Parasites of domestic and wild animals in South Africa. XLIII. Ixodid ticks of domestic dogs and cats in the Western Cape Province

I.G. HORAK¹ and SONJA MATTHEE²

ABSTRACT

Ticks were collected at monthly intervals for 16 consecutive months from individual dogs by their owners in or close to the town of Stellenbosch, Western Cape Province. They were also collected for 27 consecutive months from dogs presented for a variety of reasons at three veterinary clinics in Stellenbosch, and from dogs upon admission to an animal welfare shelter. At one of the veterinary clinics ticks were also collected from cats.

Dog owners collected six ixodid species from their pets and the most numerous of these were Haemaphysalis leachi and Rhipicephalus gertrudae. Twelve ixodid tick species and the argasid tick, Otobius megnini were collected from dogs at veterinary clinics and the animal shelter, and H. leachi, R. gertrudae and Rhipicephalus sanguineus were the most numerous. A total of nine dogs were infested with the Karoo paralysis tick, Ixodes rubicundus. No clear pattern of seasonality was evident for H. leachi, which was present throughout the year. The largest numbers of adult R. gertrudae were generally present from August to October, while adult R. sanguineus were collected during October 2000, February and March 2001, from January to April 2002 and during October 2002. Five ixodid tick species, of which H. leachi was the most numerous and prevalent, were collected from cats.

Keywords: Cats, dogs, Haemaphysalis leachi, ixodid ticks, Rhipicephalus gertrudae, Rhipicephalus sanguineus, seasonality, Stellenbosch, Western Cape Province

INTRODUCTION
During the past 20 years 50,943 ixodid ticks, belonging to 22 species in six genera have been counted on domestic dogs in five surveys conducted in South Africa (Horak, Jacot Guillarmod, Moolman & De Vos 1987b; Horak 1995; Bryson, Horak, Höhn & Louw 2000; Horak, Emslie & Spickett 2001; Jacobs, Fourie, Kok & Horak 2001). Three tick species were predominant in these surveys, namely Haemaphysalis leachi, Rhipicephalus sanguineus and Rhipicephalus simus, and 10,662, 35,460 and 19,891 individuals of the three species, respectively, were counted.

Haemaphysalis leachi is widely distributed in Africa and its adults infest both domestic and wild carnivores and felids (Walker 1991; Horak, Braack, Fourie & Walker 2000). Rhipicephalus sanguineus has probably the most widespread global distribution of any ixodid tick and nearly exclusively uses domestic dogs as hosts for both its immature and adult stages of development (Walker, Keirans & Horak 2000). Although it is widespread in South Africa, its
distribution is patchy in that it is confined to locali-
ties within urban, suburban, peri-urban and rural
areas where there are both domestic dogs and human
dwellings and associated man-made struc-
tures, to which its free-living stages are adapted.
*Rhipicephalus simus* is widely distributed in southern
Africa and its adults prefer domestic and wild
carnivores, felids, suids and equids and also
domestic cattle as hosts (Walker et al. 2000). Howev-
er, in the western regions of the Western Cape, Northern Cape and Free State Provinces of
South Africa it appears to be partially or wholly
replaced by *Rhipicephalus gertrudae* (Walker et al.
2000), of which the adults prefer cattle, sheep,
equids, wild carnivores and primates, including
humans, as hosts (Brain & Bohrmann 1992; Walker
et al. 2000; Horak et al. 2000; Horak, Fourie, Heyne,
Walker & Needham 2002).

Infestation with any tick has a nuisance value, but
*H. leachi* also transmits *Babesia canis* to dogs
(Lewis, Penzhom, Lopez-Rebollar & De Waal 1996),
*R. sanguineus* transmits *Ehrlichia canis* (Groves,
Dennis, Amyx & Huxsoll 1975) and, in countries
other than South Africa, also *Babesia canis* (Lieb-
isch & Gillani 1979). It can also transmit *Rickettsia
conori*, the causative organism of tick-bite fever in
humans (Neitz, Alexander & Mason 1941), and
hence its control from both veterinary and medical
perspectives is important. Heavy infestations with
*R. gertrudae* have been recorded as a major con-
tributing factor towards the deaths of young bab-
oons, *Papio ursinus* in an arid environment in
Namibia (Brain & Bohrmann 1992).

Four of the five above-mentioned surveys were done
in the provinces of Gauteng, North West, north-
eastern KwaZulu-Natal and central Free State, all
summer rainfall regions (Horak 1995; Bryson et al.
2000; Horak et al. 2001; Jacobs et al. 2001), while
the fifth was conducted in a non-seasonal rainfall
region in the Eastern Cape Province (Horak et al.
1987b). No survey of the ticks infesting dogs in the
Western Cape Province, a winter rainfall region,
have been conducted and the present study was
undertaken to fill this gap in our knowledge.

The checklist of the ticks of Africa, south of the
Sahara, compiled by Theiler (1962), does not indi-
cate from which countries records for cats origi-
nate. Besides this list there appears to be only one
published report of ticks infesting domestic cats in
South Africa, and it pertains to ticks on cats in the
Kruger National Park that have become feral
(Horak et al. 2000). The current survey adds to our
knowledge in this field.

**MATERIALS AND METHODS**

The survey region comprised the town of Stellen-
bosch (33°55’ S, 18°50’ E) and its immediate envi-
rions in the Western Cape Province, and two groups
of dogs were examined. In one ticks were collected
from individual dogs by their owners, and in the
other they were collected from dogs presented at
three veterinary clinics, or upon admission to an
animal welfare shelter.

Once a month from September 2000 to December
2001 the dog owners manually de-ticked their dogs
and placed the ticks from each dog in separate
labelled vials containing 70% alcohol. Two of these
dogs were de-ticked by one of us (S.M.), and the
sites of attachment recorded. The veterinarians, or
their assistants, manually de-ticked dogs presented
at their practices from October 2000 to December
2002, and the ticks for each month were pooled for
each practice. Two of the veterinarians had collect-
ed ticks prior to the commencement of the survey,
and these ticks have been included in the total
counts, but not in the monthly seasonal occurrence
counts. One of the veterinarians also collected ticks
from cats. Ticks were collected from dogs upon
their admission to the animal welfare shelter from
October 2000 to December 2002, and the ticks for
each month were pooled. Ticks were also collected
each month from December 2001 to June 2002 and
from October to December 2002 from dogs upon
admission to an animal welfare shelter in the near-
by town of Franschhoek (33°50’ S, 19°07’ E), West-
ern Cape Province.

**RESULTS**

The species and numbers of ticks collected from
individual dogs by their owners are summarized in
Table 1. Ticks belonging to six ixodid species were
collected. The most numerous of these were *H.
leachi* and *R. gertrudae*, and their sites of attach-
ment are summarized in Table 2 and their season-
ality is graphically illustrated in Fig. 1. More than
50% of adult *H. leachi* and *R. gertrudae* attached
to the head, ears, neck and shoulders of the dogs.
*Haemaphysalis leachi* was present throughout the
year with the largest numbers collected during
September 2000 and June 2001 and the smallest
Most *R. gertrudae* were collected during Septem-
ber and October 2000 and August and September
2001. With the exception of April when only one
was collected, none were present from February to
The total numbers of ticks collected from dogs at veterinary clinics and the animal shelter at Stellenbosch are summarized in Table 3. Twelve ixodid tick species and the argasid tick, *Otobius megnini* were collected from these dogs, and the seasonal occurrence of *H. leachi*, *R. gertrudae* and *R. san-

### TABLE 1 Ticks collected from dogs belonging to individual owners at Stellenbosch, Western Cape Province

<table>
<thead>
<tr>
<th>Tick species</th>
<th>Number of ticks</th>
<th>No. of collections (98)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Larvae</td>
<td>Nymphs</td>
</tr>
<tr>
<td><em>Haemaphysalis aciculifer</em></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><em>Haemaphysalis leachi</em></td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td><em>Haemaphysalis zumpti</em></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><em>Ixodes pilosus group</em></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><em>Ixodes rubicundus</em></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><em>Rhipicephalus gertrudae</em></td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### TABLE 2 Attachment sites of adult *Haemaphysalis leachi* and *Rhipicephalus gertrudae* on dogs at Stellenbosch, Western Cape Province

<table>
<thead>
<tr>
<th>Tick species (No. collected)</th>
<th>Body region</th>
<th>Rump and perineum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Head</td>
<td>Ears</td>
</tr>
<tr>
<td><em>Haemaphysalis leachi</em> (112)</td>
<td>12.5</td>
<td>9.8</td>
</tr>
<tr>
<td><em>Rhipicephalus gertrudae</em> (19)</td>
<td>10.6</td>
<td>10.5</td>
</tr>
</tbody>
</table>

### TABLE 3 Ticks collected from dogs at veterinary clinics and at an animal shelter at Stellenbosch, Western Cape Province

<table>
<thead>
<tr>
<th>Tick species</th>
<th>Number of ticks</th>
<th>No. of collections (108)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Larvae</td>
<td>Nymphs</td>
</tr>
<tr>
<td><em>Amblyomma marmoreum</em></td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td><em>Boophilus decoloratus</em></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><em>Haemaphysalis aciculifer</em></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><em>Haemaphysalis leachi</em></td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td><em>Haemaphysalis spinulosa</em></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><em>Hyalomma truncatum</em></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><em>Ixodes pilosus group</em></td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td><em>Ixodes rubicundus</em></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><em>Rhipicephalus gertrudae</em></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><em>Rhipicephalus lousburiyi</em></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><em>Rhipicephalus nitens</em></td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td><em>Rhipicephalus sanguineus</em></td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td><em>Otobius megnini</em></td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

### TABLE 4 Ticks collected from dogs at an animal shelter at Franschoek, Western Cape Province

<table>
<thead>
<tr>
<th>Tick species</th>
<th>No. of ticks</th>
<th>No. of collections (10)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Larvae</td>
<td>Nymphs</td>
</tr>
<tr>
<td><em>Haemaphysalis leachi</em></td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><em>Rhipicephalus gertrudae</em></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><em>Rhipicephalus nitens</em></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><em>Rhipicephalus sanguineus</em></td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>
TABLE 5  Ticks collected from cats at a veterinary clinic at Stellenbosch, Western Cape Province

<table>
<thead>
<tr>
<th>Tick species</th>
<th>Number of ticks</th>
<th>No. of collections (20)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Larvae</td>
<td>Nymphs</td>
</tr>
<tr>
<td>Amblyomma marmoreum</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Haemaphysalis leachi</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Haemaphysalis spinulosa</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ixodes pilosus group</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>Rhipicephalus gertrudae</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

FIG. 1 The seasonal occurrence of adult (A) Haemaphysalis leachi and (B) Rhipicephalus gertrudae on dogs belonging to individual owners at Stellenbosch, Western Cape Province.
guineus are graphically illustrated in Fig. 2. Most *H. leachi* were collected during August 2001 and from May to September 2002. *Rhipicephalus gertrudae* was most numerous in October 2000, September, October and December 2001, and August to October 2002. No ticks of this species were collected during March to May and July 2001 and during June and July 2002. *Rhipicephalus sanguineus* was present during October 2000, February and March 2001, and from January to April and during October 2002.

Four ixodid tick species were recovered from dogs at the animal shelter at Franschhoek, the most numerous of these being *H. leachi* and *R. sanguineus*, while a single female *R. nitens* was also collected (Table 4). *Haemaphysalis leachi* was collected during every month that collections were made, whereas *R. sanguineus* was present only during March and April 2002.

Five ixodid tick species were collected from cats at a veterinary clinic in Stellenbosch, and of these *H.*...
Leachi and ticks of the Ixodes pilosus group were the most numerous (Table 5).

The combined seasonal occurrence of adult ticks of the I. pilosus group on both dogs and cats at the various survey localities in Stellenbosch is graphically illustrated in Fig. 3. With the exception of March and April 2001 and 2002, when none were recovered, adult ticks of this group were present in every month of the year either during 2001 or 2002.

DISCUSSION

The major differences between this survey and those conducted on dogs elsewhere in South Africa were the frequency with which Ixodes rubicundus and R. gertrudae were recovered, and the apparently restricted seasonal occurrence of R. sanguineus.

All the parasitic stages of development of Amblyomma marmoreum, the South African tortoise tick, prefer the latter animals as hosts (Norval 1975). However, the frequency with which the immature stages, and particularly larvae, are recovered from domestic and wild carnivores implies that they are both widespread and catholic in their host preference (Horak et al. 1987b; 2000). The presence of nymphs on a dog at a veterinary clinic and another at the animal shelter at Stellenbosch during November 2000 not only confirms the presence of questing immature stages at this time of year but also their rather non-selective host preference. The collection of Boophilus decoloratus from dogs is not unusual (Goldsmid 1963; Horak 1995; Jacobs et al. 2001), and indicates that the infested animals had been in localities in which domestic cattle or horses, the preferred hosts of this tick, were kept (Mason & Norval 1980).

Although Haemaphysalis aciculifer is fairly widespread in South Africa, it is seldom present in large numbers (Walker 1991). It infests a variety of hosts and has been collected from wild carnivores (Norval 1985). One of the largest infestations recorded on the latter animals consisted of 15 adults collected from a honey badger, Mellivora capensis in the Kruger National Park (Horak et al. 2000). Its immature stages have been collected from ground-nesting birds in the Western Cape Province (Horak & Boomker 1998), thus establishing its presence here and accounting for the adults in four collections from dogs.

Adult H. leachi prefer the larger wild canids and felids as well as domestic dogs as hosts (Norval 1984; Horak et al. 1987b; 2000), but have also been collected from feral domestic cats (Horak et al. 2000). In the central Free State most adult H. leachi were collected from the neck, back and legs of dogs (Jacobs et al. 2001). Although the attachment sites of only 112 adult ticks of this species were determined in the present survey, most of these were collected from the head, neck and shoulders of the dogs. This tick is widespread throughout the
warmer eastern regions of the country (Howell, Walker & Nevill 1978), and it would appear that Stellenbosch and its environs in the Western Cape Province is an imminently suitable habitat. Adult *H. leachi* is most numerous on dogs in the Eastern Cape Province from May or June to February (Horak et al. 1987b), in the central Free State from September to November (Jacobs et al. 2001), and in north-eastern KwaZulu-Natal from January or February to March or April (Horak et al. 2001), but no clear pattern of seasonality emerged in the present survey. However, most ticks appeared to be present during the cooler months of the year from May to September. The year-round presence of *H. leachi* on dogs at Stellenbosch implies that canine babesiosis can be expected during any season.

The southern regions of the Western Cape Province do not seem to be an ideal habitat for *Hyalomma truncatum* (Howell et al. 1978), and few ticks of this species are encountered here (Horak & Boomker 1998). Although adult *H. truncatum* feed on a variety of domestic ungulates (Norval 1982), they sometimes also infest dogs (Norval 1982; Horak 1995; Jacobs et al. 2001), on which penetrating necrotic lesions may occur at their sites of attachment (Burr 1983). The single tick collected in the current survey is probably a rare accidental infestation of a dog in this region.

Ticks of the *Ixodes pilosus* group have been collected from domestic dogs and several wild carnivore species and appear to have a preference for felids (Horak et al. 1987b; 2000). Consequently the recovery of ticks of this group from both dogs and cats in the present survey is to be expected, particularly as the Stellenbosch region lies within the distribution range of these ticks (Howell et al. 1978). Most of the ticks collected from cats were nymphs, and the greater proportional density of ticks of this species on these animals than on dogs confirms its preference for felids. Although few ticks were collected from animals at any of the survey sites, and hence an accurate evaluation cannot be made, peaks in activity from late winter and spring to mid-summer are evident. In the coastal region of the Eastern Cape Province most *I. pilosus* group adults were present on caracals, *Caracal caracal* from November to May (Horak et al. 1987b), whereas most adults were present on antelopes and scrub hares, *Lepus saxatilis* in the Bontebok National Park outside Swellendam in the Western Cape Province from October to December (Horak, Sheppey, Knight & Beuthin 1986), somewhat similar to the present findings.

It has been suggested that the caracal is a preferred host of adult *I. rubicundus* (Horak, Moolman & Fourie 1987a). The subsequent collection of this tick from a black-backed jackal, *Canis mesomelas*, an African wild cat, *Felis lybica*, and a caracal in the Northern Cape Province (Horak et al. 2000), as well as from a domestic dog in the central region of the Free State Province (Jacobs et al. 2001), denotes that several carnivore species may be suitable hosts for adult ticks of this species. The recovery in the present survey of ticks from nine dogs, of which one harboured ten and another 18, confirms this observation.

Prior to this study there were only 11 records of *R. gertrudae* infesting domestic dogs and none from cats (Walker et al. 2000; Jacobs et al. 2001), now there are at least 94 records for dogs and two for cats. Its immature stages, like those of *R. simus*, prefer murid rodents as hosts. Thus *R. gertrudae* not only occupies the potential geographic distribution of *R. simus* in the Western Cape Province, but also utilizes some of the latter tick's preferred hosts (Walker et al. 2000). However, whereas *R. simus* is a spring to late summer tick on dogs in the Eastern Cape Province and a summer to late summer tick on these animals in north-eastern South Africa (Horak et al. 1987b; 2001), *R. gertrudae* is primarily a spring tick on dogs in the Western Cape Province (Fig. 1 and 2), and an autumn to spring tick on sheep in this province and in the Northern Cape Province (Horak & Fourie 1992).

*Rhipicephalus lounsburyi* is a small tick that attaches around and between the hooves of sheep and wild antelopes in north-eastern Eastern Cape Province and southern and western Western Cape Province (Horak et al. 1986; Walker 1990), and its presence on dogs must be considered accidental. The distribution of *Rhipicephalus nitens* is confined to the fynbos regions of the Western and Eastern Cape Provinces (Walker et al. 2000), and all stages of development prefer sheep, wild antelopes and scrub hares as hosts (Horak, Williams & Van Schalkwyk 1991; Horak & Boomker 1998). The collection of an adult tick from a dog at Franschhoek during December 2001, and larvae from a dog at Stellenbosch during June 2002 and from another during July reflect accidental infestations during months when adults or larvae are particularly numerous on antelopes and scrub hares in the Western Cape Province (Horak et al. 1986). Adults have previously been collected from dogs on small-holdings near Grahamstown in the Eastern Cape Province (Horak et al. 1987b).

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In northern Gauteng Province adult *R. sanguineus* are most numerous on dogs from December to May with a secondary peak during September (Horak 1982), while in central Free State Province they are most numerous from January to April (Jacobs et al. 2001). Although adult ticks were present throughout the year at both localities, numbers were generally low during June and July (mid-winter). The adult ticks collected at Stellenbosch during October 2000 and 2002 possibly stem from recently-moulted over-wintered nymphs, while those collected during the period January to April at Stellenbosch and Franschhoek probably represent the next generation adult progeny of spring-moulted ticks. This corresponds somewhat to the situation in northern Gauteng, but suggests that only two life cycles per year are completed at Stellenbosch, and not three as at the former locality (Horak 1982). Because of the chronic nature of canine ehrlichiosis, dogs suffering from it may present several months after detachment of the vector adult *R. sanguineus* ticks. The larvae and various nymph stages of the argasid tick *O. meg nisi* may be found in the external ear canals of cattle that are kraaled at night, and of calves that are reared in stone or brick-walled pens (Howell et al. 1978; Fourie & Horak 1990). They have also been collected from the ear canals of sheep, goats, horses, dogs, cats and humans (Howell et al. 1978; Naude, Heyne, Van Der Merwe & Benic 2001; Huchzermeyer 2002). The source of the ticks on dogs in the present survey is likely to have been premises in which infested cattle or horses had been housed.

ACKNOWLEDGEMENTS

We greatly appreciate the time spent collecting ticks by Drs M.C. Franken, J.V. Jackson and M.E. Potgieter and the staff at their veterinary practices, by the staff of the Animal Welfare Society at Stellenbosch and the staff of the SPCA at Franschhoek, and by the dog owners Mrs A. Huckfeldt, Mr B. Mostert and Prof J. Nel. This project was funded by financial assistance provided by Pfizer Animal Health.

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