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BODY WEIGHT CHANGES, MORPHOMETRY AND ATTACHMENT OF PUBERTY IN CAPTIVE BRED GRASSCUTTERS
(Thryonomys swinderarianus Temminck)

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Target Audience: Academic/ animal scientists/ small scale farmers.

ABSTRACT

A systematic investigation was conducted to determine attainment of puberty, morphmetric and body weight changes in grasscutters reared in captivity Mean birth weight of captive-bred grasscutters was 117.70 ± 34.00g. (N=36). Males (X±118=-28.70g, N=16) were significantly (P<0.01) heavier than the females (X==100.90±-27.56g, N=20). Males consistently showed higher rates of live weight gain than the females. At 36th week, a male grasscutter had attained 1.6kg live weight while a female was 950g. Mean age at puberty was estimated 252.50 day for male and 214.67days for the female. With the exception of the shoulder height at birth, body linear measurements were longer in the male than the female and consistently increased throughout the study period. The relationship between each morphometric index and body weight was significantly (P<0.01) linear and strongest (r=0.98) between body weight and heart girth.

Key words: Body weight, morphometry, puberty, grasscutters captive breeding.

DESCRIPTION OF PROBLEM

Most mammals conform to a common plan of reproduction, but wide variations in patterns and behaviours and features of species differences. (1). Out of about 5,000 mammalian species that are known,(1,2) reproductive biology has been studied in only 25 species (2). Some of the already studied species are characterized by peculair reproductive phenomena as well as variations among species such as restricted season, absence of oestrous, puberty age gestaton length and litter size(1,3).

As more attention is directed to the captive breeding of unconvetional and unexploited wild animal species as meat sources to meet the shortfall in animal protein supply in less developed countries of the tropics (4) baseline information that are not hitherto available on the various characteristics of these animals becomes important. Judging from the current level of interest and attention the grasscutter portends the potential of a farm animal of the future in all the West African sub-region (5).

There had been various reports (6, 7, 8, 5, 9, 10) on the gestation length of the grasscutter but no work was ever carried out to determined their oestrus cycle, indices of maturity, mother-young relationship and similar features

that are crucial to the successful breeding of grasscutter in captvity. There are also evidences in literature on relationships between body linear measurements, bodyweights and age of ungulates (11, 12, 13, 14) but none is available for the grasscutter.

Information on some indices of reproduction and performance of captive bred grasscutters was recently reported (15). As part of the series of systematic investigations which were undertaken to provide adequate information on the indices of reproduction in the grasscutters, this paper on the body linear measurements, body weight changes and attainment of puberty in grasscutters littered in captivity.

MATERIALS AND METHODS

Ten grasscutter were acquired from Bacita Sugar Plantation comprising of 8 females and 2 males at the inception of the breeding exercise. Detail description of experimental animal stock and accommodation (cage design) feeding, breeding protocols of making and records of breeding performance have been given in an earlier report (15).

All newly born grasscutters were individually weighed at birth and at weekly interval using the Metler balance. The total body length , (TL), length of Head (H), Shoulder height (SH), Length of hind limb (HL). Length of tail (T), Heartgirth (HG), were taken at birth and at weekly interval until newly captive bred grasscutter was 10 weeks old. Litters were seperated from their mother after 4 weeks and further observation continued on the weaned grasscutters in seperate cages.

Determination of puberty in male grasscutters was studied in two ways (i) Observation of secondary sex features and (ii) Presence of spermatozoa. The emergence of secondary sex characters which were used to distinguish juvenile animals from sub-adult and from adult (15) were monitored weekly through close observations during weighing periods. The presence of spermatozoa in the genital glands was monitored as an indicator of attainment of maturity. The age at which the presence of sperm was first observed was taken as the age at puberty.

Semen collection to determine the presence of spermatozoa or on set of spermatogenesis was carried out by the electro-ejaculation technique as described (16) electro ejaculation was stimulated by inserting a single bi - polar probe or electrode into the anus of the male grasscutter. The probe was lubricated with Vaseline so that electrical centres of the electrode which is about 1.5cm could enter the rectum. Electro-stimulation of nerves to the reproductive system was brought about by gradually increasing voltage with the aid of a rheostat. The tip of the penis was placed inside a test-tube to collect semen.

For the determination of puberty in female grasscutters, the vulva of the female animals was observed weekly for oestrus or ovulation. The vulva which was firmly closed at pre-maturity stage was closely monitored to

ascertain the time of its first opening . External observable physiological indices of animal that has come into oestrous or on heat that were monitored include: swelling and reddening of the vulva, frequency of urination, restlessness, riding of other animals in the rearing cage.

RESULTS AND DISCUSSION

Bodyweight changes of litter and body linear measurements: The mean birth weight of all captive bred litters (36) was 117.70 ± 34.0g. The male (X=118 ±28.70g) were generally heavier than the females (X=100.90 ± 27.56g). The difference in weight was significantly ($P<0.01$).

Table 1 shows the average weekly live weight gains of baby grasscutter from week 1 to week 12 of life. During the first two weeks of life, weight gain was similar between males of females. Therefore body weight gain in both sexes increased inconsistentiy. The inconsistent increases was poorer in the females than in the males. Male litters consistently showed higher rates of live weight gain than females. When means were pooled over the 12 weeks, gain in grasscutter was 7.28g per day in males and 4.15g per day in females. The values were significantly ($P<0.01$) different. At the 36th week, a male grasscutter had attained 1.60kg live weight while the female was about 950g.

Table 1: Mean weekly liveweight (g) gain of baby grasscutters.

	Sexes	
WEEK	Male	Female
1	19.60 ± 4.95	19.05 ± 4.99
2	26.95 ± 2.69	27.65 ± 4.96
3	25.10 ± 2.51	20.90 ± 15.13
4	68.20 ± 16.90	33.90 ± 15.77
5	61.25 ± 24.01	22.85 ± 5.48
6	53.85 ±14.20	25.88 ± 5.37
7	60.35 ± 2.79	24.05 ± 0.67
8	69.45 ± 6.61	33.35 ± 12.27
9	71.45 ± 4.14	41.45 ± 5.01
10	55.80 ± 6.08	43.45 ± 2.26
11	42.00 ± 7.00	35.30 ± 12.07
12	57.60 ± 10.18	51.05 ± 15.08

Table 2 and 3 show the linear measurement of the body of grasscutter at birth and at different weeks of life till 10 weeks. Each of the body linear measurement was longer in the male than in the female with the exception of the shoulder height at birth. The mean value for both sexes consistently increased throughout the study period. The correlation matrixes for the body measurements are shown in Table 4. The relationship between each

morphometric index and body weight was significant (P<0.01), linear and strongest between body weight and heartgirth.

Table 2: Mean body linear measurement of male grasscutters from 0 to 10 weeks of age (cm)

N=15

Variable	Period of measurement(days)										
	Day old	7	14	21	28	35	42	49	56	63	70
TL	15.60	16.87	18.10	19.50	21.40	23.67	26.03	27.86	29.22	30.73	30.83
	±0.42	± 0.91	± 1.15	± 1.22	± 1.24	± 1.45	± 1.43	± 1.63	± 2.20	± 1.92	2.03
H	5.55	5.92	6.03	6.45	6,72	7.93	8.28	8.33	8.46	8.53	8.63
	±0.19	±0.28	±0.20	±0.31	±0.29	±0.32	±0.29	±0.26	±0.23	±0.22	±0.21
HL	7.36	7.58	8,18	8.72	9.57	11.16	11.60	12.26	12.63	12.87	12.97
	±0.36	±0.35	±0.41	±0.47	±0.38	±0.53	±0.57	±0.48	±0.68	±0.58	±0.64
SH	4.91	5.30	5.75	6.35	6.68	8.21	8.67	8.70	8.93	9.03	9.04
	±0.91	±0.24	±o.22	±0.34	±0.25	±0.39	±0.47	±0.46	±0.55	±0.40	±0.37
T	6.46	6.66	7.13	7.75	8.45	9.65	11.06	11.90	12.25	12.26	12.27
	±0.39	±0.36	±0.49	±0.58	±0.77	±0.95	±0.76	±0.87	±0.95	±0.74	±1.26
HG	12.08	12.80	13.73	14.77	15.43	17.57	17.68	19.75	20.95	20.07	22.00
	±0.67	±0.66	±1.01	±1.35	±1.37	±1.25	±1.23	±1.61	±1.39	±1.26	±1.26

The progressive changes in the grasscutters body parts and body weight from birth provided an indication of attained age. It has however been observed that body weight and body dimension changes are indices of age that will require thorough examination and investigation before becoming a permanent criteria (13), especially as body weight and body measurement can be seriously influenced by nutrition health and genetic inheritance. Dapson and Irland (13) in their study of accurate method of determining age in small mammals however successfully used growth in body parts of small wild mammals throughout life as an accurate indicator of age. Ludwig and Dapson (12) also showed its effectiveness in white tailed deer.

Table 3: Mean body linear measurement of female grasscutters from 0 to 10 week of age (cm).

(N = 15)

Variable	Period of measurement (days)										
	Days-Old	7	14	21	28	35	42	49	56	63	70
TL	14.51	15.25	16.07	16.87	18.14	21.95	25.85	26.35	27.15	27.75	29.10
	±0.52	±0.49	±0.68	±0.95	±1.62	±1.85	±4.25	±3.75	±3.75	±3.85	±2.80
H	5.26	5.68	5.95	6.25	6.55	7.80	8.11	8.16	8.30	8.50	8.60
	±0.24	±0.21	±0.39	±0.32	±0.39	±0.10	±0.45	±0.43	±0.40	±0.29	±0.21
HL	7.01	7.43	7.90	8.20	8.98	10.35	11.10	11.25	11.65	12.00	12.15
	±0.29	±0.32	±0.49	±0.55	±0.67	±0.05	±0.70	±0.65	±0.75	±0.89	±0.75
SH	5.19	5.55	5.73	5.90	6.34	7.92	8.00	8.00	8.05	8.15	8.30
	±0.16	±0.23	±0.30	±0.30	±0.38	±0.50	±0.75	±0.29	±0.25	±0.25	±0.20
T	5.84	6.33	6.73	7.25	7.70	9.30	9.90	10.20	10.35	10.55	10.65
	±0.28	±0.32	±0.42	±0.47	±0.51	±0.28	±0.50	±0.40	±0.43	±0.43	±0.43
HG	11.28	11.13	11.95	12.53	13.30	15.90	16.95	17.30	18.30	18.55	18.70
	±0.55	±0.68	±0.69	±0.87	±0.99	±1.35	±0.85	±0.50	±0.41	±0.32	±0.09

Strong significant correlations were recorded between morphometric indices and body weight and the strongest were between body weight and heartgirth (Table 5). This observation accords with the reports of (17) and (18) in their study of genetic correlations in Austrialian Merino sheep and indigenous Malawi goat respectively. Taneje (17) reported positive correlation between body weight and different ages as well as between various body measurements. Correlation between various external body measurement and body weight (18) was highest between heart girth and live weight (r = 0.98). Ibiwoye et al. (14) gave similar reports (r = 0.93) in their study of Yankassa sheep and West African dwarf goat production in the Kainji Lake Basin of Nigeria. Also Onadeko (19) in a study of the ecological status of the American alligator (Alliator mississipiensis) used the estimate of distance from the edge of the eye of the reptile to the tip of the nose in inches as the estimate of the total lenght of the animal in feet (2.45 of snout is an estimate of 0.3m of body length).

Table 4: Correlation coefficients of the mean body linear mesurement and mean live weights of the grasscutter litter. (Male and Female)

	Head length	Body length	Tail lengh length	Hindlimb height	Shoulder	Heart girth
Body length	0.900					
Tail length	0.902	0.863				
Hind limb length	0.946	0.938	0.939			
Shoulder height	0.923	0.906	0.898	0.944		
Heart girth	0.901	0.866	0.967	0.941	0.919	
Live weight	0.873	0.843	0.886	0.890	0.887	0.925

Table 5: Regression equations for the relationship between body parts and weight of litter.

Body parts	Regression equations
H	H = 5.39 + 0.0056WT
TL	TL = 14.4 + 0.025WT
T	T = 5.71 + 0.01WT
HL	HL = 6.90 + 0.01WT
SH	SH = 4.96 + 0.001WT
HG	HG = 9.91 + 0.01WT

H = Length of head; TL = Total length; T = Length of tail; HL = Length of hind limb; SH = Shoulder height; HG = Heart girth.

Puberty in male and female grasscutter: Mean age at puberty was estimated at 252.50 days. The emergence of brown public patch, a brown scaly secondary sex feature characterized the attainment of puberty in male grasscutter. Spermatozoa were absent in grasscutters on which the brown public patch had not appeared. Electro-ejaculation of live animals was unsuccesssful until male grasscutter was 392 days old. At this time, only one sperm cell was obtained from the few drops of semen collected. The grasscutter at 392 days old had a live weight of 2.63kg. An old male weighing 4.46kg did not even secrete any semen despite satisfactory reaction to electro-ejaculation (16).

Mating of a male that had just attained puberty trait (emergence of public patch) did not result in pregnancy after the usual 21 days of pairing a male and a female. When a newly matured male was continuously paired with female, the female littered at exactly 280 days from the date of first pairing.

Mean age at puberty for female grasscutter was estimated at 214.67 days. At birth, the vulva of the female grasscutter was not opened. However, the vulva got opened at the 214.67 days of life. The opening of the vulva was accompanied with moistures due to the presence of mucus secretion. No indices of oestrous were observed in grasscutter.

The estimation of puberty in male and female grasscutter (8 and 7 months respectively), agrees with (9) who reported 8 months for both male and female. This results are however contrary to the record of (20) who reported that sexual maturity is attained when the youngs are about 5 months. Afolayan and Anadu (8) also reported a far higher figure of 12 months as the age at which puberty is attained.

The disparate records of some earlier reports of age on attainment of puberty in the grasscutter might not be unconnected with the design and sources of data. Certainly, most earlier attempts to breed grasscutter and generate scientific information and /or to characterise breeding in this animal were met with many problems, particularly that of sex and age determination. These major bottlenecks were the foremost research problems addressed (15) in the series of systematic investigations undertaken to provide scientific information on the indices of the reproduction of grasscutters in captivity.

CONCLUSION AND IMPLICATIONS

Sustainability in the utilization of wildlife species for bush meat can be attained, among other means, through the perpetuation of grasscutter in ex-situ management programs. Information provided on age at puberty and relationship between morphormetic indices and body weight is managerially useful. For instance, local grasscutter farmers who might not always have access to weighing scale but have a feel for an estimate of the particular morphormetic index could be guided to assume age, liveweight and size-class distribution of animals in their custody. The baseline information provided in this aspect of the study on the captive rearing of grasscutter has set the stage for further research.

REFERENCES

1. **Short, R. V. 1972,** Specieis differnces: The marsupials, Elephant, the horse and its hybids. In: Reproduction in Mammals C. R. austin and R. V. Short (Ed) Camb.
2. **Hafez, E. S. E. 1980.** Reproduction in Farm animals. Lea and Feibger. Philadelphia.
3. **Happold, D. C. D. 1987.** The Mammals of Nigeria. Clarendon press Oxford.
4. **Preston, T. R. and Lang, R. A. 1989.** The green house effect and its implications for world agriculture: The need for environmentally friendly developments. Livestock Res. For Rural Devil. 23-30.
5. **Mensah, G. A. and R. Baptist 1986** Aspects piactigues on elevate d'amlocodes (*Thryonimys swinderianus*) Rev. elev. Med vet. Pays trop. 39(2) 239-242.
6. **Ajayi, S. S. 1971.** Wildlife as a source of protein in Nigeria. Some priorities for development. Nigeria Field 36 (3) 115-127.
7. **Halternoth, T. and H. Diller 1980** A field guide to the mammals of Africa including Madagascar. Collins. London.
8. **Afolayan, T. A. and Anadu, P. A. 1981** Preliminary observations on the ecology and domestication of the grasscutter J. Inst. Ani. Tech. 31 (1): 31-38
9. **Mbah, L. A. K. 1989.** The influence of season and age of stand on the nutritive value of elephant grass (*Pennisetum purpurem*) and sugarcane (Sacharium *officinarium*) fed to the canerat (*Thryonomys swinderianus Temminck*) M.Sc. Dissertation. University of Ibadan, Ibadan, Nigeria.
10. **Amubode, F. O. 1991.** Basic information for captive-rearing of grasscutter. The conservator 1:33-34.
11. **Dapson, R.W. and J.M. Irland 1972.** An accurate method of determing age in small mammals. J. Mammal 53 (3) 100-106.
12. **Ludwig, J.R. and R.W. Dapson 1977.** Use of insoluble lens proteins to estimate age i white-tailed deer. J. Wildl Manag. 41 (2) 327-329.
13. **Larson, J.S. and R.D. Taber 1980.** Criteria of sex and age.In: Wildlife Management Techniques Manual S. D. Schemnitz (Ed) Wildlife Society pp. 143-202.
14. **Ibiwoye, T.I.I., M.O.O. Oyatogun and J. Jolayemi 1993.** Yankassa sheep and West African dwarf goat production inthe Kainji Lake Basin of Nigeria. Trop. Agric. (Trinidad) Vol. 70No. 2 April 1983. Pp 165 – 168.
15. **Onadeko, S. A. 1996** The reproductive ecologyof the grasscutter *(Thryonimys swinderianus Temminck)* in captivity. Ph.D Thesis University of Ibadan, Ibadan. Nigeria.
16. **Almquist, J. O. 1973** Diary cattle: The artificial Inseminationof Farm Animals. E. J. Perry (Ed.) Rutgers UniversityPress. New Jersey. P94 – 141)

17. **Taneje, G. D.** 1958. Genetic correlation in Australian Merino Sheep Anim. Breeding Abstract. 28:1400.
18. **Owen, J.B.** 1975. Sheep Production. Cassel and Collier McMillian Publishers Ltd. London.
19. **Onadeko, S. A.** 1983. Status of the American Alligator and Potential Resource Management Problems at Brazos Bend State Park. M.Sc. Thesis Texas A&M, Texas.
20. **Asibey, E.O.A.** 1974. Wildlife as a source of protein in Africa. South of the Sahara Biol. Conserv. 6 (1): 32-39