



Parasites of domestic and wild animals in South Africa. XL. Ticks on dogs belonging to people in rural communities and carnivore ticks on the vegetation

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ABSTRACT

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Ixodid ticks were collected at weekly intervals from February 1999 to April 2000 from domestic dogs belonging to people in rural communities in north-eastern KwaZulu-Natal. Seven ticks were identified to species level and adult *Haemaphysalis leachi* followed by immature *Amblyomma hebraeum* and adult *Rhipicephalus simus* were the most prevalent. Infestation with adult *H. leachi* was most intense during February and March 1999 and from January to April 2000, and least intense during October 1999. Infestation with adult *R. simus* was most intense during February and March 1999 and least during July and September of the same year.

For 12 consecutive years, from August 1988 to July 2000, free-living ticks were collected at monthly intervals from the vegetation of two landscape zones in the Kruger National Park. Most adult *H. leachi* were collected in the one zone from March to June, and no ticks were collected in October, whereas, with the exception of March, most were collected in the other zone during the period January to June, and only one tick was collected in October. Most adult *R. simus* were collected during February and March at both localities and only a single tick was collected in September. Adult *Rhipicephalus turanicus* was present only in the one zone and was collected only from January to June.

Keywords: Domestic dogs, free-living ticks, *Haemaphysalis leachi*, ixodid ticks, *Rhipicephalus simus*, *Rhipicephalus turanicus*, rural communities, seasonal intensity of infestation

INTRODUCTION

Several surveys on ticks infesting domestic dogs in southern Africa have been conducted (Goldsmid 1963; Horak 1982; 1995; Rautenbach 1986; Horak, Jacot Guillarmod, Moolman & De Vos 1987b; Bryson, Horak, Höhn & Louw 2000), and the distribution and

host spectrum of some of these ticks described (Theiler 1962; Norval & Mason 1981; Norval 1984; Walker, Keirans & Horak 2000). *Haemaphysalis leachi*, *Rhipicephalus sanguineus* and *Rhipicephalus simus* were the most prevalent species in the surveys, but their proportional intensity of infestation differed markedly in the various studies. Dogs belonging to more affluent owners tend to have a higher prevalence of *H. leachi* and *R. simus* (Goldsmid 1963; Horak *et al.* 1987b; Horak 1995). On the other hand, dogs belonging to less affluent owners, who often live in urban or peri-urban townships, have a higher prevalence of *R. sanguineus* (Bryson *et al.* 2000). Both *H. leachi* and *R. simus* utilize rodents as hosts for their immature stages (Norval & Mason 1981; Rechav 1982; Norval 1984), while the immature stages of *R. sanguineus*, like the adults, feed virtually only on domestic dogs (Walker *et al.* 2000).

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Along with other ticks, the adults of several species that parasitize both domestic dogs and wild carnivores have been collected by drag-sampling vegetation in the Kruger National Park (KNP) with flannel strips (Spickett, Horak, Van Niekerk & Braack 1992; Horak, Spickett & Braack 2000).

In this paper we discuss the tick species collected from domestic dogs belonging to people living in a rural environment in north-eastern KwaZulu-Natal, and compare their seasonal intensities of infestation with that of ticks collected from vegetation in the KNP, in which both large and small wild carnivore species abound.

MATERIALS AND METHODS

The State Veterinary District of Jozini in north-eastern KwaZulu-Natal includes the region east of the Lebombo Mountains down to the Indian Ocean and comprises the Magisterial Districts of Ingwavuma and Ubombo. This area, much of which is less than 80 m above sea level, is known as Maputaland. The soil is sandy and the vegetation in part of the region

is classified as Coastal Forest and Thornveld, and in the remainder as Lowveld (Acocks 1988).

At weekly intervals from February 1999 to April 2000 Animal Health Technicians, reporting to the State Veterinarian, Jozini and residing at various localities within the Maputaland region (Fig. 1), collected ticks from their own dogs or from the dogs of their neighbours. These ticks were placed in bottles containing 70% alcohol and a label added. The ticks in the weekly collections were identified and counted and the monthly totals for each locality calculated. Seasonal intensity of infestation was determined from the mean monthly intensity of infestation for all the localities.

Using flannel strips, free-living ticks were collected at monthly intervals for a period of 12 consecutive years from August 1988 to July 2000, by drag-sampling the vegetation alongside the Nhlowa road approximately 15 km north of the Crocodile Bridge rest camp (25°22'S, 31°54'E; Alt. 217 m) in the south-east of the KNP, Mpumalanga Province (Fig. 1). The vegetation of this region is classified as Lowveld (Acocks 1988) and the landscape zone described as *Sclero*

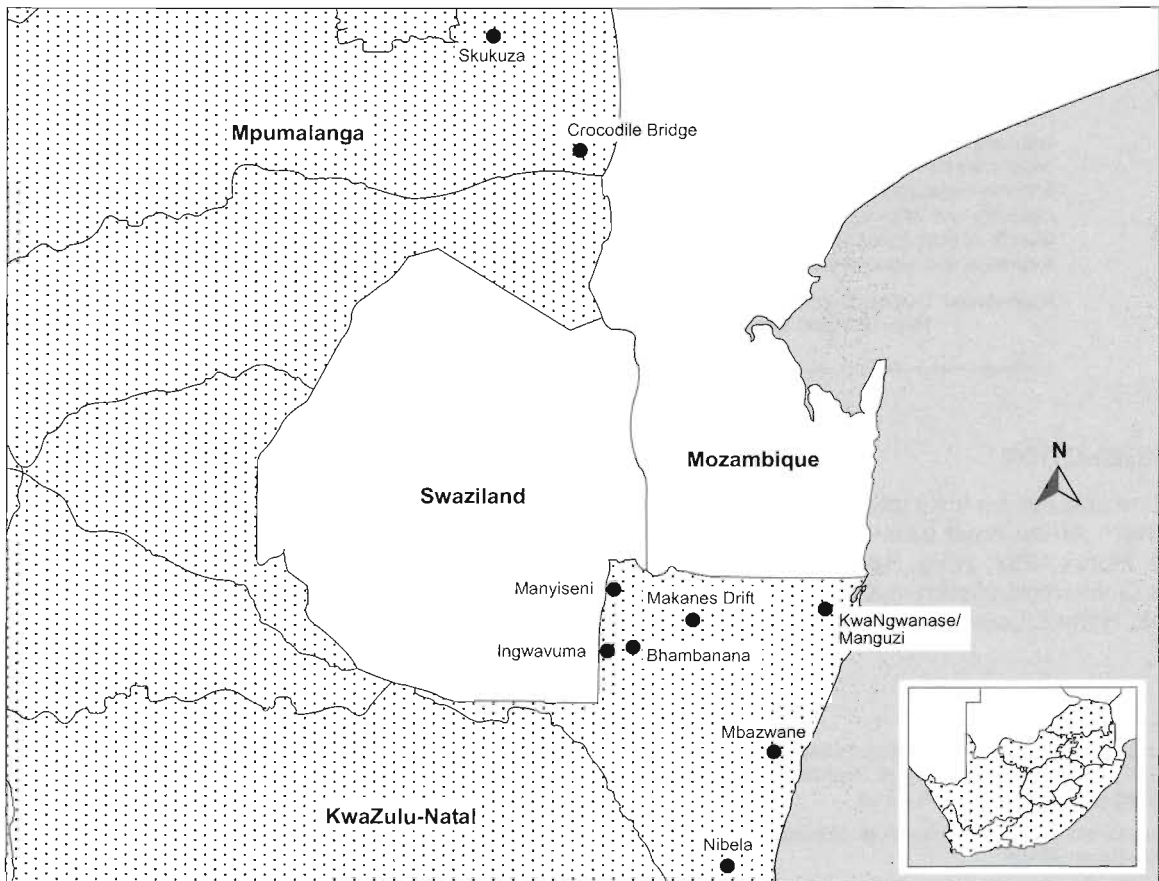


FIG. 1 Localities at which ticks were collected from dogs in north-eastern KwaZulu-Natal and from vegetation in the Kruger National Park

carya caffra/Acacia nigrescens Savanna (Gertenbach 1983). The vegetation next to a firebreak alongside the Nwaswitshaka River, approximately 5 km south-west of the Skukuza rest camp (24°58'S, 31°36'E; Alt. 262 m) in the south-west of the park (Fig. 1), was sampled in a similar fashion. The vegetation of this landscape zone is described as Thickets of the Sabie and Crocodile Rivers (Gertenbach 1983) and is also classified as Lowveld (Acocks 1988). Although a large number of tick species were collected from the vegetation, only the adults of those

ticks that prefer carnivores as hosts, namely *H. leachi*, *R. simus* and *Rhipicephalus turanicus* were considered for the purpose of this study. The seasonal abundance of a particular species on the vegetation was determined by adding the numbers of ticks of that species collected in the same month of each year over the 12-year collection period.

Because of rain or impassable roads no collections were made along the Nhlowa Road during only one month in the entire 12-year survey period, and dur-

TABLE 1 Ixodid ticks collected from domestic dogs belonging to owners in rural communities in north-eastern KwaZulu-Natal

Tick species	Number of ticks collected					No. of collections (total = 388)
	Larvae	Nymphs	Males	Females	Total	
<i>Amblyomma hebraeum</i>	27	1 218	25	17	1 287	217
<i>Haemaphysalis leachi</i>	0	4	77	573	654	232
<i>Haemaphysalis zumpti</i>	0	0	0	4	4	4
<i>Rhipicephalus appendiculatus</i>	0	4	8	24	36	62
<i>Rhipicephalus simus</i>	0	1	181	226	408	107
<i>Rhipicephalus tricuspis</i>	0	0	0	14	14	4
<i>Rhipicephalus turanicus</i>	0	0	1	9	10	9
<i>Rhipicephalus</i> sp.	0	0	3	2	5	5

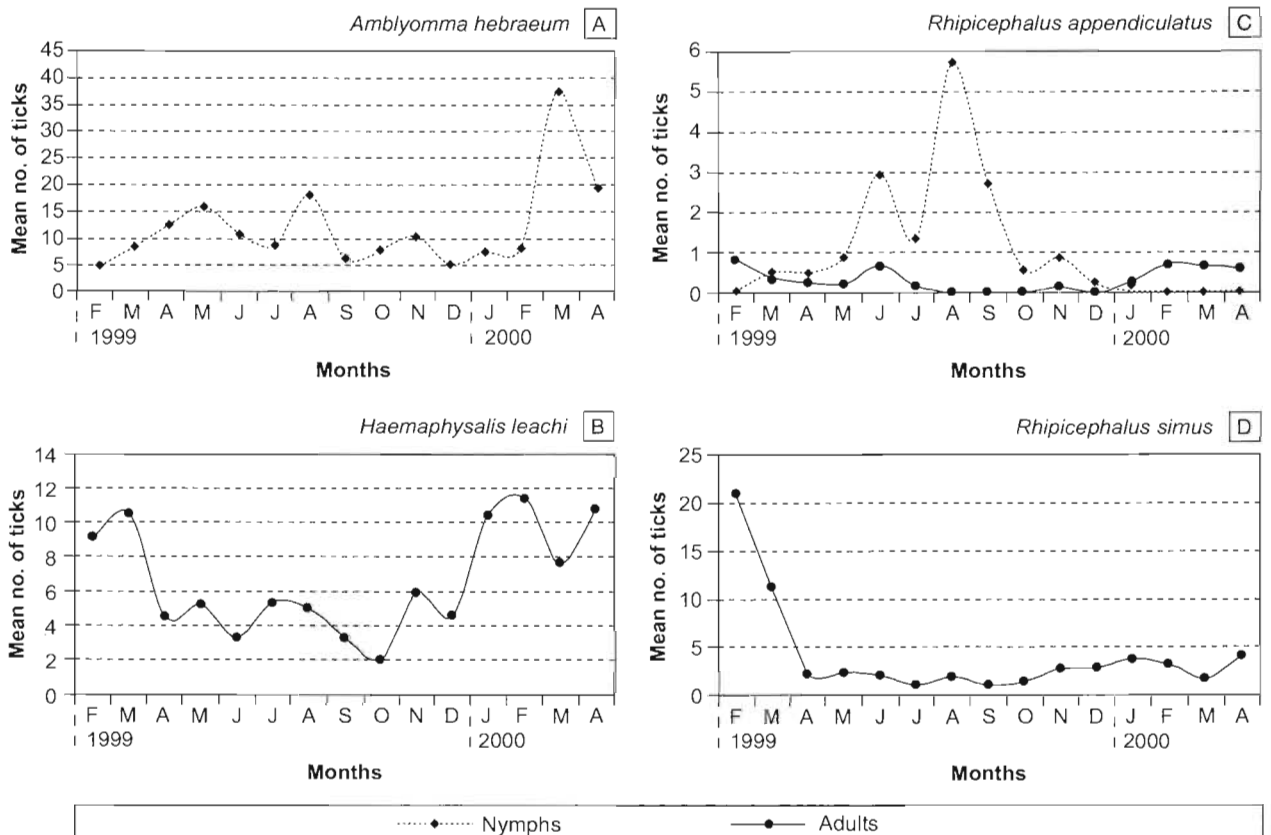


FIG. 2 The seasonal intensity of infestation of (A) *Amblyomma hebraeum* nymphs, (B) *Haemaphysalis leachi* adults, (C) *Rhipicephalus appendiculatus* nymphs and adults, and (D) *Rhipicephalus simus* adults on domestic dogs in north-eastern KwaZulu-Natal

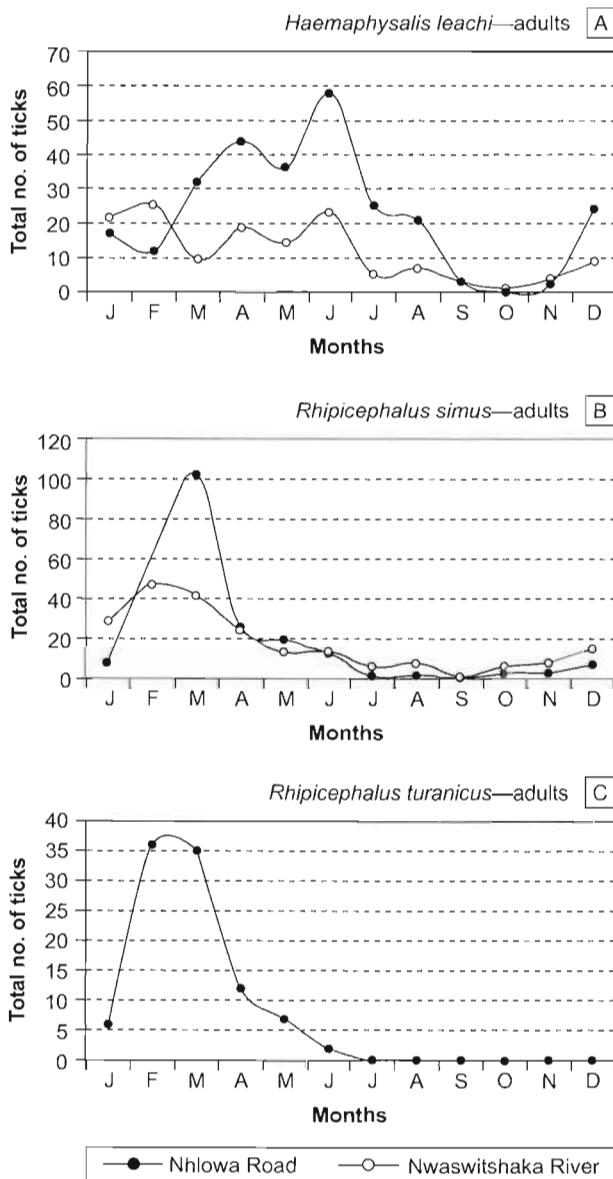


FIG. 3 The seasonality of adult (A) *Haemaphysalis leachi*, (B) *Rhipicephalus simus*, and (C) *Rhipicephalus turanicus* on vegetation in the southern Kruger National Park

ing 10 months alongside the Nwaswitshaka River. The graphs illustrating the seasonality of ticks on the vegetation have been adjusted to compensate for the missing data.

RESULTS

The species composition of the ticks collected from dogs in north-eastern KwaZulu-Natal is summarized in Table 1, and the seasonal intensity of infestation with *Amblyomma hebraeum*, *H. leachi*, *Rhipicephalus appendiculatus* and *R. simus* are graphically illustrated in Fig. 2.

Seven ixodid tick species were identified to species level, and infestation with the nymphs of *A. hebraeum* was most intense. No seasonal pattern of infestation was evident for this tick. *Haemaphysalis leachi* was the most prevalent tick and infestation was most intense during February and March 1999 and January to April 2000. Few were collected during October 1999. Albeit present in very small numbers, infestation with the nymphs of *R. appendiculatus* was most intense from June to September 1999, and the adults in February 1999 and from February to April 2000. Infestation with *R. simus* was most intense during February and March 1999, and least during July and September 1999.

The total numbers of free-living adult *H. leachi*, *R. simus* and *R. turanicus* collected in each calendar month from vegetation in the KNP are graphically illustrated in Fig. 3.

With the exception of a single tick each, *H. leachi* was never collected from the vegetation during the month of October and *R. simus* during the month of September at either of the localities in the KNP. The largest numbers of *H. leachi* were present alongside the Nhlowa road in the south-east of the park from March to June, and alongside the Nwaswitshaka River fire-break in the south-west during the period January to June. Most *Rhipicephalus simus* were collected from the vegetation at both localities during February and March. *Rhipicephalus turanicus* was collected only in the south-east of the park, and only from January to June with most present during February and March.

DISCUSSION

The most prevalent ticks on dogs in a survey conducted in Harare, Zimbabwe were *H. leachi*, *R. sanguineus* and *R. simus* (Goldsmid 1963). These dogs were also infested with small numbers of the cattle ticks *Boophilus decoloratus*, *R. appendiculatus* and *Rhipicephalus evertsi evertsi*. Infestation with *H. leachi*, an *Ixodes* sp. (near *I. pilosus*) and *R. simus* was the most intense on dogs on small-holdings near Grahamstown in the Eastern Cape Province, South Africa (Horak *et al.* 1987b). No *R. sanguineus* was found on these dogs, but they harboured small numbers of the cattle ticks *A. hebraeum*, *Haemaphysalis silacea* and *R. appendiculatus*. At the Faculty of Veterinary Science, University of Pretoria, Onderstepoort, the majority of 395 dogs diagnosed with *B. canis* infection were infested with *H. leachi*, and considerably fewer with *R. sanguineus* and *R. simus* (Horak 1995). Some of these dogs also had small burdens of *A. hebraeum*, *B. decoloratus*, *Hyalomma truncatum*, *R. appendiculatus* and *R. evertsi evertsi*.

Infestation with *R. sanguineus* was the most prevalent and intense on dogs at the Faculty of Veterinary Science of the Medical University of Southern Africa

and at an outreach clinic run by that Faculty in North West Province (Rautenbach, Boomker & De Villiers 1991; Bryson *et al.* 2000). The dogs in these surveys belonged to owners from less affluent communities than those in the Zimbabwe, Eastern Cape and Onderstepoort surveys, and a large percentage of the dogs were either chained or caged (Rautenbach *et al.* 1991). This provided ideal breeding conditions for all stages of development of *R. sanguineus*.

Amblyomma hebraeum

The adults of this tick prefer large herbivores including domestic cattle as hosts and the immature stages may be collected from a variety of large and small animals (Theiler 1962; Norval 1983; Horak, MacIvor, Petney & De Vos 1987a). Many larvae and fewer nymphs have been collected from wild carnivores, and domestic dogs are also frequently infested, but usually only with small numbers of ticks (Horak *et al.* 1987b; Horak 1995; Bryson *et al.* 2000; Horak, Braack, Fourie & Walker 2000). The large number of ticks collected from the dogs in north-eastern KwaZulu-Natal is a reflection both of the suitability of the habitat for this species, and of the proximity between the dogs and their owners' cattle.

Haemaphysalis leachi

This tick is present in the moister eastern half and southern regions of South Africa (Howell, Walker & Nevill 1978). It has, however, been suggested that the distribution of *H. leachi* is affected more by the presence of rodent hosts for the immature stages than by climate (Norval 1984). The rural environment of the dogs in the present survey was ideal for them to have come into contact with adult ticks that had fed on rodents during their immature stages, hence the high prevalence of infestation. The preferred hosts of adult *H. leachi* are all larger members of the order Carnivora, including domestic dogs, jackals and the large cats, while the larvae and nymphs prefer murid rodents, but will also feed on canids (Theiler 1962; Norval 1984; Horak *et al.* 1987b; 2000). Rather strangely, however, only two of eight hunting dogs (*Lycaon pictus*) and one of ten spotted hyaenas (*Crocuta crocuta*), examined in surveys conducted on wild carnivores in South Africa, were infested with adult *H. leachi* and then only with between one and five ticks each (Horak *et al.* 1987b; 2000).

On dogs on small-holdings near Grahamstown, in the south-east of South Africa, the seasonal intensity of infestation with adult *H. leachi* followed nearly the same pattern for three consecutive years (Horak *et al.* 1987b). Most ticks were present from May or June to February, with the smallest numbers collected during March or April. In the present surveys in the north-east of the country in KwaZulu-Natal and in the KNP, most ticks were collected between January and

March or April from dogs and from January to June from vegetation respectively. The lowest numbers were collected from dogs and vegetation during October. The reasons for these contrasting patterns in the seasonal intensity of infestation between the northern and southern study sites could be due to differences in climate, day-length and the seasonal abundance of rodents around the homesteads of the dog owners or in the veld.

Rhipicephalus appendiculatus

Although *R. appendiculatus* prefers ruminants as hosts in all its stages of development (Walker *et al.* 2000), large numbers have been collected from wild carnivores and some from domestic dogs (Goldsmid 1963; Norval, Walker & Colborne 1982; Horak *et al.* 1987b; 2000; Horak 1995; Bryson *et al.* 2000). The presence of nymphs on dogs in north-eastern KwaZulu-Natal from March to December and the majority of adults during the period February to April is not unlike that on nyalas (*Tragelaphus angasii*) in nature reserves to the south of the study region (Horak, Boomker & Flamand 1995), or on the vegetation alongside the Nhlowa road in the KNP (Spickett *et al.* 1992).

Rhipicephalus simus

Rhipicephalus simus is widespread in the moister regions of southern Africa and its adults prefer domestic dogs, large wild carnivores, suids, equids and domestic cattle as hosts (Norval & Mason 1981; Walker *et al.* 2000; Horak *et al.* 2000). The immature stages feed on murid rodents (Norval & Mason 1981; Rechav 1982; Walker *et al.* 2000). This species comprised between 9% and 18% of the ticks collected from dogs in Harare, Zimbabwe, and from dogs on small-holdings near Grahamstown in the Eastern Cape Province and at Onderstepoort, South Africa (Goldsmid 1963; Horak *et al.* 1987b; Horak 1995).

In the Eastern Cape Province infestation with adult *R. simus* was most intense on dogs from August to April or May, and least intense during June and July (Horak *et al.* 1987b). Most *R. simus* were collected from dogs in north-eastern KwaZulu-Natal and the vegetation in the KNP during February and March, and the smallest numbers from July to October in the present surveys. The seasonal intensity of infestation on dogs in KwaZulu-Natal and on the vegetation in the KNP is similar to that on warhogs (*Phacochoerus africanus*) examined close to the current drag-sampling localities in the KNP during 1980 and 1981 (Horak, Boomker, De Vos & Potgieter 1988).

The reason for the low numbers of ticks on dogs in KwaZulu-Natal from February to April in the second year of the survey must probably be sought elsewhere than in a paucity of hosts for the immature stages. *Rhipicephalus simus* and *H. leachi* make use

of the same rodent species as hosts for these stages (Norval & Mason 1981; Norval 1984), and often even the same animal (Braack, Horak, Jordaan, Segerman & Louw 1996), and there was no similar decline in the numbers of *H. leachi* on the dogs in the second year of the study.

Rhipicephalus tricuspis

This tick has been collected from the smaller wild canids, for which it seems to have a preference, and from domestic dogs (Walker *et al.* 2000). *Rhipicephalus tricuspis* has not previously been reported in KwaZulu-Natal, but has been found in southern Mozambique north of the region in which the present survey on dogs was conducted (Walker *et al.* 2000). Although the tick's preferred habitat is various types of dry woodland, the soil structure in many of the regions in which it has been recorded is sandy. Another of its preferred hosts is spring hares (*Pedetes capensis*), and these animals require compacted sandy soil to make their burrows (Skinner & Smithers 1990). Spring hares do not occur in north-eastern KwaZulu-Natal, but the sandy nature of the soil within the survey region apparently contributes towards its suitability as a habitat for *R. tricuspis*.

Rhipicephalus turanicus

The identity of this tick has long been confused with that of *R. sanguineus*. However, its status as a valid separate species has been confirmed and the preference of its adults for cattle, sheep, domestic dogs, wild carnivores and hares established (Pegram, Clifford, Walker & Keirans 1987; Walker *et al.* 2000). In north-eastern KwaZulu-Natal adult *R. turanicus* was present on scrub hares (*Lepus saxatilis*) throughout the year with the highest prevalence of infestation from January to July (Horak, Spickett, Braack, Penzhorn, Bagnall & Uys 1995). Small numbers have also been collected from wild carnivores in the KNP (Horak *et al.* 2000). In the present surveys ten ticks were collected from the dogs in KwaZulu-Natal (Table 1), and 95 from the vegetation along the Nhlwala road in the KNP. The presence of adult *R. turanicus* in the south-east of the KNP only from January to June suggests that a single life cycle is completed annually at this locality.

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