

Ixodid ticks on indigenous goats owned by small-scale farmers in four communal grazing areas in South Africa

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ABSTRACT

Indigenous goats belonging to small-scale farmers in 4 communal grazing areas in South Africa were sampled for ixodid ticks during the period September 1991 to May 1993. Three of these areas were in the North West Province (Rietgat, Madinyane and Bethany), and one in Mpumalanga Province (Geluk). No tick control was practised unless requested by the owners. Seven ixodid tick species, of which the majority were immature ticks, were collected from the goats in North West Province. *Amblyomma hebraeum* was the most numerous of these, followed by *Rhipicephalus evertsi evertsi* and *Rhipicephalus appendiculatus*. Substantially more ticks were collected from goats at Rietgat than at the Madinyane and Bethany grazing areas. Five tick species were collected at Geluk and *R. evertsi evertsi* comprised more than 95 % of the total population. At Rietgat and Geluk *A. hebraeum* nymphs were present on goats throughout the year, while most *R. appendiculatus* nymphs were collected during September and October 1991 and most adults during January and February 1992. At both Rietgat and Geluk most immature *R. evertsi evertsi* were collected from spring to late summer, while adults were present throughout the year.

Key words: communal grazing areas, indigenous goats, ixodid ticks, seasonal occurrence, South Africa.

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INTRODUCTION

Indigenous goats are widespread in Africa and play a significant economic and cultural role in the lives of rural farming communities⁶. Cattle are, however, considerably more important in these communities, and the status of the farmer is often related to the number of cattle owned. Cattle are usually better cared for than goats and may be regularly dipped and vaccinated against diseases when these procedures are subsidised by government, whereas goats are normally seen as a source of meat, and are seldom dipped or vaccinated. This has led to the selection of a small, hardy goat, highly resistant to disease, that can survive with little or no veterinary intervention⁵.

The seasonal occurrence of ixodid ticks on goats and cattle has been recorded at several localities in South Africa^{3,9–11,17,18}. Studies on the ticks infesting goats and cattle in the KwaZulu-Natal and Eastern

Cape provinces indicate that most of the species common on cattle are also present on goats, but in considerably lower numbers^{4,17}. Because of the importance of Angora and Boer goats in commercial farming enterprises, many of the earlier surveys in South Africa have involved these animals^{8,9,11,17}, and few targeted indigenous goats.

In Valley Bushveld¹ near Grahamstown in the Eastern Cape, 12 tick species were collected from Angora goats, and *Haemaphysalis silacea*, *Rhipicephalus appendiculatus* and *Rhipicephalus glabroscutatum* were the most prevalent and abundant¹¹. In the same vegetation type near Uitenhage in this province, *Amblyomma hebraeum* and *R. glabroscutatum* were the most prevalent and abundant species on Angora and Boer goats¹⁴. The lower legs and feet were the preferred site of attachment for both species, leading to foot abscessation and consequent lameness¹⁴. By contrast, very few ticks were collected from Angora goats grazed on irrigated Kikuyu grass pastures within a Valley Bushveld region in the Eastern Cape Province⁸. In the southwestern Free State, *Ixodes rubicundus* and *Rhipicephalus warburtoni* (as

R. punctatus) were the most prevalent species on Angora goats in a vegetation type described as False Upper Karoo⁹.

Three studies on the prevalence of ixodid ticks on indigenous goats in South Africa have been published^{4,5,18}. In KwaZulu-Natal the authors noted that the goats served as alternative hosts of economically important cattle ticks⁴ and any effective tick control programme would have to include goats. A survey in the Northern Province showed that *A. hebraeum*, *R. appendiculatus*, and *R. evertsi evertsi* were common on indigenous goats¹⁸ and a similar study in the same province found 9 species on goats, with *A. hebraeum* the most prevalent⁵. The present surveys were carried out to determine the numbers and species composition of ixodid ticks infesting indigenous goats belonging to small-scale farmers in the North West and Mpumalanga provinces in which similar surveys had not previously been conducted.

MATERIALS AND METHODS

The present survey was conducted between September 1991 and May 1993 and was part of a larger project assessing the dynamics of ticks and tick-borne diseases (TBDs) in 4 communal grazing areas (CGAs). A detailed description of the materials and methods has already been given^{19,20} and only a brief resumé follows.

Study sites and collection periods

Rietgat (25°24'S, 27°49'E) is situated in the North West Province. Most of the area surrounding Rietgat has been set aside for communal grazing by cattle, goats and donkeys. A dip-tank was operational in 1992, but because of various managerial problems it was closed down. With the exception of December 1991, April and August 1992 and January 1993, when no collections were made, ticks were collected at monthly intervals from September 1991 to May 1993.

Madinyane (25°22'S, 27°52'E) is close to Rietgat, and cattle, sheep and goats grazed the CGA, which was divided into camps used on an individual basis by stock-owners. There was no dip-tank in the area. The months during which ticks

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Table 1: Total number of ticks collected from indigenous goats in the Rietgat, Mandinyane and Bethany communal grazing areas, North West Province.

Tick species	Number of ticks collected				
	Larvae	Nymphs	Males	Females	Total
<i>Amblyomma hebraeum</i>	224	581	52	38	895
<i>Boophilus decoloratus</i>	0	15	0	1	16
<i>Hyalomma marginatum rufipes</i>	0	0	3	2	5
<i>Hyalomma truncatum</i>	0	0	6	1	7
<i>Rhipicephalus appendiculatus</i>	11	235	20	18	284
<i>Rhipicephalus evertsi evertsi</i>	223	57	147	79	506
<i>Rhipicephalus simus</i>	0	0	4	4	8
Total	458	888	232	143	1721

were collected were the same as at Rietgat.

Bethany (25°31'S, 27°33'E) is also situated in the North West Province. The CGA is 5 km northwest of Bethany and was divided into 16 camps, used rotationally. With the exception of April, September and December 1992, and January, May and July 1993, when no sampling was done, ticks were collected at monthly intervals from February 1992 to August 1993.

Geluk is 50 km east of the town Badplaas (25°00'S, 30°54'E), Mpumalanga Province. The CGA was not divided into camps and the owners used the available grazing as they needed it. The livestock drank from the Umvongotsini stream, a tributary of the Komati River. A dip-tank was present and had been efficiently run since 1975. Recently, however, farmers were charged for its use, and consequently fewer used it regularly. With the exception of December 1991, May, August, October and December 1992, and February 1993, during which the CGA was not visited, ticks were collected at monthly intervals from November 1991 to March 1993.

Vegetation and climate

Rietgat, Madinyane and Bethany have the same climate and vegetation type, described as Sourish Mixed Bushveld¹. The CGAs were overgrazed and encroachment by *Acacia karoo*, *Acacia caffra* and *Acacia robusta* was common. Rain falls mainly in summer, and temperatures

ranged from a mean monthly low of 5 °C in midwinter to a mean monthly high of 32 °C in summer. The vegetation at Geluk, which is classified as Piet Retief Sourveld, was more verdant than that in the CGAs in North West Province and, although overgrazed, there was little evidence of bush encroachment or erosion. Rain fell chiefly in summer and maximum temperatures could rise to 35 °C.

Collection of ticks

With the exception of Geluk, where on 3 occasions only 2 goats were sampled, 3 goats were sampled during each visit to the CGAs. Although an attempt was made to sample the same 3 goats at each occasion, frequently this was not possible. All visible ixodid ticks were collected by means of blunt-tipped forceps from both sides of the goats after the animals had been restrained on the pen floor. Special care was taken to collect ticks from the legs, particularly around the claws. The hands of the collector were also run over the goat's pelage to detect larger ticks that may not have been readily visible to the naked eye. The ticks were placed in 70 % ethyl alcohol and transported to the laboratory where they were identified and counted under a stereoscopic microscope.

Because the 3 CGAs in North West Province were close together, data for all ticks collected there have been combined. Only at Rietgat in North West Province and at Geluk in Mpumalanga were the numbers of ticks collected adequate to warrant graphic illustration of their seasonality.

RESULTS

A total of 153 whole-body samples were taken from goats during the survey (Rietgat, $n = 51$; Madinyane, $n = 51$; Bethany, $n = 21$; Geluk, $n = 30$). The numbers of ticks collected from goats in North West Province are summarised in Table 1 and those at Geluk in Mpumalanga in Table 2.

Seven species were recovered from the goats in the North West Province, with *A. hebraeum* (52.0 %), *R. appendiculatus* (16.5 %) and *R. evertsi evertsi* (29.4 %) accounting for the major portion of the population (Table 1). Although most of the ticks were immature, several adults of the 3 species listed above were also collected. The number of ticks taken from the goats at Rietgat was considerably greater than the combined total from the goats at Madinyane or Bethany. Five species were collected from the goats at Geluk and *R. evertsi evertsi* was the most numerous (Table 2).

The seasonal intensities of infestation of *A. hebraeum*, *R. appendiculatus* and *R. evertsi evertsi* are graphically illustrated in Figs 1 and 2. At Rietgat most *A. hebraeum* larvae were collected during the period October or November to March or May, while nymphs were present in every collection with the largest numbers recovered from September 1991 to January 1992 (Fig. 1a). Most adults were present during the summer months. Most *R. appendiculatus* nymphs were collected during September and October 1991 and most adults during January and February

Table 2: Total number of ticks collected from indigenous goats in the Geluk communal grazing area, Mpumalanga province.

Tick species	Number of ticks collected				
	Larvae	Nymphs	Males	Females	Total
<i>Amblyomma hebraeum</i>	11	63	6	0	80
<i>Boophilus decoloratus</i>	0	1	0	2	3
<i>Rhipicephalus appendiculatus</i>	3	64	13	19	99
<i>Rhipicephalus evertsi evertsi</i>	3012	1297	283	121	4713
<i>Rhipicephalus simus</i>	0	0	0	3	3
Total	3026	1425	302	145	4898

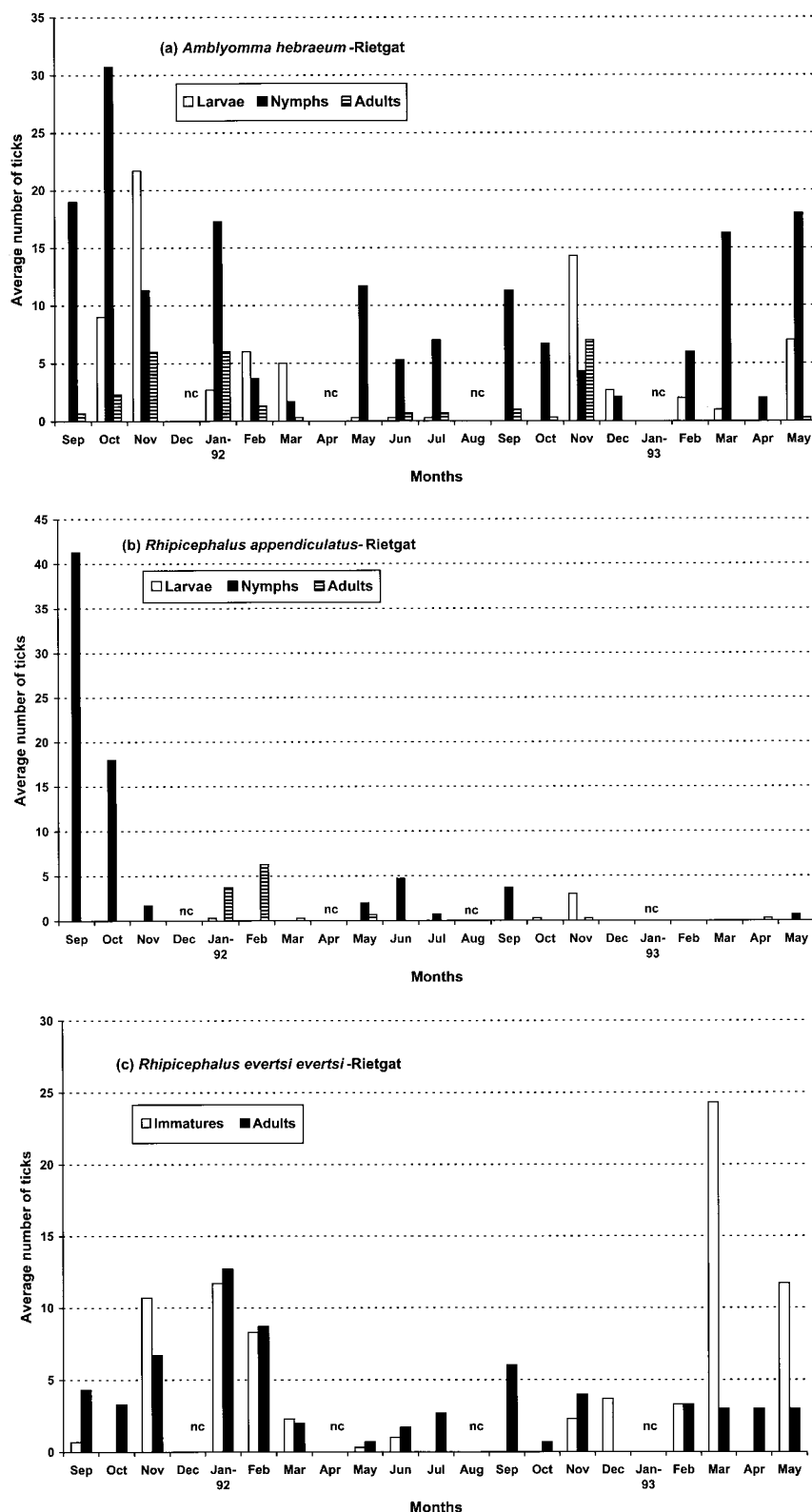


Fig. 1: Average monthly numbers of (a) *A. hebraeum*, (b) *R. appendiculatus* and (c) *R. evertsi evertsi* collected from three goats in the Rietgat communal grazing area, North West Province, between September 1991 and May 1993; (nc = no collections made).

1992 (Fig. 1b). Excluding June 1992, when none were collected, *A. hebraeum* nymphs were recovered at every visit to Geluk (Fig. 2a). At both Rietgat and Geluk most immature *R. evertsi evertsi* were collected during the period spring to late summer, while adults were present in varying numbers throughout the year (Figs 1c, 2b).

DISCUSSION

With the exception of *R. evertsi evertsi*, whose larvae can easily be collected from the ear canals, the tick-collection method employed in this survey was biased towards the recovery of the larger nymphs and adults. Therefore relatively large numbers of the latter stages compared to

the number of larvae were collected. More larvae and nymphs would probably have been collected had the goats' hair also been combed with a coarse metal comb⁴. *Amblyomma hebraeum*, *R. appendiculatus* and *R. evertsi evertsi* accounted for the major proportion of the ticks collected from the goats on the CGAs in the North West Province. At Geluk the composition of the tick population was distinctly different, with small *A. hebraeum* and *R. appendiculatus* populations and a large *R. evertsi evertsi* population.

The presence of *A. hebraeum* nymphs on goats throughout the year in this project agrees with the results of an earlier survey on indigenous goats in the Northern Province¹⁸. This has important implications for endemic stability to *Cowdria ruminantium* (heartwater) infection in goats as both nymphs and adults of this tick can transmit infection. Reports from South Africa⁶, Mozambique² and Nigeria¹³ indicate that susceptibility to heartwater is a major constraint to programmes aimed at improving indigenous goat breeds in Africa. For example, in Mozambique both *A. hebraeum* and *Amblyomma variegatum* are present, and serological and clinical evidence suggests that *A. hebraeum*, which occurs only in the south, is a more efficient vector of *C. ruminantium* than *A. variegatum*². Because most of the goats required for restocking programmes in Mozambique originate in the north of that country, where only *A. variegatum* occurs, great care must be taken to prevent losses due to heartwater when goats are translocated to the south².

The substantial numbers of *A. hebraeum* on goats at some of the CGAs in the present study would impact negatively on any project that involved introducing heartwater-susceptible European goat breeds into these areas. Researchers on small ruminants in South Africa have, however, suggested that cross-breeding local indigenous goats with high milk-producing European goats could be a feasible alternative for small-holder farmers⁷. Although cowdriosis remains a major deterrent to implementing this programme^{6,7}, it has been reported that cross-breeding indigenous goats with Saanen goats produces heartwater-resistant offspring⁷.

Before such breed-improvement programmes are implemented it would be advisable to conduct serological surveys for *C. ruminantium* in the CGAs, as this would give some indication of the prevalence of infection in goats in these areas. The tests for cowdriosis in goats have recently been improved, leading to enhanced specificity because of decreased cross-reactivity with *Ehrlichia*

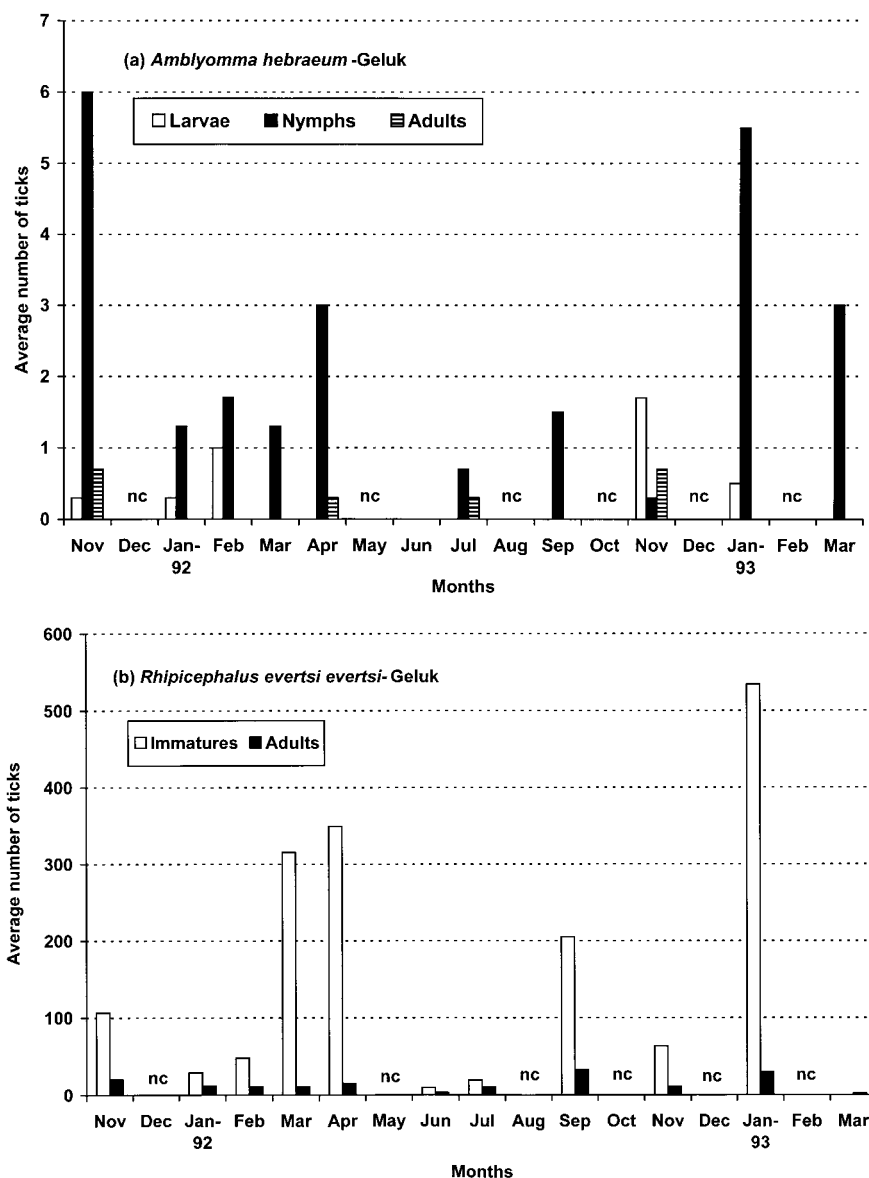


Fig. 2: Average monthly numbers of (a) *A. hebraeum* and (b) *R. evertsi evertsi* collected from three goats in the Geluk communal grazing area, Mpumalanga Province, between November 1991 and March 1993; (nc = no collections made).

spp. carried by ticks in this region¹⁵. These improvements imply that serological surveys on goats should have more credibility than in the past.

Boophilus decoloratus was uncommon on the goats, as described for goats in the Northern Province^{5,18}. In KwaZulu-Natal, however, 3.15 % of the ticks collected from goats were *B. decoloratus* and 2.7 % *Boophilus microplus*⁴. The preferred hosts of *B. decoloratus* are cattle and greater kudus^{3,12}, and both goats and sheep are considered inefficient hosts of this tick.

Few *Hyalomma* spp. were collected from the goats, as in earlier reports^{5,11,18}. These ticks prefer large hosts, from which considerable numbers can be collected^{10,16}.

Numerous adult *R. appendiculatus* have been collected from goats in the Eastern Cape Province and in the Northern Province during late summer^{17,18}. In the present surveys, however, nymphs were the

most prevalent instar, a result similar to that obtained on goats in KwaZulu-Natal⁴. The adults of this tick prefer large hosts such as cattle, African buffaloes and greater kudus as hosts, while the immature stages are found on these animals as well as the smaller domestic livestock and wildlife species²¹.

Rhipicephalus evertsi evertsi was present in large numbers on goats at 2 of the CGAs (Rietgat and Geluk), and virtually absent from the other 2. The adults of this tick prefer equids and cattle as hosts²¹, and the presence of these animals on the CGAs may have a bearing on the relative abundance of *R. evertsi evertsi* on the goats. In KwaZulu-Natal approximately 40 % of the 10 015 ticks collected from goats running with cattle were *R. evertsi evertsi*, although only 184 of these were adult ticks⁴.

Rhipicephalus simus was rare on the

goats, and only 11 adult ticks were collected. The preferred hosts of this tick are monogastric animal such as zebras, carnivores, and warthogs, and goats are seldom infested²¹.

As most of the ticks recovered in this survey were attached to the legs and ventral surfaces of the goats as well as in and on the ears, acaricide applied in a belly bath and as a hand-dressing to the ears would probably provide adequate control.

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