

## Ixodid ticks of Angora and Boer goats, grysbok, common duikers, kudus and scrub hares in Valley Bushveld in the Eastern Cape Province, South Africa

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### ABSTRACT

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At monthly intervals from February 1983 to January 1984 two Angora goats, two Boer goats, one grysbok, *Raphicerus melanotis*, one common duiker, *Sylvicapra grimmia*, one greater kudu, *Tragelaphus strepsiceros*, and four scrub hares, *Lepus saxatilis*, were killed on a farm in Valley Bushveld in the Eastern Cape Province, South Africa and examined for ticks. Seven ixodid tick species were collected, of which *Rhipicephalus glabroscutatum* followed by *Amblyomma hebraeum* and *Rhipicephalus oculatus* were the most numerous. *Amblyomma hebraeum* was mainly a parasite of the two goat breeds, with the Angora goats harbouring greater numbers than the Boer goats, while large numbers of *R. glabroscutatum* parasitized the goats and the antelopes. *Rhipicephalus oculatus* was nearly exclusively a parasite of scrub hares.

The larvae of *A. hebraeum* were most numerous on goats from May to July, the nymphs from September to November and the adults from August to December and during February, while the immature stages of *R. glabroscutatum* were most numerous on these animals from April to July and the adults from August to December. Peak activity periods of the latter tick were somewhat longer on kudus than on goats; the immature stages were most numerous from January to August and the adults from July to February. The larvae of *R. oculatus* were most numerous on scrub hares from March to May, nymphs from September to November and adults from October to December.

**Keywords:** Angora goats, Boer goats, common duikers, grysbok, ixodid ticks, kudu, scrub hares, seasonality, Valley Bushveld

### INTRODUCTION

Angora and Boer goats are farmed extensively in the Valley Bushveld regions of the Eastern Cape Province, South Africa, and on many farms they are sympatric with various browsing antelope species,

particularly greater kudu, *Tragelaphus strepsiceros*, and common duikers, *Sylvicapra grimmia*. The Valley Bushveld north of Uitenhage is an important goat farming area and, in addition, kudu and other antelope species are frequently hunted commercially as an extra source of income. A number of studies on the ticks infesting goats and kudus in Valley Bushveld as well as those infesting scrub hares, *Lepus saxatilis*, that are also present on nearly every farm, have already been published (Knight & Rechav 1978; Rechav 1982; Horak & Knight 1986; Horak & MacIvor 1987; MacIvor & Horak 1987; Horak & Fourie 1991; Horak, Knight & Williams 1991b; Horak, Boomker, Spickett & De Vos 1992).

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The present study was undertaken to determine the role that goats and wild animals might play in the maintenance of two tick species that impact negatively on goat farming in the Uitenhage region. These are *Amblyomma hebraeum*, the vector of *Ehrlichia (Cowdria) ruminantium*, the causative organism of heartwater in goats and other domestic and wild ruminants (Oberem & Bezuidenhout 1987), and *Rhipicephalus glabroscutatum*, whose adults are associated with foot abscess in goats (Maclvor & Horak 1987).

## MATERIALS AND METHODS

### Study area

The farm "Brakhill" (33°33'S, 25°25'E; Alt. 200–400 m), 25 km north of Uitenhage in the Eastern Cape Province, comprises approximately 4 000 ha of hilly country divided into 25 large and 45 small stock camps. Although it lies on the coastal plateau, it only receives approximately 300 mm of rain annually. The vegetation on the farm is typical Fish River scrub, which is considered by Acocks (1988) to be a subsection of Valley Bushveld, and has been described in detail in the publication by Boomker, Horak & Maclvor (1989) on the helminths infecting goats and antelopes on the farm.

A large camp, 355 ha in extent, was selected as the study site because of a reported annual mortality of 15%, presumably due to heartwater, in goats kept in this camp. Approximately 2 000 Angora goats and 600 Boer goats were kept in camps on the farm, and numerous wild antelopes, that were not restricted by the internal fencing, inhabited the whole farm.

### Survey animals

At monthly intervals from February 1983 to January 1984, two 2–3-year-old Angora goats and two sim-

ilarly aged Boer goats, from a mixed flock of approximately 70 Angora and Boer goats running in the survey camp, were slaughtered. No acaricidal treatment had been applied to animals in the study camp for 2 years prior to the commencement of the survey and none was applied during its conduct. In addition one grysbok, *Raphicerus melanotis*, one common duiker, one kudu and four scrub hares were shot at night, wherever they could be found on the farm, in the same months as the goats were killed.

### Tick recovery

The hides of the goats and antelopes were processed for tick recovery as described for kudus by Horak *et al.* (1992), and the scrub hares were processed as described by Horak, Sheppey, Knight & Beuthin (1986).

## RESULTS AND DISCUSSION

The species and numbers of ticks collected from the Angora and Boer goats are summarized in Tables 1 and 2, and those from the antelopes and scrub hares in Tables 3–6. The seasonal occurrence of *A. hebraeum* and *R. glabroscutatum* on the two goat breeds is graphically illustrated in Fig. 1, and that of the latter tick on kudus and of *Rhipicephalus oculatus* on scrub hares in Fig. 2.

Seven ixodid tick species were collected from the survey animals, and all host species examined were infested with *A. hebraeum*, *Haemaphysalis silacea*, *Rhipicephalus evertsi evertsi*, *R. glabroscutatum* and *R. oculatus*. With the exception of scrub hares, on which it was the second most numerous species, *R. glabroscutatum* was the dominant species on all hosts and a total of 98 386 ticks was recorded. It was followed by *A. hebraeum*, which was the

TABLE 1 Ixodid ticks on 24 Angora goats on the farm "Brakhill", Eastern Cape Province

Tick species	Number collected					Proportional density (%)
	Larvae	Nymphs	Male	Female	Total	
<i>Amblyomma hebraeum</i>	10 059	1 770	295	92	12 216	31.71
<i>Haemaphysalis silacea</i>	150	29	11	2	192	0.50
<i>Hyalomma truncatum</i>	0	0	46	20	66	0.17
<i>Rhipicephalus evertsi evertsi</i>	24	81	8	8	121	0.31
<i>Rhipicephalus glabroscutatum</i>	13 226	11 099	953	635	25 913	67.26
<i>Rhipicephalus oculatus</i>	0	0	1	1	2	0.01
<i>Rhipicephalus simus</i>	0	0	7	7	14	0.04
Total	23 459	12 979	1 321	765	38 524	

TABLE 2 Ixodid ticks on 24 Boer goats on the farm "Brakhill", Eastern Cape Province

Tick species	Number collected					Proportional density (%)
	Larvae	Nymphs	Male	Female	Total	
<i>Amblyomma hebraeum</i>	5573	1348	114	70	7105	26.66
<i>Haemaphysalis silacea</i>	282	53	5	9	349	1.31
<i>Hyalomma truncatum</i>	0	0	6	9	15	0.06
<i>Rhipicephalus evertsi evertsi</i>	8	78	13	5	104	0.39
<i>Rhipicephalus glabroscutatum</i>	11 395	6 230	894	559	19 078	71.57
<i>Rhipicephalus oculatus</i>	0	0	0	1	1	0.004
<i>Rhipicephalus simus</i>	0	0	2	1	3	0.01
Total	17 258	7 709	1 029	649	26 655	

TABLE 3 Ixodid ticks on 12 grysbok on the farm "Brakhill", Eastern Cape Province

Tick species	Number collected					Proportional density (%)
	Larvae	Nymphs	Male	Female	Total	
<i>Amblyomma hebraeum</i>	260	40	0	0	300	3.81
<i>Haemaphysalis silacea</i>	40	32	2	0	74	0.94
<i>Rhipicephalus evertsi evertsi</i>	0	3	1	0	4	0.05
<i>Rhipicephalus glabroscutatum</i>	5 897	1 409	116	55	7 477	94.95
<i>Rhipicephalus oculatus</i>	0	16	3	1	20	0.25
Total	6 197	1 500	122	56	7 875	

TABLE 4 Ixodid ticks on 12 common duikers on the farm "Brakhill", Eastern Cape Province

Tick species	Number collected					Proportional density (%)
	Larvae	Nymphs	Male	Female	Total	
<i>Amblyomma hebraeum</i>	848	47	0	0	895	6.38
<i>Haemaphysalis silacea</i>	196	157	22	6	381	2.72
<i>Hyalomma truncatum</i>	0	0	1	0	1	0.007
<i>Rhipicephalus evertsi evertsi</i>	1	2	0	0	3	0.02
<i>Rhipicephalus glabroscutatum</i>	9 118	3 113	302	209	12 742	90.86
<i>Rhipicephalus oculatus</i>	1	0	1	0	2	0.01
Total	10 164	3 319	326	215	14 024	

TABLE 5 Ixodid ticks on 12 greater kudu on the farm "Brakhill", Eastern Cape Province

Tick species	Number collected					Proportional density (%)
	Larvae	Nymphs	Male	Female	Total	
<i>Amblyomma hebraeum</i>	1 064	29	1	1	1 095	3.11
<i>Haemaphysalis silacea</i>	673	325	403	16	1 417	4.03
<i>Rhipicephalus evertsi evertsi</i>	1	4	0	0	5	0.02
<i>Rhipicephalus glabroscutatum</i>	21 647	8 974	1 365	650	32 636	92.77
<i>Rhipicephalus oculatus</i>	16	0	5	4	25	0.07
Total	23 401	9 332	1 774	671	35 178	

TABLE 6 Ixodid ticks on 48 scrub hares on the farm "Brakhill", Eastern Cape Province

Tick species	Number collected					Proportional density (%)
	Larvae	Nymphs	Male	Female	Total	
<i>Amblyomma hebraeum</i>	125	29	0	0	154	2.48
<i>Haemaphysalis silacea</i>	32	32	0	0	64	1.03
<i>Hyalomma truncatum</i>	60	248	0	0	308	4.96
<i>Rhipicephalus evertsi evertsi</i>	4	0	0	0	4	0.07
<i>Rhipicephalus glabroscutatum</i>	435	102	3	0	540	8.69
<i>Rhipicephalus oculatus</i>	3 720	1 152	175	94	5 141	82.77
Total	4 376	1 563	178	94	6 211	

second most numerous species on goats, grysbok and duikers, and a total of 21 765 was recorded. *Haemaphysalis silacea* was the second most numerous species on kudus, while *R. oculatus* outnumbered all other species on the scrub hares.

#### ***Amblyomma hebraeum***

Adult *A. hebraeum* prefers large animals as hosts (Horak, MacIvor, Petney & De Vos 1987), with male kudus at the lower end of the size scale and female kudus generally too small to be parasitized (Horak *et al.* 1992). Kudus are, however, excellent hosts of the immature stages of this tick and *A. hebraeum* was the dominant species on these animals in the Andries Vosloo Kudu Reserve to the north of Grahamstown in the Eastern Cape Province (Horak *et al.* 1992). The relatively small numbers of all stages of development, and particularly adults, collected from kudus in the current study could have been due to the regular acaricidal treatment of goats in all but the study camp, thus eventually leading to a reduced challenge.

A similar phenomenon has been recorded on kudus, scrub hares and helmeted guinea fowls, *Numida meleagris*, on the farm "Bucklands", north of Grahamstown, on which the domestic stock were regularly treated with an acaricide. As in the present study, only *A. hebraeum* and no other tick species appeared to be affected by the treatment regime on that farm (Horak & Knight 1986). Whereas the kudus in the present survey were shot wherever they were encountered on the farm, the goats came only from the study camp, in which no acaricide had been used for at least 2 years. Consequently the goats were the major, if not the only, potential host species in this camp, and it is thus not surprising that they were infested with large numbers of adult *A. hebraeum* despite their relatively small size.

The Angora goats harboured nearly twice as many larvae and more than twice the number of adult *A. hebraeum* as the Boer goats, while the numbers of nymphs on the two goat breeds were nearly the same. These differences may be due to differences in habitat utilization, immune status, efficiency of grooming by the two breeds, or host preference of the ticks. The fairly discrete peak in larval numbers on the goats from May to July indicates that this tick probably completes a single cycle annually, a finding similar to that on kudus in the Andries Vosloo Kudu Reserve (Horak *et al.* 1992). Nymphs were most numerous on the goats from September to November and adults from August to December and during February.

#### ***Haemaphysalis silacea***

The distribution of *H. silacea* is limited to South Africa where it is confined to pockets of Valley Bushveld in the Eastern Cape Province and in north-eastern KwaZulu-Natal (Howell, Walker & Nevill 1978; Walker 1991). It has a wide host range (Rechav 1982; Horak & Knight 1986) and is adapted to surviving in humid valleys as well as in extremely hot and dry heavily bushed regions, such as the present study site. Kudus and other browsing tragelaphine antelope species appear to be the hosts of choice (Horak *et al.* 1992; Horak, Boomker & Flamand 1995).

#### ***Hyalomma truncatum***

This tick is widespread and commonly encountered in drier inland regions (Howell *et al.* 1978), but is usually only present in small numbers in the southern coastal regions. Some of the goats and one of the duikers were infested with adult *H. truncatum*, while 11 of the 48 scrub hares were infested with the immature stages of this two-host species.

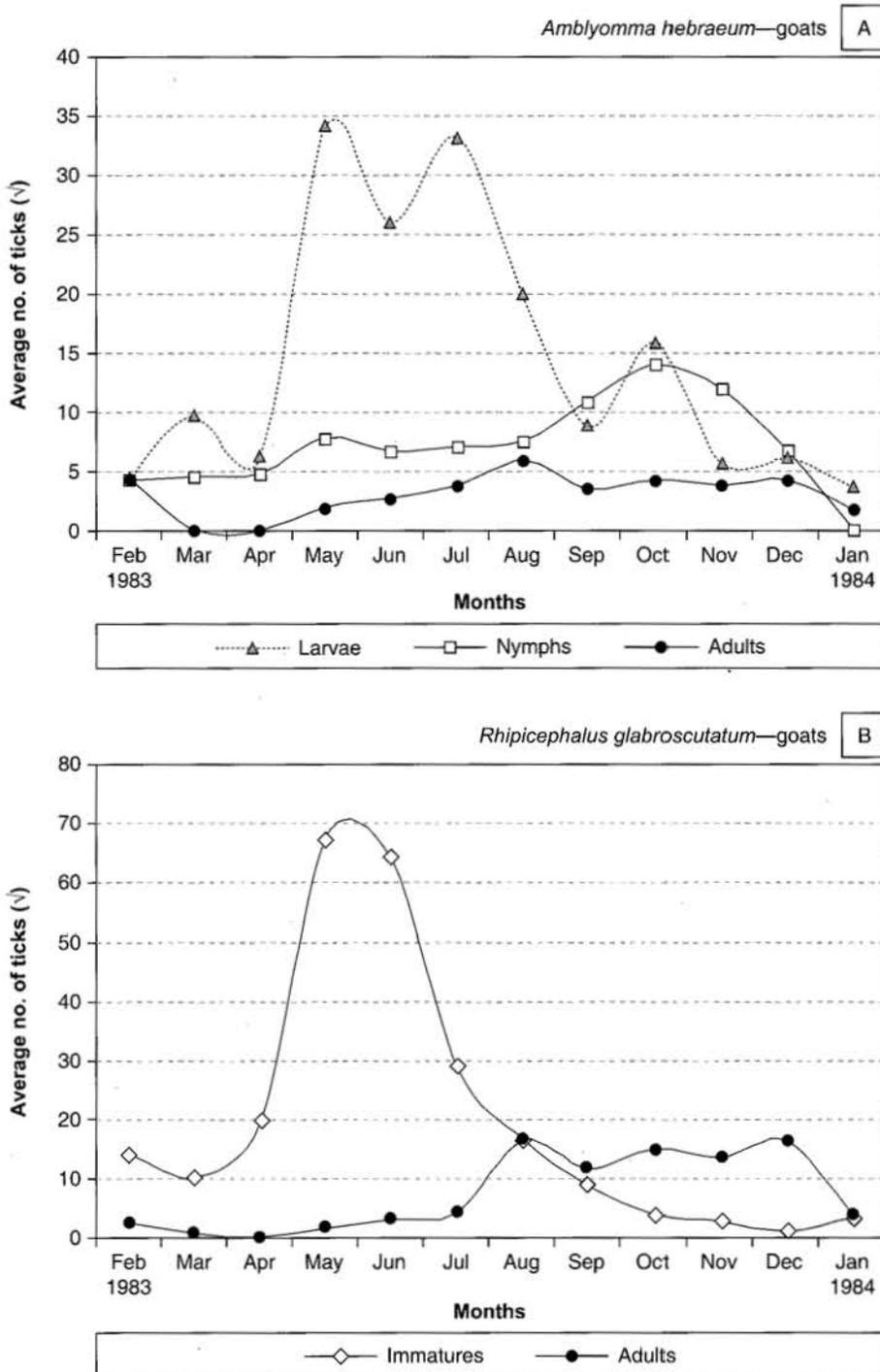


FIG. 1 The seasonal occurrence of [A] *Amblyomma hebraeum* and [B] *Rhipicephalus glabroscutatum* on Angora and Boer goats in Valley Bushveld in the Eastern Cape Province

### *Rhipicephalus evertsi evertsi*

Although *R. evertsi evertsi* is very widely distributed on the African continent, particularly in the eastern regions, with the exception of on equids and on eland, *Taurotragus oryx*, it seldom occurs in large

numbers (Walker, Keirans & Horak 2000). The small numbers recovered in this survey are not only an indication of the absence of preferred hosts, but also of the unsuitability of the habitat for a tick that is more common in regions receiving between 400 and 1 000 mm of annual rainfall.

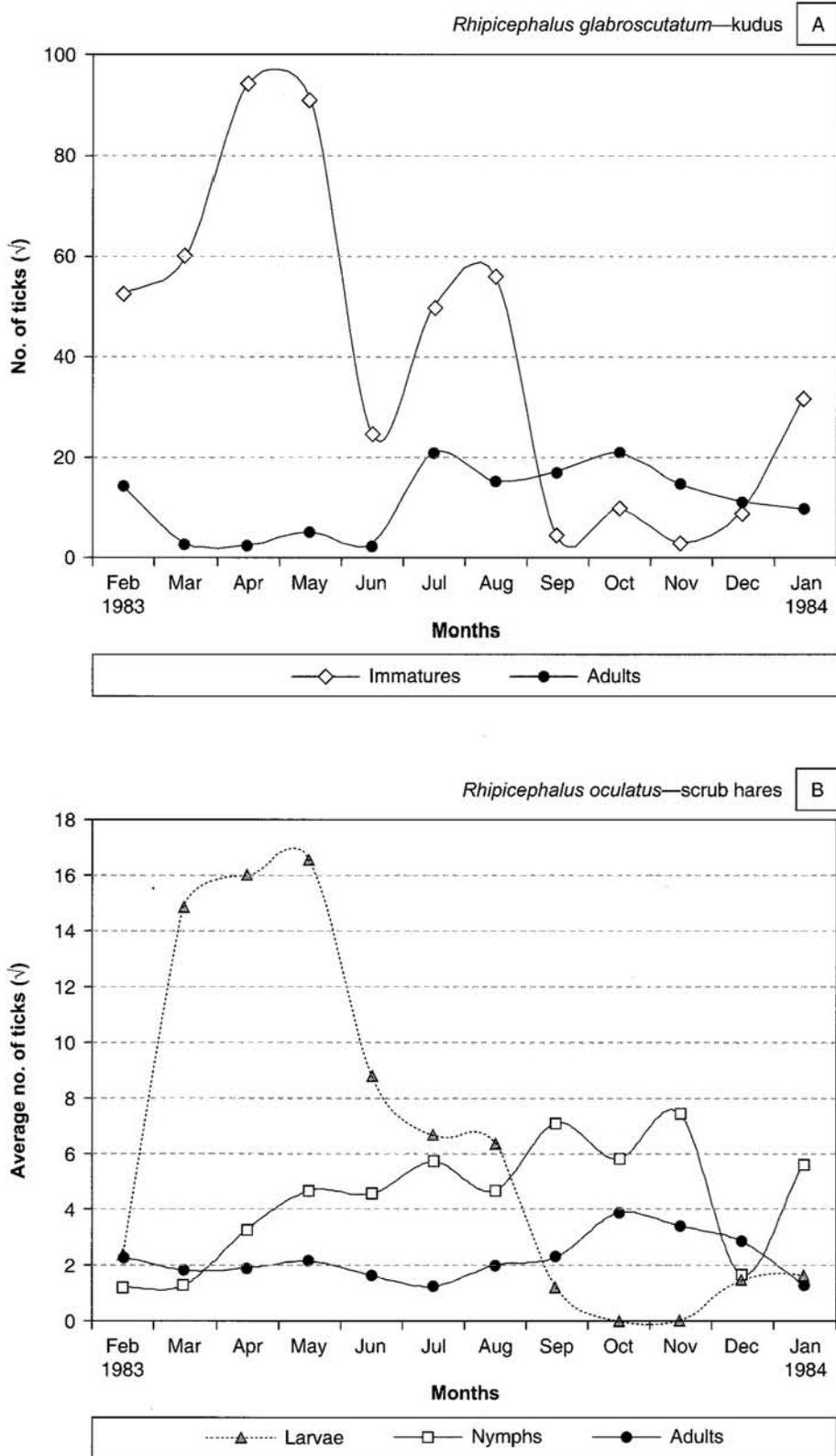


FIG. 2 The seasonal occurrence of [A] *Rhipicephalus glabroscutatum* on greater kudus, and [B] *Rhipicephalus oculatus* on scrub hares in Valley Bushveld in the Eastern Cape Province

### *Rhipicephalus glabroscutatum*

This two-host tick occurs only in South Africa and is present in a broad southerly band extending from approximately the Andries Vosloo Kudu Reserve in the east (MacIvor 1985), to the Atlantic seaboard at Langebaan in the west (Walker *et al.* 2000). It is the dominant ixodid tick species in the study site and kudus are the host species of preference, with 12 of these animals harbouring more immature and more adult *R. glabroscutatum* than 24 goats of either breed, or than the combined burdens of the grysbok and duikers. The total numbers of larvae and adults harboured by the Angora and Boer goats did not differ substantially, but the Angora goats were infested with nearly twice as many nymphs as were the Boer goats, indicating a better translation of larvae to nymphs on the former than on the latter animals. Considerable numbers of larvae and nymphs have previously been collected from scrub hares in the Andries Vosloo Kudu Reserve and on the adjacent farm "Bucklands", as well as from scrub hares in the Mountain Zebra National Park (Horak & Fourie 1991; Horak, Fourie, Novellie & Williams 1991a).

The immature stages of *R. glabroscutatum* were most numerous on goats from April to July and the adults from August to December, while the peak activity periods of both the immatures and the adults were somewhat longer on the kudus, extending from January to August for the larvae and nymphs and July to February for the adults. Its seasonal occurrence on the goats and kudus was similar to that on Angora goats on the farm "Bucklands" and on kudus in the adjacent Andries Vosloo Kudu Reserve in the east of the tick's distribution range; on four antelope species in the Mountain Zebra National Park near Cradock in the north-east of its range; and on two antelope species in the Bontebok National Park, near Swellendam, in the south-west of its range (Horak *et al.* 1986; 1991a, b; 1992). All stages of development attach to the lower legs and around the hooves of their preferred ruminant hosts (MacIvor & Horak 1987). While no adult ticks were found between the hooves of the antelopes examined on "Brakhill", the goats frequently harboured large numbers. The spring to mid-summer increase in adult tick numbers is positively correlated with the occurrence of foot abscess in Angora and Boer goats on the survey farm "Brakhill". In fact, 49 abscessed feet were detected between July and December 1983 on ten Angora goats and ten Boer goats running in the same camp as the survey goats (MacIvor & Horak 1987), whereas no abscesses were encountered

on the feet of any of the antelopes from which ticks were collected.

### *Rhipicephalus oculatus*

Although this tick has in the past been confused with the more recently described *Rhipicephalus exophthalmos* (Keirans, Walker, Horak & Heyne 1993), its presence in the current survey was confirmed not only by its taxonomic features, but also by its preference in all stages of development for scrub hares. The recovery of some immature and adult *R. oculatus* from the goats and antelopes can possibly be ascribed to the large numbers present on the farm as evidenced by the burdens of the scrub hares. Few specimens of immature *R. exophthalmos* have ever been collected, and the adults, although found on scrub hares, equally prefer cattle, sheep, goats and kudus as hosts (Walker *et al.* 2000). We would, however, like to emphasize that we may still have made some mistakes when identifying adult *R. oculatus* on the goats, antelopes and hares as, at the time of the study, *R. exophthalmos* had not been described.

The peak in seasonal occurrence of *R. oculatus* larvae on the scrub hares from March to May, nymphs from September to November and adults from October to December is not unlike that recorded on scrub hares in the Andries Vosloo Kudu Reserve and in the Mountain Zebra National Park (Horak & Fourie 1991; Horak *et al.* 1991a).

### *Rhipicephalus simus*

The preferred hosts of adult *R. simus* are carnivores, suids and equids, but domestic stock, and particularly cattle are also frequently infested. This tick is more prevalent in the moister eastern summer rainfall regions of the country than in the southern and western winter rainfall or semi-arid regions (Walker *et al.* 2000). Both the availability of preferred hosts and the unfavourable climate on "Brakhill" militated against its presence there.

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