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Grasscutter: The Haematology and Major Parasites

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Abstract: Grasscutter contributes to both the local and export earnings of most countries in Sub-Saharan Africa. At the local market level, for example, approximately 73 tons of grasscutter meat representing more than 15, 000 animals can be sold in a year. According to recent survey, the grasscutter continues to dominate the bush meat trade. However, international trade as well as regional and continental interests in the grasscutter meat provides economic bases for the development of the grasscutter industry. The industry will be greatly enhanced through the establishment of breeding centres to provide stocks for farmers and other growers who will multiply its' production and also provide additional source of income, desperately required in the quest to help the rural poor to meet their basic necessities and sustain their food security. Detailed information on the health and diseases of these rodents are reported here. Some of the disease agents include species of gastrointestinal helminthes (nematodes, trematodes, cestodes and acanthocephala) and haemoparasites (*Trypanosoma*, *Babesia* and *Plasmodium* species).

Key words: Grasscutter, haematology, parasites

INTRODUCTION

The need for adequate cheap sources of animal protein has brought attention to the rearing of wild animals. One of the successfully reared wild animals today is the grasscutter (Akinloye, 2005).

Proper grasscutter feeding has been the major factor that determines the health of the animal apart from the environmental component in which the animal exists (Asibey, 1974).

The grasscutter meat is a favourite one and it accounts for the greater proportion of bush meat sold in most of the continent of Africa, particularly West Africa (NRC, 1991).

Studies in Ghana carried out by Ewer (1969) demonstrated that the animals could be kept in captivity (Baptist and Mensah, 1986; Ntiamo-Baidu, 1998). Their study confirmed the feasibility of rearing the grasscutter in captivity and demonstrated increased litter size as a function of good feeding.

There are several justifications for rearing the wild grasscutter when taken into captivity. Such justifications include; the grasscutter does not require an extensive area to function; it can be easily fed any other agricultural by products available in Nigeria; there is no religious taboo on the consumption of the meat; it does not require imported raw material inputs to succeed; it has a high litter size of eight per twelve months and low mortality rate of about 10% among offspring and its excretory wastes do not have offensive odour.

The domestication of grasscutter has not yet been perfectly established (Addo, 1997). Captive reared grasscutters are fed with forages and concentrates depending on the availability of the feed source, but the concentrates must be in low quantity to avoid a negative influence on the animal (Akinloye, 2005; Opara and Fagbemi, 2009).

Low production of animals is brought about by many factors in the tropics one of which is disease (Van Veen *et al*., 1974; Ikeme, 1977; Opara and Fagbemi, 2010a).

According to studies by Opara *et al*. (2006), it was reported that there was no significant difference between the haematological indices of these captive-reared grasscutters and those of the wild ones.

A previous report has also shown that the wild grasscutters harbour *Trypanosoma* sp., *Babesia* sp. and *Plasmodium* sp., in their blood without obvious clinical symptoms (Opara and Fagbemi, 2010b, c).

The severity of these diseases depends on the nutritional state of the animals, especially during the dry season when feed is inadequate in quality and quantity (Opara and Fagbemi, 2009).

ORIGIN OF THE GRASSCUTTER

Grasscutter is a wild herbivorous rodent found in the sub-Saharan region of Africa. It is the biggest after porcupine in the rodent class. It is referred to as Cane rat or cutting grass by many. Scientifically, it is referred to as *Thryonomys swinderianus*. Its sub-order is that of Hystricomorpha (porcupine relatives) and the super family is Petromuroidea (Rock rat- like), with genus *Thryonomys* (Wood, 1974).

Kingdom : Animalia
Phylum : Chordata
Sub-phylum : Vertebrata
Class : Mammalia
Order : Rodentia
Sub-order : Hystricomorpha
Family : Thryonomyidae
Genus : *Thryonomys*
Species : *Thryonomys swinderianus*

The Species Are of Two Types

Thryonomys swinderianus Temminck which is the giant breed and *Thryonomys gregorianus* (Rosevear, 1969; Simpson, 1974).

PHYSICAL DESCRIPTION

The body length of *Thryonomys swinderianus* varies from 25-70 cm, with an average of 48 cm and their tail reaches 0.65-26 cm in length (Fitzinger, 1995). The total body weight of adult ranges between 4-12 kg. The heaviest bodies have an average weight in males of 4.5 and 3.5 kg in females (Merwe, 2000), which looks like a giant guinea pig with a short tail. The body is heavily built, small round with bristle fur and coat and a circular ear (Akinloye, 2005). The fur reflects the general colour of the animal, with brownish colour from the base to the middle of the fur, while the upper fur appears light yellow to reddish. The combination of these colours gives the animal brownish yellow/red colour. Besides these,

Fig. 1: The Grasscutter (*Thryonomys swinderianus*), matured adult measures 40-60 cm long; weighs 2-6 kg; mixture of reddish brown and grey fur; monogastric herbivore; quick runner; skilled swimmer; poor vision; good sense of smell; lives up to 4 years in captivity; Induced ovulator; Gestation period 150-156 days; litter size up to 6. (Opara *et al*., 2006)

common colours that range from grayish black to brown exist. Genetic improvement on breeding has produced other colours such as black, yellow red and white coloured animals. But the skin is always white after processing. They have rounded nose, short ears and incisors that grow continuously (Mills, 1997). The pelage is coarse, with flattened bristle- like hairs that grow in groups of five or six. The fore feet are smaller than the hind feet and have three well developed middle digits with the first and fifth digits greatly reduced. The hind feet have no first digit and all digits have heavy claws (Fitzinger, 1995). The dental formula for *Thryonomys swinderianus* is 1/1, 0/0. 1/1, 3/3 (Merwe, 2000). They are endothermic and bilaterally symmetrical. The arrangement of the grasscutters digits and pads on the fore feet allows a stem to be gripped in one paw only, while being fed into the mouth unlike other rodents that use both paws to hold a single stem (Fitzinger, 1995).

Despite their size and short limbs, grasscutter runs quickly when disturbed and they are reputed to be good swimmers. Their nipples are arranged in lateral position and this makes the young ones to suckle their mother from the side (Asibey, 1974). The head is broad with short flattened muzzle and with small eyes and ears. Its tail is covered with small hairs. The mammary formula is 3+3 = 6 (Asibey, 1974). The grasscutter is shown in Fig. 1.

SOCIAL BEHAVIOR

Thryonomys swinderianus is a semi nocturnal animal and they live in colonies comprising of one male and several females in each colony and the young ones from more than one generation. Even though it possesses digits equipped with power and sharp claws, it does not crawl on vertically erect wall or object unlike African giant rat. It burrows into the ground, but can temporarily shelter in hollow made by other animals. It is sensitive to noise and almost very frightened when it senses danger (Fitzinger, 1995).

The animal always shelters itself with dry grass to provide warmth since the animals is allergic to cold weather (Abioye *et al*., 2008). Grasscutter cannot jump any obstacle above 3 ft. Many of the animal's weaknesses make it prone to easy capture when spotted by hunters, capture team or predators. Nevertheless, grasscutter has the ability of freezing up while hiding under grasses without being detected when it is being hunted (Ntiamoa-Baidu,

1998). That is why hunters usually adopt the heavy use of fiend dogs to flush it out during hunting. The animal tends to always protect its home range (feeding, nesting and mating territory) against another animal of their kind. That is why grasscutter's house and enclosure are divided into many partitions suitable for easy grouping of the animals to avoid cannibalism and fighting among animals, more especially during mating. They are also caecophagic (Asibey, 1974; Fitzinger, 1995; Abioye *et al*., 2008).

BIOLOGY OF GRASSCUTTER

Thryonomys swinderianus live in groups of males and females during the breeding season. During the dry season, the males separate from the groups and live by themselves. The females live together afterwards (Fitzinger, 1995; Jori *et al*., 2001). The wet season of the year is usually the breeding season (Oduor-Okelo and Gombe, 1982). The females are spontaneous ovulators (Addo *et al*., 2001) and usually two litters are possible in a year, but the females must be flushed before refertilization for high prolificacy. Sexual maturity is attained at 6 months for males and 5 months for females. There may be slight variation due to feeding. The gestation period is 5 months (152+2 or -2 days). The average litter size is 4 in the wild but up to twelve litters size has been recorded in captivity (Addo, 2002; Abioye *et al*., 2008). Growth continues at old age but very slowly. The estrus cycle lasts for a period of 6.62 days and the offspring weighing about 1.29 g and relatively well developed. The offsprings are precocious, fully furred and capable of running and have their eyes open at birth. Sexual determination in the grasscutter is done at birth on the basis of the pro-genital distance, which is larger in males than in females as well as a dark brownish stain around the genital part of the mature buck (Addo *et al*., 2001). Flushing of doe is necessary also to allow for proper breast feeding of the kids and this can last for about three to six weeks. The doe possesses three pairs of mammary glands by the side of the belly. Apart from the anogenital colour and distance, the animal size can be a criterion for sex differentiation, where the males are larger in size than the females. Shape of the animal's nose is also a criterion. The male has blunt and muscular nose shape, while the female has a pointed nose shape. However, the shape of the animal's nose becomes more conspicuous when the animal is in motion or while the animal adopts a standing position. Another criterion is the peculiar sound produced by the males and females, especially during courtship (Asibey, 1974).

LIFE SPAN/LONGEVITY

The average lifespan of a captive-reared grasscutter ranges from 7-9 years. They can live up to 12 years depending on health care given to the animals during their service lives. The total life span is measured from the period of parturition to death while the service life is the period when the animal reaches maturity to the time when it can no longer reproduce. That is the period of efficient reproductive performance of the animals.

HAEMATOLOGICAL AND BIOCHEMICAL VALUES IN THE GRASSCUTTERS

Studies have shown that certain factors influence haematological and biochemical parameters (Weldy *et al*., 1964). Haematological and biochemical analyses of an animal's blood represent a good diagnostic aid for the assessment of physiological, nutritional and pathological conditions of animals (Jain, 1986; Bush, 1991;Awah-Ndukum *et al*., 2001). Nutrition age, sex, genetics (breed and crossbreeding), reproduction, housing, starvation,

environment factors, stress, transportation and diseases are known to affect haematological and biochemical values (Coles, 1986) and thought to play major roles in the differences in haematological and biochemical parameters observed between tropical and temperate animals (Ogunriade *et al*., 1981; Bush, 1991; Ogunsanmi *et al*., 1994; Opara and Fagbemi, 2009). Ogunsanmi *et al*. (2002), determined the haematological, plasma biochemical and whole blood electrolytes profile in the normal live-captive and rehabilitated adult African grasscutters. They reported no statistical evidence of sexual dimorphism in the values of these parameters of the cane rats, except plasma alanine transaminase (ALT), which was significantly higher ($p<0.001$) in the males than in the females. In their studies, Owolabi (2002) and Opara *et al*. (2006), reported a significantly ($p<0.05$) higher lymphocyte, eosinophil and basophil values for both the female and male wild grasscutters, compared with those of captive- reared. They equally reported a significantly higher white blood cell counts in female than male wilds grasscutters and attributed these differences to the free nature of the wild rodents which are more prone to all kinds of infections (Gotoh *et al*., 2001; Dinh, 2002). The significantly high levels of basophils and eosinophils among the wild grasscutters (Opara *et al*., 2006) were due to the presence of inhabiting parasites in the animals.

PARASITIC DISEASES OF THE GRASSCUTTER

The grasscutter unlike many other livestock species such as rabbits, sheep and goats requiring an appreciable drug input, is very hardy and requires little or no drug input (Adu, 2002; Opara and Fagbemi, 2008a).

Incidence, severity and disease prevalence have been shown to vary with the management systems (Smith and van Hautert, 1984; Adu, 2002). Again, Adu (2002) reported that the major disease conditions include pulmonary congestion, septic wounds, ruptured uterus, orchitis with septicaemia, gastro-intestinal obstruction, gastroenteritis and pneumonia. The gastrointestinal obstruction and gastro enteritis may be caused by helminthes parasites (Jori *et al*., 2001; Awah-Ndukum *et al*., 2001).

GASTROINTESTINAL HELMINTHES

The study of helminth parasites of domestic animals began as early as 1884 in America where on Act was enacted to prevent the exportation of diseased cattle and to provide means for the suppression and extirpation of diseases among domestic animals (Blood and Radostits, 1994). The idea came up as a result of hardship and large economic losses brought about by these parasitic helminthes, hence the need for control and eradication of these parasites. As a result of this, many researches on gastrointestinal helminthes parasites have been reported.

Blood and Radostits (1994), observed that the incidence of helminthes diseases varies between areas depending on the climate, nutritional status of the animal, pasture management as well as the animals' immunity to worm infestation. As a result, Van Veen *et al*. (1974) reported that environmental factors such as topography, climate and husbandry practice have led to a situation where a number of helminthes parasites common to many parts of the world are rare or do not occur at all in Nigeria and that some helminth parasites common in Nigeria have not been reported elsewhere.

The incidence, severity and disease prevalence have been shown to vary with management systems. Smith and van Hautert (1984) reported that, while infections accounted for over half of the disease conditions observed in a group of intensively managed

ruminants, they were of negligible prevalence in a controlled group raised semi-intensively. In the later group, parasitic gastroenteritis was the most prevalent disease condition.

A study conducted by Adu *et al.* (1999) in Ghana reported the infestation of grasscutters by *Ascaris* sp., *Schistosoma haematobium* and *Trichuris* sp., including ticks of *Dermacentor* sp. and *Rhipicephalus* sp. But the *Ascaris* sp., encountered in the grasscutter is non-pathogenic to the domestic stock until proved otherwise since each animal species has its specific ascarid (Blood and Radostits, 1994). The observation of *Schistosoma haematobium* eggs in the grasscutter is very important in the spread of infection to both livestock and man and the infection can only occur when part of its life cycle passes through an intermediate fresh water mollusc host. The identification of the eggs of *Trichuris trichuria* is important, in that various species attack various domestic stock and possibility of infection of domestic stock would be by sharing the same pasture and by domestic stock hanging around where the wild-stock are slaughtered and faeces disposed of in the nearby bushes.

Jori *et al.* (2001) revealed the presence of *Paralibyostrongylus hebreniticus*, *Trichuris* sp. and *Taenia* sp., in the gastrointestinal tracts of the grasscutters. Matamorous *et al.* (1991) in Costa Rica also reported the incidence of *Trichuris* sp., *Taenia* sp., *Strongyloides* sp. and *Ascaridia* sp., as the helminthes parasites of the grasscutters.

A preliminary study conducted by Yeboah and Simpson (2004) in Ghana, reported some ecto and end-parasites of the grasscutters Four species of ticks found included *Rhipicephalus simpsoni*, *Ixodes aulacodi Ixodes* sp. and *Haemaphysalis parmata*. The six helminthes parasites they reported comprised of two genera of cestode and four of nematodes. The cestodes were *Furhmanella transvaalensis*, *Railletina mahonae*; while the nematodes were *Longistriata spira Trachypharynx natalensis*, *Paralibyostrongylus vondewei* and *Trichuris paravispicularis*.

A study carried out in Cameroon by Mpoame (1994) and Awah-Ndukum *et al.* (2001) had also reported the presence of a flea (*Xenopsylla* sp.) cestode (*Hymenolopsis* sp.) and Nematode (*Heterakis* sp.) from a dead grasscutter in captivity. Opara and Fagbemi (2008a, b) in Nigeria reported a wider array of helminthes in the wild grasscutters, which comprised of 14 nematode species (*Ascaris*, *Bunostomum*, *Cooperia*, *Gaigaria*, *Gongylonema*, *Haemonchus*, *Heterakis*, *Mammomonogamus*, *Metastrongylus*, *Oesophagostomum*, *Strongyloides*, *Toxocara*, *Trichstrongylus* and *Trichuris* sp.), 5 trematodes, (*Cotylophoron*, *Dicrocoelium*, *Gastrodiscus*, *Paramphistomum* and *Schistosoma* sp.), 4 cestodes (*Avitellina*, *Moniezia*, *Taenia* and *Thysaniezia* sp.) and 1 acanthocephala (*Moniliformis* sp.). Another study by these same authors (Opara and Fagbemi, 2010a) showed that grasscutters harbor helminth parasites while in captivity. The helminthes of interest observed in the captive-reared grasscutters included 7 nematodes (*Ascaridia*, *Haemonchus*, *Mammomonogamus*, *Oesophagostomum*, *Strongyloides*, *Trichostrongylus* and *Trichuris* sp.), two trematodes (*Fasciola* and *Schistosoma* sp.) and two cestodes (*Taenia* and *Thysaniezia* sp.).

BLOOD PROTOZOAN PARASITES

There have been reports of few cases of naturally occurring blood parasites of the cane rats (Namso and Okaka, 1998), since they co-habit with other animal species. For example Ntekim and Braide (1981) reported the occurrence of *Trypanosoma lewisi* in the blood of wild rats, while Opara and Fagbemi (2008b) reported the natural occurrence of *Trypanosoma*

congolense, *T. vivax*, *T. simiae*, *Plasmodium* and *Babesia* sp., among wild grasscutters and *Trypanosoma congolense*, *T. vivax*, *Plasmodium* and *Babesia* sp., in the captive-reared grasscutters.

HAEMATOLOGICAL EFFECTS OF BLOOD PROTOZOA IN GRASSCUTTERS

Opara and Fagbemi (2010a) reported that the Mean Corpuscular Volume (MCV) of trypanosome infected grasscutters does not change more than for uninfected ones, while the Mean Corpuscular Haemoglobin Concentration (MCHC) significantly decreases ($p>0.05$) suggesting a macrocytic hypochromic anaemia). They also observed that grasscutters experimentally infected with *Trypanosoma congolense* and *T. vivax* suffered leucopenia at 7 dpi, while the uninfected ones did not. Thus, indicating that trypanosomiasis in grasscutters also leads to leucopenia (Seifert, 1996), which further reduces the animals' immunity and thereby exposing them to other infections.

Trypanosome infected grasscutters equally experience a significant decrease in plasma glucose, which also agrees with Soulsby (1982), who reported that blood form of trypanosomes absorb nutrients such as glucose by mediated mechanism of membrane transport.

He also reported that blood protozoa increase the long chain fatty acids of plasma membrane of red blood cells, but this is not the case in the grasscutters, as this could probably be because the grasscutter has very low body fat content (Adu *et al*., 1999). In their work, Opara and Fagbemi (2010a) reported that grasscutters experimentally infected with *T. vivax* had significantly ($p< 0.05$) higher plasma Aspartate Amino Transferase (AST). Serum AST is however not a specific enzyme for the liver, as high levels can also be found in skeletal and cardiac muscles as well as red blood cells (Bush, 1991). Thus, increase in AST may indicate an on-going liver disease (Duncan *et al*., 1994) as observed at histopathology.

Temperature of grasscutters infected with *T. vivax* and *T. congolense*, showed dramatic fluctuation. Soulsby (1982) had reported that undulating temperature is a clinical feature in animals infected with trypanosomes.

Pathological lesions observed in some of the tissues of trypanosome infected grasscutters include liver and kidney vacuolar and tubular epithelial degeneration, respectively, with thrombosis in alveolar blood vessels. These are in agreement with Soulsby (1982) and Shah-Fischer and Say (1989), who also reported organ degenerative changes in animal trypanosomiasis.

CONCLUSION

The distribution of grasscutters in Africa, south of Sahara, the management system required, nutrition and reproductive performance have all been well studied. Also detailed information on health and diseases of these rodents are reported here. Furthermore, the grasscutter is known to be economically important as an agricultural pest and its' meat is widely accepted by all classes of people. It is also a good laboratory animal for research studies.

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