



Parasites of domestic and wild animals in South Africa. XXXV. Ixodid ticks and bot fly larvae in the Bontebok National Park

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ABSTRACT

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Ixodid ticks were collected during February of each year from 1983–1992 from bontebok and grey rhebok in the Bontebok National Park, Western Cape Province. When available other mammals as well as ground-nesting birds and leopard tortoises were examined. Eleven tick species were recovered. *Rhipicephalus nitens* followed by *Rhipicephalus glabroscutatum* and an *Ixodes* sp. (near *I. pilosus*) were the most abundant, while *Amblyomma marmoreum* infested the widest host range.

The larvae of three bot flies were also collected. *Gedoelstia* sp. and *Strobiloestrus* sp. larvae were recovered from bontebok and grey rhebok and larvae of *Oestrus ovis* only from grey rhebok.

Keywords: Birds, bontebok, Bontebok National Park, bot fly larvae, grey rhebok, hares, ixodid ticks, rodents, tortoises

INTRODUCTION

A bi-monthly study, lasting 13 months, of some of the arthropods infesting animals in the Bontebok National Park, Western Cape Province, South Africa, has already been conducted (Horak, Sheppey, Knight & Beuthin 1986b). That survey was carried out to ascertain not only the arthropod species, particularly ixodid ticks and bot fly larvae, parasitizing animals in the Park but also their seasonal abundances. The present study extended the scope of the previous one by including ground-nesting birds and tortoises. It also looked at possible changes that might have occurred in tick burdens of bontebok and grey rhebok over a period of 10 years. The latter aspect has been addressed in a separate publication (Horak, Fourie & Boomker 1997).

MATERIALS AND METHODS

Study locality

The study was conducted on animals resident in the Bontebok National Park (34°02'S, 20°25'E). The physiography of this park has previously been described by Boomker, Horak & De Vos (1981).

Survey period

Animals were examined during February of each year over a period of 10 years from 1983–1992. The animals examined during February 1983 and 1984 in the earlier study conducted by Horak *et al.* (1986b) have been included in this survey as being the first 2 years of the 10-year period.

Survey animals

The mammal, bird and tortoise species and the numbers of each examined are summarized in Table 1.

The species examined comprised two ruminants, two rodents, a hare, three ground-nesting birds and the leopard tortoise. The larger mammals and birds were

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TABLE 1 Mammals, birds and reptiles examined for ixodid ticks in the Bontebok National Park

Common name	Specific name	No. examined
Mammals		
Bontebok	<i>Damaliscus pygargus dorcas</i>	34
Grey rhebok	<i>Pelea capreolus</i>	37
Cape gerbil	<i>Tatera afra</i>	1
Four-striped grass mouse	<i>Rhabdomys pumilio</i>	25
Scrub hare	<i>Lepus saxatilis</i>	11
Birds		
Cape francolin	<i>Francolinus capensis</i>	7
Greywing francolin	<i>Francolinus africanus</i>	7
Helmeted guineafowl	<i>Numida meleagris</i>	4
Reptiles		
Leopard tortoise	<i>Geochelone pardalis</i>	9

shot while the rodents were either shot or were trapped and then killed. The tortoises were examined alive.

Parasite recovery

The ticks on the antelopes were collected, identified and counted as described by Horak, Boomker, Spickett & De Vos (1992); those on the rodents and hares as described by Horak *et al.* (1986b); and those on the birds as described by Horak & Williams (1986). All ticks visible on the tortoises were removed with the aid of forceps and placed in 70% ethyl alcohol for later identification and counting. The length of the idiosoma of all engorging female ticks was measured to ascertain how many would have been likely to detach within the next 24 h.

Bot fly larvae were collected from the nasal passages and paranasal sinuses, the eyes, heart and the skin and subcutaneous tissue as described by Malan, Reinecke & Scialdo (1981), Horak, Brown, Boomker, De Vos & Van Zyl (1982) and Horak *et al.* (1986b).

RESULTS AND DISCUSSION

Ixodid ticks

Eleven species of ticks were recovered. Large numbers of four of them were collected and are listed in Table 2. The ticks collected in relatively small numbers or only from a few host species are listed in Table 3.

Amblyomma marmoreum

This tick was present on seven of the nine host species examined. The leopard tortoises were infested with all stages of development and the other animals mainly with larvae. Tortoises are the preferred hosts of the adults (Norval 1975). The immature stages, and particularly the larvae, will infest a large variety of

reptiles, mammals and birds (Norval 1975; Horak, MacIvor, Petney & De Vos 1987a). As in the case of *Amblyomma hebraeum* the immature stages do not favour the four-striped grass mouse (Howell, Petney & Horak 1989), or probably any other rodent species, as hosts.

Boophilus sp.

Although no specific identification of the larvae recovered could be made both *Boophilus decoloratus* and *Boophilus microplus* have been collected from a grey rhebok just outside the park (Horak *et al.* 1986b). Infestations of these ticks are maintained by domestic cattle on the farms adjoining the park.

Haemaphysalis aciculifer

Both immature and adult stages were collected. Although this tick is widely distributed, particularly in the eastern regions of South Africa, where its presence is associated with bush and scrub, it is never encountered in large numbers (Walker 1991). The preferred hosts of the adults are various small and large wild bovids while the immatures feed on rodents and hares as well as on other small mammals and carnivores (Hoogstraal & El Kammah 1972; Walker 1991). Cape francolin also appear to be good hosts of the immature stages as nearly all were infested in the present study.

Haemaphysalis leachi

Adult ticks prefer domestic dogs and the larger wild carnivores while the immature stages can be found on these animals, hares and rodents (Norval 1984; Horak, Jacot Guillarmod, Moolman & De Vos 1987b; Fourie, Horak & Van den Heever 1992; Horak, Spickett, Braack & Penzhorn 1993). The source of infestation in the Bontebok Park is probably caracal (*Caracal caracal*) and feral domestic cats as well as domestic dogs which occasionally gain entrance.

TABLE 2 Host records of the more abundant ixodid tick species in the Bontebok National Park

Tick and host species	No. of hosts examined	No. infested	Total numbers of ticks collected				
			Larvae	Nymphs	Males	Females	Total
<i>Amblyomma marmoreum</i>							
Bontebok	34	11	70	0	0	0	70
Grey rhebok	37	11	96	0	0	0	96
Scrub hare	11	3	12	2	0	0	14
Cape francolin	7	3	15	1	0	0	16
Greywing francolin	7	4	129	0	0	0	129
Helmeted guineafowl	4	2	9	1	0	0	10
Leopard tortoise	9	7	7	5	77	19	108
<i>Ixodes</i> sp. (near <i>I. pilosus</i>)							
Bontebok	34	16	92	21	2	6	121
Grey rhebok	37	28	888	90	18	83 (11)	1 079
Four-striped grass mouse	25	2	1	1	0	0	2
Scrub hare	11	6	24	3	1	8	36
<i>Rhipicephalus glabroscutatum</i>							
Bontebok	34	29	2 408	358	20	27 (5)	2 813
Grey rhebok	37	27	828	80	26	15	949
Scrub hare	11	4	6	2	0	0	8
<i>Rhipicephalus nitens</i>							
Bontebok	34	34	9 110	122	407	469 (34)	10 108
Grey rhebok	37	35	3 306	29	250	357 (73)	3 942
Scrub hare	11	11	292	176	69	54 (14)	591
Helmeted guineafowl	4	1	1	0	0	0	1

() = number of engorging female ticks that could detach within the next 24 h

Hyalomma truncatum

All stages of development were recovered. Adult ticks prefer large herbivores (Norval 1982; Horak, Fourie, Novellie & Williams 1991b) and in the Bontebok Park the adults may be maintained by the Cape mountain zebras (*Equus zebra zebra*) introduced in 1988 and red hartebeest (*Alcelaphus buselaphus caama*). Leopard tortoises, which abound in the park, probably also harbour some adult ticks (Hoogstraal 1956; Table 3). Scrub hares and various rodents are the preferred hosts of the immature stages (Rechav, Zeederberg & Zeller 1987; Horak *et al.* 1991b, 1993). The Western Cape Province south of the Langeberg mountain range does not appear to be a particularly good habitat for this tick, hence the relatively small numbers collected.

Ixodes sp. (near *I. pilosus*)

This tick has been described by McKay (1994) as the "hairless palp" species within the *I. pilosus* group whose distribution is restricted to the coastal forests and coastal fynbos of the eastern and southern Cape. Grey rhebok appear to be its preferred host. This assumption, however, may be partially related to the habitat preferences of both the antelope and the tick. The grey rhebok frequent the gravel terraces

and low hills within the park and the tick probably also prefers this habitat. *Ixodes rubicundus*, which is present in the Karoo less than 100 km to the north of the park, is more abundant on hill and mountain slopes than on open plains (Stampa 1959). All stages of development of the *Ixodes* sp. (near *I. pilosus*) were collected also from bontebok and from scrub hares. Females considerably outnumbered males on all hosts infested with adult ticks. As with other species in this genus copulation probably takes place off the host thus accounting for the small number of parasitic males collected (Fourie & Horak 1994).

Rhipicephalus evertsi evertsi

Both the immature and adult stages of development of this two-host tick prefer zebras as hosts (Hoogstraal 1956; Norval 1981; Horak *et al.* 1991b). The population in the park is probably now sustained by the mountain zebras, while the antelope and scrub hares serve as additional hosts for the immature stages.

Rhipicephalus gertrudae

Adults have previously been collected from bontebok and grey rhebok in the park (Horak *et al.* 1986b). The mountain zebras now in the park are also good hosts of the adults (Walker 1991). The latter author suggested

TABLE 3 Host records of the less abundant ixodid tick species in the Bontebok National Park

Tick and host species	No. of hosts examined	No. infested	Total numbers of ticks collected				
			Larvae	Nymphs	Males	Females	Total
<i>Boophilus</i> sp.							
Bontebok	34	1	4	0	0	0	4
Scrub hare	11	2	9	0	0	0	9
<i>Haemaphysalis aciculifer</i>							
Bontebok	34	2	4	0	0	2	6
Grey rhebok	37	2	0	0	0	3 (3)	3
Four-striped grass mouse	25	7	6	5	0	0	11
Cape francolin	7	6	11	7	0	0	18
<i>Haemaphysalis leachi</i>							
Four-striped grass mouse	25	4	83	2	0	0	85
Scrub hare	11	1	7	1	0	0	8
<i>Hyalomma truncatum</i>							
Bontebok	34	1	0	2	0	0	2
Cape gerbil	1	1	1	2	0	0	3
Four-striped grass mouse	25	2	0	4	0	0	4
Scrub hare	11	5	84	23	0	0	107
Leopard tortoise	9	2	0	0	0	2	2
<i>Rhipicephalus evertsi evertsi</i>							
Bontebok	34	5	8	28	0	0	36
Grey rhebok	37	4	11	24	2	1	38
Scrub hare	11	3	7	19	0	0	26
<i>Rhipicephalus gertrudae</i>							
Four-striped grass mouse	25	17	45	28	0	0	73
Scrub hare	11	1	0	3	0	0	3
Cape francolin	7	1	1	0	0	0	1
Helmeted guineafowl	4	1	1	0	0	0	1
<i>Rhipicephalus lounsburyi</i>							
Four-striped grass mouse	25	1	0	1	0	0	1

() = number of engorging female ticks that could detach within the next 24 h

that when the hosts of the immature stages were discovered they were likely to be small mammals, probably rodents. This supposition has been confirmed with the collection of larvae and nymphs from Namaqua rock mice (*Aethomys namaquensis*) in the Free State (Fourie *et al.* 1992), and from four-striped grass mice in the present study. The single larva collected in each case from a francolin and from a guineafowl must be regarded as accidental infestations.

Rhipicephalus glabroscutatum

All stages of development were present on the bontebok and grey rhebok. Both adult and immature ticks attach to the lower legs and around the hooves of wild and domestic ruminants and equids (Horak & Knight 1986; Horak, Knight & De Vos 1986a; Horak *et al.*

1991b). Although few ticks were found on scrub hares in the present study, they can be good hosts of the immature stages (Horak & Fourie 1991; Horak *et al.* 1991b).

The life cycle of *R. glabroscutatum* takes a year to complete. Adults are most abundant from July or August to January or February (Horak *et al.* 1986b; MacIvor & Horak 1987) and immatures from February or March to August or September (Horak *et al.* 1986b, 1991b; Horak & Fourie 1991). In the present study a considerably larger number of larvae than nymphs of this two-host tick were collected. This reflects the fact that all the animals were examined during February, at the very commencement of immature activity and consequently few larvae had probably as yet moulted to nymphs.

Rhipicephalus lounsburyi

Adults attach around the feet and hooves of several wild ruminants and of sheep (Walker 1990). The collection of a single nymph from a four-striped grass mouse in the present study is the first record of a host for the immature stages. Adults were previously recorded as *Rhipicephalus* sp. from bontebok and grey rhebok in the park (Horak *et al.* 1986b).

Rhipicephalus nitens

The distribution of this tick is associated with Cape shrubland vegetation (fynbos) in a coastal strip from Cape Town to approximately 60 km west of Port Elizabeth (Walker 1991). It is a three-host species and all stages of development were present on bontebok, grey rhebok and scrub hares. The adults are most abundant from November to February, larvae from February to June and nymphs from June to October (Horak *et al.* 1986b; Horak, Williams & Van Schalkwyk 1991a). These authors remarked that female ticks usually outnumbered males late in the season of adult activity. This trend is discernible in the present study.

The biology of *R. nitens* differs from those of *Rhipicephalus appendiculatus* and *Rhipicephalus zambeziensis*, two ticks that are morphologically similar to it and which also occur in South Africa. The adults of *R. nitens* are most abundant during the hot fairly dry summer and the immature stages during the cool wet winter of the Western Cape Province, and all stages of development are found on antelopes as well as on scrub hares (Horak *et al.* 1986b). The other two ticks occur in the North-West, Northern and Mpumalanga Provinces with *R. appendiculatus* also being present in KwaZulu-Natal and the Eastern Cape Province (Howell, Walker & Nevill 1978; Norval, Walker & Colborne 1982). Their adults are most abundant during the hot wet summer and cooler dry

winter months characteristic of their habitats, and all stages of development are found on antelopes, while scrub hares harbour only the immature stages (Horak & Fourie 1991; Horak *et al.* 1992, 1993).

Bot fly larvae

The numbers of bot fly larvae collected from the bontebok and grey rhebok are summarized in Table 4.

Oestrus ovis

The larvae of this fly parasitize domestic sheep and goats and have also been collected from some wild sheep (*Ovis* sp.) and goats (*Capra* sp.) (Zumpt 1965). No wild bovids in Africa south of the Sahara have been found to serve as suitable hosts for the larvae (Zumpt 1965). Although seven grey rhebok in the present study were infested, the fly was apparently unable to complete its life cycle in these animals as all third stage larvae collected were dead. The reason for this failure is possibly twofold. Firstly in sheep and goats the development of second and third stage larvae takes place within the protected environment of the frontal sinuses (Horak 1977). In grey rhebok, which appear to have no frontal sinus cavities, this development has to take place in the more exposed nasal passages. Secondly some of the larvae enter the large maxillary sinuses of the grey rhebok and develop there to mature third stage larvae. These large larvae are, however, unable to leave these sinuses because of the narrowness of the openings and consequently die. The infestation in the park is maintained by sheep on the surrounding farms.

Geddoelstia sp.

No specific identification could be made but the spinulation and the shape of the post-anal bulge of the third stage larvae collected from the bontebok lie

TABLE 4 Host records of oestrid fly larvae collected in the Bontebok National Park

Fly and host species	No. of hosts examined	No. infested	Total numbers of larvae collected			
			1 st stage	2 nd stage	3 rd stage	Total
<i>Oestrus ovis</i>						
Grey rhebok	37	7	2	5	14 (14)	21 (14)
<i>Geddoelstia</i> sp.						
Bontebok	34	34	1 464	765	1 093	3 322
Grey rhebok	37	1	2	0	0	2
<i>Strobiloestrus</i> sp.						
Bontebok	34	4	0	7 (5)	0	7 (5)
Grey rhebok	37	35	0	607	0	607

() = dead larvae included in totals

between those of *Gedoelestia cristata* and *Gedoelestia hässleri*. These larvae may well belong to a hitherto undescribed species of oestrid fly.

All the bontebok were infested. Twenty-two first stage larvae were recovered from the corneas of five animals, 639 first stage larvae from the auricle and the ventricle of the right heart and the commencement of the pulmonary artery of 23 animals, and two from the lungs of a single antelope. A slight corneal opacity was evident on an eye of one animal. The first stage larvae migrate via the eyes, the vascular system, the heart, the lungs and the trachea to reach the paranasal sinus cavities of the bontebok. The fairly large proportion of first stage larvae recovered from the chambers of the right heart implies that they may accumulate here before completing their migration. In blue wildebeest (*Connochaetes taurinus*) first stage *Gedoelestia* spp. larvae appear to accumulate on the dura mater before migrating to the paranasal sinus cavities (Horak, De Vos & Brown 1983).

Basson (1962, 1966) has described the pathology of infestation in natural and abnormal hosts. First stage *Gedoelestia* spp. larvae cause little macroscopically-visible damage to the eyes of their natural hosts, which include the bontebok (Basson, 1966). Hence the virtual absence of lesions in this animal. Grey rhebok are abnormal or accidental hosts of these fly larvae and corneal lesions were present in 11 animals, with both eyes of two rhebok being affected. The lesions varied from slight opacities to purulent conjunctivitis, and in one case enucleation. Two first stage larvae were collected from the cornea of one animal. Basson (1962) also noted that the life cycle cannot progress beyond the first larval stage in abnormal hosts and no second or third stage larvae were collected from the grey rhebok.

Strobiloestrus sp.

The larvae collected from the grey rhebok and from the bontebok are probably those of *Strobiloestrus clarkii* (Zumpt 1965). As no mature third stage larvae were present we were unable to rear flies and confirm this.

All but two of the grey rhebok were infested with second instar larvae, the largest number harboured by a single animal comprising 130 larvae. The life cycle of this fly takes a year to complete, and only second stage larvae are present during February, the month in which all the animals were examined (Horak *et al.* 1986b). Grey rhebok are the normal hosts as virtually all were infested and third stage larvae, which were nearly mature, have previously been collected from these animals (Horak *et al.* 1986b). The small number of bontebok infested and the large proportion of dead larvae collected from them indicate that they are abnormal hosts and the infestations accidental. Accidental infestations have also been

recorded in domestic cattle and in Merino sheep (Horak & Boomker 1981; Brain, Van der Merwe & Horak 1983).

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