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DISTRIBUTION OF *BOOPHILUS* SPECIES TICKS IN SWAZILAND

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SUMMARY

Recent outbreaks of bovine babesiosis caused by Babesia bovis *in Swaziland had indicated the presence of the vector tick* Boophilus microplus *in the country although it had never before been directly identified. Engorged female* Boophilus *ticks were collected from cattle at diptanks in the course of a tick resistance survey and used to map the distribution of the two different species of* Boophilus. B. decoloratus *was found to be widespread throughout the country.* B. microplus *was identified for the first time in Swaziland and was found to have a patchy distribution. The implications of these findings are discussed.*

INTRODUCTION

Boophilus decoloratus, the African bluetick, is indigenous to Africa. *Boophilus microplus* is not indigenous and was probably introduced to south and east Africa on cattle imported from Asia via Madagascar. A survey in 1940 reported the presence of *B. decoloratus* in Swaziland but *B. microplus* was not found despite its existence in neighbouring Portuguese East Africa, now Mozambique. As recently as 1978, *B. microplus* had not been found in collections made for a tick resistance survey in Swaziland. *Boophilus* are important vectors of tick-borne diseases. Both species are vectors of *Anaplasma marginale,* the causative agent of anaplasmosis, and of *Babesia bigemina,* which causes African redwater. However, *B. microplus* also transmits *Babesia bovis* which causes Asiatic redwater. *B. decoloratus* cannot transmit *B. bovis.* Recent outbreaks of Asiatic redwater in Swaziland had provided indirect evidence of the presence of *B. microplus* but *B. microplus* had never been found and identified. It was decided to map the distribution of the two species using samples collected for an extensive tick resistance survey.

MATERIALS AND METHODS

Swaziland is divided into a patchwork of 676 diptank areas each of which has its own diptank or sprayrace. All of the cattle in each area are dipped or sprayed with acaricide on a regular basis. Engorged adult female ticks were collected from cattle before dipping or spraying at 301 locations between October 1985 and April 1986. Ticks were detached manually, usually from unrestrained cattle in most cases.

Ticks of the *Boophilus* genus were distinguished from other species by gross examination. Further examination under a ×45 stereobinocular microscope was then undertaken to distinguish between the two *Boophilus* species. The principal features used for identification were the mouthparts. *B. decoloratus* has three

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rows of teeth on each side of the hypostome and a convex protruberance with setae on the medial aspect of the first palpal segments. *B. microplus* has four rows of teeth on each side of the hypostome and a concavity with no setae on the medial aspect of the first palpal segments. A number of *Boophilus* could not be differentiated due to tissue obscuring the mouthparts, damage to the dentition or detachment of the mouthparts during collection.

RESULTS

TABLE I

Numbers of dip tanks from which Boophilus *ticks are collected*

	Number of diptanks
B. decoloratus alone	50
B. microplus alone	0
B. decoloratus and *B. microplus*	8
Unidentified *Boophilus*	9
No *Boophilus*	234

Mean sample size 32 ticks; range 1 to 207.

The distribution of *Boophilus* in Swaziland is shown in Fig. 1, and the numbers of dip tanks from which they were collected are shown in Table I.

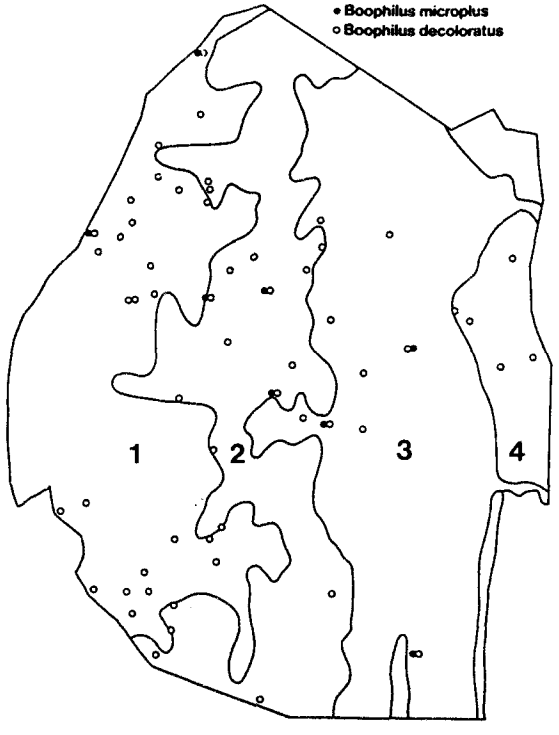

FIG. 1. The distribution of *Boophilus* in Swaziland. 1. Highveld—average altitude 1,300 m; 2. Middelveld—average altitude 700 m; 3. Lowveld—average altitude 200 m; 4. Lubombo Upland—600 m.

DISCUSSION

The results show a widespread distribution of *B. decoloratus*, and a patchy distribution of *B. microplus*. Researchers in South Africa have suggested that where these two species occur together there is interspecific competition; further, it appears that *B. decoloratus* has been replaced by *B. microplus* in some areas (Spickett and Malan, 1978). *B. microplus* should be considered as the invading species in Swaziland, accounting for mixed infestations, whilst *B. decoloratus* is the long established species which still occurs alone in many areas (A. M. Spickett, pers. comm.). Factors which could affect this competition include climate, reproductive potential, susceptibility to host resistance mechanisms and resistance to acaricides.

Climate

Gothe (1967) found a significant difference in cold tolerance between larvae of the two species. Some *B. decoloratus* larvae could survive at −10°C for 24 hours whilst *B. microplus* larvae could only tolerate 0°C for up to 72 hours. Long term data from the Swaziland Ministry of Natural Resources shows mean minimum temperatures to range between 10·8°C in the highveld and 14·3°C in the lowveld. Absolute minimum temperatures range between −8·4°C in the highveld and −0·5°C in the lowveld.

Gothe (1967) considered that winter conditions in South Africa would influence the spread and survival of *B. microplus*, the larvae of which are exceptionally susceptible to cold, whilst the spread of *B. decoloratus* would not be restricted, although numbers and activity might be limited. He considered that decreasing humidity would play a more important role in limiting the spread of *B. decoloratus*. These factors would be expected to play similar roles in Swaziland.

Reproductive potential

Spickett and Malan (1978) reported cross-matings between the two species to be sterile. *B. microplus* males showed a slightly greater, though statistically insignificant, mating capacity. Females of the two species showed no significant difference in oviposition potential. They concluded that the replacement of *B. decoloratus* by *B. microplus* in some areas must be due to other factors than reproductive capacity, such as adaptation to environment, development of resistance to acaricides and favourable weather conditions.

Work by Norval and Sutherst (1986) showed only 10% hybridisation under natural mating conditions, indicating mating preference for their own species or assortative mating. Sutherst further demonstrated that in the presence of assortative mating, *B. microplus* with its higher reproductive potential may be able to displace *B. decoloratus* over a long period (A. M. Spickett, pers. comm.). This obviously contradicts the work of Spickett and Malan (1978).

Susceptibility to host resistance mechanisms

Norval and Short (1984) found that when equal numbers of larvae of both species were placed on cattle a much larger number of *B. microplus* matured than *B. decolaratus*. They suggested that greater susceptibility to host resistance mechanisms combined with the effects of inter-specific mating could explain why *B. decoloratus* competes so unsuccessfully with *B. microplus*.

Resistance to acaricides

Baker, Jordaan and Robertson (1978) studied the resistance to acaricides of *B. decoloratus* and *B. microplus* from the eastern coastal regions of South Africa and Transkei. They concluded that apart from sodium arsenite, *B. microplus* was the most susceptible of the two species to acaricides. However, this had not stopped the spread of *B. microplus* into new areas and its consolidation in others.

In this study *B. microplus* was recovered mainly from diptank areas where sodium arsenite was used or where dipping of cattle was irregular. It would therefore seem that effective dipping and strict quarantine of areas where dipping has stopped could help limit the spread of the tick. Where grazing is shared between neighbouring diptank areas the danger of spread between cattle populations should be considered. It remains to be seen whether *B. microplus* will establish itself in Swaziland at the cost of *B. decoloratus* or whether natural conditions and effective, intensive dipping can control its spread.

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REPARTITION DES TIQUES BOOPHILUS AU SWAZILAND

Résumé—Des cas récents de babésiose bovine à *Babesia bovis* au Swaziland ont montré la présence de la tique *Boophilus microplus*, comme vecteur, bien qu'elle n'ait jamais été identifiée auparavant. Lors d'une unquête sur la résistance des tiques, des femelles gorgées de *Boophilus* ont été récoltées sur des bovins détiqués par balnéation et ont servi à établir une carte de distribution de deux différentes espèces. *B. decoloratus* était très répandu dans le pays. *B. microplus* a été identifié pour la première fois au Swaziland avec une répartition inégale. Les conséquences de ces observations sont discutées.

LA DISTRIBUCION DE GARRAPATAS *BOOPHILUS* EN SWAZILANDIA

Resumen—Los brotes recientes de babesiosis por *Babesia bovis* en Swazilandia, han indicato la presencia de la garrapata vector *Boophilus microplus* en el país, a pesar de que nunca había sido

identificada. Para el efecto, se colectaron especímenes de hembres adultas en un baño de inmersión, para determiner la distribución de las dos especies de *Boophilus*. El *B. decoloratus* se encontró ampliamente distribuido en todo el país y el *B. microplus*, sólo en determinadas zonas, siendo la primera identificación de esta última garrapata en Swazilandia. Se discutenlas implicaciones de este hallazgo.