclusion

It appears from the results of this study that grasscutter will litter throughout the year. This is borne out of the fact that 90% of the females killed by hunters in September were gravid but no copulation, pregnancy and parturition occurred during the same period in captivity. The physiological phenomenon responsible for this observation is yet to be investigated but it may not be unconnected with silent heat on the part of the females. Asibey (1974) claimed that breeding occurs throughout the year in grasscutter but Happold (1987) noted that it is likely that there are seasonal variations in reproductive activity of the animal. It is apparent that availability of food resources and adequate environmental factors are the major influences in the seasonability of grasscutter breeding.

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