The effect of severe drought on the abundance of ticks on vegetation and on scrub hares in the Kruger National Park

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Free-living ixodid ticks were collected monthly from August 1988 to July 1993 from the vegetation of landscape zones 17 (*Sclerocarya caffra/Acacia nigrescens* Savanna) and 4 (Thickets of the Sabie and Crocodile Rivers) in the south-east and south-west of the Kruger National Park respectively, and parasitic ticks from scrub hares in the latter landscape zone. Total tick collections from the vegetation of both landscape zones were lowest in the year following the drought year of August 1991 to July 1992, while the tick burdens of the scrub hares were lowest during the drought year itself.

Key words: ixodid ticks, abundance, landscape zones, scrub hares, drought.

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Introduction

The seasonal abundance of free-living ixodid ticks in the *Sclerocarya caffra/Acacia nigrescens* landscape zone in the south-eastern region of the Kruger National Park has been determined by monthly drag-sampling of the vegetation in this region (Spickett *et al.* 1992). Similar data for parasitic ticks have been obtained by monthly sampling of scrub hares (*Lepus saxatilis*) in the landscape zone described as Thickets of the Sabie and Crocodile Rivers in the south-west of the park (Horak *et al.* 1993). Thirteen ixodid tick species were recovered from the vegetation and 12 from the scrub hares.

The present paper records the total numbers of ticks collected annually by monthly drag-sampling of vegetation in two landscape zones in the Kruger National Park and monthly examination of scrub hares in one of these zones over a period of five years from August 1988 to July 1993. During this time exceptionally low rainfall was recorded for the period August 1991 to July 1992.

Materials and Methods

Study Sites

Free-living ticks were collected in the southern region of the Sclerocarya caffra/Acacia nigrescens Savanna landscape zone and in the Skukuza region of the Thickets of the Sabie and Crocodile Rivers landscape zone (Landscape Zones 17 and 4 respectively of Gertenbach 1983). Ticks were also collected from scrub hares shot in the latter zone.

Tick collection

Free-living ticks questing on vegetation were collected at monthly intervals from August 1988 to July 1993 by drag-sampling (Zimmerman & Garris 1985; Petney & Horak 1987). Detailed descriptions of our

collection methods are given in Spickett *et al.* (1991, 1992). Five scrub hares were shot each month and ticks collected from these animals as described by Horak *et al.* (1986) and Horak & Fourie (1991). All the ticks were identified and counted under a stereoscopic microscope.

Presentation of data

The total numbers of ticks collected each year from August to July in each of the landscape zones and from the scrub hares are graphically illustrated and compared. Similar comparisons are made for each of the major tick species.

Results

The vast majority of ticks recovered from vegetation were in the larval stage. The largest total number of ticks (Fig. 1b) and larvae of *Amblyomma hebraeum* (Fig. 1c), *Boophilus decoloratus* (Fig. 2a), *Rhipicephalus appendiculatus* (Fig. 2b) and *Rhipicephalus zambeziensis* (Fig. 2c) were collected from the vegetation of landscape zone 17 during the year of lowest rainfall from August 1991 to July 1992 (Fig. 1a). In each case a decrease in numbers was evident only during the following year, with the greatest decrease occurring in the total number of ticks (Fig 1b) and number of *A. hebraeum* larvae recovered (Fig. 1c).

The total number of ticks (Fig. 3a) recovered from the vegetation of landscape zone 4 during the drought year (August 1991 to July 1992) did not differ markedly from the numbers collected in preceding years. However, a considerable reduction in the total number of ticks recovered occurred in the year following the drought. This reduction resulted from a decrease in the numbers of larvae of the major species, namely *A. hebraeum* (Fig. 3b), *B. decoloratus* (Fig. 4a) and *R. zambeziensis* (Fig. 4b).

The smallest total number of ticks (Fig. 5a) was recovered from the scrub hares during the drought year. This was attributable to reduced numbers of larvae of *A. hebraeum* (Fig. 5b) and *Amblyomma marmoreum* (Fig. 5c), immature *Hyalomma truncatum* (Fig. 6a) and larvae of *R. zambeziensis* (Fig. 6b).

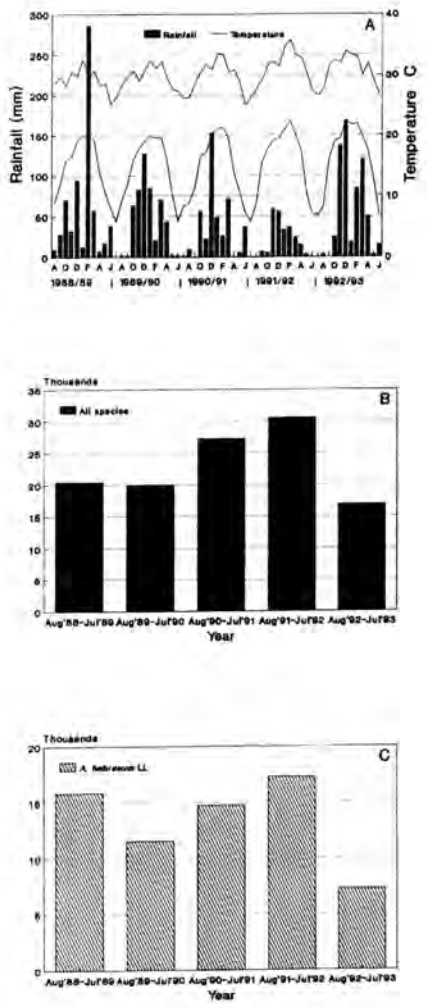

Fig. 1. A) Total monthly rainfall, and maximum and minimum temperature for Skukuza. B) Total numbers of ticks of all species. C) Total numbers of *Amblyomma hebraeum* larvae collected each year in landscape zone 17.

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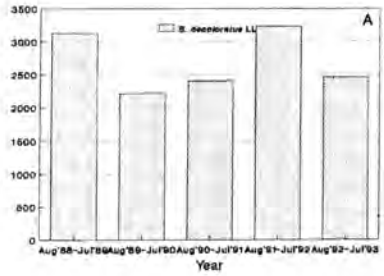
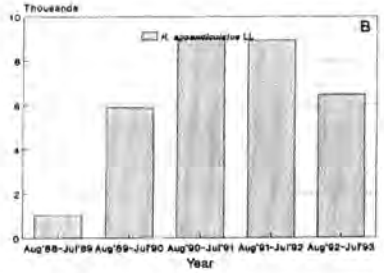




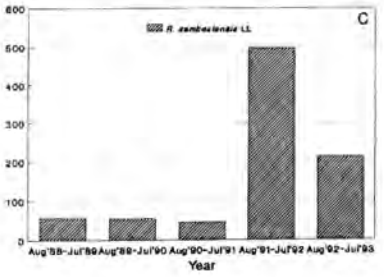
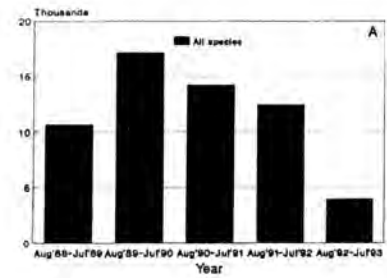


Fig. 2. Total numbers of larvae of A) *Boophilus decoloratus*; B) *Rhipicephalus appendiculatus*; and C) *Rhipicephalus zambeziensis* collected each year in landscape zone 17.



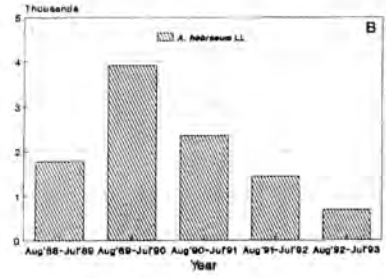


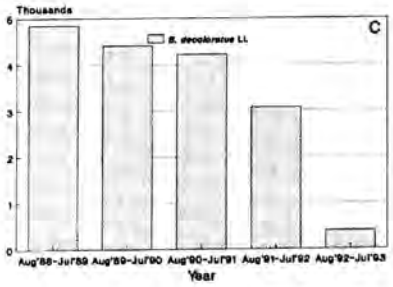
Fig. 3. Total numbers of A) ticks of all species; and B) *Amblyomma hebraeum* larvae collected each year in landscape zone 4.

Discussion

A number of explanations for the fluctuations in tick abundance during and after the drought can be proffered. These are, however, only speculative as the fluctuations are probably caused by a complex set of interactions and are not, therefore, easily explained.

The grass cover in that portion of landscape zone 17 in which we worked appeared to be amongst the most dense to be seen anywhere in the park—both before and during the drought year. The rainfall following the drought resulted in a visually apparent increase in the density and length of this grass cover. This could have had a diluting effect on tick density, resulting in the reduced numbers recovered during the year following the drought.

The grass and forb cover in that region of landscape zone 4 which we sampled was partially destroyed by fire during September



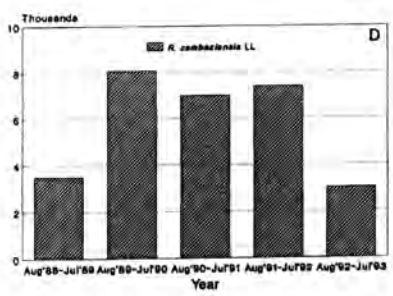
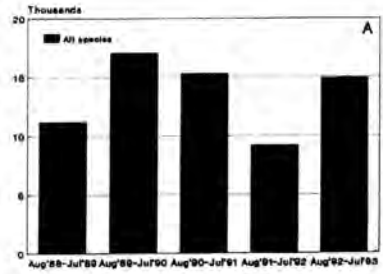
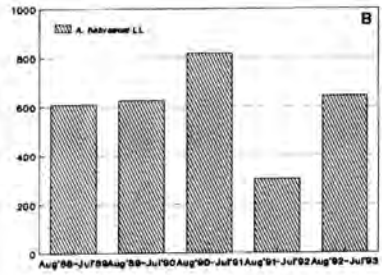


Fig. 4. Total numbers of larvae of A) *Boophilus decoloratus*; and B) *Rhipicephalus zambeziensis* collected each year in landscape zone 4.

1990. Although the cover improved during the summer of 1990/1991 it was again severely affected by the drought of 1991/92 and, on a subjective assessment, large numbers of animals emigrated from this region. The rain following the drought resulted in a massive regrowth of forbs, weeds and to a lesser extent grass and it was only during the latter half of 1993 that the animals returned. The reduced animal population during 1991/92 and much of 1993 probably affected the tick population adversely, while the considerable regrowth of forbs and weeds following the rains could have diluted tick density, thus resulting in the small numbers recovered from the vegetation in the year following the drought.

The numbers of ticks recovered from the scrub hares examined in landscape zone 4





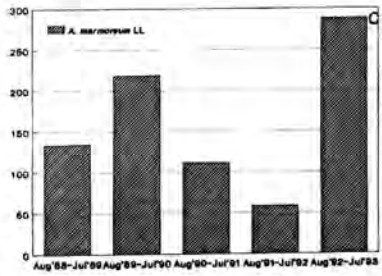


Fig. 5. Total numbers of A) ticks of all species; B) *Amblyomma hebraeum* larvae; and C) *Amblyomma marmoreum* larvae collected each year from scrub hares in landscape zone 4.

contradict the above theories. The drought seemed to result in an immediate and considerable reduction of the tick burdens of these animals. There is, however, an essential difference between the species found on the scrub hares and the free-living tick species recovered from the vegetation. The major tick on the hares was *H. truncatum* but this species was never recovered from

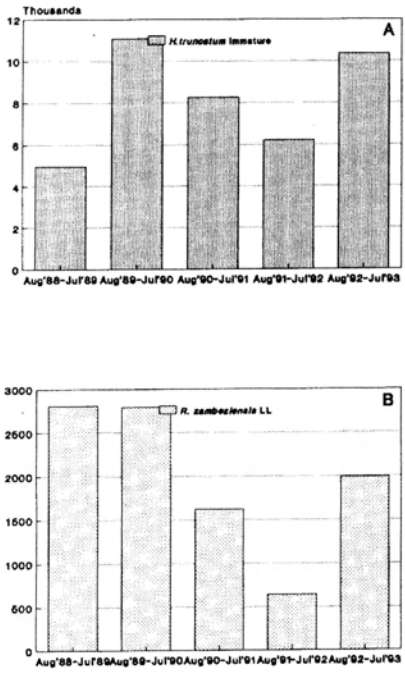


Fig. 6. Total numbers of A) *Hyalomma truncatum* immatures; and B) *Rhipicephalus zambeziensis* larvae collected each year from scrub hares in landscape zone 4.

the vegetation. Nevertheless, the larvae of *A. hebraeum*, *A. marmoreum* and *R. zambeziensis* all showed trends similar to those of *H. truncatum*.

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