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A PRELIMINARY SURVEY OF MACROPARASITE COMMUNITIES OF RODENTS OF KAHAWA, CENTRAL KENYA

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Abstract. A preliminary survey of macroparasite communities of *Mastomys natalensis, Lemniscomys striatus, Arvicanthis niloticus, Tatera robusta* and *Mus minutoides* trapped alive in three microhabitat types within a dry sub-humid grassland showed a high diversity in both ecto- and endoparasites. *Rhipicephalus appendiculatus, Amblyomma variegatum, Boophilus* sp., *Orchopeas* sp., *Leptopsylla* sp. and *Xenopsylla cheopis* were collected from the skin and hair. *Fasciola* sp., *Taenia* sp., *Hymenolepis* sp., *Ascaris* sp., *Trichostrongyus* sp., *Clonorchis* sp. and *Heterophyes* sp. were retrieved from the alimentary canal or their eggs isolated from faeces. The distribution of rodent macroparasites was dependent on host species and microhabitat. Mean ectoparasite intensity also varied with host microhabitat and species. *Arvicanthis niloticus* had heavier intestinal macroparasite infestation compared with *Mastomys natalensis* and *Lemniscomys striatus*. Generally, bigger hosts exhibited a heavier parasitic load. It is inferred that rodents may be important in the transmission and sustenance of livestock diseases in this grassland.

Key words: *Mastomys, Lemniscomys, Arvicanthis*, macroparasites.

INTRODUCTION

Rodent control programmes in sub-Saharan Africa are usually directed at field and storage pest species. However, most rodent pests are also carriers of pathogens (FIEDLER, 1994), which calls for extended studies on their role in transmission or sustenance of human (KILONZO *et al.*, 1992; IKEH *et al.*, 1995; GITHURE *et al.*, 1996), livestock and wildlife (GROBLER *et al.*, 1995) disease. Future rodent management programmes will need to incorporate control of pathogens (microparasites) and their vectors (macroparasites). Studying parasite communities of rodents has also its own ecological significance (POULIN, 1995). In a preliminary study on macroparasites of rodents in three microhabitat types we surveyed diversity, distribution and host factors affecting parasite community composition around Kahawa, Kenya.

MATERIAL AND METHODS

Study area

The study site was located at the Kenyatta University campus in Kahawa, 25 Km north east of Nairobi (1° 14' S, 36° 48' E). The climate there is dry subhumid with an annual temperature range of 20-25°C and rainfall of 600-1100 mm. Three microhabitats were selected, based on vegetation characteristics and anthropogenic activities: (a) an acacia-themeda grassland characterised by *Themeda triandra* Forsk and *Hyparrhenia* spp. with sparse trees and tree-saplings of *Acacia* species; (b) a maize field with post-harvest stalks and *Bidens pilosa* L. with occasional *Leonotis* species; (c) areas with intense human activities, *i.e.* small-livestock pens around University laboratories.

Collection of specimens

Rodents were live-trapped using Sherman traps. For each microhabitat, five traps were checked on two consecutive nights per week for eight weeks in January and April 1996. Peanut butter on commercial mouse-pellets was used for baiting. Trapped animals were transferred to the laboratory, killed with chloroform, and species, sex and body weight were recorded. Each animal was then carefully examined for ectoparasites. Parasites were collected and preserved in 10% buffered formalin before identification. Total number of parasite types and sites of recovery were noted per host specimen. Dissection was carried out and gastrointestinal tracts carefully examined for helminths. Autopsy from lungs and liver was collected for histological analysis. Faecal samples were obtained from the rectum and examined.

Tissue processing

Lung and liver tissues were processed in paraffin wax before sectioning as described by CULLING (1974). Autopsied tissues were dehydrated in alcohol, de-alcoholated and waxed. Waxed tissues were sectioned at 0.5 (m using a sledge microtome (Leitz Weizlar 1512) and fixed on slides with Meyer's egg albumin, rehydrated and stained. DPX mountant (BDH Limited, Poole, England) was added before microscopic observations.

Faecal processing

The formol-ether concentration method (MANSON-BAHR & BELL, 1987) was used to process faecal samples. This involved centrifuging samples in formol-water and ether at 3000 rpm for one minute (RITCHIE, 1948). Sediments were then spread on slides, giemsa-stained and observed under a microscope.

Statistical analyses

Mean intensity of infection was determined for ectoparasites and helminths retrieved from the alimentary canal by calculating the number of parasites per rodent host (total

number of parasites/total number of host individuals). Prevalence of occurrence was applied for eggs in faeces and determined by the percentage of the host population that was infected. A student's t-test was used to compare parasitic load between the sexes. ANOVA was applied to inspect the effects of host habitat and species on parasitic load. Correlation analysis was used to determine any relationship between host body weight and parasitic loads. Simpson's diversity index ($S=1/\Sigma[p_i]^2$) was used to compare diversity of rodents within the microhabitats and of parasites for various environmental factors (BEGON *et al.*, 1990)

RESULTS

During this study, a total of 29 rodents were trapped belonging to five species (Table 1), i.e. four murids (*Mastomys natalensis* [Smith,1834], *Lemniscomys striatus* L. [1758], *Mus minutoides* Smith [1834], *Arvicanthis niloticus* [Desmarest, 1822]) and a cricetid *Tatera robusta* (Cretzschmar, 1830). Captures were low with a trapping success of 12.9% in 240 nights. More than one individual was captured only in respect of *M. natalensis, L. striatus* and *A. niloticus* . *M.natalensis* was captured in all the microhabitats, *L. striatus* in grassland and maize field and *A. niloticus* mainly around small livestock pens and in grassland.

TABLE 1

Number of rodent specimens captured in different microhabitats (G= grassland, M= maize field, P= around small livestock pens) within Kenyatta University, Kenya in January and April 1996

Rodents	*Number captured and microhabitat types*			
	G	*M*	*P*	*Total*
Mastomys natalensis	3	5	6	14
Lemniscomys striatus	5	2	0	7
Arvicanthis niloticus	1	0	5	6
Mus minutoides	0	1	0	1
Tatera robusta	0	0	1	1
Total	9	8	12	29

Macroparasite distribution varied with host microhabitat, species or both (Table 2). Diversity of ectoparasites varied with host factors such as species, habitat and size (Table 3). Similarly, mean intensity of infection of ectoparasites varied significantly with host species ($P<0.05$) and microhabitat ($p<0.01$) (Table 3). Generally, a weak ($r=0.44$) but significant ($p<0.03$, $n=25$) relationship between ectoparasite load and host body size was recorded (Fig. 1). Host parameters affected helminth distribution and *A.niloticus* exhibited significantly ($p<0.05$) heavier loads (Table 3). From the histological preparations, only two individuals showed lesions in lungs (a *L. striatus*) and liver (a *T. robusta).*

TABLE 2

Distribution of rodent macroparasites in relation to host species and micohabitats around Kahawa, Kenya in January and April 1996. The figures show number of specimens from which parasites or helminth eggs were retrieved. Sample sizes are denoted by (n). Rodents were captured in grassland (G), maize fields (M) and around small-livestock pens (P)

Macroparasites	*M. natalensis*			*L. striatus*		*A. niloticus*	
	G	*M*	*P*	*G*	*M*	*G*	*P*
(n)	*3*	*5*	*6*	*5*	*2*	*1*	*5*
Rhipicephalus appendiculatus Neumann, 1901	3	5	4	4	2	1	0
Amblyomma variegatum Fabricius, 1794	0	2	0	2	0	1	0
Boophilus sp.	1	1	0	0	1	0	0
Orchopeas sp.	0	0	2	0	1	0	0
Leptopsylla sp.	0	2	0	4	0	1	0
Xenopsylla cheopis (Rothschild, 1903)	0	2	0	0	0	0	0
Schistosoma spp.	2	4	2	0	0	1	0
Fasciola sp.	1	5	4	2	2	0	0
Taenia spp.	2	2	2	5	1	0	2
Hymenolepis sp.	0	0	0	0	0	0	1
Ascaris sp.	0	1	3	5	2	0	3
Trichostrongyus sp.?	0	0	0	0	1	0	0
Clonorchis sp.?	0	1	0	0	0	0	0
Heterophyes sp.?	0	1	1	0	0	0	0

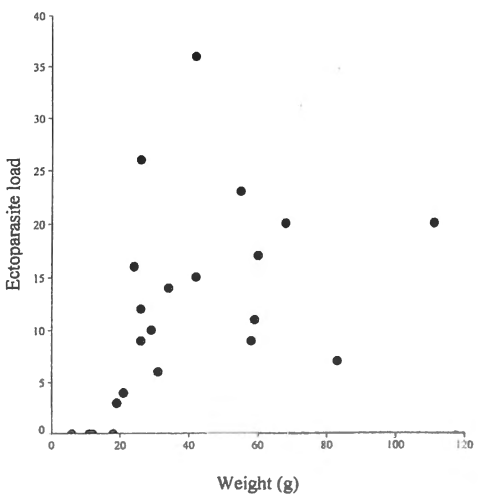

Fig. 1. – A scattergram showing relationship between host weight and ectoparasite loads among rodents (n=25) in Kahawa, Kenya.

TABLE 3

Diversity indices (a) and % mean intensity of infection (b) of macroparasites in relation to various host parameters, i.e. species, microhabitat and size. Mn= Mastomys, Ls= Lemniscomys, An= Arvicanthis, G= grassland, M= maize field, P= around small-livestock pens

species	*microhabitat*			*size (g)*		
	Mn	*Ls*	*An*	*M*	*G*	*P*
					<20	*>20*
(a) Diversity indices						
Ectoparasites	0.8	1.2	1.6	1.4	1.5	1.3
0.2	0.8					
Helminths	2.5	1.8	1.4	1.5	1.4	1.9
0.2	0.5					
(b) Mean intensity of infection (%)						
Ectoparasites	10.9^{a}	12.6^{a}	1.2^{b}	10.8^{1}	17.2^{2}	4.8^{1}
Helminths	1.2^{a}	1.0^{a}	5.3^{b}	0.9	1.4	3.1

Different letters (^{a}) and numbers (^{1}) in superscripts across rows denote significantly different means.

DISCUSSION

In our study we retrieved ectoparasites and endoparasites from diverse taxonomic groups from *M. natalensis, L. striatus, A. niloticus, M. minutoides* and *T. robusta*. Despite the low sample sizes, these preliminary findings have shown that macroparasite distribution in rodents around Kahawa depend to a great extent on (i) species and (ii) microhabitat (Table 2). For ectoparasites, the two factors were also important for their diversity and mean intensity (%) on hosts (Table 3). Rodents captured in the maize field showed higher percent infestation ($p<0.01$) than in the other microhabitats. Ectoparasite infracommunity was more diverse in *A. niloticus* while *L. striatus* and *M. natalensis* displayed heavier loads ($p<0.05$). Such variation in the parasitic community composition in different microhabitats and host species has been documented before (reviewed by POULIN, 1995) and is believed to be due to ecological characteristics such as diet. The significant ($p<0.03$) relationship observed between host size and parasitic load (Fig. 1), which is also consistent with other findings (POULIN, 1995), may be explained by the fact that bigger host animals generally have larger home ranges and presumably thereforeare more exposed to infective stages of parasites.

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