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Tick Parasites of Domestic Animals of Kerala, South India

K. Prakasan and N. Ramani

Department of Zoology, Division of Acarology, University of Calicut,
Kerala-673 635, India

Abstract: A three year study was carried out on the domestic animals of Kerala for the presence of tick infestation. Eighteen tick species viz. *Haemaphysalis bispinosa* Neumann, 1897, *H. intermedia* Warburton and Nuttall, 1909, *H. turturis* Nuttall and Warburton, 1915, *H. aculeata* Lavarra, 1904, *H. cuspidata* Warburton, 1910, *H. spinigera* Neumann, 1897, *H. knobigera* sp. nov*., *Rhipicephalus haemaphysaloides* (Supino, 1897), *R. sanguineus* (Latreille, 1806), *R. (Boophilus) annulatus* (Say, 1821), *R. (B.) microplus* (Canestrini, 1887), *R. (B.) decoloratus* (Koch, 1844), *Hyalomma marginatum isaaci* Sharif, 1928, *H. anatolicum anatolicum* Koch, 1844, *H. hussaini* Sharif, 1928, *Nosomma monstrosum* (Nuttall and Warburton, 1908), *N. keralensis* sp. nov** and *Amblyomma integrum* Karsch, 1879 were collected from various domestic animals. Dogs showed the maximum rate of infestation (84.0%) and cats had the lowest (8.33%).

Key words: Ticks, domestic animals, Kerala, South India

INTRODUCTION

Ticks constitute a successful group of obligate ectoparasitic arthropods infesting most species of vertebrates, particularly the mammals. The impact of ticks on human economy merits special consideration as they affect the health of man and his domestic wealth directly and indirectly. Although widely recognized as pests, ticks are best known for their notorious vector status. Despite their medical and veterinary importance, ticks remained as an unstudied group in India till 1928. The pioneering work of Sharif (1928) which resulted in the publication of an identification key to ixodid ticks formed the basis for subsequent studies on various aspects of Indian tick fauna. Checklists of Indian ticks were prepared by Sen (1938), Jagannath *et al.* (1973), Miranpuri and Naithani (1978) and Geevarghese *et al.* (1997) based on collections made from several parts of the country. Demonstration of various species of ticks in the transmission of Kyasanur Forest Disease was made by various authorities like Bhat and Naik (1978), Upadhyaya *et al.* (1983), Sreenivasan *et al.* (1983) and Venugopal *et al.* (1994). Incidence and prevalence of ixodid ticks on sheep and goats in Karnataka and various other diverse biotopes of South India were studied by Jagannath and Lokesh (1988) and Saxena (1997). Prevalence of ixodid ticks in Tamil Nadu was reported by Kumar *et al.* (2002). A report on human infesting ixodid ticks of Kerala was made by Prakasan and Ramani (2003). Studies made by Latha *et al.* (2004) on the seasonal activity of ticks disclosed moderate tick burdens in small ruminants and *Haemaphysalis bispinosa* as the most common tick species in Tamil Nadu.

Duly considering the lack of information on ticks infesting domestic animals of Kerala and the importance of cattle wealth in the economy of the state, the present study was undertaken to reveal the common tick fauna parasitizing our domestic animals. Further attention was focused during the study, to acquire knowledge on the species diversity and rate of infestation of different tick species with respect to individual host animal and also the nature of damage induced by them.

Corresponding Author: N. Ramani, Department of Zoology, Division of Acarology, University of Calicut,
Kerala-673 635, India

* and **The new species will be described elsewhere

MATERIALS AND METHODS

A survey on the tick fauna infesting species of domestic animals like cow, buffalo, goat, pig, dog, cat domestic fowl, duck, sheep, and pigeon was carried out for a period of three years from May, 1999-May, 2002. During the study period, domestic animals from various districts of Kerala viz., Kasaragod, Kannur, Wayanad, Kozhikode, Malappuram, Thrissur and Palakkad were examined. Tick specimens collected from Thiruvananthapuram and Alappuzha districts were also examined. The cattle market at Chelari in the Malappuram district was selected as one of the major collection sites where regular visits were made for the examination of cattle and their associated fauna of ticks. Apart from this, domestic animals from various houses/localities/grazing fields in the above 9 districts were also examined carefully for the recovery of ticks. The stray cattle, dogs and goats of the Calicut University Campus were also included in the survey.

Different stages of ticks from the above hosts were collected with the help of a forceps and brush. For inducing easy detachment, cotton plugs soaked in chloroform was pressed at the sties of attachment. The adults and developmental stages collected were preserved in 70% alcohol. The preserved specimens were washed, dehydrated, cleared and mounted in DPX (a commercially available mixture of Distyrene, a plasticizer and Xylene) or Hoyer's medium. Identification up to species level was made following identification keys and checklists authored by Sen (1938) and Geevarghese *et al.* (1997) etc. and consulting specialists. The population density of individual species with respect to host animals was analyzed. The feeding symptoms and nature of damage induced on individual hosts were also noted and discussed.

RESULTS AND DISCUSSION

In the present study, a total of 3702 domestic animals belonging to 8 species from 9 districts of Kerala as well as from neighbouring states were examined with respect to the tick fauna harboured by them. Positive signs of tick infestation could be evidenced on all the seven species of animals examined (Table 1). Cow, buffalo, goat, dog, pig, sheep and cat were the animals found infested by different species of ticks (Table 2). Dogs and goats had the maximum rate of tick infestation while cat revealed the minimum (Table 1).

Taxonomic analysis of the tick specimens collected from the above-mentioned domestic animals enabled to categorize them into 5 genera, one subgenus and 18 species including two subspecies. The species recovered were *Haemaphysalis bispinosa*, *H. intermedia*, *H. turturis*, *H. aculeata*, *H. cuspidata*, *H. knobigera*, *H. spinigera*, *Rhipicephalus haemaphysaloides*, *R. sanguineus*, *R. (Boophilus) annulatus*, *R. (B.) microplus*, *R. (B.) decoloratus*, *Hyalomma marginatum isaaci*, *H. anatolicum anatolicum*, *H. hussaini*, *Nosomma monstrosus*, *N. keralensis* and *Amblyomma integrum*. The above 18 species could be categorized under a single family, Ixodidae. The prevalence of ixodid ticks on domestic animals of several other Indian states like Assam, Karnataka and Tamil Nadu was already reported by Miranpuri and Singh (1978), Jagannath *et al.* (1979), Kumar *et al.* (2002) and Latha *et al.* (2004). Thus the results of the present study also confirm ixodid ticks as the predominant parasites of domestic animals of India, especially that of South India. In no instance during the present study, the recovery of argasid ticks could be made from any of the host animals examined. Probably, this suggests the very rare occurrence of argasid ticks in exposed conditions like the hosts' body surface.

Members of the genus *Haemaphysalis* have been reported earlier as the common parasites of monkeys (Trapido *et al.*, 1964), rodents and sheep (Saxena, 1997) and also of goat, cattle and buffaloes (Miranpuri, 1988; Latha *et al.*, 2004). Recovery of the members of this genus from the forest vegetation surveyed during the current study suggests their ability to enjoy wide host range including

Table 1: Total rate of the tick infestation on different domestic animals

Name of the host	Total No. of host		Percentage of infestation (%)
	Observed	Infested	
Cow	1261	739	58.60
Buffalo	1764	247	14.00
Goat	554	414	74.73
Sheep	10	1	10.00
Pig	31	3	09.68
Dog	70	59	84.28
Cat	12	1	8.33

Table 2: Species of ticks recovered with respect to genera and host animals

Genus	Species	Host
<i>Haemaphysalis</i>	<i>H. bispinosa</i>	Cow, buffalo, goat, dog, cat, sheep
	<i>H. intermedia</i>	Goat, cow, buffalo, dog
	<i>H. turturis</i>	Cow, goat
	<i>H. aculeata</i>	Cow
	<i>H. cuspidata</i>	Buffalo
	<i>H. knobigera</i>	Cow, goat
	<i>H. spinigera</i>	Cow
	Rhipicephalus (Boophilus)	<i>B. annulatus</i>
<i>B. microplus</i>		Buffalo
<i>B. decoloratus</i>		Cow, buffalo, goat
Rhipicephalus	<i>R. haemaphysaloides</i>	Cow, buffalo, goat, pig
	<i>R. sanguineus</i>	Cow, goat
Hyalomma	<i>H. marginatum isaaci</i>	Buffalo
	<i>H. anatolicum anatolicum</i>	Buffalo, cow
	<i>H. hussaini</i>	Buffalo, cow
Nosomma	<i>N. monstrosom</i>	Buffalo
	<i>N. keralensis</i>	Buffalo
Amblyomma	<i>A. integrum</i>	Buffalo

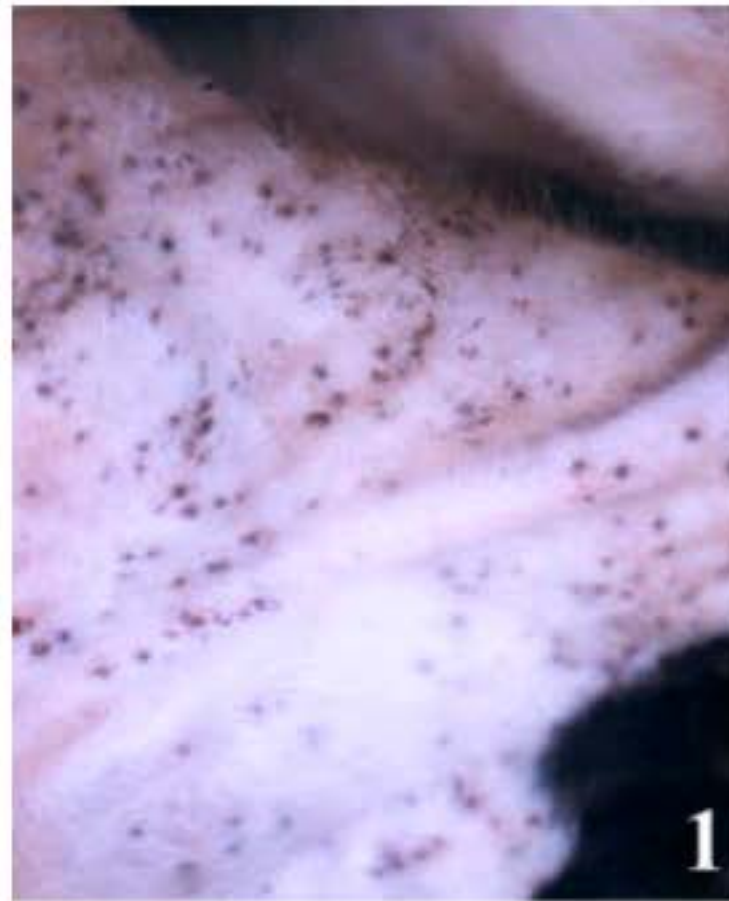


Fig. 1: A cow severely infested with *Haemaphysalis bispinosa*

the wild and domestic animals of Kerala. The most common and prevalent species encountered during the study was *H. bispinosa* which was found infesting majority of the observed animals (Table 2) (Fig. 1). This suggests its ability to enjoy wide host selection unlike the argasids, which are generally

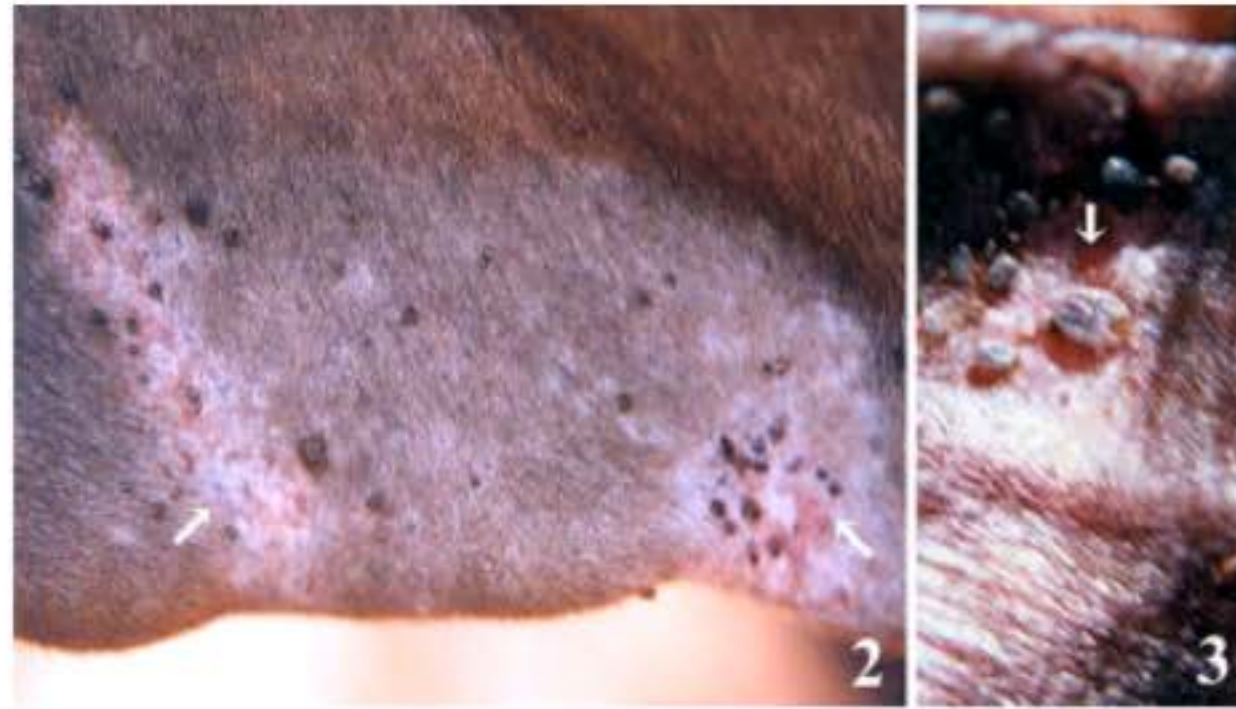


Fig. 2 and 3: A tick infested host showing lesion and hair loss



Fig. 4 and 5: A portion of skin of a heavily infested host with ticks, showing small raised papules

nidicolous in habit. Contradictorily, *B. microplus* was the common species on domestic animals of the Nilgiri District of Tamil Nadu as reported by Kumar *et al.* (2002). Prevalence of the above species along with *B. annulatus* was observed by Jagannath *et al.* (1979) also on domestic animals of Karnataka, thereby establishing the dominance of *Boophilus* in that state. In the present study members of *Boophilus* were obtained only from cattle which supports the earlier findings of Arlian and Moher (1987) that these ticks possess marked specificity for cattle.

R. haemaphysaloides was recognised as the species with comparatively low host specificity and it was found infesting 5 species of hosts. However, the number of this species was low on all the hosts observed. Hiregoudar and Jagannath (1977) also reported the occurrence of *R. haemaphysaloides* on the domestic animals of Karnataka. Thus, the above species can be accounted as one of the common tick species of South India.

The feeding symptoms and nature of damage induced on the host animals by all the species of ticks involved in the present study were more or less similar. The irritation or injury caused by tick bite often led to dermatitis and allergic reactions on the skin of the hosts as observed in the study. Large lesions, oedema, hair loss etc. could be observed in many of the heavily infested hosts (Fig. 2 and 3). Aggregation of different stages, particularly the nymphal stages of *R. (B.) annulatus* was observed along the wound marks seen on the host's body, thereby confirming their hematophagous nature. Thousands of different developmental stages of ticks were found on the same host thereby giving an ugly appearance to the hosts in severely infested conditions (Fig. 4 and 5). Red coloured areas with drops of blood oozing out were observed on the body of several hosts (Fig. 6).



Fig. 6: Blood oozing out from the site of tick bite



Fig. 7: Ear pinna of a goat with feeding lesions

Species diversity and distribution pattern of the various species of ticks were found varying with respect to variations in localities. The various species of ticks collected during the study showed site preference on the body of hosts even though they were found distributed on the entire surface of body. The foldings of ear pinna of various host animals were recognised as the most preferred site for the attachment of most of the tick species (Fig. 7), especially for the brevirostrate ticks, whereas the longirostrate ticks were more common on hosts with thick skin and less hairy configuration. This agrees with the remark made by Ebiling (1972) that regional differences exist in the properties of skin, hair and feathers of the same host and such variations would provide a variety of inter and intra-specific niches for the parasites. In severe cases of infestation, the ear pinna was found shrunken, imparting a twisted appearance with heavy load of ticks. Calves with massive tick load were observed to be anaemic exhibiting stunted growth, reduced feeding activity and vigor.

In conclusion, the present study discusses the results of a survey carried out on the species diversity of the ixodid ticks infesting the domestic animals of Kerala. Natural infestation by ticks could be evidenced on host animals like cow, buffalo, goat, dog, sheep, pig and cat. Dogs showed the maximum rate of infestation while cats had the lowest. High rate of infestation was also observed on dog (84.2%) and goat (74.73%). This indicates the fact that tick infestation forms a major constrain for the proper development and well being of the important domestic animals in Kerala.

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