

## FACTORS AFFECTING GROWTH AND BODY MEASUREMENTS OF THE GRASSCUTTER (RODENTIA: THRYONOMYIDAE)

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### ABSTRACT

*Overall mean body weights ( $0.138 \pm 0.06$  and  $0.513 \pm 0.03$  kg), body lengths ( $17.24 \pm 0.30$  and  $21.68 \pm 0.65$  cm), heart girths ( $12.57 \pm 0.18$  and  $16.83 \pm 0.90$  cm), and height-at-withers ( $7.39 \pm 0.14$  and  $9.86 \pm 0.52$  cm) of the grasscutter (*Thryonomys swinderianus* Temminck) at birth and 60 days of age, respectively, were recorded. Litter size and sex significantly influenced body weight and linear body measurements in the grasscutter. Mean birth weight ( $0.173 \pm 0.02$  kg) of rats born singles was significantly different from that of twin births ( $0.135 \pm 0.08$  kg) and triplets ( $0.135 \pm 0.09$  kg) ( $P < 0.05$ ). Male grasscutters with a mean birth weight of  $0.148 \pm 0.01$  kg were heavier ( $P < 0.05$ ) than the females, which weighed  $0.128 \pm 0.02$  kg. Average daily weight gain for the first 60 days for males ( $0.007$  kg/d) was significantly different from that of females ( $0.005$  kg/d) ( $P < 0.05$ ). Parity had no significant effect on the rat's birth weight, weight at 60 days of age, and average daily weight gain for the first 60 days. Litter size, sex and parity did not have significant effect on the linear body measurements of the grasscutter at birth ( $P > 0.05$ ). However litter size and sex had significant influence on body length and heart girth of the grasscutter at 60 days of age ( $P < 0.05$ ). At 60 days the mean body length ( $23 \pm 0.28$  cm) and heart girth ( $18.13 \pm 0.23$  cm) of rats born singles were longer and larger than those of twins ( $21.66 \pm 0.89$  and  $16.82 \pm 0.76$  cm) and triplets ( $21.59 \pm 0.96$  and  $16.71 \pm 0.80$ ). Males also have longer body length and larger heart girth than females at that age.*

**Keywords:** Grasscutter, Growth, Body Weight, Linear Measurements

### INTRODUCTION

Correlation matrix has shown high, positive and significant values among body weight, body length, heart girth and height-at-withers in the grasscutter. Ikpeze and Ebenebe (2004) reported that any one of these linear measurements could be used to predict the grasscutter body weight at 2-10 months of age. However, genetic improvement is required to improve the meat yield of the grasscutter.

To achieve this goal proper measurement of grasscutter body traits is required. Equally important is the need to understand the factors that influence their growth and development. The aim of this study therefore is to estimate the possible effects of parity, the litter size and sex on the birth weight, growth rate and linear body measurements in the grasscutter. This will provide parameters as correction factors in estimating body traits for selection purposes.

### MATERIALS AND METHODS

Data used for this study were collected from 48 grasscutter rats given birth by 7 dams. The female grasscutters were identified. Their first three parities occurred between 2001 and 2003 at our grasscutter research station in Akpaka forest reserve Onitsha. The animals were reared under the floor-housing system of management (Ikpeze and Ebenebe, 2004). Combinations of grasses and pineapple crowns were provided *ad lib* as the main diets of the animals. Proximate analysis indicated high content of fiber in the feeds of the grasscutter. Grasses fed the animals included *Adropogon gayanas* (11.60 % CP, 21 % CF), *Panicum maximum* (5.65 % CP, 30 % CF), *Paspalum vaginatum* (14.0 %, 27.4 % CF) *Pennisetum purpureum* (7.35 % CP, 25 % CF) and pineapple crowns (*Ananas cosmosus* - CP 3.75 %).

Records kept on each dam, included parity, litter size, and sex of the resultant rats. Body weight of the rats at birth and at 60 days

was taken using a Way Master precision scale. The average daily weight gain (kg/day) was obtained by subtracting the birth weight (kg) from 60 day's body weight and dividing by 60. The body length (cm) was measured as the distance from the tip of the nose to the base of the tail. Heart girth (cm) was measured as the circumference of the chest, and height-at-withers (cm) was the distance from the surface of a platform to the withers. The rats were measured at birth and at 60 days of age. 48 sets of measurements were obtained for the nine variables considered.

Only rats with complete records from birth to 60 days of age were included in the statistical analyses. Least square means for body weight, average daily weight gains, linear body traits were estimated. One way analysis of variance was done to examine the possible effects of parity, litter size and sex of resultant rats on the measured variables.

## RESULTS AND DISCUSSION

Tables 1, 2 and 3 show the 48 sets of data obtained from the female grasscutters during their first three parities respectively. The seven females produced 17 grasscutter rats at their first parity, sixteen at second parity, and 15 during the third parity. Average litter size was 2 - 3, with an average sex ratio of one male to two female births. Mean values of the measurements obtained from the resultant grasscutter during the periods under study are summarized as shown in Tables 4 and 5. The effects of litter size, sex and parity on the birth weight, weight at 60 days of age, the average daily weight gain for the first 60 days are shown in Table 4. The mean values of body length, heart girth, and height-at-withers are presented in Table 5.

The average litter size of 2 - 3 recorded in this study compares favourably with Average of 2 - 4 reported by Ajayi (1983). Asibey (1974), Onadeko and Amubode (2002) also reported an average of 4 litter births. The extent to which dietary composition of feed, level of feeding, and housing condition influence litter size in captive grasscutter has not been fully investigated. Succulent grasses, pineapple crowns and oil palm fruits that were provided *ad lib* as the major feeds of the grasscutter were available in the study area throughout the seasons. Timibitei (1998) reported that the rabbit reared in floor system obtained about 18% of digestible crude fiber by eating the fibrous litter materials to balance their fiber

requirement. This instinctive behaviour may be in operation in the grasscutter reared in the floor system in this study. Elephant grass (*Pennisetum purpureum*) was highly utilized by the grasscutter in the wild (Afolayan and Anadu, 1980). Crowns of pineapple (*Ananas comosus*), nuts of oil palm (*Elaeis guineensis*), fruits of pawpaw (*Carica papaya*) were also reported to be cherished by the grasscutter (Adu, 1995). It was observed in this study that males feed more aggressively than the females; females usually started feeding when the males were satisfied. Litter size had significant influence on the birth weight of grasscutters.

Mean birth weights ( $0.173 \pm 0.02$  kg) of grasscutters born singles were significantly different from the twin births ( $0.135 \pm 0.08$  kg) and triplets births ( $0.135 \pm 0.09$  kg) (see Table 4). This is an indication that birth weight may be inversely related to litter size, but this requires further investigation. Male grasscutters with a mean birth weight of  $0.148 \pm 0.01$  kg were generally heavier than the females, which weighed  $0.128 \pm 0.02$  kg ( $P < 0.05$ ). The mean birth weight of 0.138 kg recorded in this study compares favourably with 0.134 kg and 0.128 kg for males and females grasscutters respectively (Yewadan and Schrage, 1992). Onadeko and Amubode (2002) had reported a mean birth weight of  $0.118 \pm 0.0027$  kg and  $0.100 \pm 0.0275$  kg for males and females respectively. There were significant differences in the mean daily weight gains for the first 60 days in single births ( $0.007 \pm 0.0004$  kg), twin births ( $0.006 \pm 0.0008$  kg) and triplet births were competition usually occurred among the littermates. Mean daily weight gain for the first 60 days in the male ( $0.007 \pm 0.0003$  kg/d) was significantly different from the female ( $0.005 \pm 0.0006$  kg/d), perhaps due to the aggressive feeding behaviour of the male. At 60 days, the mean body length ( $23 \pm 0.28$  cm) and heart girth ( $18.13 \pm 0.23$  cm) of rats born singles were longer and larger than those of twins ( $21.66 \pm 0.89$  and  $16.82 \pm 0.76$  cm) and triplets ( $21.59 \pm 0.96$  and  $16.71 \pm 0.80$ ). Males also have longer body length ( $22.49 \pm 0.58$ ) and larger heart girth ( $17.63 \pm 0.47$ ) than females ( $21.34 \pm 0.96$  and  $16.47 \pm 0.73$  respectively) at that age. There is an indication of sexual dimorphism in the grasscutter. Parity had no significant effect on the rat's birth, 60 days weight, and average daily weight gain for first 60 days. The effect of younger dams giving birth to rats of smaller birth weight may have been obscured by the presence of dams of similar ages across parities.

Table 1: Records obtained from female grasscutters during their 1<sup>st</sup> Parity at Akpaka Forest Reserve Onitsha

Dams s/no.	Litter size	Rats s/no	Sex	Body measurements at Birth				Body measurements at 60 days				Daily weight gain for 1 <sup>st</sup> 60 days (kg/day)
				BW (kg)	BL (cm)	HG (cm)	H (cm)	BW (kg)	BL (cm)	HG (cm)	H (cm)	
1	3	1	M	0.148	17.72	12.84	7.60	0.586	23.15	18.00	10.64	0.00730
		2	F	0.137	17.59	12.70	7.54	0.522	22.35	17.25	10.20	0.00640
		3	F	0.139	17.62	12.73	7.55	0.526	22.39	17.30	10.22	0.00645
2	1	4	M	0.192	18.25	13.35	7.92	0.592	23.20	18.07	10.68	0.00666
		3	F	0.142	17.65	12.77	7.57	0.526	22.39	17.29	10.22	0.00640
3	3	6	F	0.144	17.67	12.79	7.59	0.520	22.30	17.22	10.18	0.00626
		7	F	0.148	17.72	12.81	7.59	0.513	22.23	17.14	10.14	0.00608
		8	M	0.151	17.75	12.80	7.65	0.593	23.22	18.07	10.68	0.00736
4	2	9	F	0.146	17.70	12.82	7.60	0.548	22.66	17.59	10.37	0.00670
		10	M	0.150	17.75	12.86	7.63	0.585	23.12	17.98	10.63	0.00725
5	3	11	F	0.140	17.62	12.74	7.50	0.537	22.52	17.42	10.30	0.00661
		12	F	0.145	17.68	12.80	7.59	0.532	22.48	17.36	10.26	0.00645
		13	F	0.143	17.66	12.78	7.58	0.526	22.38	17.29	10.22	0.00638
6	3	14	F	0.141	17.64	12.78	7.58	0.529	22.42	17.32	10.24	0.00646
		15	F	0.144	17.64	12.76	7.56	0.524	22.36	17.27	10.21	0.00633
7	2	16	F	0.145	17.68	12.80	7.50	0.530	22.44	17.34	10.25	0.00641
		17	F	0.144	17.67	12.80	7.59	0.527	22.40	17.30	10.23	0.00638
<b>Average</b>				<b>0.147</b>	<b>17.70</b>	<b>12.82</b>	<b>7.59</b>	<b>0.542</b>	<b>22.58</b>	<b>17.48</b>	<b>10.33</b>	<b>0.00658</b>

Average litter size was 2.43 with a sex ratio of 4 male to 13 females (i.e., 1:3.25). Though the average birth weight was 0.147kg, it appears to be inversely related to litter size. Males were generally heavier than females at birth and at 60 days of age.

Table 2: Records obtained from female grasscutters during their 2<sup>nd</sup> Parity at Akpaka Forest Reserve Onitsha

Dams s/no.	Litter size	Rats s/no	Sex	Body measurements at Birth				Body measurements at 60 days				Daily weight gain for 1 <sup>st</sup> 60 days (kg/day)
				BW (kg)	BL (cm)	HG (cm)	H (cm)	BW (kg)	BL (cm)	HG (cm)	H (cm)	
1	2	18	M	0.131	17.10	12.48	7.29	0.554	22.19	17.40	10.13	0.00705
		19	F	0.126	17.00	12.42	7.26	0.442	20.84	16.10	9.38	0.00526
2	3	20	F	0.132	17.10	12.49	7.30	0.448	20.92	16.17	9.42	0.00526
		21	F	0.128	17.06	12.45	7.27	0.442	20.81	16.00	9.35	0.00523
		22	F	0.118	16.94	12.33	7.20	0.429	20.68	15.95	9.29	0.00518
3	3	23	M	0.138	17.20	12.6	7.35	0.566	22.34	17.57	10.21	0.00693
		24	M	0.140	17.62	12.70	7.48	0.559	22.25	17.48	10.16	0.00698
		25	F	0.123	17.00	12.39	7.24	0.458	21.05	16.28	9.48	0.00558
4	1	26	M	0.175	17.63	13.00	7.58	0.642	23.25	18.42	10.72	0.00778
5	3	27	M	0.141	17.60	12.72	7.50	0.572	22.41	17.61	10.25	0.00718
		28	F	0.133	17.13	12.50	7.30	0.496	21.49	16.72	9.74	0.00605
		29	F	0.128	17.05	12.40	7.25	0.437	20.78	16.04	9.34	0.00515
6	2	30	M	0.130	17.09	12.47	7.28	0.559	22.25	17.48	10.16	0.00715
		31	F	0.124	17.00	12.40	7.25	0.468	21.18	16.40	9.56	0.00573
7	2	32	F	0.128	17.06	12.45	7.26	0.443	20.86	16.11	9.38	0.00525
		33	F	0.122	16.90	12.37	7.23	0.421	20.59	15.85	9.24	0.00498
<b>Average</b>				<b>0.133</b>	<b>17.70</b>	<b>12.51</b>	<b>7.31</b>	<b>0.496</b>	<b>22.58</b>	<b>17.48</b>	<b>10.33</b>	<b>0.0060</b>

Average litter size was 2.28 with a sex ratio of 6 male to 10 females (i.e., 1:1.6). Though the average birth weight was 0.133kg, males were generally heavier than females at birth and at 60 days of age.

Table 3: Records obtained from female grasscutters during their 3<sup>rd</sup> Parity at Akpaka Forest Reserve Onitsha

Dams s/no.	Litter size	Rats s/no	Sex	Body measurements at Birth				Body measurements at 60 days				Daily weight gain for 1 <sup>st</sup> 60 days (kg/day)
				BW (kg)	BL (cm)	HG (cm)	H (cm)	BW (kg)	BL (cm)	HG (cm)	H (cm)	
1	1	34	M	0.138	16.98	12.42	7.29	0.605	22.54	17.78	10.40	0.00778
2	2	35	M	0.142	17.00	12.46	7.31	0.545	21.82	17.09	10.00	0.00671
		36	F	0.131	16.89	12.34	7.25	0.421	20.35	15.67	9.17	0.00480
3	3	37	M	0.140	17.00	12.45	7.30	0.517	21.49	16.77	9.82	0.00628
		38	M	0.138	16.98	12.42	7.28	0.525	21.56	16.86	9.87	0.00645
		39	F	0.130	16.88	12.32	7.23	0.416	20.29	15.61	9.14	0.00476
4	3	40	F	0.135	16.94	12.38	7.27	0.407	20.18	15.51	9.08	0.00453
		41	F	0.126	16.83	12.28	7.20	0.426	20.41	15.73	9.21	0.00500
		42	F	0.120	16.76	12.21	7.17	0.422	20.36	15.68	9.18	0.00503
5	1	43	M	0.188	17.54	13.00	7.62	0.647	23.04	18.27	10.68	0.00765
6	2	44	M	0.138	16.98	12.41	7.28	0.561	22.01	17.28	10.10	0.00705
		45	F	0.133	16.92	12.38	7.25	0.433	20.49	15.81	9.25	0.00500
7	3	46	F	0.125	16.82	12.27	7.20	0.411	20.23	15.55	9.10	0.00496
		47	F	0.115	16.70	12.15	7.14	0.400	20.10	15.43	9.00	0.00475
		48	F	0.122	16.80	12.23	7.18	0.424	20.38	15.70	9.20	0.00503
<b>Average</b>				<b>0.134</b>	<b>16.93</b>	<b>12.38</b>	<b>7.26</b>	<b>0.477</b>	<b>21.01</b>	<b>16.31</b>	<b>9.54</b>	<b>0.00570</b>

Average litter size was 2.4 with a sex ratio of 6 males to 9 females (1:1.5). Though the average birth weight was 0.134 kg, but males were generally heavier than females at birth and at 60 days old.

Table 4: Factors that affect birth weight, post-weaning weight, and average daily weight gain of grasscutters at Akpaka Forest Reserve Onitsha.

Factors	No. of rats	Birth wt. (kg)	Wt. at 60 days (kg)	DWG for 1 <sup>st</sup> 60 days (kg/day)
Litter size	48			
1	4	0.173±0.02 <sup>a</sup>	0.621±0.02 <sup>a</sup>	0.007±0.0004 <sup>a</sup>
2	14	0.135±0.08 <sup>b</sup>	0.503±0.05 <sup>b</sup>	0.006±0.0008 <sup>ab</sup>
3	30	0.135±0.09 <sup>b</sup>	0.492±0.05 <sup>b</sup>	0.005±0.0008 <sup>b</sup>
Sex	48			
Male	16	0.148±0.01 <sup>a</sup>	0.575±0.03 <sup>a</sup>	0.007±0.0003 <sup>a</sup>
Female	32	0.128±0.02 <sup>b</sup>	0.472±0.04 <sup>b</sup>	0.005±0.0006 <sup>b</sup>
Parity	48			
1 <sup>st</sup>	17	0.147±0.01	0.542±0.02	0.006±0.0003
2 <sup>nd</sup>	16	0.132±0.01	0.496±0.06	0.006±0.0009
3 <sup>rd</sup>	15	0.134±0.01	0.477±0.07	0.005±0.0010
Overall mean	48	0.138±0.06	0.513±0.03	0.006±0.0003

a, b Means in the same column under the same factor with different superscripts differ significantly ( $P < 0.05$ ).

Table 5: Factors that affect linear body measurements in grasscutters at Akpaka Forest Reserve Onitsha

Factors	No. of rats	Linear body measurements at birth			Linear body measurements at 60 days		
		BL (cm)	HG (cm)	H (cm)	BL (cm)	HG (cm)	H (cm)
Litter size	48						
1	4	17.60±0.45	12.94±0.33	7.60±0.22	23.00±0.28 <sup>a</sup>	18.13±0.23 <sup>a</sup>	10.62±0.12
2	14	17.98±0.32	12.52±0.17	7.35±0.14	21.66±0.89 <sup>b</sup>	16.82±0.76 <sup>b</sup>	9.85±0.48
3	30	17.27±0.36	12.55±0.22	7.39±0.18	21.59±0.96 <sup>b</sup>	16.71±0.80 <sup>b</sup>	9.81±0.50
Sex	48						
Male	16	17.38±0.37	12.68±0.26	7.46±0.18	22.49±0.58 <sup>a</sup>	17.63±0.47 <sup>a</sup>	10.32±0.30
Female	32	17.23±0.36	12.67±0.93	7.36±0.16	21.34±0.96 <sup>b</sup>	16.47±0.73 <sup>b</sup>	9.67±0.48
Parity	48						
1 <sup>st</sup>	17	17.70±0.14	12.82±0.12	7.59±0.08	22.58±0.33	17.48±0.31	10.33±0.18
2 <sup>nd</sup>	16	17.15±0.23	12.51±0.16	7.31±0.10	21.49±0.79	16.67±0.78	9.73±0.44
3 <sup>rd</sup>	15	16.93±0.18	12.38±0.18	7.28±0.10	21.01±0.93	16.31±0.90	9.54±0.52
Overall mean	48	17.24±0.30	12.57±0.18	7.39±0.14	21.68±0.65	16.83±0.90	9.86±0.52

a, b Means in the same column under the same factor with different superscripts differ significantly ( $P < 0.05$ ).

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