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Summary

Analyses of the grasscutter body by anatomic and economic components in relation to values for local Zebu cattle show that the grasscutter is basically a meat type. This is expressed in the male body size, body case, carcass weight and lean meat output. In the female, these traits are significantly depressed in favour of higher yields of viscera, chiefly in digestive and excretory organs. Considering that the activities of these organs are heightened during reproduction, the possibility is suggested that higher yields of these relative of body weight may have adaptive significance in the reproductive process, or in terms of female productivity, in the multiplication of the species as a form of meat output.

Résumé

Des analyses anatomiques et économiques faites des parties composantes de l'agouti par rapport a la valeur du boeuf local Zébu indique que l'agouti est principalement d'une catégorie de viande. Ce phénomène s'exprime dans la colle animal du mâle de l'agouti, son corps, le poids du cadavre et le rendement de la viande maigre. Chez la femelle, ces traits sont considérablement dépressés en faveur du rendement élevé des viscères, surtout dans les organes excrétoires et digestifs. Considérant que les activités de ces organes s'augmentent au cours de la reproduction, il est suggéré qu'il est bien possible que de rendements élevés en rapport avec le poids du corps peut avoir une utilité susceptible dans le processus reproductif, ou en fonction de la productivité femelle, dans la multiplication des espèces sous forme de rendment de la viande.

Introduction

The grasscutter, *Thryonomys swinderianus* Temminck, also known as the cane rat, is perhaps the most popular source of meat among wildlife in Ghana (Asibey, 1969). Clottey (1968) estimated that the consumption of grasscutter is highest among rural populations and low income sections of the cities, and probably second only to snails and shelled forms of all non-livestock meat sold in Ghana. By no means, however, is the grasscutter the most predominant game in every location in Ghana.

Presently information relative to the biology and the commercialization of grasscutter production is only slowly building up. Ewer (1969) discussed form, function and aspects of behaviour in the captive grasscutter. Bucknor (1969) studied selected breeding and production factors of grasscutters under captivity in an effort to develop indices for their domestication. Clottey (1971) suggested methods by which populations of these mammals can be stabilized in natural habitats for sustained exploitation as meat.

Recently, attention has been turned to the meat value and the nutritional potential of the mammal. In a chemical analysis of meat samples of various animals, Asibey & Eyeson (1975) found protein values to be higher for the grasscutter (22.7%) than for most species of livestock; beef for instance, gave a value of 19.6 per cent while mutton yielded 17.2 per cent. Phosphorus and calcium also showed higher values; in relation to mutton for instance, the differences observed for the two minerals were greater for the grasscutter by factors of 27.9 and 89.2 per cent respectively. The overall objective of the present study was to reinforce the technical justification for the commercialization of the grasscutter production in meat-deficient situations. In the study the physical body composition of the sexes was analysed in relation to their anatomic and economic components.

Experimental

Twenty mature grasscutters, one-half of them male and the other half the non-pregnant female were used in the investigation. They were purchased as dead game approximately 4–5 h post-mortem at Kantamanto, the main game market in Accra. They had been brought there by hunters, trappers or dealers from nearby grassland and savanna habitats of the grasscutter outside the Accra metropolitan area.

Using procedures modified from AMSA (1966) each animal body was washed, weighed and chilled for at least 12 h at 4.4–7.2°C /70–90% RH. The midventral portion was cut open to remove the internal organ mass thus separating the viscera from the body case. These were rendered into sub-anatomic components and weighed into economic yield groups as follows: carcass and offal (representing the marketing yields) and edible meat and by-products (representing utilizable products). Appendage and viscera elements were further separated and weighed individually to determine their yield. Fig. 1 sets out the scheme by which the cuts and dissections were made.

All data were presented in units of kg weight and in their percentage measure. Statistical analyses were made to determine the mean values of the traits, their standard deviation and the difference between the means by the Student "t" test (Steel & Torrie, 1960). All data were assembled (Tables 1 and 2).

Results

Table 1, presenting the mammalian body as dead weight and the anatomic components as body case and viscera, showed that male yields were higher than female in the two units of measurement and in all traits except

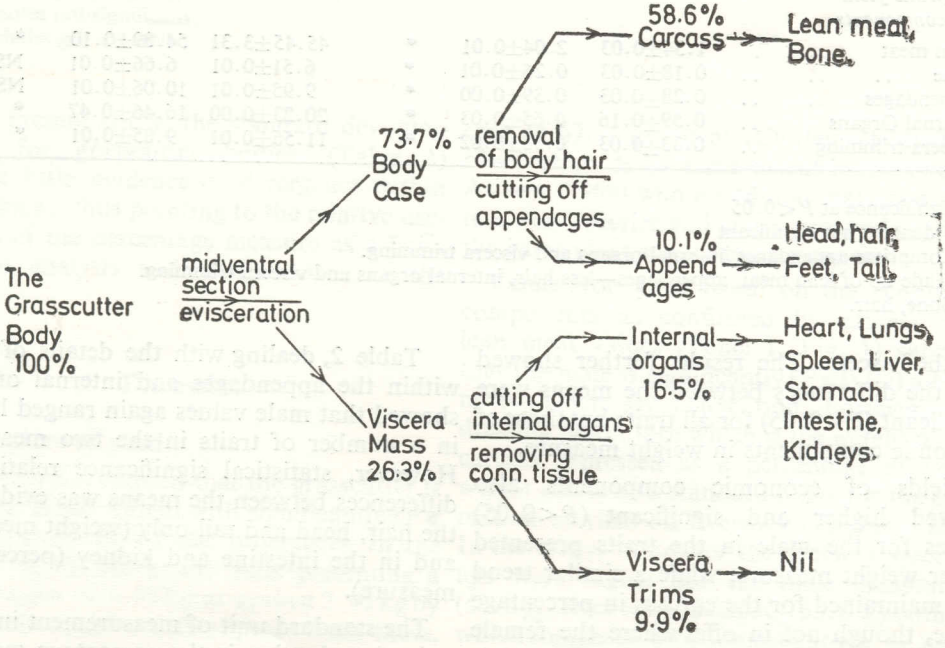

Fig. 1. Scheme for the dissection and cutting of the grasscutter body.

TABLE 1

Prime body components mean ± standard deviation

	Weight measure (kg)			*Percentage measure*		
	Female	*Male*	*Difference between means*	*Female*	*Male*	*Difference between means*
The mammalian body						
Body size (as dead wt)	2.90±0.02	3.93±0.02	*			
Anatomic components						
Body case	1.97±0.03	2.89±0.03	NS	68.21±0.01	73.68±0.03	*
Viscera mass	0.92±0.01	1.03±0.03	NS	31.68±0.34	26.30±0.03	
Economic components						
(*a*) *Market yields*						
Carcass	1.53±0.02	2.30±0.02	*	53.00±0.35	58.58±0.01	*
Offal[1]	1.35±0.03	1.62±0.03	*	49.00±6.30	44.41±9.46	NS
(*b*) *Utilizable yields*						
Edible meat[2]	2.54±0.07	3.46±0.04	*	88.20±0.02	88.26±0.08	NS
By-products[3]	0.33±0.01	0.46±0.01	*	11.79±0.01	11.75±0.05	NS
Some prime yield sub-components						
Lean meat	1.34±0.03	2.04±0.01	*	45.45±3.31	54.89±0.10	*
Bone	0.18±0.03	0.26±0.01	*	6.51±0.01	6.66±0.01	NS
Appendages	0.28±0.03	0.39±0.00	*	9.95±0.01	10.06±0.01	NS
Internal Organs ..	0.59±0.16	0.65±0.03	*	20.23±0.00	16.46±0.47	*
Viscera trimming ..	0.33±0.03	0.38±0.02	*	11.56±0.01	9.85±0.01	*

* Significance at $P<0.05$
NS denotes not significant
1 Comprises appendages internal organs and viscera trimming.
2 Made up of lean meat, appendages—less hair, internal organs and viscera trimming.
3 Bone, hair.

for the viscera. The results further showed that the differences between the means were significant ($P<0.05$) for all traits but those of anatomic components in weight measure.

Yields of economic components also showed higher and significant ($P<0.05$) values for the male in the traits presented under weight measure, while a similar trend was maintained for the carcass in percentage value, though not in offal where the female superseded the male in yield by an appreciable margin. In both edible meat and by-products (percentage measure) the two sexes maintained equal yield.

Table 2, dealing with the details of yield within the appendages and internal organs, showed that male values again ranged higher in a number of traits in the two measures. However, statistical significance relative to differences between the means was evident in the hair, head and tail only (weight measure) and in the intestine and kidney (percentage measure).

The standard unit of measurement in meat animal evaluation is the percentage measure (Ziegler, 1962). However, weight has been known to be useful whenever animals of different sizes were being compared (Dinkel, 1965).

TABLE 2

Detail of other components mean ± standard deviation

	Weight measure (kg)			*Percentage measure*		
	Female	*Male*	*Difference between means*	*Female*	*Male*	*Difference between means*
Appendage yields						
Hair	0.15±0.01	0.20±0.00	*	5.26±0.00	5.07±0.01	NS
Head	0.21±0.03	0.30±0.02	*	7.52±0.06	7.86±0.02	NS
Tail	0.02±0.01	0.03±0.00	*	0.81±0.02	0.80±0.01	NS
Feet	0.04±0.02	0.05±0.01	NS	1.61±0.02	1.39±0.02	NS
Internal organs (trimmed)						
Heart	0.03±0.04	0.02±0.01	NS	0.53±0.01	0.56±0.02	NS
Lungs	0.02±0.01	0.03±0.02	NS	0.84±0.06	0.91±0.01	NS
Liver	0.06±0.03	0.06±0.00	NS	1.73±0.02	1.73±0.04	NS
Spleen	0.01±0.00	0.01±0.00	NS	0.34±0.03	0.28±0.03	NS
Stomach[1]	0.06±0.02	0.10±0.00	NS	2.23±0.05	2.62±0.02	NS
Intestine[2]	0.40±0.03	0·41±0.00	NS	14.14±0.00	10.12±0.02	*
Kidney	0.01±0.03	0.01±0.00	NS	0.37±0.02	0.27±0.03	*

* Significance at $P \pm 0.05$
NS Denotes not significant
1, 2. Includes gut contents

In the present study, the standard deviation values for grasscutter bodies (Table 1) showed little evidence of divergence within populations, thus pointing to the relative usefulness of the percentage measure as a basis for the analysis and interpretation of the results.

Discussion

Basic indices of yield

The analyses showed that the grasscutter is a rather small animal with significantly ($P < 0.05$) highly discernible differences in the weights of the sexes; the male presenting a mean weight of 3.93 kg as against 2.90 kg by the female (Table 1). It appears from these, and given a body case (or prime meat base) value of 73.7 and 68.2 per cent respectively that the male is the main meat producing type. In the local Zebu cattle, the value for the body case is 67. 1 per cent (Clottey, 1972). This observation is to some extent borne out by Asibey (1969) who noted that male grasscutters were heavier and more preponderant in the game meat supply than females.

Values for yield based on the economic components as confirmed by carcass and lean meat values (Table 1, Fig. 1) showed that the male is significantly ($P < 0.05$) a high meat-yielder. By convention, however, the dressing percentage which is the weight of the carcass expressed as a percentage of body weight serves as a standard index for the estimation of yield on livestock (Ziegler, 1962.) In the study, values for the dressing percentage were higher for the male grasscutter (58.6%) than for the female (53.0%) both of which compared with domestic stock; i.e Zebu cattle with a dressing percentage of 45.9 per cent (Clottey, 1972) showed the grasscutter to have still a higher yield over livestock (Fig. 2).

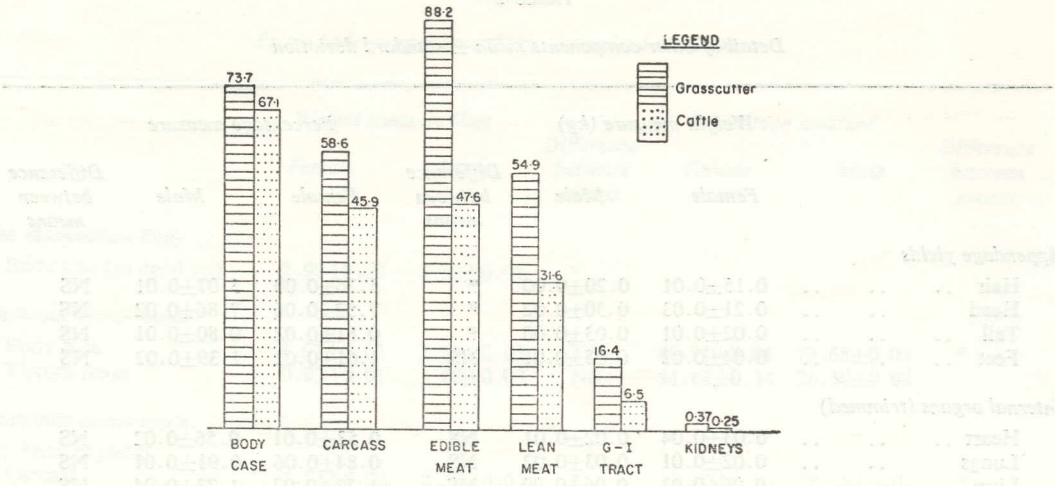

Fig. 2. Comparative study of indices of meat yield in the grasscutter and cattle.

With respect to lean meat, the output of the grasscutter (54.9% as against cattle 31.6%) could still be considered as high. One advantage is that the skin is always included with the lean structure both in the dissection, cutting and marketing of the mammal. By contrast, cattle skin is usually eliminated as hide in the Zebu by as much as 9.4 per cent of the body weight. Another contributory factor to high leanness in the grasscutter is the relatively low bone content of the carcass. Measured against the Zebu, the grasscutter carcass dissected 6.7 per cent bone while cattle yielded 13.8 per cent.

The quantity of edible meat produced by the grasscutter (Table 1) did not show any variation between the sexes; both yielded a high value of 88.2%. The figure for local cattle is 47.6 per cent (Clottey, 1972) which works out to a 2:1 ratio in meat output in favour of the grasscutter. Strictly speaking, yield of edible meat is dictated by consumer preferences and eating habits, and not by anatomic or other considerations. This is one reason why the grasscutter is a popular animal with many Ghanaians, despite the limitations presented by its small size and sometimes unavailability.

Other measures of yield

Gerrard (1947) showed that higher yields of viscera are indicated whenever values for meat yield take a downward trend relative to body weight. This observation was confirmed in the female grasscutter where the values for total viscera, intestine and kidneys significantly ($P<0.05$) exceeded those of the male. Ramsey *et al.* (1965) have similarly observed larger yields of these traits in dairy cattle.

Statistically and physiologically, a larger percentage intestinal/kidney mass relative to body weight presupposes the need for an increased or larger nutrient-absorption and waste-elimination base. It is also evident that reproduction with its attendant increased demands of metabolism during pregnancy, lactation and litter care, is perhaps the most significant role that the female can be called upon to play for which an increase in structure and function comparable to the levels indicated might be desirable.

To this extent, higher yields in the intestine and kidneys may be adaptive. Possibly, this adaptation may aid the productivity effort by promoting and/or supporting the functions that lead to increase in animal numbers, and hence in meat output, through reproduction

rather than by increase in size or yield of carcass. Thus, while a larger body case in the grasscutter may point to greater carcass/lean meat output particularly in the male, in the female, the relatively larger percentage viscera could aid the meat production process through output of individual animal numbers.

Conclusion

Considered in terms of body composition it is apparent that the grasscutter shows evidence of high productivity in almost every category of meat output, i.e. body size, body case, carcass, lean meat and edible meat. It is also evident that on a relative (percentage) basis, this occurs to a degree greater than in cattle, and, furthermore, this trait is expressed more significantly in the male than the female.

On the other hand, higher yields of viscera, chiefly in the kidneys and intestines are encountered in the female. This is noteworthy, considering the female role in nutrient-supply and waste-elimination functions in pregnancy and litter-bearing and the influence these have on meat output as expressed in terms of individual animal numbers rather than in conventional indices of meat yield.

On this basis, it would seem plausible to suggest that the grasscutter could offer a positive and a stable organization as a meat yielder which could open up nutritional possibilities in livestock-poor and protein-deficient economies. To this extent, there may seem to be some technical justification for the commercialization of grasscutter production in areas where nutritional problems occur and where the mammal is known to flourish and is popular with the vast majority of the people.

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