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# PARASITES OF DOMESTIC AND WILD ANIMALS IN SOUTH AFRICA. XVIII. THE CROWNED GUINEA FOWL (*NUMIDA MELEAGRIS*), AN IMPORTANT HOST OF IMMATURE IXODID TICKS

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## ABSTRACT

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The tick burdens of 10 crowned guinea fowl (*Numida meleagris*), shot at approximately 3-monthly intervals in the Mountain Zebra National Park, and of 21 crowned guinea fowl from the Andries Vosloo Kudu Reserve, the majority of which were shot at monthly intervals, were determined.

No adult ticks were recovered from any of the guinea fowl. The birds in the Mountain Zebra National Park harboured 4 species of ixodid ticks of which *Amblyomma marmoreum* was the most abundant and most prevalent. Three birds also harboured *Hyalomma marginatum turanicum*. Six ixodid tick species were present on guinea fowl in the Andries Vosloo Kudu Reserve. Of these *Amblyomma hebraeum* was the most abundant and all the birds were infested. Most of these birds were also infested with *A. marmoreum* and *Haemaphysalis silacea* and some harboured *Hyalomma marginatum rufipes*. The seasonal abundance of ticks on crowned guinea fowl is discussed.


## INTRODUCTION

The former distribution of crowned guinea fowl (*Numida meleagris*) in southern Africa extended east from Uitenhage in the southern Cape Province to Natal and Moçambique and across the Transvaal to South West Africa (McLachlan & Liversidge, 1978). The species has now also been introduced into the south-western Cape Province as well as into other areas. Their distribution coincides with that of several ixodid ticks of importance to domestic livestock (Howell, Walker & Nevill, 1978), and it is thus not surprising that numerous tick species have been recovered from these birds (Theiler, 1962). The actual numbers of immature *Amblyomma hebraeum, Amblyomma marmoreum, Haemaphysalis silacea* and *Hyalomma marginatum rufipes* present on crowned guinea fowl in the eastern Cape Province have been recorded by Norval (1974; 1975 a, b).

Our initial examination during February 1984 of crowned guinea fowl in the Mountain Zebra National Park (32° 15′ S, 25° 41′ E; Alt. 1200–1957 m) in the eastern Cape Province revealed that they were fairly heavily infested with the immature stages of *A. marmoreum*, the South African tortoise tick. This observation prompted us to examine crowned guinea fowl in a habitat in which *A. hebraeum*, the bont tick, abounds. Consequently birds were shot and examined at regular intervals in the Andries Vosloo Kudu Reserve (33° 07′ S, 26° 40′ E; Alt. 300–450 m), also in the eastern Cape Province. The present paper records the tick burdens of these 2 groups of guinea fowl.

## MATERIALS AND METHODS

### *Study sites*

The Mountain Zebra National Park is situated in a region in which the vegetation is classified as Karoid *Merxmuellera* Mountain Veld replaced by Karoo (Acocks, 1975). The physiography of this park has been described in greater detail by Penzhorn (1979).

The Andries Vosloo Kudu Reserve lies in a region in which the vegetation is classified as Valley Bushveld (Acocks, 1975). A detailed description of the vegetation on a farm adjoining this reserve has been given by Rechav (1982).

### *Survey birds*

Two crowned guinea fowl were shot in the Mountain Zebra National Park at approximately 3-monthly intervals from February 1984–March 1985. At monthly intervals from May 1984–May 1985 an attempt was made to shoot 2 crowned guinea fowl in the Andries Vosloo Kudu Reserve. Despite intensive efforts this was not always possible: only 1 bird was shot during September 1984 and during March and April 1985 while none were obtained during February 1985.

### *Necropsy and counting procedures*

After the guinea fowl had been shot the whole carcass was immediately placed in a sturdy plastic bag which was securely closed and transported to the laboratory. At the laboratory the bird was decapitated just caudad to the level where the bare neck joins the feathered neck and the feathered portion of the carcass was skinned. The wing-tips were not skinned, but the bone was severed and the whole wing-tip included with the skin. The head, the skin (including wing-tips) and the legs were returned to the plastic bag and sufficient tick-detaching agent* was added to wet all this collected material. On the following morning the bag was opened and its contents were poured out and thoroughly washed with a strong jet of water over a sieve with 150 $\mu$m apertures. The fine material that was retained by the sieve was collected for microscopic examination, and the head, skin and legs, which had been washed, were also collected for examination.

The whole head and neck and the whole back and tail, 1 wing, 1 side and 1 leg and all the material that had been retained by the sieve were examined separately under a stereoscopic microscope. Ticks present on or in this material were collected, counted and identified. The number of ticks recovered from the wing, the side and the leg were doubled and added to the numbers recovered from the remainder of the material in order to calculate the total tick burden of each bird.

## RESULTS

### *Mountain Zebra National Park*

The numbers of ixodid ticks recovered from the 10 guinea fowl examined are summarized in Table 1.

The guinea fowl were infested with the immature stages of 4 ixodid ticks. Of these *A. marmoreum* was the most abundant and all the birds were infested.

### *Andries Vosloo Kudu Reserve*

The numbers of ixodid ticks recovered are summarized in Table 2.

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TABLE 1 Ixodid ticks recovered from 10 crowned guinea fowl in the Mountain Zebra National Park

| Guinea fowl No. | Date slaughtered | Number of ticks recovered | | | | | |
|---|---|---|---|---|---|---|---|
| | | *Amblyomma marmoreum* | | *Hyalomma marginatum turanicum* | | *Margaropus winthemi* | *Rhipicephalus evertsi evertsi* |
| | | Larvae | Nymphae | Larvae | Nymphae | Larvae | Larvae |
| 1 | 16 February '84 | 585 | 1 | 0 | 0 | 0 | 2 |
| 2 | 16 February '84 | 144 | 7 | 0 | 0 | 0 | 0 |
| 3 | 11 May | 3 | 0 | 1 | 1 | 0 | 1 |
| 4 | 11 May | 30 | 0 | 0 | 0 | 0 | 0 |
| 5 | 31 July | 3 | 0 | 12 | 1 | 0 | 0 |
| 6 | 31 July | 8 | 0 | 2 | 0 | 0 | 0 |
| 7 | 12 November | 15 | 2 | 0 | 0 | 0 | 0 |
| 8 | 14 November | 0 | 2 | 0 | 0 | 0 | 0 |
| 9 | 15 March '85 | 37 | 0 | 0 | 0 | 0 | 0 |
| 10 | 19 March '85 | 40 | 1 | 0 | 0 | 1 | 0 |

TABLE 2 Ixodid ticks recovered from 21 crowned guinea fowl in the Andries Vosloo Kudu Reserve

| Guinea fowl No. | Sex | Date slaughtered | Number of ticks recovered | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | *Amblyomma hebraeum* | | *Amblyomma marmoreum* | | *Haemaphysalis silacea* | | *Hyalomma marginatum rufipes* | | *Boophilus* sp. | *Rhipicephalus* sp. |
| | | | L | N | L | N | L | N | L | N | L | L |
| 11 | F | 3 May 1984 | 781 | 14 | 7 | 0 | 154 | 4 | 0 | 0 | 0 | 1 |
| 12 | M | 3 May 1984 | 129 | 44 | 54 | 3 | 593 | 25 | 3 | 0 | 0 | 0 |
| 13 | M | 5 June | 186 | 7 | 17 | 0 | 63 | 13 | 1 | 0 | 0 | 0 |
| 14 | M | 5 June | 117 | 2 | 13 | 0 | 55 | 9 | 0 | 0 | 0 | 0 |
| 15 | M | 4 July | 523 | 19 | 4 | 0 | 29 | 16 | 3 | 0 | 0 | 1 |
| 16 | F | 4 July | 71 | 9 | 1 | 0 | 53 | 28 | 3 | 0 | 0 | 0 |
| 17 | F | 17 August | 599 | 27 | 0 | 0 | 938 | 286 | 0 | 0 | 0 | 0 |
| 18 | M | 17 August | 942 | 16 | 9 | 0 | 1988 | 380 | 0 | 0 | 0 | 0 |
| 19 | M | 12 September | 112 | 5 | 10 | 1 | 80 | 58 | 0 | 0 | 0 | 0 |
| 20 | M | 9 October | 61 | 49 | 2 | 5 | 235 | 151 | 0 | 0 | 0 | 0 |
| 21 | M | 30 October | 1 | 18 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 |
| 22 | M | 21 November | 98 | 85 | 2 | 5 | 3 | 17 | 0 | 0 | 0 | 0 |
| 23 | F | 21 November | 14 | 2 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 24 | F | 14 December | 1169 | 40 | 0 | 3 | 4 | 3 | 2 | 0 | 0 | 0 |
| 25 | M | 14 December | 452 | 30 | 1 | 4 | 6 | 12 | 0 | 0 | 0 | 0 |
| 26 | F | 18 Jan 1985 | 95 | 3 | 21 | 1 | 8 | 0 | 2 | 0 | 0 | 0 |
| 27 | M | 21 Jan 1985 | 446 | 35 | 32 | 3 | 22 | 9 | 6 | 0 | 0 | 0 |
| 28 | M | 11 March | 545 | 9 | 30 | 0 | 139 | 4 | 1 | 0 | 0 | 0 |
| 29 | F | 12 April | 543 | 15 | 7 | 0 | 220 | 32 | 1 | 0 | 2 | 0 |
| 30 | M | 20 May | 743 | 18 | 6 | 2 | 459 | 86 | 4 | 0 | 0 | 0 |
| 31 | M | 20 May | 641 | 8 | 7 | 0 | 7 | 3 | 4 | 0 | 0 | 0 |

L = Larvae N = Nymphae

TABLE 3 The distribution of ticks on 21 crowned guinea fowl examined in the Andries Vosloo Kudu Reserve

| Developmental stage | Total No. of ticks recovered | Total No. still attached after washing | Relative abundance of ticks still attached after washing (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Head and upper neck | Neck | Back | Wings | Sides | Legs | Tail |
| Larvae | 13581 | 7912 | 82,9 | 4,9 | 0,1 | 6,1 | 1,1 | 4,4 | 0,5 |
| Nymphae | 1623 | 668 | 26,5 | 3,6 | 0,3 | 41,9 | 7,5 | 10,5 | 9,7 |

No adult ticks were found, while the immature stages of 6 ixodid tick species were recovered. *A. hebraeum* comprised the major portion of the total tick burden and all the guinea fowl were infested. Practically all the birds were also infested with *A. marmoreum* and *H. silacea*, the latter tick considerably outnumbering the former. Several birds were infested with small numbers of immature *H. marginatum rufipes*, while 2 *Boophilus* sp. larvae and 2 larvae resembling *Rhipicephalus simus* were also recovered.

The distribution of those ticks that remained attached to the skins of the guinea fowl after they had been placed in the tick detaching agent and thoroughly washed is summarized in Table 3.

Tick larvae were concentrated on the head and the upper neck region, on both of which the skin is blue in colour and virtually bare. The nymphae were found mainly on the wings and on the head and upper neck.

## DISCUSSION

It could be argued that the number of crowned guinea fowl examined in each of the reserves is too small to warrant valid conclusions being drawn. It must be borne in mind, however, that the guinea fowl populations of

both reserves are not large and could have been adversely affected by heavy culling for survey purposes. The size of the population in the Kudu Reserve can be gauged by the fact that despite hunting on several days during February 1985 no guinea fowl were collected.

The majority of attached larval ticks were recovered from the heads and upper neck regions of the guinea fowl (Table 3). As these sites are limited in size it is possible that competition for space might affect the magnitude of the tick burdens. The 2 guinea fowl examined during August 1984 in the Andries Vosloo Kudu Reserve had the largest burdens of *H. silacea* and the 2nd and 6th largest burdens of *A. hebraeum*. The total burdens of these guinea fowl also exceeded that of any other guinea fowl by more than 500 ticks. With the possible exception of these 2 birds it would thus appear as if the numbers of ticks harboured by the guinea fowl had not yet reached a level where competition for attachment sites would be a factor in determining their population size.

In a review of tick-host specificity, Hoogstraal & Aeschlimann (1982) state that 1 *Amblyomma* sp., 8 *Haemaphysalis* spp. and approximately 40 *Ixodes* spp. are strict-total parasites of birds. Furthermore the immature stages of approximately 17 *Amblyomma* spp., about 25 *Haemaphysalis* spp., 6 *Hyalomma* spp. and 8 *Ixodes* spp. exhibit moderate specificity and those of approximately 8 *Amblyomma* spp., 2 *Haemaphysalis* spp. and approximately 8 *Ixodes* spp. exhibit non-particular specificity, chiefly in the immature stages, for birds. Theiler (1962) lists 13 ixodid tick species that have been recovered from crowned guinea fowl in the Ethiopian region. Of these 13 species she records the adults of only 3, namely, *Boophilus decoloratus, Haemaphysalis hoodi* and *Haemaphysalis parmata* as infesting these birds.

*B. decoloratus, H. hoodi* and *H. parmata* are all found in South Africa. We regard infestation of guinea fowl with adult *B. decoloratus* as being accidental, while we feel that Theiler's (1962) record for adult *H. parmata* was incorrectly transcribed from Morel & Mouchet (1958), who are the only authors to record this tick from the crowned guinea fowl, and then only in the larval and nymphal stage. Hence the adults of only *H. hoodi* are parasites of crowned guinea fowl in this country. No specimens of the latter species and no adult ticks of any species were recovered in the present surveys. The crowned guinea fowl is, however, a host of the immature stages of several ixodid ticks (Theiler, 1962), some of which were recovered from the birds we examined.

*A. hebraeum*

The crowned guinea fowl must be regarded as one of the preferred hosts of the larvae of *A. hebraeum*, which have a very wide host range (Theiler, 1962; Norval, 1974). The distribution of this tick does not extend into the Cradock area (Howell *et al.*, 1978), hence its absence from the guinea fowl examined in the Mountain Zebra National Park which lies within this region. The numbers recovered from the birds in the Andries Vosloo Kudu Reserve considerably exceed those recorded by Norval (1974) on 3 of these birds on the farm "Paardekraal" in the eastern Cape Province. These larger burdens probably reflect an improved recovery technique rather than any other cause.

Horak, Potgieter, Walker, De Vos & Boomker (1983) collected and counted the ticks from 5 greater kudu (*Tragelaphus strepsiceros*) that had been injured or died during June 1982 in a game capture operation in the Andries Vosloo Kudu Reserve. The mean burden of *A. hebraeum* on these kudu was 411 larvae and 21 nymphae. The mean larval and nymphal burdens (394 and 22, respectively) of the 21 guinea fowl examined in the present survey are remarkably similar to those of the kudu. It must be borne in mind, however, that the guinea fowl were shot over a period of 13 months, compared with only 1 month in the case of the kudu. The mean ratio of 17,9 larvae to 1,0 nymphae on the birds is in our opinion an indication that crowned guinea fowl are better hosts of the former than of the latter stage of development. Although a similar ratio was evident on the 5 kudu, they were all examined during June, a time normally associated with reduced nymphal activity in this region (Knight & Rechav, 1978; Rechav, 1982). It is interesting to note that Walker & Schulz (1984) recovered considerable numbers of nymphae of *A. hebraeum* from tortoises they examined in the Addo Elephant National Park in the eastern Cape Province.

The seasonal abundance of *A. hebraeum* on greater kudu shot in the Andries Vosloo Kudu Reserve and its surroundings has been determined by Knight & Rechav (1978). They found the greatest numbers of larvae during April, nymphae during April, September and November–January and adults from March–May. MacIvor & Horak (1984) examined Angora and Boer goats running in Valley Bushveld in the Uitenhage region of the eastern Cape Province for ticks. They found larvae of *A. hebraeum* to be most abundant from May–August, nymphae from September–November and adults from August–February.

In the present survey larvae and nymphae were present in each month during which guinea fowl were shot in the Andries Vosloo Kudu Reserve. The largest numbers of larvae were present from May–August 1984 and from December 1984–May 1985, while peak numbers of nymphae were recovered from October–December 1984 (Table 2). With the exception of the December–May larval peak on the guinea fowl the peaks of immature tick activity correspond almost exactly with those noted on goats by MacIvor & Horak (1984).

Because of their mobility and the large number of immature ticks they harbour, crowned guinea fowl are in our opinion important disseminators of *A. hebraeum* in those regions where their distributions overlap. We do not suggest, however, that this tick can be controlled by destroying guinea fowl. It utilizes too many small and large animal species as hosts for its immature stages (Theiler, 1962; Norval, 1974) to make the destruction of 1 host species a viable proposition as a control stategy. Adequate acaricidal control of adult *A. hebraeum* on domestic livestock on farms on which guinea fowl also occur should also reduce the number of immature ticks on the birds.

*A. marmoreum*

Hoogstraal & Aeschlimann (1982) list *A. marmoreum* as having a strict-total host specificity for tortoises in the Ethiopian region. Norval (1975b), however, has found that several bird and mammal species can also serve as hosts of the larvae and nymphae. The results of the present surveys indicate that the crowned guinea fowl is a good host of the immature stages of this tick, particularly as the distributions of the tick, the guinea fowl and tortoises overlap in extensive regions of southern Africa.

In the eastern Cape Province, Norval (1975b) found that, judging by samples obtained by the drag method, the greatest numbers of larvae of *A. marmoreum* were present on the vegetation from February until early June, while nymphae were recovered from August–March. In the Mountain Zebra Park, where the guinea fowl were examined at approximately 3-monthly intervals, the greatest numbers of larvae were present during February 1984 and March 1985 and nymphae were present during February and November 1984 and March 1985 (Table 1). In the Kudu Reserve, the larvae were most abundant during May and June 1984 and January and March 1985,

and nymphae, although present in very small numbers, were most abundant from October–December (Table 2). These times all fall within the seasons suggested by Norval (1975b) as the periods of greatest activity.

*H. silacea*

The distribution of this tick is associated with well-wooded ravines and river valleys in the eastern Cape Province and, to a lesser extent, Natal (Howell *et al.*, 1978), hence its absence in the high altitude, semi-arid Mountain Zebra National Park. Theiler (1962) lists the crowned guinea fowl amongst the hosts from which immature *H. silacea* have been recovered, and Norval (1974) has recovered 4 nymphae from 1 of 3 guinea fowl examined on a farm in the eastern Cape Province.

In a study of the ecology of this tick in the latter region, Norval (1975a), using the drag method of larval collection, recovered the largest numbers of larvae from the vegetation from April–August and again during February, and the largest numbers of nymphae from July–December. Knight & Rechav (1978), who at monthly intervals examined 2 kudu in the Andries Vosloo Kudu Reserve and its vicinity, recovered the greatest numbers of larvae from these animals from April–June, nymphae from May–September and adults from April–June and August–January. On a farm adjoining the Kudu Reserve, Rechav (1982) found that, although larvae were present on Angora goats during most of the year, they reached the highest levels from February–March. Nymphae were most abundant from April or May until September.

In the present study most larvae were recovered from May–October 1984 and from March–May 1985, with a major peak of activity during August 1984. Most nymphae were present in August and October 1984 (Table 2).

Although many cattle in the eastern Cape Province are infested, *H. silacea* is considered to be of little economic importance on domestic livestock in South Africa.

*Hyalomma spp.*

We are unable to differentiate immature *H. marginatum rufipes* morphologically from immature *H. marginatum turanicum*. However, judging by the distributions of these ticks (Howell *et al.*, 1978) and by the fact that 1 of us (I.G.H.) has recovered adults of the former tick from an eland in the Andries Vosloo Kudu Reserve (Horak *et al.*, 1983) and of the latter from several large herbivores in the Mountain Zebra National Park, we have assigned the immature stages recovered from the guinea fowl in these 2 parks to the same species as the adult ticks present. No immature *Hyalomma truncatum* (which we can differentiate from the other species) were recovered from the guinea fowl.

The birds examined in the Mountain Zebra Park cannot be regarded as the preferred hosts of the immature stages of *H. marginatum turanicum*. Scrub hares (*Lepus saxatilis*) examined in this park at the same time as the guinea fowl frequently harboured large numbers of immature ticks of this species and must be considered 1 of the preferred hosts (Horak, Fourie & Novellie, unpublished data, 1984). The autumn and winter abundance of the immature stages on the guinea fowl (Table 1) is similar to that recorded on the hares. In the Kudu Reserve the period of activity of immature *H. marginatum rufipes* appeared to extend from November–July (Table 2).

*Other ticks*

The small numbers of larvae of other tick species recovered from the guinea fowl in both parks must be regarded as accidental infestations. Zebras and other equids are the preferred hosts of *Margaropus winthemi* and *Rhipicephalus evertsi evertsi* (Howell *et al.*, 1978; Norval, 1981; Horak, De Vos & De Klerk, 1984) and the presence of more than 200 Cape Mountain zebras in the Mountain Zebra National Park ensures an abundant supply of the immature stages of both these ticks.

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