Occurrence and prevalence of gastrointestinal helminthes in the wild grasscutter (*Thryonomys swinderianus*, Temminck) from Southeast Nigeria

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Abstract

One thousand and twenty (1020) wild grasscutters, comprising of 470 (46.1%) males and 550 (53.9%) females were examined, between July, 2006 and June, 2007 and 1000 (98.0%) of them were infected with gastrointestinal helminthes. Small sized grasscutters harbored more helminth parasites than the relatively bigger ones. Mean worm load (XWLD) was higher in the female than in the male (11.3) wild grasscutters examined. Wild grasscutters were infected with gastrointestinal helminthes from the months of October to March, with a decline in prevalence rate, following the month of April to September. Decreased infection rate picked up in May among the males, dropped in the female grasscutters too. Gastrointestinal helminth infection of wild grasscutters was highest during the early dry season (EDS) of the year, which was 32.9%, 31.4% in the late dry (LDS), 23.2% in early rains (ERS) and 12.5% in the late rainy season (LRS). Helminth parasites encountered in the GIT of the wild grasscutters included 14 Nematodes (*Ascaris*, *Bunostomum*, *Cooperia*, *Gaigaria*, *Gongylonema*, *Haemonchus*, *Heterakis*, *Mammomonogamus*, *Metastrongylus*, *Oesophagostomum*, *Strongyloides*, *Toxocara*, *Trichostrongylus* and *Trichuris* species); 5 Trematodes (*Cotylophoron*, *Dicrocoeluim*, *Gastrodiscus*, *Paramphistomum* and *Schistosoma* species), 4 Cestodes (*Avitellina*, *Moniezia*, *Taenia* and *Thysaniezia* species) and Acanthocephalan (*Moniliformis* sp). No worker had ever reported this wide array of helminth parasites in the grasscutters. Nematode parasites accounted for 71.4% of the total parasites, Trematodes 12.7%, Cestodes 12.9% and Acanthocephalan 3.1%. There were no significant differences ($P > 0.05$) in the prevalence of helminth infection's between the male and female wild grasscutters, but there was a significantly ($P < 0.5$) higher *Taenia* sp infection in the males than female grasscutters. Predilection sites of the helminth Nematodes in the grasscutters were oesophagus (26.8%), stomach (34.6%), small intestine (24.3%) and large intestine (14.3%). Among the Trematodes, their site preferences were oesophagus (47.3%), stomach (10.9%), small intestine (38.2%) and large intestine (3.6%); the Cestodes were oesophagus (36.7%), stomach (45.3%) and small intestine (18.0%). It is hoped that this study will stimulate and encourage further research into other agents of grasscutter diseases, in order to reduce their mortality and thereby help to increase grasscutter meat production in the country. [Life Science Journal. 2008; 5(3): 50 – 56] (ISSN: 1097 – 8135).

Keywords: gastrointestinal; helminthes; wild; grasscutter; Southeast Nigeria

1 Introduction

Grasscutter (*Thryonomys swinderianus*) is a wild hystricomorphic rodent widely distributed in the African subregion and exploited in most areas as a source of animal protein (Vos, 1978; Asibey, 1974; National Research Council, 1991). Being the most preferred (Martin, 1985) and most expensive meat in West Africa including Nigeria, Togo, Benin, Ghana and Cote d'voire (Baptist and Mensah, 1986; Asibey and Addo, 2000), it contributes to both local and export earning of most West African Countries (Asibey, 1969; National Research Council, 1991; Baptist and Mensah, 1986; GEPC, 1995; Ntiamoa-Baidu, 1998)

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and is therefore hunted aggressively. Unfortunately its collection from the wild is attended by destruction of the environment through the setting of bush fires by hunters (National Research Council, 1991; Yeboah and Adamu, 1995; Ntiamoa-Baidu, 1998). To alleviate this problem, attempts are being made in the sub-region to domesticate the grasscutter (National Research Council, 1991; Addo, 2002) and make it more readily available, gain economic benefit and also reduce the environmental destruction that accompanies its collection from the wild. For example, a major research programme on grasscutter has been initiated in Benin Republic under the Project Benino-Allemand d'Aulacodiculture (PBAA) to select genetically improved grasscutter stocks adapted to life in captivity and to promote the rearing of the animal in rural and sub-urban environments (Baptist and Mensah, 1986).

Social-economical and zootechnical characteristics of raising grasscutter have been reported (Baptist and Mensah, 1986; Mensah *et al*, 1986; Holzer *et al*, 1986; National Research Council, 1991; Awa-Ndukum *et al*, 2001), but there is little information on their disease status. However, preliminary studies on the captive grasscutter (Awah-Ndukum *et al*, 2001) in Cameroon showed the occurrence of ectoparasites such as Fleas (*Xenopsylla* sp) and endoparasites like Cestode (*Hymenolopsis* sp) and Nematode (*Heterakis* sp) in this animal. In another work by Yeboah and Simpson (2004) in Ghana, four species of ticks namely *Rhipicephalus simpsoni*, *Ixodes aulacodi*, *Ixodes* sp and *Haemaphysalis parmata* were the ectoparasites found while six species of helminthes parasites comprising 2 species of Cestodes (*Furhmanella transvalensis*, *Railettina mahone*) and 4 species of Nematode (*Longistriata spira*, *Trachypharynx natalensis*, *Paralibyostrongylus vondwei* and *Trichuris paravispicularis*) were equally found.

However, there is a need for detailed information on the agents of diseases of the grasscutter under both captive and wild conditions, its potential in transmitting or as the reservoir of these pathogens, since domestication and farming are gradually spreading through this country and in the eastern states in particular as a source of protein to supplement its meat obtained from the wild.

This research work will investigate and document the agents of grasscutter diseases in order to reduce mortality and thereby help to increase grasscutter meat production in the country.

2 Materials and Methods

This study was carried out in Imo State, which is situated in the central part of the southeastern region of Nigeria. The vegetation is typically of the rain-forest type, with two seasons, namely, rainy and dry seasons. The rainy season extends from April to October while the dry season runs through the rest of the year. The mean annual rainfall is 250 mm, while the temperature and humidity range from 25 ºC to 35 ºC and 70% to 80% respectively. The population density in the communities where the studies were carried out ranged from 500 to 2000 persons per square kilometer (NNIC 1991).

A longitudinal incision was made through the abdomen of wild grasscutters examined, which continued forward along the mid-dorsal line up to the neck to expose the abdominal contents. The different parts of the GIT were dissected out to show the oesophagus, stomach, small intestine, large intestine, caecum, colon and rectum (Figure 1). After this, the different parts were ligated with a silk thread to prevent the contents from spilling from one region to another. Each ligated part of the GIT was then opened by an incision and its contents emptied into a Petri-dish for examination for adult and or larval forms of the worms. The lining of each region was scrapped, washed and careful examined for any worms attaching to it. Worms found were collected with a pair of fine forceps and stored in 10% formalin with few drops of glycerol added to the preservative inside the bottle. Also, the liver and lungs were examined for parasites as described by Soulsby (1982). The helminthes were later taken out with forceps, differentiated into Trematodes, Cestodes, Nematodes and Acanthocephalans then transferred into test tubes for staining and identification. Nematode worms were cleared in xylene placed on slides with Canada balsam mounts, sealed with wax on mounting and observed under × 10 microscope magnification. Cestodes proglottids were left for longer periods in Gower's caramine, because of their thick walls and were later dehydrated through series of graded alcohol and finally cleared in cedar wood oil for at least 10minutes. The worms were counted and later identified microscopically; using standard manuals (MAFF, 1986), while the GIT segments already were also examined under the microscope for helminthes eggs, as described by Soulsby (1982) and MAFF (1986).

All raw data generated were analyzed, using simple averages, percentages, descriptive and quantitative statistics. The prevalence of grasscutter parasites among sexes, season and environment were determined. Significant testing of differences in proportions was done, using the student's *t*-Test, ANOVA in accordance with the procedures described by Steel and Torrie (1980). Where significant differences were observed between means,

they were separated by the Duncan's new multiple range test (Obi, 1990).

3 Results

The overall prevalence of GIT Helminth parasites in wild grasscutters in Imo State is shown in Table 1. A total of 1020 adult wild grasscutters were examined for the presence of gastrointestinal helminth parasites which comprised of 470 (46.1%) males and 550 (53.9%) females. Out of this total, 1000 (98.0%) of them, consisting of 460 (46.0%) males and 540 (54.0%) female were infected.

Table 1. Overall prevalence of GIT helminth parasites of wild grasscutters in Imo State Southeast

Sex of grasscutters	No. exam	% exam	No. infected	% infected
Male	470	46.1	460	46.0
Female	550	53.9	540	54.0
Total	1020	-	1000	98.0

Table 2 reports the results of worm burden among GIT helminth infected wild grasscutters in Imo State. The 460 male wild grasscutters yielded 5180 worms, giving a mean worm load of 11.3, while 540 females yielded 6820 worms and a mean worm load of 12.6. Among the males, number of parasites within the range of 0 – 5 was not recovered, whereas 6 – 10 parasites per animal were recovered from 20 (4.3%) grasscutters, with a worm load of 140 and mean worm load of 7. Four hundred and forty (95.7%) male grasscutters harbored 11 – 15 parasites per animal and yielded a total of 5040 worms and a mean worm load of 11.5. Again, no male grasscutter yielded between 16 – 20 parasites per animal. Among the female grasscutters, none had parasite number of 0 – 5. However, 20 (3.7%) of them produced 6 – 10 parasites per animal, with a worm load of 140 and mean worm load of 7. From 380 (70.4%) female rodents were harvested 4480 worms with a mean worm load of 11.8, where each animal harbored between 11 – 15 parasites per female grasscutter. From 140 (29.5) of the animals harboring between 16 – 20 parasites per animal were recovered 2200 worms, indicating a worm load of 15.7. The highest mean worm load (15.7) was recorded against female grasscutters harboring 16 – 20 parasites per animal, followed by 11.8 from those harboring 11 – 15 parasites per animal. In the males, the highest mean worm load of 11.5 was obtained for grasscutters harboring between 11 – 15 parasites per animal.

Figure 1 portrays the monthly prevalence of GIT helminthes in wild grasscutters across sexes. Helminth infection was considerably low in the male rodents between the months of July and September, but the prevalence was high in the month of October and remained so till March. Decrease in this high infection rate of GIT helminthes was experienced in the months of March and April, through May, before a sharp drop in June. In the female wild grasscutters slightly high prevalence of Helminth parasites was obtained in the month of July, followed by a decrease in August and September and then a relatively high infection rates in October and November. A decline in this trend was witnessed among the female animals in the month of December. However, this moderately high worm load was maintained throughout the months of January, February, March and April, before a sharp decrease in the prevalence rate occurred in May. Another isolated increase in Helminth infection occurred in June.

Table 2. Worm burden of GIT helminth infected wild grasscutters in Imo State Southeast

No. parasit/animal	Male			Female		
	No.(%) infected	WLD	XWLD	No.(%) infected	WLD	XWLD
0 – 5	0	0	0	0	0	0
6 – 10	20 (4.3)	140	7	20 (3.7)	140	7
11 – 15	440 (95.7)	5040	11.5	380 (70.4)	4480	11.8
16 – 20	0	0	0	140 (29.5)	2200	15.7
Total	460 (46.0)	5180	11.3	540 (54.0)	6820	12.6

WLD: Worm Load; XWLD: Mean Worm Load.

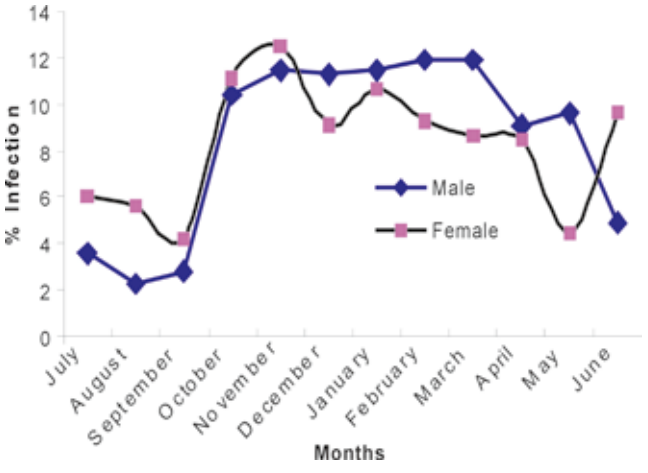

Figure 1. Monthly variation on prevalence of GIT helminth parasites of wild grasscutters.

The results of seasonal influence on the prevalence of GIT helminthes of wild grasscutters in Imo State are shown in Table 3. Out of 1020 grasscutters studied, 336 (32.9%) and 321 (31.4%) of them were examined during the early dry and late dry seasons (EDS, LDS). Animals examined in the early rainy season (ERS) and late rainy season (LRS) were 235 (23.05%) and 128 (12.5%). The 1000 grasscutters infected were 329 (32.9%) and 314 (31.4%) during the EDS and LDS respectively. In the ERS, the prevalence rate of helminth infection was 232 (23.2%), while that of the LRS was 125 (12.5%).

Table 3. Seasonal variation on prevalence of GIT helminth parasites of wild grasscutters in Imo State Southeast

Season	No. exam	% exam	No. infected	% infected
LRS	128	12.5	125	12.5
EDS	336	32.9	329	32.9
LDS	321	31.4	314	31.4
ERS	235	23.0	232	23.2
Total	1020	-	1000	98.0

LRS: July – September; EDS: October – December; LDS: January – March; ERS: April – June.

The effect of sex on the prevalence of GIT helminth parasites of wild grasscutters in Imo State is shown in Table 4. Of the 7820 parasites harvested from the wild grasscutters, 5580 (71.4%) were Nematodes, 1010 (12.9%) Cestodes, 990 (12.7%) Trematodes and 240 (3.1%) Acanthocephalans. Overall, more female wild grasscutters were infected, giving a prevalence rate of 4280 (54.7%) while the males recorded 3540 (45.3%) prevalence rates. However, there was no sex difference ($P > 0.05$) in the prevalence of the parasites, except the cestode, *Taenia* sp which significantly differed ($P < 0.05$) between the males and female grasscutters.

Sex influence on prevalence of GIT helminth groups in wild grasscutters (Figure 2) indicates that Nematodes and Trematodes were higher among the female grasscutters than the males. The males on the other hand, were more infected by Acanthocephalan and slightly by Cestodes.

Figure 3 represents the overall prevalence of helminth parasite groups at different predilection sites along the GIT of wild grasscutters. Generally, Nematode worms were found mostly in the stomach, oesophagus, small intestine and large intestine in this order. Trematodes were most common in the oesophagus, then small intestine, stomach and large intestine. Cestode parasites mostly inhabited the stomach, followed by oesophagus, then the small intestine. No Cestode parasite was found in the large intestine. The Acanthocephalans encountered were mostly in the small intestine and then, in the stomach. They were not found in the oesophagus and large intestine.

Table 4. Sex influence on the prevalence of GIT Nematodes, Trematodes, Cestodes and Acanthocephalan of wild grasscutters in Imo Sate Southeast

Helminth parasites	No. (%) parasites in males	No. (%) parasites in females	*P*-value ($P > F$)
Nematodes			
Ascaris sp	350 (15.1)	400 (13.0)	0.3332 N/S
Bunostomum sp	210 (8.4)	310 (10.1)	0.8478 N/S
Cooperia sp	220 (8.8)	290 (9.4)	0.6860 N/S
Gaigaria sp	130 (5.2)	140 (4.6)	0.5820 N/S
Gongylonema sp	110 (4.4)	120 (3.9)	0.8474 N/S
Haemonchus sp	170 (6.8)	190 (6.2)	0.8370 N/S
Heterakis sp	170 (6.8)	260 (8.5)	0.2313 N/S
Mammomonogamus sp	150 (6.0)	110 (3.6)	1.0000 N/S
Metastrongylus sp	80 (3.2)	60 (2.0)	0.8496 N/S
Oesophagostomum	110 (4.4)	230 (7.5)	0.2754 N/S
Strongyloides sp	240 (9.6)	300 (9.8)	0.0669 N/S
Toxocara sp	120 (4.8)	150 (4.9)	0.1753 N/S
Trichostrongylus sp	150 (6.0)	150 (4.9)	0.6145 N/S
Trichuris sp	270 (10.8)	360 (11.7)	0.4099 N/S
Sub total	2510 (45.0)	3070 (55.0)	-
Trematodes			
Cotylophoron sp	130 (33.3)	80 (13.3)	0.0621 N/S
Dicrocoelium sp	20 (5.1)	140 (23.3)	0.6412 N/S
Gastrodiscus sp	80 (20.5)	120 (20.0)	0.2826 N/S
Paramphistomum sp	100 (25.6)	140 (23.3)	0.3622 N/S
Schistosoma sp	60 (25.4)	120 (20.0)	0.8817 N/S
Sub total	390 (39.4)	600 (60.6)	-
Cestodes			
Avitellina sp	160 (31.3)	130 (26.0)	0.3658 N/S
Moniezia sp	140 (27.5)	230 (46.0)	0.1126 N/S
Taenia sp	20 (3.9)	0 (0)	< 0.0001 S
Thysaniezia	190 (37.3)	140 (28.0)	0.9043 N/S
Sub total	510 (50.5)	500 (49.5)	-
Acanthocephalan			
Moniliformis sp	130 (100.0)	110 (100.0)	0.7367 N/S
Sub total	130 (54.2)	110 (45.8)	-
Grand total	3540 (45.3)	4280 (54.7)	7820

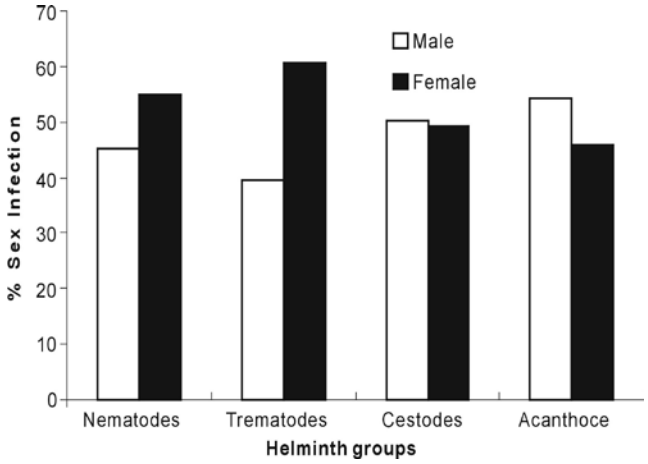

Figure 2. Sex influence on prevalence of GIT helminth groups in wild grasscutters.

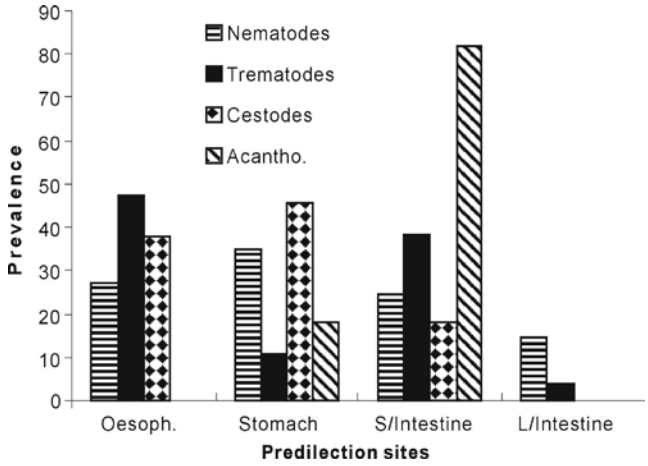

Figure 3. Overall prevalence of helminth parasite groups at different predilection sites.

4 Discussion

This study examined the overall prevalence of GIT helminth parasites of wild grasscutters in Imo State and reported an infection rate of 98.0%. This finding agrees with Akomas and Enwere (2001), who reported a prevalence of 96% while working with grasscutters in Umudike, Abia State. This result agreed partially with Odumodu (1999), who reported a prevalence of 84.0% in Anambra (a neighbouring state to Imo) but disagreed with Ajayi *et al* (2007), who reported just a prevalence of 38.3% from Jos (middle belt region of the country). The different prevalence rates may be attributed to the differences in the types of ecology (Opara *et al*, 2006) from where these rodents were caught. The grasscutters used in their study were caught around human habitations, where the animals feed on food wastes from garbage bins. The grasscutters in this study were hunted and caught in the wild, where the main source of food was pastures contaminated with human and domestic animals' faeces. Grasscutters are found in grasslands and wooded savannah throughout the humid and semi-humid areas, south of the Sahara where they inhabit and feed (National Research Council, 1991; Asibey and Addo, 2000).

High prevalence of GIT helminth infection was observed in the male and female grasscutters during the dry months. Decline in the infection rates was witnessed in the wet months of April to September. Activities of hunters are most prominent during the dry months of the year. The bushes are sparse at these periods and allow the hunters roam in the bush, unhindered. Again these are the months when preparation of land (bush clearing and burning etc) for farming begins. As soon as the rains begin, these activities decline because the bushes will be overgrown.

The dry seasons (EDS and LDS) experienced high prevalence of helminth infection. This declined along the seasons, as the rains set in. During the dry season, grasscutters cover a large expanse of land and feed on a variety of plants and other food materials. In this way, they acquire more helminth infections through their consumption of contaminated feed materials. Again, dry season is followed by lack of water and drying up of many ponds and watering points for wild animals. As a result, many of these animals drink from a common water body (Kruse *et al*, 2004), thereby increasing the risks of infection and re-infection with GIT helminth parasites.

The examination of the GIT of wild grasscutters revealed that endo-parasites included 14 species of Nematodes, 5 Trematodes, 4 Cestodes and 1 Acanthocephalan. The Nematodes were identified as *Ascaris* sp, *Bunostomum* sp, *Cooperia* sp, *Gaigaria* sp, *Gongylonema* sp, *Haemonchus* sp, *Heterakis* sp, *Mammomonogamus* sp, *Metastrongylus* sp, *Oesophagostomum* sp, *Strongyloides* sp, *Toxocara* sp, *Trichostrongylus* sp and *Trichuris* sp. The Trematodes included *Cotylophoron* sp, *Dicrocoelium* sp, *Gastrodiscus* sp, *Paramphistomum* sp and *Schistosoma* sp, while the Cestodes were *Avitellina* sp, *Moniezia* sp, *Taenia* sp and *Thysaniezia* sp. The Acanthocephalan identified was *Moniliformis* sp. Other workers such as Mpoame (1995), Odumodu (1999), Yeboah and Simpson (2001) and Ajayi *et al* (2007) had reported some of these parasites in Cameron, Anambra (Southeastern Nigeria), Ghana and Jos (North central Nigeria) respectively. However, the present study thus reports the first occurrence of *Bunostomum*, *Cooperia*, *Gaigaria Gongylonema*, *Mam-*

momonogamus and *Toxocara* species (All Nematodes), *Cotylophoron* sp, *Dicrocoelium* sp, *Gastrodiscus* sp, *Paramphistomum* sp, *Schistosoma* sp and *Gastrodiscus* sp (all Trematodes) and *Avitellina*, *Moniezia* and *Thysaniezia* (all Cestodes) as parasites in the grasscutters. This study also showed that all the helminth parasites except *Taenia* sp established themselves well in both sexes of the rodents, with a higher prevalence of 54.3% recorded in the males. *Taenia* sp significantly ($P < 0.05$) infected more males than female wild grasscutters. It is difficult presently to explain this difference. This study has reported more helminth species, than had any other worker in this rodent. The different prevalence rates and number of helminth species may be attributed to the fewer numbers of grasscutters examined by these researchers and again, by the different agro-ecological zones where these studies were carried out. Interestingly, none of these workers documented the occurrence of trematodes in the grasscutters they examined.

The predilection sites of the GIT helminthes in the wild grasscutters were, stomach (32.6%), oesophagus (30.3%), small intestine (27.0%) and large intestine (10.2%). All helminth parasite groups encountered were in the stomach and small intestine. This finding agrees with Yeboah and Simpson (2001) who reported these GIT regions as the predilection sites for the 2 Cestodes (in the small intestine) and another 2 Nematodes (in the stomach) they encountered. Nematodes, Trematodes and Cestodes occurred in the oesophagus of the wild grasscutters. Yeboah and Simpson (2001) did not find any helminth parasites in the oesophagus of the grasscutters they studied. They attributed this to the constant passage of roughages chewed by the grasscutters which dislodge any helminth species which attempts to cling to the oesophagus. The trematodes and 98.0% of the cestodes occurred in the form of eggs. It is possible that these eggs were ingested along with contaminated pastures and being transported by gastrointestinal tract movements (such as peristalsis and rhythmic movements) to the stomach were enzymatic actions would digest the egg shell, thereby liberating the helminth larvae. All the 4 groups of helminthes (Nematodes, Trematodes, Cestodes, and Acanthocephalans) were found in the stomach and small intestine of the grasscutters. This agrees with the findings of Yeboah and Simpson (2001). The occurrence of the helminthes in the small intestine suggests that they prefer this part of the alimentary canal. The reason for their preference of the small intestine might be due to the abundance of digested nourishing food there. Cestodes generally lack a well developed alimentary canal and therefore, cannot digest their own food. The small intestine thus, provides a perfect site where already digested food is readily available for absorption through the body surface. The occurrence of the helminthes in the stomach suggests that they are flexible in their habitat choice, capable of adapting to the high acidity of the stomach and the alkaline medium of the small intestine. For the species of helminth parasites to occupy the same habitat, it is likely that they occupy different niches in the gut and therefore, avoid competition. Two species of helminthes (Nematodes and Trematodes) occurred in the large intestine. This is contrary to the report of Yeboah and Simpson (2004). They did not report the occurrence of any helminth parasites in the rectum of the grasscutters they examined. The large intestine contains some nourishing food, since absorption equally takes place there. This suggests that some of the nematodes and trematodes that could not find niches in the more suitable environment of the small intestine would avoid the competition there and settle in the large intestine. This explains why only 10.2% of these helminth parasites were found in the large intestine.

5 Conclusion and Recommendations

In recent years, domestication of the grasscutters is becoming popular as an alternative source of bush meat and animal protein which are seriously needed by Nigerians.

For this to be successful there is the need to prevent diseases and infections in the grasscutters under captivity. This can only be done when agents of disease mutilating against grasscutter farming have been identified. The desired benefit of farming the grasscutter may not be achieved given the high prevalence of parasites and infections observed in this study. The present study has shown that grasscutters are infected with various species of gastrointestinal helminthes which have negative influence on their growth and development. This present study has also shown that any region of the digestive tract of the grasscutter can serve as predilection site for the parasites without deleterious effects on the grasscutter. Therefore veterinarians and farmers are advised to give serious attention to regular examination, deworming and treatment of infected grasscutters, for effective control of faecal contaminations and re-infections of these animals, including man and other domestic livestock.

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