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RESEARCH COMMUNICATION

THE HOST STATUS OF THE STRIPED MOUSE, *RHABDOMYS PUMILIO*, IN RELATION TO THE TICK VECTORS OF HEARTWATER IN SOUTH AFRICA

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ABSTRACT

HOWELL, D. J., PETNEY, T. N. & HORAK, I. G., 1989. the host status of the striped mouse, *Rhabdomys pumilio*, in relation to the tick vectors of heartwater in South Africa. *Onderstepoort Journal of Veterinary Research*, 56, 289–291 (1989)

Striped mice, *Rhabdomys pumilio*, were trapped over a 17 month period in the Thomas Baines Nature Reserve in the eastern Cape Province of South Africa. Captured mice were placed in cages, over water, and naturally detaching ticks were collected. Only 5 larvae and 1 nymph of *Amblyomma hebraeum* were recovered from the mice. These represented less than 0,1 % of the total number of ticks recovered. No *Amblyomma marmoreum* were recovered. As the vegetation and large mammals and tortoises in the Thomas Baines Nature Reserve abound in larvae of both these vectors of heartwater the low infestation rates of *R. pumilio* indicate that it is either unsuitable or inaccessible for these ticks. *R. pumilio* is therefore unlikely to play a role in the epidemiology of heartwater.

INTRODUCTION

Heartwater is a disease of cattle, sheep and goats caused by the rickettsia, *Cowdria ruminantium*. *Ablyomma hebraeum* is the most common, widely distributed vector of this disease in South Africa (Walker & Olwage, 1987). *Amblyomma marmoreum*, which is also widely distributed (Walker & Olwage, 1987) has recently been found to be a suitable laboratory vector of the disease (Oberem & Bezuidenhout, 1987) although its role in nature is at present unknown. The immature stages of both species utilize a wide variety of reptilian, avian and mammalian hosts (Petney, Horak & Rechav, 1987). This lack of host specificity complicates the epidemiological picture of heartwater as a large variety of animals could act as natural hosts of the disease (Oberem & Bezuidenhout, 1987). *Amblyomma tholloni*, the only other vector of heartwater in South Africa, is a parasite of elephants and is confined mainly to the Kruger National Park (Walker & Olwage, 1987).

Rodents represent one potential group of hosts of *C. ruminantium*. Laboratory mice are susceptible to at least some strains of the organism (Du Plessis & Kümm, 1971; MacKenzie & McHardy, 1987) and have even been considered as a possible model for the study of the epidemiology of the disease (Du Plessis, 1985). Considerably less is known of the potential role of wild rodents in the heartwater cycle (MacKenzie & McHardy, 1987) although reports suggest that *Rhabdomys pumilio, Mastomys coucha* (referred to as *Praomys coucha*) and *Otomys angoniensis*
may carry the disease at a clinical or subclinical level (Hudson & Henderson, 1941; MacKenzie & McHardy, 1984).

Immature *A. hebraeum* have been found on various rodent species including *R. pumilio* and *Otomys* sp. (Theiler, 1962). This information has not, however been quantified so that the significance of rodents as possible vectors of heartwater is unknown. Although Theiler (1962) did not record *A. marmoreum* from rodents it has been found in small numbers on bush Karoo rats *(Otomys unisulcatus)* Horak, MacIvor, Petney & De Vos, 1987).

This paper reports a 17 month long study of ticks infesting the striped mouse, *R. pumilio*, and aims to quantify the role of this rodent as a host for *A. hebraeum* and *A. marmoreum*. This mouse is a common species distributed throughout much of the area in which heartwater occurs (Smithers, 1983). Its involvement in the epidemiology of heartwater would be of considerable importance in our attempts to model and control the disease.

METHODS AND MATERIALS

The study was carried out in the Thomas Baines Nature Reserve (32° 23′ S; 26° 28′ E), eastern Cape Province, South Africa. Except for September 1987, live-trapping was done on a monthly basis from July 1987 until November 1988. Seventy traps were set over a 6-day period with rolled oats and peanut-butter as bait. The traps were placed in established rodent runs in succulent kaffrarian thicket vegetation (Cowling, 1984). They were set each evening and checked each morning. Of the rodents captured only *R. pumilio* were retained and these were transferred to holding cages over water. Ticks detaching from the mice were collected each morning and evening. After 7 days tick detachment ceased and the mice were released at the site of their capture. Ticks were placed in glass vials and allowed to moult before being identified. Ticks which died before moulting were also identified giving an estimate of natural mortality.

RESULTS

Four species of ticks, *Rhipicephalus follis, Rhipicephalus simus, Haemaphysalis leachi* and *A. hebraeum* were recovered from *R. pumilio*. Of these the first 2 species dominated the collections and they and *H. leachi* will be dealt with in a separate publication. Very few larvae and only 1 nymph of *A. hebraeum* were recovered (Table 1). Three of the larvae and the nymph did not engorge on the mice and were dead on recovery. The other two larvae engorged only partially before detaching and did not moult to nymphae. No *A. marmoreum* were recovered.

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TABLE 1 The absolute and relative frequency with which *Amblyomma hebraeum* was found on *Rhabdomys pumilio* in the Thomas Baines Nature Reserve from July 1987 until November 1988

Life history stage	Total No. of samples	Samples containing *A. hebraeum*	Total No. of ticks recovered	*A. hebraeum* recovered		% *A. hebraeum*
				Live	Dead	
Larvae	159	5	15 440	2	3	0,03
Nymphae	140	1	947	0	1	0,10

DISCUSSION

The succulent kaffrarian thicket vegetation of the Thomas Baines Nature Reserve supports a very high density of larvae of *A. hebraeum* throughout the year (Petney & Horak, 1987). As many as 1 000 larvae have been recovered from flannel strips dragged for a distance of 250 m across the vegetation of the reserve. Several thousand larvae have also been recovered from eland *(Taurotragus oryx)* and several hundred from buffalo *(Syncerus caffer)* examined in the reserve (Horak *et al.*, 1987). Five scrub hare *(Lepus saxatilis)* sampled during the period of this study yielded a total of 460 larval and 46 nymphal *A. hebraeum* indicating that smaller mammals can carry substantial burdens of this tick (Horak & Petney, unpublished data). *A. marmoreum* larvae are also common in the reserve (Dower, Petney & Horak, 1988). A scarcity of *A. hebraeum* and *A. marmoreum* larvae is therefore unlikely to be the cause of the low infestation levels found on *R. pumilio*.

It is possible that the striped mouse is an unsuitable host which is actively avoided by the larvae of *A. hebraeum*. The low rate of successful engorgement of this tick on *R. pumilio* may indicate that it is also a poor host. It is also possible that the ticks and mice are separated by differences in their preferred habitats. Londt & Whitehead (1972) have shown that *A. hebraeum* larvae prefer to move to a height of 40 to 50 cm above the ground when they are active. This may well be above the height at which *R. pumilio* forages or builds its nests (Smithers, 1983).

Whatever the reason for the low level of infestation of striped mice by *A. hebraeum* and the complete absence of *A. marmoreum*, it seems that because of this it is unlikely that *R. pumilio* is involved in the heartwater cycle. Transovarial transmission of *C. ruminantium* is probably rare (Bezuidenhout & Jacobsz, 1986) hence larvae are unlikely to be infected. The aquisition of infection by larvae from an infected striped mouse would therefore require that an infected nymph had previously fed on that particular host. Our results show that both larval and nymphal feeding on *R. pumilio* is very rare. Thus the probability of an infected nymph feeding on a mouse which is later to be infested by larvae seems highly unlikely.

Given the low infestation rate of this common rodent with *A. hebraeum* and the absence of *A. marmoreum* on it, it would be well worth looking at the involvement of other rodents in the life cycle of these ticks. Horak *et al.* (1987) recovered no *A. marmoreum* from striped mice in the Mountain Zebra National Park, situated in a region where this tick is plentiful. At the same time they found 2 bush Karoo rats of a total of 38 examined in the Park each to be infested with 1 larva of *A. marmoreum*. If the infestation levels of rodents with these *Amblyomma* spp. are generally low this would greatly simplify epidemiological models of heartwater.

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