

PARASITES OF DOMESTIC AND WILD ANIMALS IN SOUTH AFRICA. XIX. IXODID TICKS AND FLEAS ON ROCK DASSIES (*PROCAVIA CAPENSIS*) IN THE MOUNTAIN-ZEBRA NATIONAL PARK

I. G. HORAK⁽¹⁾ and L. J. FOURIE⁽²⁾

ABSTRACT

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Five or 6 rock dassies (*Procavia capensis*) were shot at monthly intervals for 13 consecutive months in the Mountain Zebra National Park and processed for arthropod parasite recovery. Ten species of ixodid ticks and 2 flea species were recovered. The seasonal prevalence of the rock dassie ticks, *Haemaphysalis hyracophila* and *Rhipicephalus distinctus*, and of the immature stages of *Rhipicephalus arnoldi*, a tick that usually infests the red rock rabbit (*Pronolagus rupestris*), was determined. Only 10 of the approximately 10 000 ticks recovered from the rock dassies belonged to species that may infest domestic livestock.

INTRODUCTION

Numerous studies on various aspects of the biology of rock dassies (*Procavia capensis*) have been conducted in several regions of South Africa [for review see Fourie (1983)]. Not surprisingly therefore, many of the arthropod parasites infesting these animals have been collected and described. Ledger (1980) lists the lice species and Haeselbarth, Segerman & Zumpt (1966) list the flea species that have been recovered from rock dassies. Descriptions of fleas belonging to the genus *Procytopsylla*, which are commonly found on dassies, are given by De Meillon, Davis & Hardy (1961) and Haeselbarth (1965). Theiler (1962) lists the ticks recovered from rock dassies in the Ethiopian Region, and Theiler (1947), Hoogstraal, Walker & Neitz (1971) and Hoogstraal & Wassef (1981) have described 3 species which prefer dassies as hosts. None of these publications, however, indicates the level of infestation or the seasonal prevalence of the various parasites.

During a research project on the population dynamics of the rock dassie in the Mountain Zebra National Park, a study of limiting factors, of which parasitism appeared to be one, was made by Fourie (1983). This afforded the opportunity to collect, count, identify and determine the seasonal prevalence of the various parasites infesting rock dassies. In this paper the ixodid tick and the flea burdens of the dassies are described. The lice and helminth burdens will be described in separate papers.

MATERIALS AND METHODS

Study area

The survey was conducted in the Mountain Zebra National Park (32° 15' S, 25° 41' E; Alt. 1200–1957 m) which comprises an area 6 536 ha in extent and is situated 24 km south-west of Cradock in the eastern Cape Province. The physiography and climate of this park have been described by Fourie (1983).

De Graaff & Nel (1970) and Nel & Pretorius (1971) have listed 33 small mammal species occurring in the park. The number of rock dassies is estimated to be in the region of 12 700 animals, and the numbers of large animals counted in February 1983 during a National Parks Board ground count census are summarized in Table 1.

TABLE 1 The number of large mammals counted in February 1983 during a census conducted in the Mountain Zebra National Park

Animal species	Number present
Mountain reedbeek (<i>Redunca fulvorufula</i>)	500–600
Springbok (<i>Antidorcas marsupialis</i>)	400–450
Blesbok (<i>Damaliscus dorcas phillipsi</i>)	80–90
Black wildebeest (<i>Connochaetes gnou</i>)	155–165
Eland (<i>Taurotragus oryx</i>)	140–150
Red hartebeest (<i>Alcelaphus buselaphus caama</i>)	60–70
Grey duiker (<i>Sylvicapra grimmia</i>)	30–40
Steenbok (<i>Raphicerus campestris</i>)	30–40
Klipspringer (<i>Oreotragus oreotragus</i>)	15–20
Kudu (<i>Tragelaphus strepsiceros</i>)	25–30
Cape mountain zebra (<i>Equus zebra zebra</i>)	210
Ostrich (<i>Struthio camelus</i>)	49

Sampling procedure

With the exception of March 1981, when only 5 dassies were shot, 6 rock dassies were shot in the park at approximately monthly intervals for a period of 13 consecutive months (March 1980–March 1981). An attempt was made to shoot 3 juveniles and 3 adults (including sub-adults) on each occasion. Immediately after the dassies had been shot, their ages and sexes were recorded and the animals were placed separately in undamaged plastic bags.

Necropsy procedure

After the plastic bags were transferred to the laboratory acaricide* sufficient to thoroughly wet the dassies was poured into each bag. The dassies were left in the bags for approximately 1 h, after which they were removed and the excess insecticide running from them was drained back into the bags. The contents of each plastic bag were poured separately through a sieve with 150 µm apertures, and the bags were rinsed with water which was also poured through the sieve to ensure that all parasites were collected. The dassies were individually placed in a large plastic tray and skinned. Using a brush with steel bristles approximately 3 cm in length, the skins were scrubbed in the plastic tray and were then thoroughly washed in a bucket of tap water. This water, together with the contents of the plastic tray, were poured through the sieve. Scrubbing, washing and sieving were repeated 3 times, and after a careful examination for parasites, particular attention being paid to the

⁽¹⁾ Tick Research Unit, Rhodes University, Grahamstown 6140

⁽²⁾ Department of Zoology and Entomology, University of the Orange Free State, Bloemfontein 9300

* Dazzel: Agricura

TABLE 2 The ixodid ticks and the fleas recovered from 77 rock dassies in the Mountain Zebra National Park

Arthropod species	Total numbers of arthropods recovered					Percentage of dassies infested	
	Larvae	Nymphae	Adults		Total		Relative abundance %
			Males	Females			
<i>Amblyomma marmoreum</i>	105	2	0	0	107	1,03	22,1
<i>Haemaphysalis</i> sp.	63	8	—	—	71	0,69	16,9
<i>Haemaphysalis hyracophila</i>	—	—	20	9	29	0,28	24,7
<i>Hyalomma truncatum</i>	0	0	0	1	1	0,01	1,3
<i>Ixodes</i> sp.	1	0	0	0	1	0,01	1,3
<i>Margaropus winthemi</i>	2	0	0	0	2	0,02	2,6
<i>Rhipicephalus arnoldi</i>	632	227	0	0	859	8,29	74,0
<i>Rhipicephalus</i> sp. (near <i>R. capensis</i>)	0	0	0	1	1	0,01	1,3
<i>Rhipicephalus distinctus</i>	7302	1112	629	238	9281	89,60	100,0
<i>Rhipicephalus evertsi evertsi</i>	3	0	0	0	3	0,03	2,6
<i>Rhipicephalus glabroscutatum</i>	3	0	0	0	3	0,03	2,6
Total	8111	1349	649	249	10358	100,00	
Fleas			Adults		Total	Relative abundance %	
			Males	Females			
<i>Echidnophaga gallinacea</i>			1	0	1	0,05	1,3
<i>Procaviopsylla crusae</i>			980	1217	2197	99,95	98,7
Total			981	1217	2198	100,00	

ears and other regions inaccessible to the brush, the skins were discarded. The contents of the sieve were transferred to individually-labelled bottles and preserved with 10% formalin.

Counting procedure

All the material collected from each animal was examined under a stereoscopic microscope, and all the arthropod parasites were counted and collected. The ixodid ticks were identified under the stereoscopic microscope, use being made of laboratory-reared specimens of the immature stages of *Rhipicephalus arnoldi* and *Rhipicephalus distinctus* to assist with the identification. The fleas were also identified under the stereoscopic microscope, but only after their identity had been determined from cleared mounted specimens examined under a compound microscope.

Climate

Rainfall was recorded at 2 localities in the park and their mean rainfall calculated, while daily minimum and maximum atmospheric temperatures were recorded at Cradock approximately 24 km away.

RESULTS

During the scrubbing process it was noticed that engorged female ticks were prevalent around wounds, the lips and the anogenital region.

The total numbers and relative abundance of ixodid ticks and of fleas recovered from the 77 dassies examined are summarized in Table 2.

If one assumes that the immature *Haemaphysalis* sp. found are immature *Haemaphysalis hyracophila*, then 10 ixodid tick species were recovered. *R. distinctus* was the most abundant and most prevalent tick. Although fairly large numbers of immature *R. arnoldi* were recovered, no adults were found. The greatest total number of ticks present on a single dassie was 1103 on an adult female shot during March 1981.

Two flea species, of which *Procaviopsylla crusae* was the most abundant and most prevalent, were recovered.

A square root transformation of the total numbers of ticks recovered each month was used, and the seasonal abundance of *H. hyracophila*, *R. arnoldi* and *R. distinctus* is graphically illustrated in Fig. 1-3.

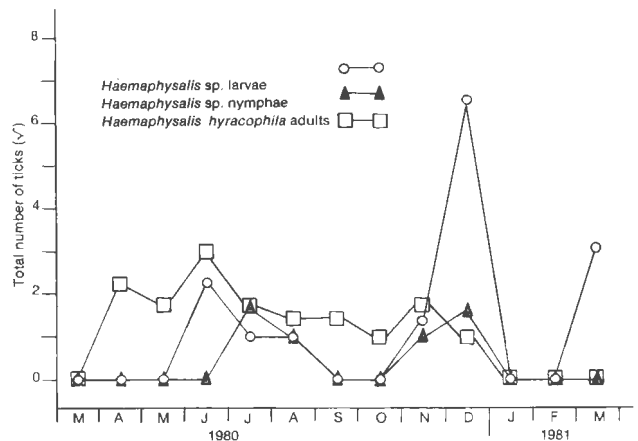


FIG. 1 The seasonal abundance of immature *Haemaphysalis* sp. and adult *Haemaphysalis hyracophila* on rock dassies in the Mountain Zebra National Park

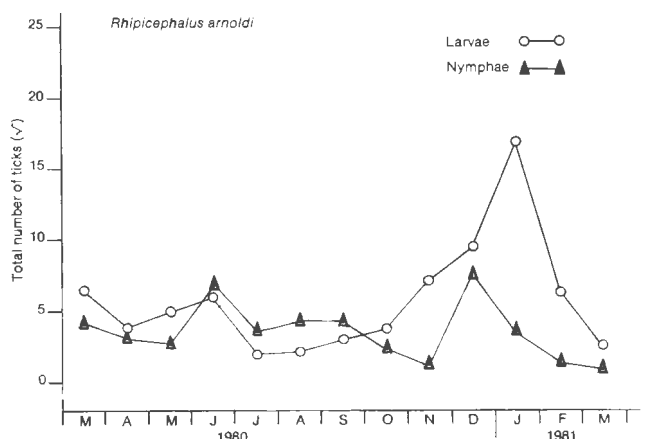


FIG. 2 The seasonal abundance of immature *Rhipicephalus arnoldi* on rock dassies in the Mountain Zebra National Park

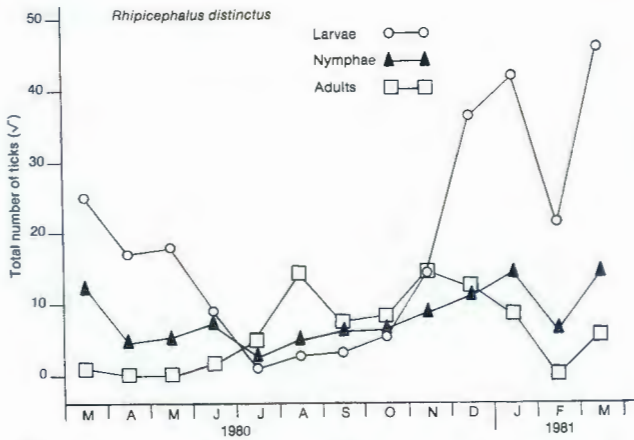


FIG. 3 The seasonal abundance of *Rhipicephalus distinctus* on rock dassies in the Mountain Zebra National Park

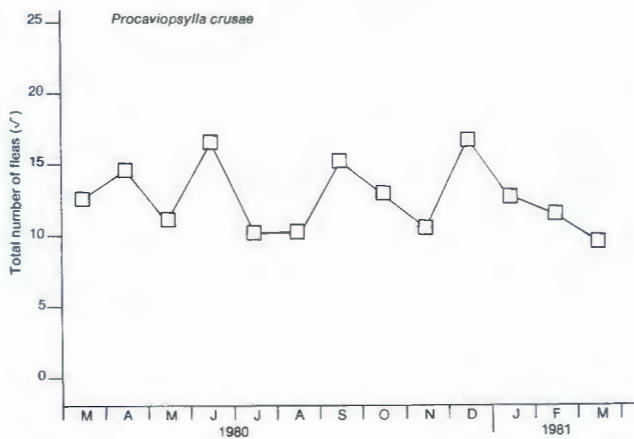


FIG. 4 The seasonal abundance of *Procaviopsylla crusae* on rock dassies in the Mountain Zebra National Park

Few immature *Haemaphysalis* sp. (presumably *H. hyracophila*) were recovered, and these at erratic intervals, while adult *H. hyracophila*, although present only in small numbers, were consistently recovered from April–December 1980.

Larvae of *R. arnoldi* were present throughout the survey period and reached a peak during December 1980 and January 1981. Nymphae were also consistently present, peak numbers of which were recovered during June and December 1980.

Peak burdens of *R. distinctus* larvae were present from March–May 1980 and from December 1980–March 1981. Peak numbers of nymphae were present during March 1980 and during January and March 1981. Adults were present in the largest numbers from August 1980–January 1981.

The seasonal prevalence of the flea, *Procaviopsylla crusae*, determined by a square root transformation of the total number recovered, is graphically illustrated in Fig. 4.

Fleas were present throughout the survey period, with peaks occurring at 2–3 monthly intervals during April, June, September and December 1980.

The total monthly rainfall in the park and monthly mean minimum and maximum atmospheric temperatures at Cradock are graphically illustrated in Fig. 5.

The highest rainfall was measured in February 1981, while the highest temperatures were recorded during March and December 1980 and January and February 1981.

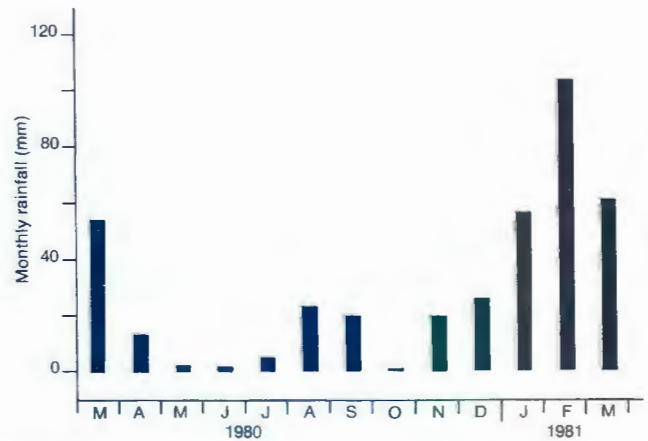
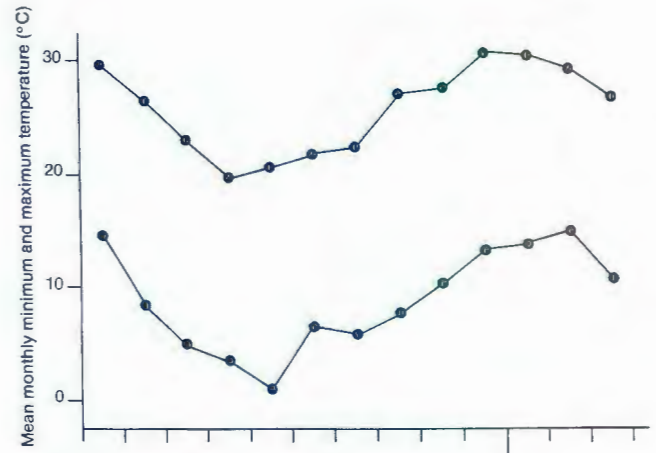


FIG. 5 Total monthly rainfall measured in the Mountain Zebra National Park and mean atmospheric temperatures recorded at Cradock 24 km to the north-east.

DISCUSSION

Although 10 tick species were recovered from the dassies, only *H. hyracophila* and *R. distinctus* appear to be true dassie ticks. This is so because small numbers of adults and probably also immatures of the former and large numbers of both adults and immatures of the latter were recovered from a high percentage of dassies. All the other ticks recovered can be regarded as accidental infestations that actually prefer other hosts.

Amblyomma marmoreum

The immature stages of this tick, commonly known as the South African tortoise tick, have a wide range of hosts (Theiler, 1962; Norval, 1975). As tortoises are the preferred hosts of adult *A. marmoreum* and they abound in the park, it is not surprising that a fairly high percentage of dassies is infested.

H. hyracophila

The total number of immature *Haemaphysalis* sp. recovered was small when compared with the total number of adult *H. hyracophila*. This indicates that, if these are immature *H. hyracophila*, either the recovery technique used is not adequate or that other animals within the park also serve as hosts of the immature stages. The prolonged period during which adults were present, 9 months in all, suggests that several separate cohorts of larvae and nymphae, also present over a prolonged period, were responsible for the sustained adult presence. The very small total numbers of immatures and adults recovered, however, preclude an accurate determination of seasonal prevalence.

R. arnoldi

Although large numbers of immature *R. arnoldi* were recovered from many dassies, this is not a true dassie tick, as no adults were recovered. In the park the preferred hosts of the adults are red rock rabbits (*Pronolagus rupestris*) (Horak, Fourie & Novellie, unpublished data, 1984)

R. distinctus

The total number of *R. distinctus* larvae recovered appear to be adequate to yield the number of nymphae found, but the latter would be insufficient to produce the numbers of adults present. Either the collection technique could be at fault or an alternative host for the immature stages could be involved. Horak, Fourie & Novellie (unpublished data, 1984) have found that red rock rabbits, which are frequently present in the same habitat in the park as dassies, often harbour fairly large numbers of immature *R. distinctus*, but no adults. This source would serve to augment the numbers of nymphae of this tick.

The life cycle and seasonal prevalence of *R. distinctus* are not clear from the available data, and we suggest the following as a likely possibility. The prolonged period of peak adult activity from August–January would account for the prolonged maximum availability of larvae from November–May. The larvae which engorge and detach during the warm summer months of November–February or March could presumably rapidly moult to nymphae, while those that detach in the cooler autumn to early winter months of April–June might give rise to nymphae only some months later. The nymphae that engorge during summer would be responsible for the rise in adult numbers from winter to spring (August–October), and those that engorge during autumn to spring (April–October) would give rise to adults during summer (November–January). Thus, only 1 life cycle per year seems likely.

Other ticks

Adult *Hyalomma truncatum*, of which only 1 was recovered from the dassies, is a parasite of large herbivores, such as Cape mountain zebra (*Equus zebra zebra*) and eland (*Taurotragus oryx*). The immature stages of this tick, none of which were recovered from the dassies, prefer scrub hares (*Lepus saxatilis*) as hosts (Horak, Fourie & Novellie, unpublished data, 1984). The immature and adult stages of *Margaropus winthemi* and *Rhipicephalus evertsi evertsi* prefer the Cape mountain zebra, and those of *Rhipicephalus glabroscutatum* the mountain reedbuck (*Redunca fulvorufula*) and the eland (Horak, Fourie & Novellie, unpublished data, 1984). The Cape mountain zebra and eland are the preferred hosts of adult *Rhipicephalus* sp. (near *R. capensis*) of which the dassies harboured only 1 female. Despite the recovery of fairly large numbers of larvae of this tick from various species of rats and mice in the park (Horak, Fourie & Novellie, unpublished data, 1984), the dassies harboured none.

Those tick species, which occur on the large herbivores in the Mountain Zebra National Park and which also frequently infest domestic livestock, are *Hyalomma marginatum turanicum*, *H. truncatum*, *Ixodes rubicundus*, *M. winthemi*, *Rhipicephalus* sp. (near *R. capensis*), *R. evertsi evertsi* and *R. glabroscutatum* (Horak, Fourie & Novellie, unpublished data, 1984). The absence, or virtual absence, of all stages of development of these ticks on the comparatively large number of dassies examined during 13 consecutive months is a good indication that the rock dassie in this region of the Karoo poses

no threat to domestic stock because of the tick species that it may harbour.

Fleas

The flea, *P. crusae*, is a common parasite of the rock dassie (Haeselbarth *et al.*, 1966). Nevertheless, fleas of this species may often be found on caracal in those regions where dassies constitute the major food source of this animal (Horak, Moolman & Fourie, unpublished data, 1984). In fact, the caracal is the type host of this flea (Haeselbarth *et al.*, 1966). No clear pattern of seasonal prevalence could be determined on the dassies. The single *Echidnophaga gallinacea* recovered from a dassie is an accidental infestation, the normal host probably being one of the larger ground-frequenting birds in the park.

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