

SEASONAL PREVALENCE OF IXODID TICKS ON CATTLE IN THE WINDHOEK DISTRICT OF SOUTH WEST AFRICA/NAMIBIA

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ABSTRACT

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The seasonal prevalence of ixodid ticks was determined over a 2-year period by the weekly removal from at least 5 cattle of all adult ticks and the immature stages of *Rhipicephalus evertsi mimeticus* in the ears. The highest mean weekly burden was 286.6 adult ticks/cow/week in March 1979, and the lowest 6.9 adult ticks/cow/week in July 1979.

Virtually no tick control is practised in this area.

Rhipicephalus capensis group adults peaked in the summer from October to March/April.

Rhipicephalus evertsi mimeticus adults were present throughout the year, though in slightly greater numbers from November to May. Immature stages of this species in the ears showed a peak in February/March in addition to variably-timed high peaks in the first 2 winters.

Hyalomma marginatum rufipes and *Hyalomma truncatum* peaked from December to March. Very small numbers of *Boophilus decoloratus* and *Rhipicephalus oculatus* were recovered. Tick burdens of all major species differed significantly in the 2 study years.

INTRODUCTION

Apart from a distribution study (J. D. Bezuidenhout, unpublished data, 1974), little is known about ixodid ticks in South West Africa/Namibia. The central and northern savanna areas are used mainly for extensive beef cattle farming and are largely or entirely free of many of the cattle diseases (such as heartwater and theileriosis) which are important in other ranching areas in the subcontinent. Anaplasmosis, however, plays a prominent role in the disease profile, and various other tick-associated diseases, such as redwater, sweating sickness, and secondary abscessation, can occur (Schneider, 1977). To provide background information for epidemiological studies on anaplasmosis, the seasonal prevalence of ticks on cattle in the Windhoek District was investigated.

MATERIALS AND METHODS

Study farm

The unit Bergvlug, lying \pm 20 km north-east of Windhoek, originally formed the easternmost part (portion 2) of the farm Hoffnung No. 66. In 1949 it was bought by the then Division of Agriculture and administered from the adjacent farm Neudamm No. 63. Bergvlug lies in the Neudamm Hochland which, together with the Khomas Hochland, forms the central Bergland physiographic zone described by Leser (1976). These areas both support highland savanna (Giess, 1971). The rainfall on Bergvlug in the season prior to the start of the study (July 1977-June 1978) was 490 mm, while the rainfall during the 2 consecutive study seasons was 350 mm and 448 mm. The mean annual rainfall for Bergvlug over 26 years is 425 mm. Monthly rainfall figures (from the farm) and mean monthly maximum and minimum temperatures (from the nearby Windhoek weather station) for the study period are given in Fig. 1. Kudu (*Tragelaphus strepsiceros*) are the only antelope which are common in the study area. Two horses were kept for work purposes on the farm.

Survey cattle

In the first 12 months of the study, 8-10 specific Simmentaler cows from a herd of about 50 Simmentaler and Africander cows of various ages were used for the weekly tick collection. In the 2nd year, 5 specific Simmentaler cows (plus 1 reserve animal whose ticks were removed weekly but not counted or identified unless one of the other animals was absent) were considered sufficient for the purposes of the study. The herd in which the study cows ran was subjected to a rotational grazing system; this involved a 2-3-week grazing period and a 12-week or longer rest period for each camp. During the breeding season (mid-January till end of March) equally sized Africander and Simmentaler groups ran separately. A total of approximately 190 cattle ran on the 5000 ha study farm during the 2-year period of investigation.

Sampling procedure

Collections were made at approximately weekly intervals from the beginning of July 1978 till the end of June 1980. Ear scrapings were continued for an additional 2 months to span the 3rd winter. All adult ticks were collected, using fingers or forceps, by 2 persons, one working on each side of a crush which held the animal. A neck clamp and ropes were used to immobilize its head for tick collection. Immature *Rhipicephalus evertsi mimeticus* in the ears were collected by scraping each ear canal and adjacent pinna as thoroughly as possible with a small spoon-shaped spatula, but no neck scrapings for immature *Boophilus* spp. were performed.

All the ticks collected were placed in alcohol and subsequently identified at the laboratory.

RESULTS

The relative abundance and mean weekly burdens of adult ticks collected during the 2-year period are given in Table 1.

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TABLE 1 Relative abundance and mean weekly burdens of adult ticks

| Species | July 1978 – June 1979 | | July 1979 – June 1980 | |
|--|-----------------------|--------------------|-----------------------|--------------------|
| | Relative abundance | Mean weekly burden | Relative abundance | Mean weekly burden |
| <i>Rhipicephalus capensis</i> group..... | 65,9% | 62,3 ^a | 50,9% | 29,0 ^a |
| <i>Rhipicephalus evertsi mimeticus</i> | 13,7% | 12,9 ^c | 27,5% | 15,6 ^c |
| <i>Hyalomma marginatum rufipes</i> | 16,6% | 15,7 ^d | 17,3% | 9,8 ^d |
| <i>Hyalomma truncatum</i> .. | 3,7% | 3,5 ^e | 4,3% | 2,5 ^e |
| Other (mostly <i>Boophilus decoloratus</i>) | 0,1% | 0,1 | 0,05% | 0,03 |
| Total | 100% | 94,5 ^b | 100,05% | 56,93 ^b |

Superscripted pairs differ significantly as follows:
^a: P<0,005 ^b: P<0,01 ^c: P<0,025 ^d: P<0,05 ^e: P<0,10

The mean weekly burdens of *R. evertsi mimeticus* rose significantly in the 2nd year, while those of all the other major species dropped significantly (Table 1). This situation resulted in a high relative abundance of *R. evertsi*

mimeticus in the 2nd year. The monthly prevalence during the 2-year period of all adult ticks, of the adults of each species separately, and of the immatures of *R. evertsi mimeticus* is shown in Fig. 2–8. Included in Fig. 3–4 and Fig. 6–7 are single bar scales representing the female/male ratios for those months in which the sample of the relevant species contained over 100 specimens, the depicted ratio exceeding 1 when there were more females than males. In the case of the immature stages of *R. evertsi mimeticus* (Fig. 5), the larval/nymphal ratios for the last 14 months' collections are given, using similar bar scales.

The total tick burdens, rising sharply during November in both years, reached a maximum in March in 1979 and in February in 1980 (Fig. 2). Counts were lowest during the months June–August.

The *Rhipicephalus capensis* group, being the most important component of the total adult count, paralleled the above tendency, but showed more distinct dips in December 1978 and January 1980 (Fig. 3). The female/male ratio for this group was consistently higher in the 2nd year.

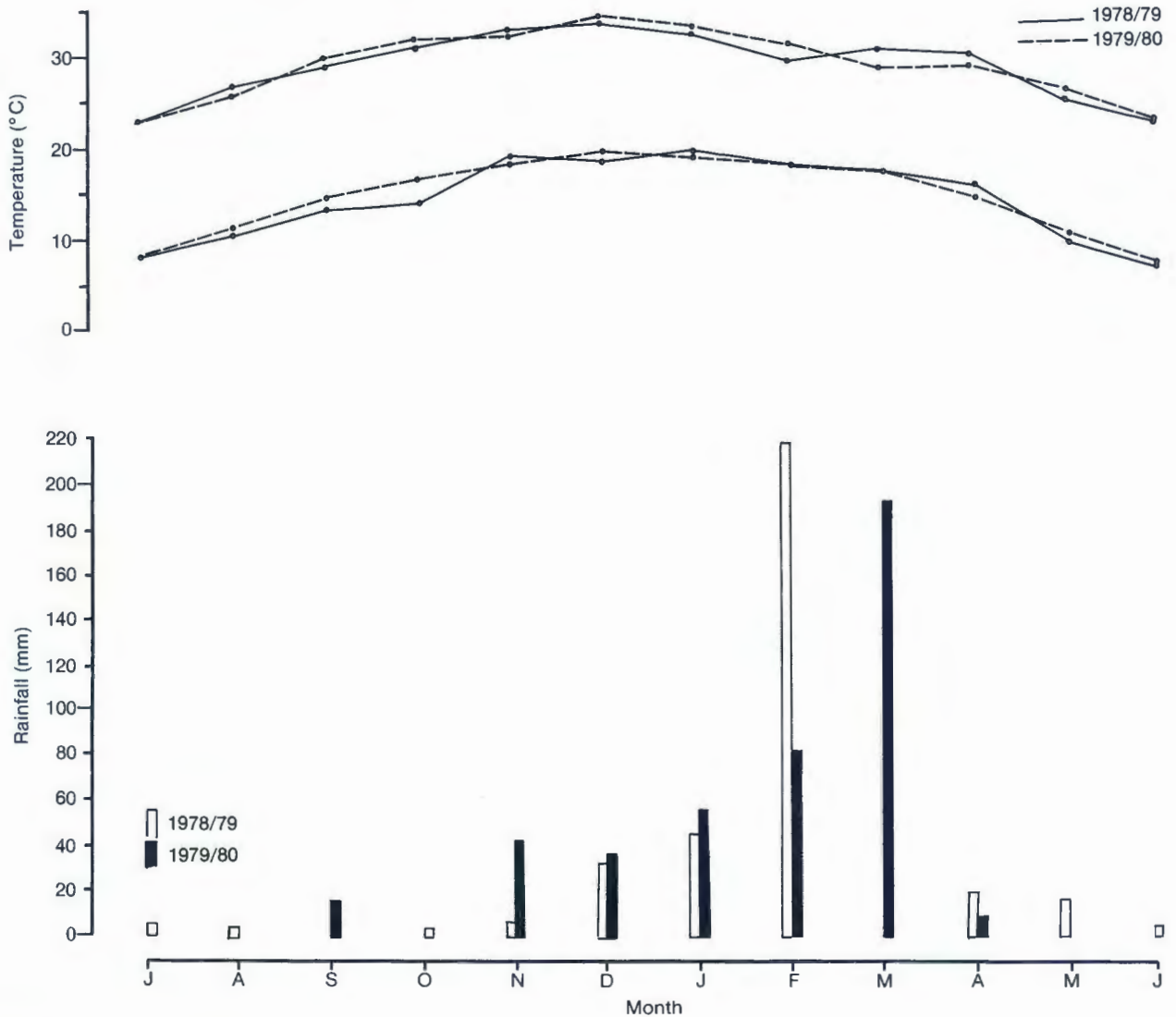


FIG. 1 Mean monthly maximum and minimum temperatures and monthly rainfall during the study period

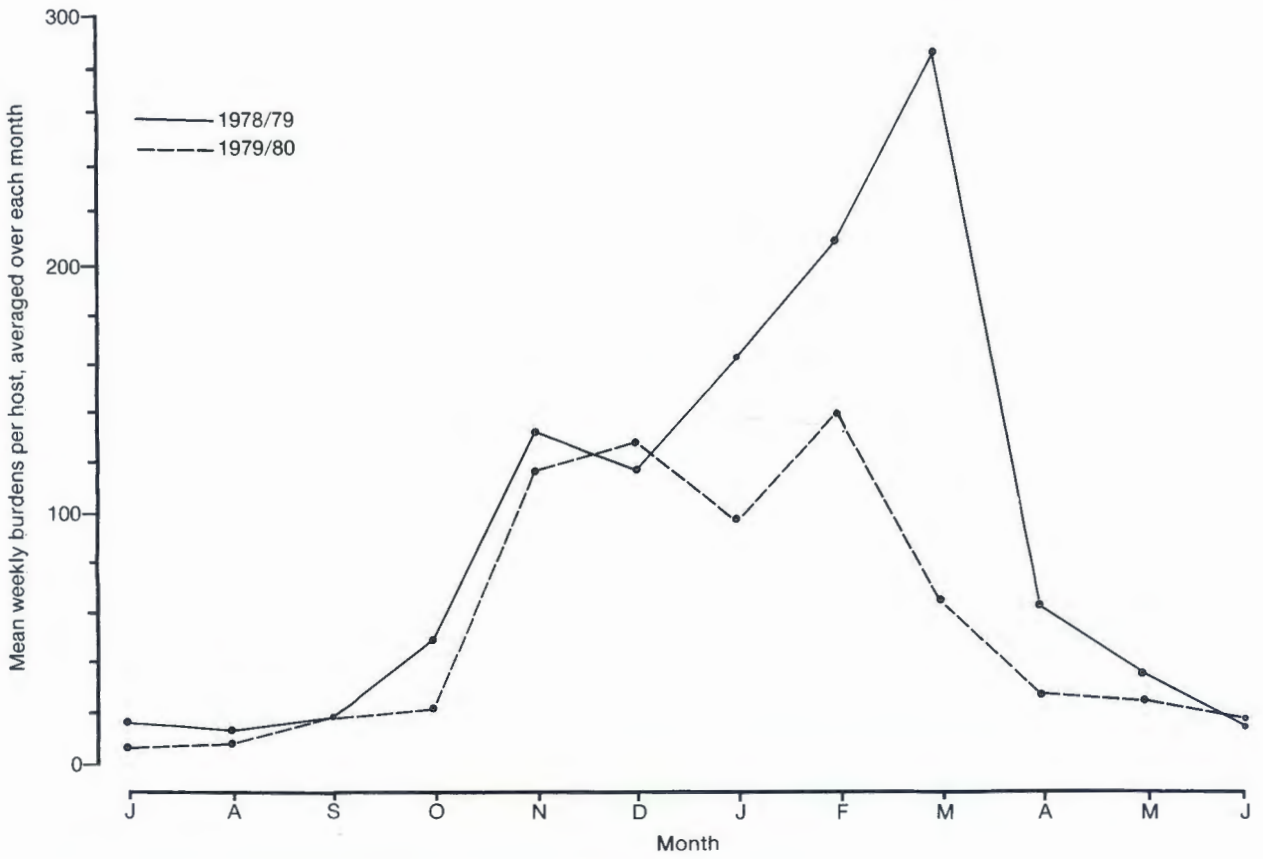


FIG. 2 Seasonal prevalence of adult ixodid ticks, all species combined

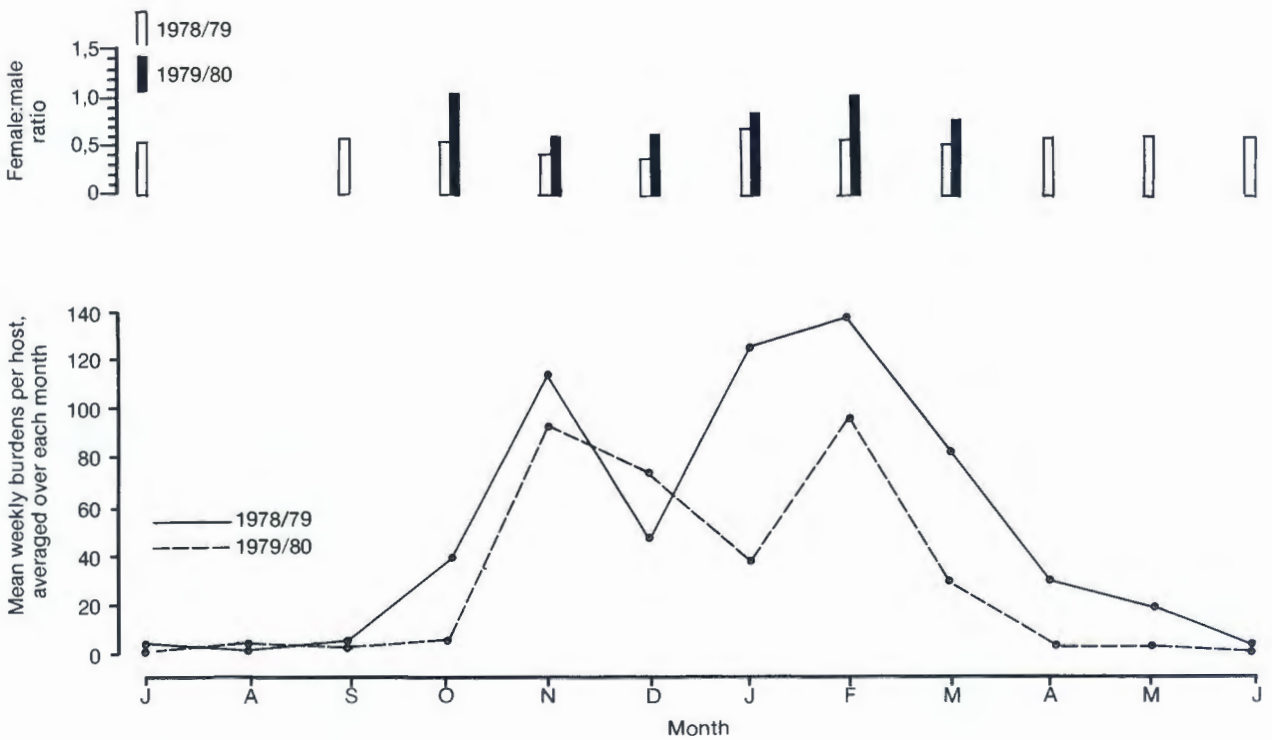


FIG. 3 Seasonal prevalence and female:male ratios of adult *Rhipicephalus capensis* group ticks

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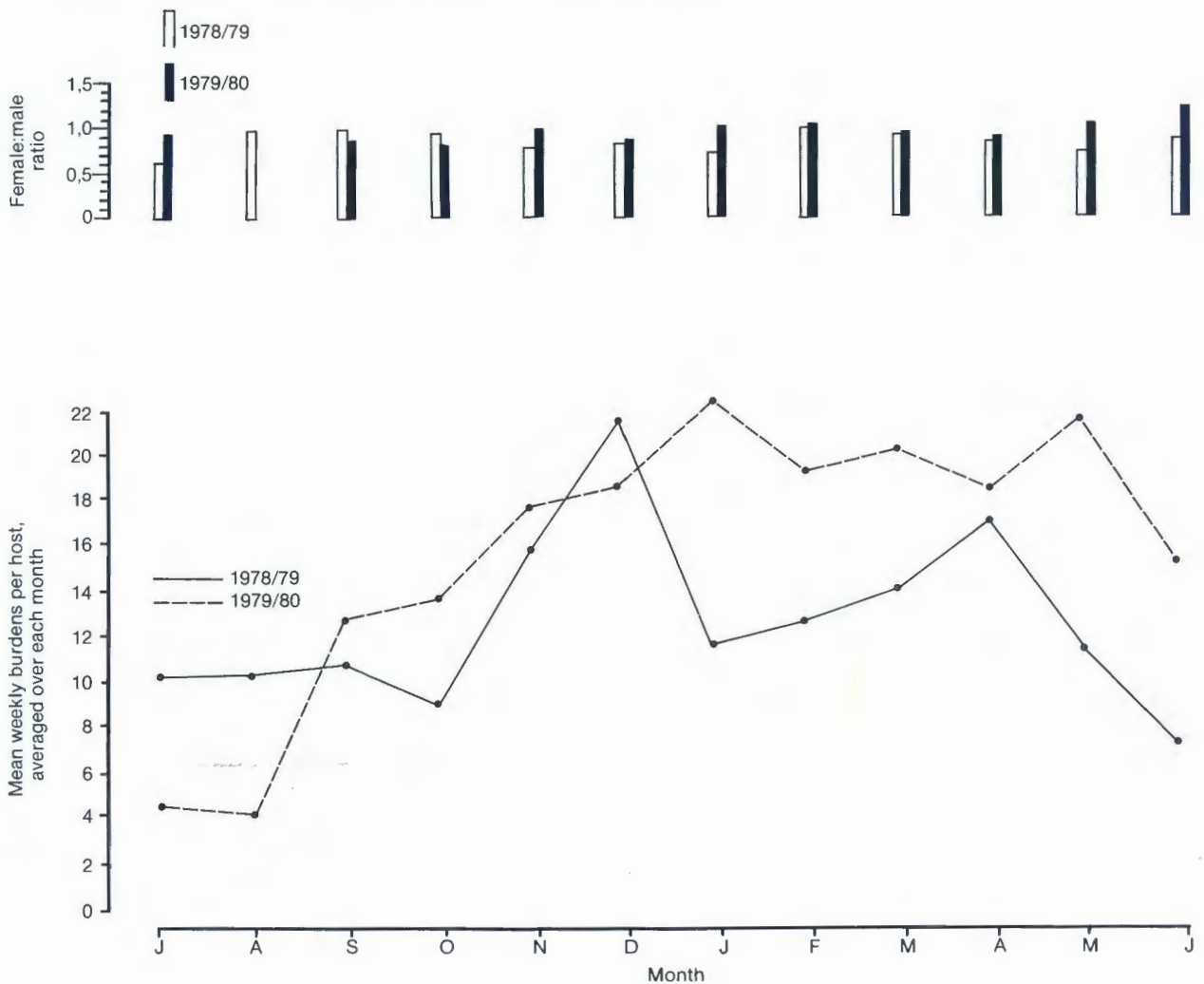


FIG. 4 Seasonal prevalence and female:male ratios in adult *Rhipicephalus evertsi mimeticus*

The numbers of *R. evertsi mimeticus* adults never fluctuated as dramatically as those of other species, but the numbers in both study years were slightly higher from November–May (Fig. 4). Immature *R. evertsi mimeticus* showed high peaks from the commencement of the study (July 1978) to September 1978, and again from May 1979–June 1979. A lower peak was observed in both study years in February–March (Fig. 5).

Both *Hyalomma marginatum rufipes* (Fig. 6) and *Hyalomma truncatum* (Fig. 7) peaked from November to March, with the female/male ratio in *H. marginatum rufipes* tending to be highest during and immediately after the peak season.

The extremely low numbers of *Boophilus decoloratus* recorded showed 2 small spikes in both years: December–January and June–July (Fig. 8).

Very small numbers of *Rhipicephalus oculatus* were collected in August 1978 and October 1979.

DISCUSSION

This is the 1st study on the seasonal prevalence of ticks in South West Africa/Namibia and, to the authors' knowledge, the 1st detailed study for any semi-arid farming zone in Southern Africa.

The drop in burdens in all species (except *R. evertsi mimeticus*) in the 2nd study year probably reflects the below-average rainfall of the previous year. This may have led to poor survival of ticks during the free-living part of their life cycles. In spite of differing rainfall patterns in the 2 study years, however, the timing of peaks for each species was very similar. These 2 deductions suggest that the specific amount and distribution of rainfall immediately prior to a peak has little influence on the height and timing of the peak in the case of the species studied.

The total burdens of adult ticks found in this study largely reflect the main component, the *R. capensis* group and, to a lesser extent, *H. marginatum rufipes*.

An attempt was made to separate the 1979/80 *R. capensis* group collection into *R. capensis* and *R. gertrudae* according to the criteria given by Feldman–Muhsam (1960), but the percentage division obtained by applying normal morphological criteria under the stereoscopic microscope did not agree with that obtained by cutting out and mounting the female genital apertures of large samples. These 2 species were thus lumped as *R. capensis* group, and all that can be said is that *R. gertrudae* predominated and the percentage division between the 2 species (by whatever criteria were used) remained fairly constant during the peak season.

There was no indication that any of the other *R. capensis* group ticks (e.g. *R. compositus* and *R. longus*) were present. Theiler (1950) suggests that *R. capensis* is inactive during the April – June period, irrespective of locality. In this study, the inactive period began in April but extended through till October, after which burdens again rose. Her statement that *R. capensis* is insecurely established in areas where it occurs in South West Africa/Namibia would seem to be controverted by our data, although it must be remembered that the 2 study years followed several years of above-average rainfall. Feldman–Muhsam (1969) considers that early statements (including those of Theiler) on the ecology and geographical distribution of *R. capensis* are obscure, because *R. capensis* and *R. gertrudae* have been confused with each other and their data were pooled. The only statements concerning the host preferences of immature *R. capensis* that could be traced were those of Theiler (1962), who mentioned chiefly rodent species. The authors have never noted immatures of any ticks other than *Hyalomma* spp. during cursory examinations of birds and small mammals in the Windhoek district. More detailed recovery techniques, such as scrubbing hides, may show that the immatures of *R. capensis* group occur on certain rodents or even on cattle.

Walker, Mehlitz & Jones (1978) note that the available evidence suggests *R. evertsi mimeticus* has the same host preferences, predilection sites and life cycle as *R. evertsi evertsi*. The overall picture given by studies of

the latter's seasonal prevalence is that no clear seasonal pattern exists (Schröder, 1980, Minshull, 1981; Norval 1981 a). The findings of this study with respect to the seasonal prevalence of immatures agree only with those from work on impala at Nylsvlei (Horak, 1982).

The seasonal prevalence of adults agrees in detail only with data from a previous study on cattle at Nylsvlei (Londt, Horak & De Villiers, 1979), and in broad outline with data from various localities in Natal presented by Baker & Ducasse (1967). No clear "waves" of activity, like those described by Matson & Norval (1977), were discernible in this study. The high ratio of nymphs to larvae in February–March 1980 probably indicated rapid development at that time of the year. The only equids on the farm were 2 work-horses, and the relatively high burdens (particularly of immatures) recorded on cattle in this study thus bore little relationship to the presence of equids, as has often been seen elsewhere (Norval, 1981 a). Kudu could, however, have acted as alternate hosts (Norval, 1981 a).

In this study the seasonal prevalence of *H. marginatum rufipes* co-incides exactly with that of *H. truncatum*. The seasonal findings for the 2 *Hyalomma* spp. correspond well with those tabulated in Londt *et al.* (1979), and with those in subsequent studies (Minshull, 1981; Horak, 1982; Norval, 1982) on game and cattle, with the qualification that in several of these studies *H. marginatum rufipes* numbers started increasing slightly earlier,

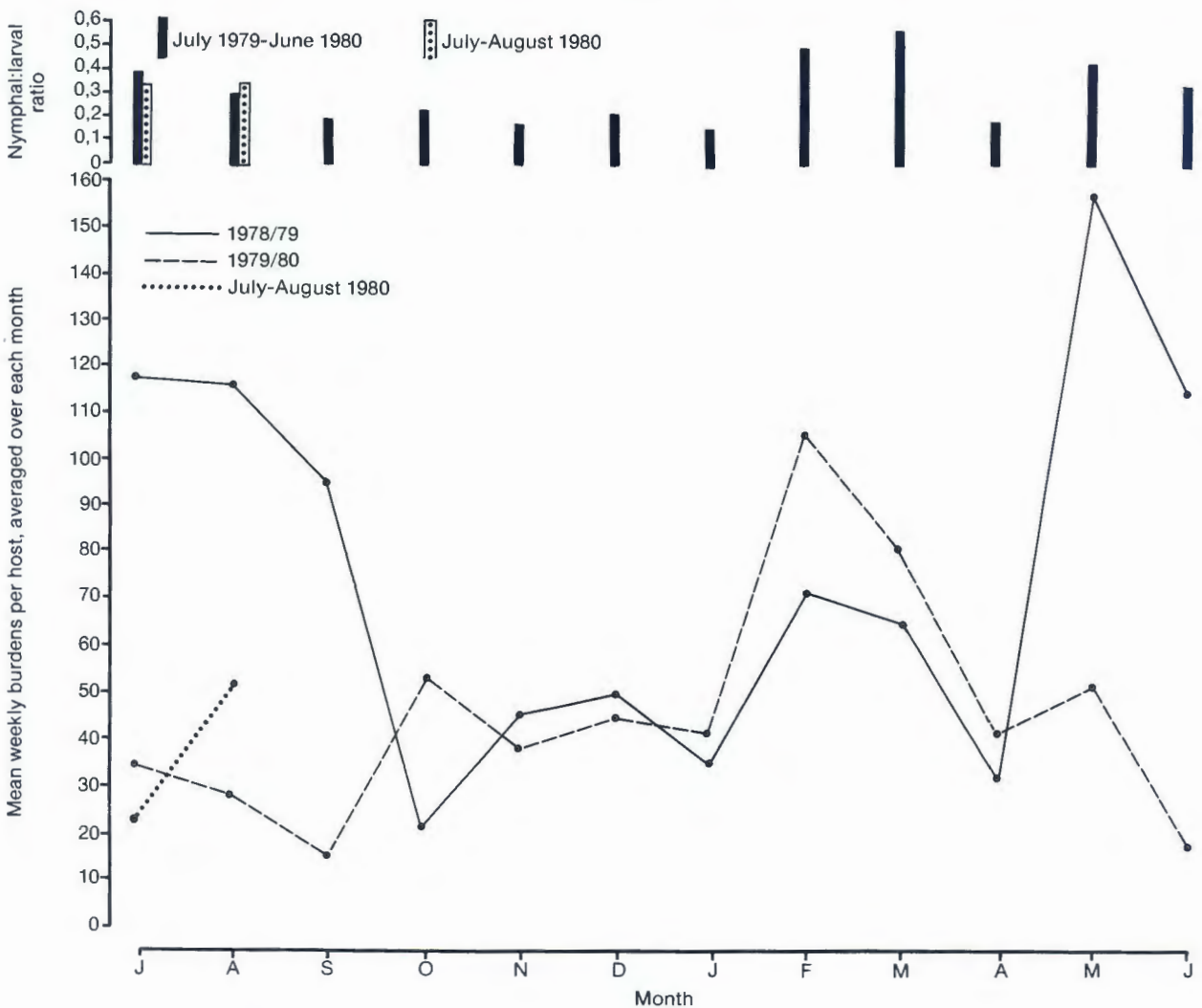


FIG. 5 Seasonal prevalence and nymphal:larval ratios of *Rhipicephalus evertsi mimeticus* in ears

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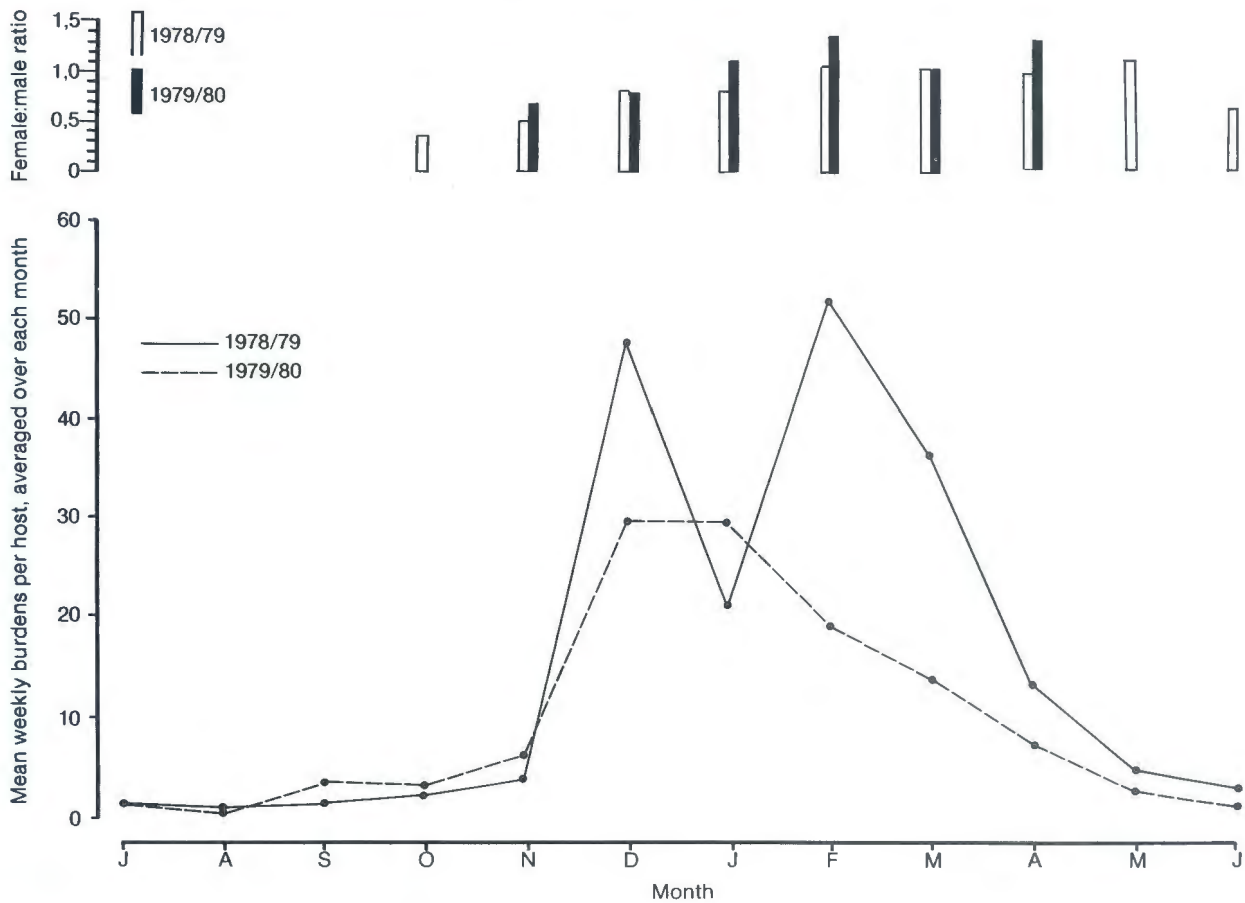


FIG. 6 Seasonal prevalence and female:male ratios in adult *Hyalomma marginatum rufipes*

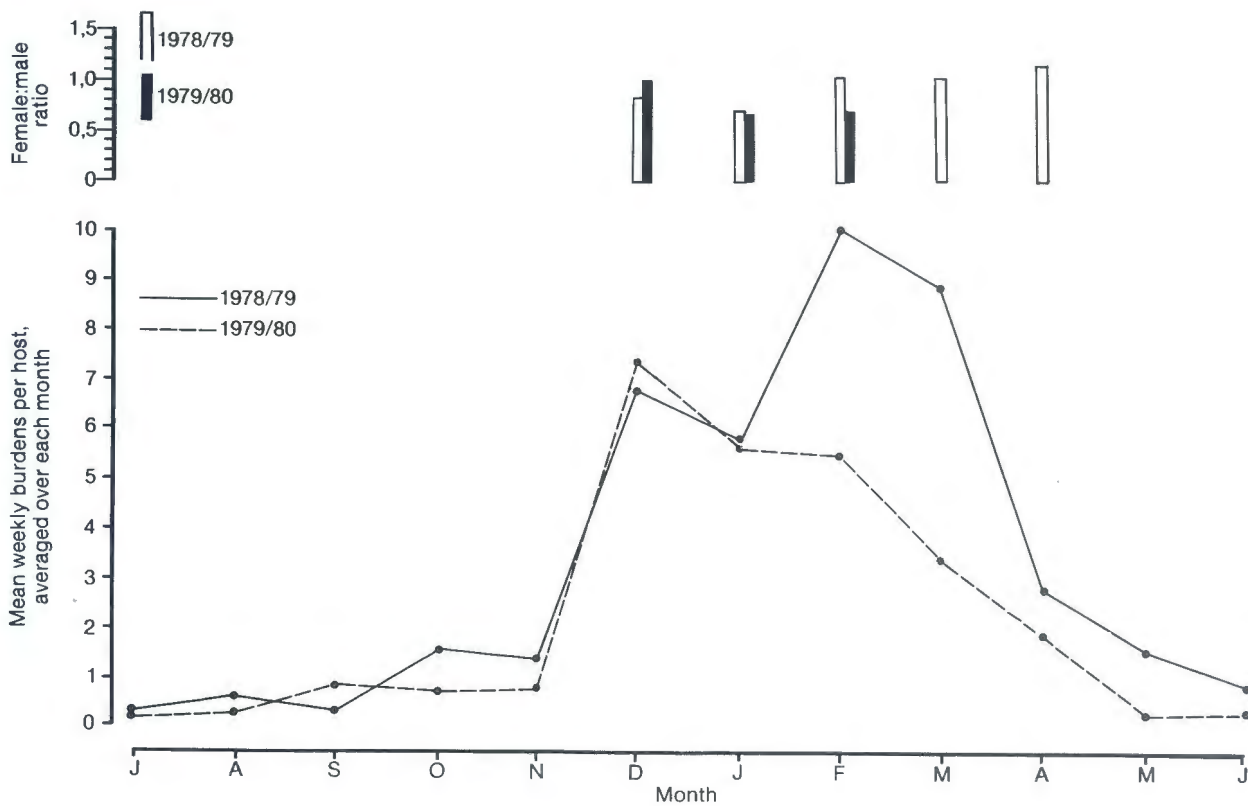


FIG. 7 Seasonal prevalence and female:male ratios in adult *Hyalomma truncatum*

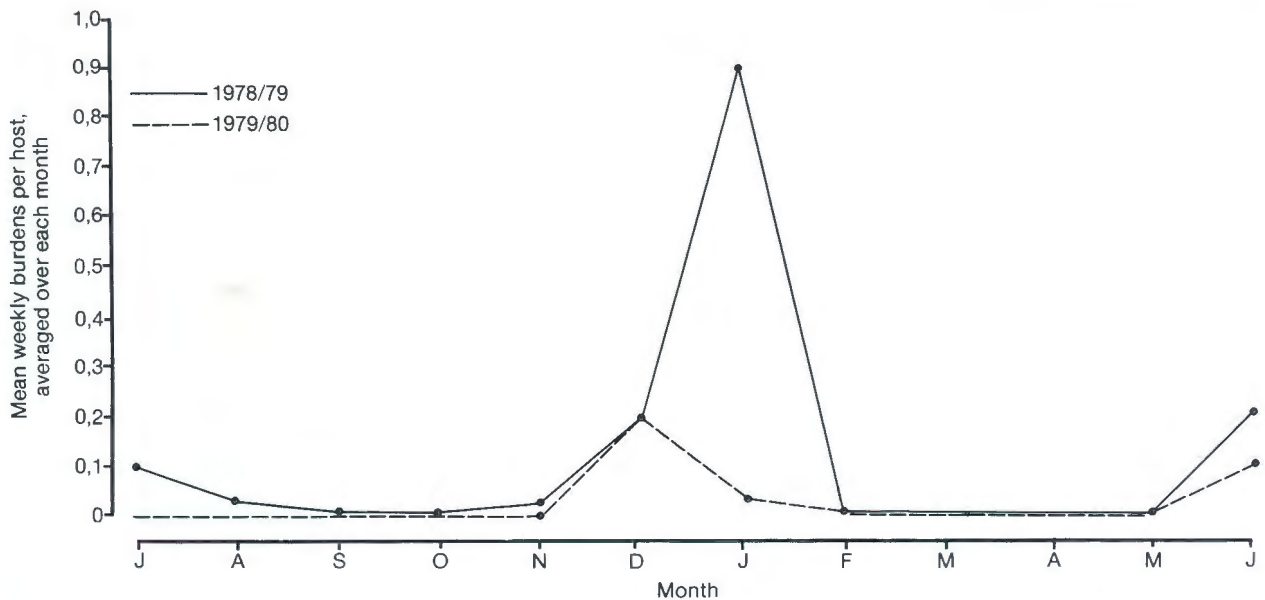


FIG. 8 Seasonal prevalence of adult *Boophilus decoloratus*

and in some of the studies relatively high numbers of *H. truncatum* persisted slightly later, than in this study. Although no index of the numbers of birds and hares available as hosts for immatures was obtained, bird life was abundant, while hares were very seldom seen. If this could be verified, it would explain the greater numbers of *H. marginatum rufipes* (Norval, 1982).

The seasonal findings with respect to *B. decoloratus* must be considered as tentative in view of the extremely small number of ticks collected. Most Southern African studies indicate year-round activity (Jooste, 1966; Londt *et al.*, 1979; Mason & Norval, 1980), though 2 indicate seasonality (Baker & Ducasse 1967; Robertson, 1981). In this study the 2 spikes of activity differ from either of these findings, and are far shorter in duration. This tick may complete 2 generations per annum in South West Africa/Namibia. The low numbers we collected can possibly be attributed to the 12-week or longer rest period employed in the grazing system. Soulsby (1982) states that unfed larvae can survive up to 7 months, but this period is probably far shorter under the hot, dry, local field conditions. Londt (1977) states that the eggs of *B. decoloratus* are even more sensitive to desiccation than the larval stage, and points out that a temperature increase shortens the duration of the non-parasitic phases. Utech, Sutherst, Dallwitz, Wharton, Maywald & Sutherland (1983) found that 10% of larvae of the related species *Boophilus microplus* survived for 4 weeks on pasture during the Queensland summer, and for 6–11 weeks during the winter. Larvae and adult males of *B. microplus* have been shown to cross over to other hosts (Mason & Norval, 1981). *B. decoloratus* could thus conceivably be implicated in intrastadial transmission of anaplasmosis as shown by Potgieter (1981). However, the low probability of this possible cross-over, coupled with the low count of *B. decoloratus* in the Windhoek District, make this explanation for transmission unlikely. Perhaps other, commoner, species also cross over and transmit anaplasmosis intrastadially.

The sex ratio of adult *R. evertsi mimeticus* agrees broadly with that found for *R. evertsi evertsi* by Londt *et al.* (1979). In the case of *H. marginatum rufipes*, a pre-

dominance of females was often seen in the latter half of the peak season and just thereafter. No comparative data could be found for the *R. capensis* group in which the males often outnumbered the females by a factor of 2 in the 1st study year. Kaiser, Sutherst & Bourne (1982) give possible explanations for male-biased sex ratios, but we have no evidence these may be operative in the case of *R. capensis* group ticks.

In view of the awareness today of enzootic stability to tick-borne diseases (Norval, 1981 b), tick control is not recommended as a blanket measure on farms in central South West Africa/Namibia. However, when veterinarians or farmers are concerned about tick numbers the following recommendations, based largely on the findings in this study, are made: occasional spraying during the peak season for control of the *R. capensis* group, occasional hand-dressing on predilection sites for *Hyalomma* spp. during their peak period, and occasional local treatment applied to the ears in winter against immature *R. evertsi mimeticus*.

Work of this type should be repeated elsewhere in South West Africa/Namibia to give a broader base of knowledge for recommendations for practical tick and disease control. It should, if possible, be correlated with evidence of the tick-associated diseases which occur locally.

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REFERENCES

- BAKER, MAUREEN K. & DUCASSE, F. B. W., 1967. Tick infestation of livestock in Natal. 1. The predilection sites and seasonal variations of cattle ticks. *Journal of the South African Veterinary Medical Association*, 38, 447-453.
- FELDMAN-MUHSAM, B., 1960. The South African ticks *Rhipicephalus capensis* Koch and *R. gertrudae* n.sp. *Journal of Parasitology*, 46, 101-108.
- GIESS, W., 1971. A preliminary vegetation map of South West Africa. *Dinteria*, 4, 11 & map.
- HORAK, I. G., 1982. Parasites of domestic and wild animals in South Africa. XV. The seasonal prevalence of ectoparasites on impala and cattle in the Northern Transvaal. *Onderstepoort Journal of Veterinary Research*, 49, 85-93.
- JOOSTE, KATE F., 1966. A two-year study of the seasonal occurrence of adult ticks on a herd of Red Poll cows. *Rhodesian Agricultural Journal* 63, 97-99.
- KAISER, M. N., SUTHERST, R. W. & BOURNE, A. S., 1982. Relationship between ticks and zebu cattle in southern Uganda. *Tropical Animal Health and Production*, 14, 63-74.
- LESER, H., 1976. Südwestafrika—eine geographische Landeskunde, pp. 70-75. Windhoek: SWA Wissenschaftliche Gesellschaft.
- LONDT, J. G. H., 1977. Oviposition and incubation in *Boophilus decoloratus* (Koch, 1844) (Acarina: Ixodidae). *Onderstepoort Journal of Veterinary Research*, 44, 13-20.
- LONDT, J. G. H., HORAK, I. G. & DE VILLIERS, I. L., 1979. Parasites of domestic and wild animals in South Africa. XIII. The seasonal incidence of adult ticks (Acarina: Ixodidae) on cattle in the Northern Transvaal. *Onderstepoort Journal of Veterinary Research*, 46, 31-39.
- MASON, C. A. & NORVAL, R. A. I., 1980. The ticks of Zimbabwe. I. The genus *Boophilus*. *Zimbabwe Veterinary Journal*, 11, 36-43.
- MASON, C. A. & NORVAL, R. A. I., 1981. The transfer of *Boophilus microplus* (Acarina: Ixodidae) from infested to uninfested cattle under field conditions. *Veterinary Parasitology*, 8, 185-188.
- MATSON, B. A. & NORVAL, R. A. I., 1977. The seasonal occurrence of adult ixodid ticks on cattle on a Rhodesian Highveld farm. *Rhodesian Veterinary Journal*, 8, 2-6.
- MINSHULL, JACQUELINE I., 1981. Seasonal occurrence, habitat distribution and host range of four ixodid tick species at Kyle Recreational Park in South Eastern Zimbabwe. *Zimbabwe Veterinary Journal*, 12, 58-62.
- NORVAL, R. A. I., 1981 a. The ticks of Zimbabwe. III. *Rhipicephalus evertsi evertsi*. *Zimbabwe Veterinary Journal*, 12, 31-35.
- NORVAL, R. A. I., 1981 b. A re-assessment of the role of dipping in the control of tick-borne disease in Zimbabwe. *Proceedings of a Conference on Tick Biology and Control, Grahamstown, 1981*, 87-90.
- NORVAL, R. A. I., 1982. The ticks of Zimbabwe. IV. The genus *Hyalomma*. *Zimbabwe Veterinary Journal*, 13, 2-10.
- POTGIETER, F. I., 1981. Tick transmission of anaplasmosis in South Africa. *Proceedings of a Conference on Tick Biology and Control, Grahamstown, 1981*, 53-56.
- ROBERTSON, WENDY D., 1981. A four-year study of the seasonal fluctuations in the occurrence of the blue tick *Boophilus decoloratus* (Koch) in the coastal regions of the eastern Cape. *Proceedings of a Conference on Tick Biology and Control, Grahamstown, 1981*, 199-204.
- SCHNEIDER, H., 1977. Analyse der Tiergesundheitsituation in Südwestafrika/Namibia—Vergangenheit und Gegenwart. Dissertation, university of Giessen.
- SCHRÖDER, J., 1980. Cattle ticks from the Waterberg District of the Transvaal. *Journal of the South African Veterinary Association*, 51, 27-30.
- SOULSBY, E. J. L., 1982. Helminths, arthropods, and protozoa of domesticated animals, p. 462. 7th edn. London: Baillière Tindall.
- THEILER, GERTRUD, 1950. Zoological survey of the Union of South Africa. Tick Survey. Part IV. Distribution of *Rhipicephalus capensis*, the Cape Brown Tick. *Onderstepoort Journal of Veterinary Science and Animal Industry*, 24, 7-22, map & tables.
- THEILER, GERTRUD, 1962. The Ixodoidea parasites of vertebrates in Africa south of the Sahara (Ethiopian Region). 260 pp. Project S9958. Report to the Director of Veterinary Services, Onderstepoort. Mimeographed.
- UTECH, K. B. W., SUTHERST, R. W., DALLWITZ, M. J., WHARTON, R. H., MAYWALD, F. G. & SUTHERLAND, I. D., 1983. A model of the survival of larvae of the cattle tick, *Boophilus microplus*, on pasture. *Australian Journal of Agricultural Research*, 34, 63-72.
- WALKER, J. B., MEHLITZ, D. & JONES, G. E., 1978. Notes on the ticks of Botswana, 83 pp. Eschborn: German Agency for Technical Cooperation, Ltd. (GTZ).