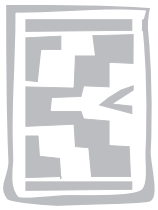

RESEARCH COMMUNICATION

Ticks on crested francolins, *Francolinus sephaena*, and on the vegetation on a farm in Limpopo Province, South Africa

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ABSTRACT

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Ticks were collected at approximately bi-monthly intervals between June 1996 and June 1997 from crested francolins, *Francolinus sephaena*, and from the vegetation on a mixed cattle and wildlife farm in Limpopo Province, South Africa. The birds were infested with the immature stages of 13 tick species, of which *Amblyomma hebraeum*, *Amblyomma marmoreum* and *Hyalomma marginatum rufipes* were the most numerous and prevalent. Ten ixodid tick species were collected from the vegetation, of which the immature stages of *Rhipicephalus appendiculatus*, *Rhipicephalus* (*Boophilus*) *decoloratus* and *Rhipicephalus evertsi evertsi* were the most numerous. No adult ticks were collected from the birds and only two from the vegetation. The restricted home range of crested francolins implies that they could serve as a source of tick infestation only for other animals within the same habitat as the birds.

Keywords: Crested francolins, *Francolinus sephaena*, free-living ticks, Limpopo Province, parasitic ticks

Birds are hosts of the immature stages of several ixodid tick species (Theiler 1962) and consequently could serve as a source of subsequent adult tick infestation for other hosts. This is particularly so for migrating birds (Hoogstraal, Kaiser, Traylor, Gaber & Guindy 1961), or species such as helmeted guineafowls, *Numida meleagris*, that on occasion can harbour large numbers of immature ticks (Horak & Williams 1986; Horak, Spickett, Braack & Williams 1991). Two species of guineafowls and several species of francolins occur in South Africa and of these the ixodid tick burdens of helmeted guineafowls, Cape francolins, *Francolinus capensis*, and grey-wing francolins, *Francolinus africanus*, have been determined (Horak & Williams 1986; Horak *et al*. 1991; Horak & Boomker 1998). Similar data for crested francolins, *Francolinus sephaena*, or crested guineafowls, *Guttera pucherani*, both of which occur in the northern and north-eastern regions of South Africa, have not been collected.

The objective of the present study was to determine whether crested francolins, which prefer thick cover and matted vegetation, play the same role as helmeted guineafowls, which prefer thorny scrub and savanna veld, as hosts for the immature stages of ticks of veterinary importance. The species spec-

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trum of ticks on the francolins was also compared with that of free-living ticks on the vegetation at the same locality.

The survey was conducted on the farm "Sandspruit" (24°38´S, 27°40´E), comprising 655 ha in the valley of a seasonally flowing river along the southern foothills of the Waterberg mountain range in Limpopo Province. Annual rainfall varies between 550 mm and 600 mm, mean annual temperature is approximately 20 °C, and the vegetation is classified as Sour Bushveld and Sourish Mixed Bushveld (Acocks 1988). A herd of 140 cows and six bulls ran on the farm, and these were hand-sprayed with a synthetic pyrethroid for the control of ticks at weekly intervals during summer and fortnightly during winter. Donkeys and a variety of wild ungulates including warthogs, impalas, greater kudus and grey duikers were also present on the farm.

An attempt was made to shoot six crested francolins every second month from June 1996 to June 1997. This, however, was not always possible because of the very dense vegetation resulting from above average rainfall during the preceding year and during the study period, and a total of only 23 birds were collected. The carcass of each bird was placed in a sturdy plastic bag immediately after it had been shot, and the bag was sealed and transported to a field laboratory. Here the bird was decapitated approximately 1 cm caudad to the junction between the head and the neck, the wings and the tail were severed from the body and the feathered portion of the carcass was skinned. The legs were severed at the tibiotarsal-tarsometatarsal joint, but left attached to the skin. The head, wings, body with legs attached, and tail were placed separately in plastic jars and sufficient tick-detaching agent (Triatix: Hoechst Roussel Vet (Pty) Ltd) was added to cover the material in each jar. Except that the skin and feathers of both wings, both legs and the entire body were examined under a stereoscopic microscope, ticks were otherwise recovered from the material in the jars and identified and counted as described by Horak & Williams (1986).

Free-living ticks were collected from the vegetation using the drag-sampling method described by Petney & Horak (1987), and with the exception of February 1997, when heavy rainfall prevented sampling, this was done every second month from June 1996 to June 1997 in each of four woodland habitats and four open grassland habitats.

The birds were infested with the immature stages of 12 ixodid tick species and the larvae of one argasid tick species (Table 1). The larvae of *A. hebraeum* were the most numerous and prevalent followed by those of *Amblyomma marmoreum* and *Hyalomma marginatum rufipes.*

The immature stages of only four tick species can be regarded as parasites of the francolins, namely *A. hebraeum, A. marmoreum, H. marginatum rufipes* and *Argas* sp. The remaining species should be considered accidental infestations or "stragglers". The highest total burden, comprising 256 larvae and five nymphs, was recorded on a bird examined during April 1997, whereas a bird examined during February 1997 harboured no ticks. The mean tick burdens of the francolins consisted of 88 larvae and three nymphs.

The carcasses of 19 of the 23 francolins were processed in a manner such that the attachment distribution of their ticks could be determined; this is summarized in Table 2. The majority of *A. hebraeum* and *H. marginatum rufipes* larvae were recovered from the heads of the birds, while those of *A. marmoreum* were collected from the body and wings.

Ten ixodid tick species were collected from the vegetation, the larvae of *Rhipicephalus appendiculatus* being the most numerous followed by those of *Rhipicephalus* (*Boophilus*) *decoloratus* and *Rhipicephalus evertsi evertsi* (Table 3). Although ten of the tick species on the francolins were also present on the vegetation, the proportional species representation in the two tick populations differed considerably.

The mean burden of 37 *A. hebraeum* larvae on the francolins is considerably lower than the mean burdens of 184 and 568 larvae on helmeted guineafowls in the Kruger National Park, Mpumulanga Province and the Andries Vosloo Kudu Reserve, Eastern Cape Province respectively (Horak *et al*. 1991). However, four francolins each harboured more than 100 larvae, indicating that these birds are also capable of carrying large numbers of ticks. Horak & Williams (1986) regard helmeted guineafowls as important disseminators of *A. hebraeum* because of their mobility and the large numbers of immature ticks that they harbour. Crested francolins on the other hand with their more restricted home ranges would seem more likely to contribute to the maintenance of localized populations of this tick. This would indeed appear to be the case in that the proportional representation of *A. hebraeum* on the francolins, with their preference for dense vegetation, was considerably greater than that on the vegetation (Tables 1 and 3).

TABLE 1 Ticks collected from 23 crested francolins on the farm "Sandspruit", Limpopo Province

Tick species	Total number of ticks collected			Proportion (%)	No. of birds infested
	Larvae	Nymphs	Total		
Amblyomma hebraeum	853	37	890	40.44	20
Amblyomma marmoreum	582	10	592	26.90	13
Hyalomma marginatum rufipes	507	16	523	23.76	13
Hyalomma truncatum	1	0	1	0.05	1
Ixodes sp.	1	0	1	0.05	1
Rhipicephalus (*Boophilus*) *decoloratus*	4	0	4	0.18	3
Rhipicephalus appendiculatus	7	3	10	0.45	3
Rhipicephalus evertsi evertsi	6	0	6	0.27	3
Rhipicephalus exophthalmos	3	0	3	0.14	2
Rhipicephalus pravus group	8	0	8	0.36	4
Rhipicephalus turanicus	7	0	7	0.32	3
Rhipicephalus zambeziensis	63	3	66	3.00	10
Argas sp.	90	0	90	4.09	4

TABLE 2 The attachment distribution of ticks on 18 crested francolins on the farm "Sandspruit", Limpopo Province

Tick species and life stage	Number of ticks	Relative abundance (%)			
		Head	Body	Wings	Tail
Amblyomma hebraeum					
Larvae	731	84.5	11.9	3.0	0.6
Nymphs	32	46.9	28.1	18.8	6.2
Amblyomma marmoreum					
Larvae	578	13.7	32.7	32.7	20.9
Nymphs	9	44.5	22.2	22.2	11.1
Hyalomma marginatum rufipes					
Larvae	382	91.6	5.8	1.8	0.8
Nymphs	10	90.0	10.0		

TABLE 3 Free-living ticks collected by drag-sampling the vegetation on the farm "Sandspruit", Limpopo Province

Tick species	Total number of ticks collected			Proportion (%)
	Larvae	Nymphs	Total	
Amblyomma hebraeum	111	0	111	7.34
Amblyomma marmoreum	10	0	10	0.66
Hyalomma marginatum rufipes	13	0	13	0.86
Ixodes sp.	2	0	2*	0.13
Rhipicephalus (*Boophilus*) *decoloratus*	363	0	363	24.01
Rhipicephalus appendiculatus	470	86	556**	36.77
Rhipicephalus evertsi evertsi	356	0	356	23.55
Rhipicephalus turanicus	3	0	3	0.20
Rhipicephalus zambeziensis	85	13	98	6.48

* plus 1 male
** plus 1 female

Helmeted guineafowls examined in the Valley Bushveld of the Eastern Cape Province were infested mainly with the larvae of *A. hebraeum* and *Haemaphysalis silacea* and lesser numbers of *A. marmoreum* and small numbers of *H. marginatum rufipes* (Horak & Williams 1986). Of these 86.9 % were

recovered from the heads and upper necks of the guineafowls, a proportion similar to the 84.5 % now recorded for *A. hebraeum* larvae on the heads of the francolins (Table 2).

Tortoises, and particularly the leopard tortoise, *Geochelone pardalis*, are the preferred hosts of all stages of development of *A. marmoreum* (Norval 1975). Helmeted guineafowls are good hosts of the larvae of this tick, and in the Mountain Zebra National Park in the Eastern Cape Province they harboured a mean burden of 86 larvae with a prevalence of 90 %, compared to eight larvae with a prevalence of 66.7 % on birds in the Andries Vosloo Kudu Reserve, and 19 larvae with a prevalence of 75.4 % on guineafowls in the Kruger National Park (Horak & Williams 1986; Horak *et al*. 1991). The mean burden of the crested francolins in the present study was 25 larvae with a prevalence of 56.5 %. Three of the seven Cape francolins examined by Horak & Boomker (1998) in the Bontebok National Park harboured a total of 15 larvae and one nymph of this tick, and four of the seven greywing francolins a total of 129 larvae.

The heads of the crested francolins were the attachment site least favoured by the larvae of *A. marmoreum*, with the body and wings harbouring most. This attachment distribution could be because of competition with the larvae of *A. hebraeum* and of *H. marginatum rufipes*, both of which prefer the head as an attachment site (Table 2). The 26.9 % proportional representation of the immature stages of *A. marmoreum* on the francolins as opposed to the 0.66 % on the vegetation indicates that larvae are attracted to the birds, or that the habitat most favoured by the birds coincides with that most suitable for the survival of the free-living stages of the tick, or that only a small proportion of larvae are collected from the vegetation by drag-sampling, or that the timing of the drag-sampling did not correspond with the periods of peak larval numbers on the vegetation.

The preferred hosts of the immature stages of *H. marginatum rufipes* are hares, *Lepus* spp. and ground-frequenting birds (Rechav, Zeederberg & Zeller 1987; Horak *et al*. 1991). Their presence on the francolins in the present survey is thus not unexpected. As this is a two-host tick the ratio of 31.7 larvae to one nymph on the birds indicates a very poor translation of larvae to nymphs. Forty-four larvae and 132 nymphs of *H. marginatum rufipes* were collected from three of five scrub hares, *Lepus saxatilis*, examined in the same area as the francolins, indicating excellent translation from one life stage to the next on these animals (Horak, Spickett, Braack, Penzhorn, Bagnall & Uys 1995). As with the previous two species there was a considerable difference between the proportional representation of larvae on the francolins (23.76 %) and free-living larvae on the vegetation (0.86 %). The single *H. truncatum* larva recovered from a bird in June 1996 is considered a “straggler”. The immature stages of the latter tick prefer hares as hosts, and it was the most numerous of the nine tick species collected from five scrub hares examined in the same region as the francolins (Horak *et al*. 1995).

The larvae of *R.* (*Boophilus*) *decoloratus* were amongst the most numerous of the free-living ticks collected from the vegetation. This tick prefers domestic and wild bovids as hosts (Mason & Norval 1980), and its presence on any bird must be considered accidental and a reflection of the number of free-living ticks in the environment.

The farm on which the present survey was conducted lies in a region of South Africa in which the distributions of *R. appendiculatus* and *Rhipicephalus zambeziensis* overlap (Walker, Keirans & Horak 2000). Although the immature stages of *R. appendiculatus* were considerably more numerous than those of *R. zambeziensis* on the vegetation the converse was true on the birds. A similar pattern of infestation has been observed on helmeted guineafowls in the Kruger National Park, where both ticks also occur (Horak *et al.* 1991). Equids are the preferred hosts of all stages of development of *Rhipicephalus evertsi evertsi,* but cattle are also good hosts (Walker *et al*. 2000). The large number of larvae collected from the vegetation can be ascribed to the presence of cattle and donkeys on the farm, while those on the francolins are accidental infestations.

Most records of *Rhipicephalus exophthalmos* emanate from the southern and western regions of South Africa and from Namibia. Scrub hares are preferred hosts of the adults, and with elephant shrews, *Elephantulus* spp., are the only animals to date from which the immature stages have been recovered (Walker *et al.* 2000). Scrub hares are also preferred hosts of all stages of development of the *Rhipicephalus pravus*-like tick (Horak *et al.* 1995), of which larvae were collected from four of the francolins. An adult of *Rhipicephalus turanicus* has previously been collected from a scrub hare in the study region (Horak *et al.* 1995), and the recovery of larvae from three francolins in the present survey confirms its presence at this locality. Infestation of the birds with the larvae of the aforemen-

tioned three ticks should be considered as accidental.

Four of the 23 birds were infested with the larvae of an *Argas* sp. A similar proportion of 118 helmeted guineafowls examined in the Kruger National Park were also infested with larvae of a tick belonging to this genus (Horak *et al.* 1991).

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