

SOME WILD HOSTS OF THE KAROO PARALYSIS TICK, *IXODES RUBICUNDUS* NEUMANN, 1904 (ACARI: IXODIDAE)

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ABSTRACT

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A variety of mammal and bird species in the Mountain Zebra National Park, eastern Cape Province, were examined for *Ixodes rubicundus*. In addition, caracal (*Felis caracal*) from the park and its vicinity as well as from the Graaff-Reinet region of the Karoo were examined. Amongst the animals collected, the red rock rabbit (*Pronolagus rupestris*) was a preferred host of the immature stages of the tick. Caracal were moderately good hosts of these stages and, with mountain reedbuck (*Redunca fulvorufula*) and eland (*Taurotragus oryx*), are the preferred hosts of adult ticks.

The seasonal abundance of the various parasitic life stages was also determined.

INTRODUCTION

The early history of paralysis in sheep caused by the ixodid tick, *Ixodes rubicundus*, has been reviewed by Stampa (1959) and by Neitz, Boughton & Walters (1971). Investigations by Theiler (1950) and the above authors have made considerable contributions towards clarifying the distribution, biology and host preferences of this tick. Although Theiler (1950) recorded *I. rubicundus* mainly from the Cape Province, with single collections from the Transvaal Highveld and southern Orange Free State, she mentions in a footnote that the tick is far more widely spread in the latter region than was indicated by the tick survey she had conducted. She states that the tick is confined to the moister regions of the Karoo, regions which are more generally hilly or mountainous rather than flat and open. Stampa (1959) has given a detailed description of the vegetation types with which *I. rubicundus* is associated. The most recent map of the tick's distribution is that of Howell, Walker & Nevill (1978).

In attempting to ascertain the host spectrum of this tick in the Karoo, Stampa (1959) examined a variety of wild animals and birds and sheep. He concluded that the adults are found mainly on sheep, but that the wild artiodactylids *Redunca fulvorufula* (mountain reedbuck), *Pelea capreolus* (vaal ribbok), *Raphicerus campestris* (steenbok) and *Antidorcas marsupialis* (springbok) can also act as hosts, while the carnivores *Proteles cristatus* (aardwolf), *Canis mesomelas* (black-backed jackal), *Felis caracal* (caracal) and *Felis lybica* (African wild cat) only serve as incidental hosts of the adult ticks. The preferred hosts of the immature stages are *Elephantulus* spp. (elephant shrews), *Pronolagus rupestris* (red rock rabbit) and *Lepus saxatilis* (scrub hare) (Stampa, 1959).

Improved methods of tick recovery from dead animals have recently been developed (Horak, De Vos & Brown, 1983). With the use of these techniques, ticks have been collected from a number of wild mammals and birds, shot or trapped and killed, in the Mountain Zebra National Park. In addition, ticks were collected from chemically immobilized, live caracal from the same locality and from caracal killed by hunters in the Graaff-Reinet District. The present paper records the numbers of *I. rubicundus* collected from these animals.

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MATERIALS AND METHODS

Survey localities

The Mountain Zebra National Park (32° 15' S, 25° 41' E) is situated in the Karoo in a region with vegetation classified as Karroid *Meurxmuellera* Mountain Veld replaced by Karoo (Acocks, 1975). The physiography and vegetation of this park have been described in greater detail by Fourie (1983). The farms on which caracal were collected are located north of Graaff-Reinet within a vegetation zone classified as False Karroid Broken Veld and False Central Lower Karoo (Acocks, 1975).

Survey animals

A variety of mammals and birds in the Mountain Zebra National Park were either shot or trapped and killed at fairly regular 3-monthly intervals over periods ranging from approximately 1–3 years. They were processed for tick recovery as described by Horak, Potgieter, Walker, De Vos & Boomker (1983), Horak, De Vos & Brown (1983), Horak & Williams (1986) and Horak & Fourie (1986). Caracal in this park and its vicinity as well as caracal on farms north of Graaff-Reinet were treated in the same way. A number of caracal in the Mountain Zebra Park were chemically immobilized, and ticks were collected manually from these animals.

RESULTS

The total numbers of *I. rubicundus* collected from the various mammal hosts are summarized in Table 1.

The highest incidence of infestation and the largest numbers of adult ticks were recorded on the caracal. Mountain reedbuck and eland (*Taurotragus oryx*) were also good hosts of adult ticks, while red rock rabbits harboured most immature ticks. Nine long-billed larks (*Certhilauda curvirostris*), 4 thick-billed larks (*Galerida magnirostris*), 3 spike-heeled larks (*Chersomanes albifasciata*), 5 familiar chats (*Cercomela familiaris*), 5 Nicholson's pipits (*Anthus similis*) and 16 crowned guinea fowl (*Numida meleagris*) examined in the park were not infested.

The monthly mean burdens of *I. rubicundus* on red rock rabbits, scrub hares, caracal, mountain reedbuck and eland are summarized in Table 2.

SOME WILD HOSTS OF THE KAROO PARALYSIS TICK, *IXODES RUBICUNDUS*

TABLE 1 The total numbers of *Ixodes rubicundus* recovered from several mammal species at 2 localities in the Karoo

Host	Common name	Dates collected	Number examined	Total number of <i>I. rubicundus</i> recovered				% infested
				Larvae	Nymphae	Males	Females	
Mountain Zebra National Park								
<i>Rhabdomys pumilio</i>	Striped mouse	Mar 84–Dec 85	30	0	0	0	0	0,0
<i>Aethomys namaquensis</i>	Namaqua rock mouse	Mar–Dec 84	6	5	0	0	0	33,3
<i>Saccostomus campestris</i>	Pouched mouse	May–Jun 84	3	4	0	0	0	33,3
<i>Otomys irroratus</i>	Vlei rat	May–Jun 84	2	2	0	0	0	50,0
<i>Otomys unisulcatus</i>	Bush Karoo rat	Mar 84–Dec 85	39	1	0	0	0	2,6
<i>Pedetes capensis</i>	Springhaas	Feb 83–Dec 85	17	0	0	0	0	0,0
<i>Pronolagus rupestris</i>	Red rock rabbit	Nov 82–Dec 85	28	105	585	0	0	71,4
<i>Lepus saxatilis</i>	Scrub hare	Feb 83–Dec 85	26	8	27	0	0	42,3
<i>Procavia capensis</i>	Rock dassie	May 83–Dec 85	25	0	0	0	0	0,0
<i>Felis caracal*</i>	Caracal	May 84–Mar 85	18	94	6	72	110	83,3
<i>Felis caracal**</i>	Caracal	Apr–Jul 84	9	0	0	125	170	100,0
<i>Redunca fulvorufula</i>	Mountain reedbeek	Nov 83–Dec 85	18	16	0	20	29	38,9
<i>Antidorcas marsupialis</i>	Springbok	Nov 83–Dec 85	18	4	2	0	0	16,7
<i>Connochaetes gnou</i>	Black wildebeest	Feb 83–Dec 85	11	2	0	0	2	18,2
<i>Taurotragus oryx</i>	Eland	May 83–Dec 85	11	0	0	34	81	63,6
<i>Equus zebra zebra</i>	Cape mountain zebra	Feb 83–Oct 85	15	32	0	0	0	6,7
Graaf-Reinet District								
<i>Felis caracal</i>	Caracal	May–Sep 84	10	46	14	60	83	100,0

* Mountain Zebra National Park and its vicinity

** Chemically immobilized, live caracal from the park and its vicinity; some of these animals were examined on more than one occasion

TABLE 2 The monthly mean numbers of *Ixodes rubicundus* collected from mammals in the Mountain Zebra National Park

Months	Mean number of ticks collected from								
	Red rock rabbits		Scrub hares		Caracal*			Mountain reedbeek	Eland
	Larvae	Nymphae	Larvae	Nymphae	Larvae	Nymphae	Adults	Adults	Adults
January	—**	—	—	—	—	—	—	—	—
February	0	0	0	0	—	—	—	0	0
March	0	0	1,0	0,5	4,0	0	0	1,0	0
April	—	—	—	—	—	—	—	—	—
May	16,5	0,3	0	0	9,6	0	14,3	4,5	30,5
June	8,5	0	0	0	0	0	8,0	10,0	15,0
July	—	—	—	—	5,8	1,0	13,3	—	—
August	4,8	8,5	1,5	0,3	0	0	6,0	8,0	13,0
September	1,5	3,0	0	5,5	0	1,0	3,0	1,0	21,0
October	0	255,5	0	5,5	0	1,0	0	—	—
November	0	4,3	0	0,8	—	—	—	0	1,7
December	0	3,5	0	0	—	—	—	0	0

* Caracal killed in the park and its vicinity

** No animals examined during the period indicated

Although only small numbers of larvae were recovered, these were generally present from March–August or September. The greatest number of nymphae were recovered from August–October and adults from May–September.

DISCUSSION

It is essential that regular examinations of hosts, over a period of a year or more, be carried out whenever ticks with a seasonally restricted abundance are present. *I. rubicundus* is such a tick, and if animals were examined only from December–March, few if any ticks of this species would be recovered. Conversely, with the exception of the 1 animal killed during March, all the caracal in the present study were examined during the months of maximum tick abundance. This would to some extent account for the high incidence of infestation recorded on this host. Stampa (1959) examined only 3 of these animals and recovered some adult *I. rubicundus*. He concluded that the caracal and other carnivora served only as incidental hosts of the adults, the preferred hosts being sheep and certain wild artiodactylids. Our results indicate that the caracal is a preferred wild host of the adults and is also a moderately good host of the immature stages. In the case of *Ixodes pilosus*, a tick inhabiting the coastal regions of the Cape Province, the caracal is a

preferred host of the immature stages and a moderately good host of the adults (Horak, unpublished data, 1986).

The absence of adult ticks on springbok and the small numbers on the black wildebeest (*Connochaetes gnou*) do not necessarily mean that these animals are poor hosts of *I. rubicundus*. Both these antelope inhabit the grassy plateau in the park, whereas the ticks prefer hilly slopes (Theiler, 1950; Stampa, 1959; Howell *et al.*, 1978), hence the habitats of the 2 do not overlap. Horak, Meltzer & De Vos (1982) and Horak, De Vos & Brown (1983) have found, however, that both springbok and wildebeest normally harbour only small numbers of ticks of any species.

Our findings support those of Stampa (1959) that the red rock rabbit is a preferred host of the immature stages of *I. rubicundus*. However, the small numbers of larvae recovered from the rabbits and other animals, compared with the numbers of nymphae and adults collected, indicate that some animal other than those examined is the preferred host of larvae. Unfortunately, we did not examine elephant shrews which, according to Stampa (1959), are also preferred hosts of the immature stages. Despite the small numbers of larvae recovered, several host species were infested with this developmental stage (Table 1).

Stampa (1959) states that the free-living immature stages are exclusively nocturnal in their activity. This may be one of several reasons for the difference in the tick burdens of rock dassies (*Procapra capensis*) and red rock rabbits. The habitats of these animals overlap in the Mountain Zebra Park (Fourie, 1983), but the rabbits are nocturnal and the dassies are diurnal in their habits (Smithers, 1983). None of the dassies were infested, while 71,4 % of the rock rabbits were (Table 1).

The seasonal abundance of the various developmental stages observed in the present survey is remarkably similar to that recorded by Stampa (1959). He recovered peak numbers of larvae (collected from the pasture by dragging) from March–August, nymphae on red rock rabbits from June–November and adults on sheep from March–August.

The life cycle of *I. rubicundus*, which is a 3-host tick, takes 2 years to complete (Howell *et al.*, 1978). Larvae are present on hosts during autumn and nymphae during spring of the first year. Engorged nymphae over-summer off the host under protective vegetation and moult during late summer and autumn to adults. These are found on hosts from autumn to spring of the 2nd year. Engorged females or eggs then over-summer under protective vegetation and restart the life cycle the following autumn. Our observations support a 2-year life cycle. Larvae are present too early in late summer and autumn for them to have hatched from eggs laid by females present at the same time. Nymphae, in turn, are present too late in spring and early summer for them to moult to adults during the same calendar year. The absence of all parasitic stages of development of *I. rubicundus* during the summer months indicates that over-summering takes place off the host as engorged females or eggs during 1 year of the life cycle, and as engorged nymphae during the 2nd year. The extended time this tick requires to complete its life cycle under laboratory conditions (Neitz *et al.*, 1971), also supports the observations on the length of the life cycle in the field.

Caracal are infested with large numbers of adult *I. rubicundus* without, to our knowledge, developing symptoms of paralysis. The many adults recovered from the chemically immobilized, healthy animals, some of which were caught on more than 1 occasion and harboured large numbers of adults each time, support this view. Sheep, goats, cattle and certain antelope species, however, may become paralysed if infested (Stampa, 1959; Howell *et al.*, 1978).

A detailed study of the host relationships and seasonal abundance of *Ixodes holocyclus* has been conducted by Doube (1974) in south-eastern Queensland, Australia. He found that in that region the long-tailed, short-nosed bandicoot (*Isodon macrourus*) was the preferred host of all stages of development of the tick, although mountain possums (*Trichosurus caninus*) and tree rats (*Melomys cervinipes*), trapped during autumn, also harboured moderate numbers of immatures. Larvae were most abundant from summer to autumn, nymphae from autumn to winter and females in spring and early summer. The life cycle was completed in 1 year. Although bandicoots may suffer from paralysis induced by *I. holocyclus* (Oxer & Ricardo, 1942), it is usually dogs and other domestic animals that are affected (Doube & Kemp, 1975; Stone, Neish & Wright, 1983). These observations are not unlike those recorded for *I. rubicundus* and the caracal.

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