

Case report

The first detection of *Amblyomma hebraeum* (Acarina: Ixodidae) in Iran

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ABSTRACT

Amblyomma hebraeum (Koch, 1844), has been already reported from along the coast of South Africa, eastern Swaziland, southern Mozambique, eastern Botswana, and in southern and eastern regions of Zimbabwe. The aim of this study was to determine the ecto-parasites and the harmful arthropods of wildlife animals, collected from cages of Shiraz zoo in Fars province, southern Iran, in 2016. Accordingly, the Ticks collected from the white camels were identified as *Amblyomma hebraeum*. This species which was collected from white camel of Fars province, is reported for the first time from Iran. The presence of *A. hebraeum* poses a serious threat to the livestock industry in Iran and there is need to investigate the presence of this species in Iranian livestock.

1. Introduction

Ticks (Acari: Ixodidae and Argasidae) are obligate blood suckers which often must wait many weeks or months for an encounter with a suitable host (Anderson et al., 1998). Ticks (Acari: Ixodidae) are a group of parasitic arthropods well known for the threat they pose to humans and livestock by transmitting diseases and by their debilitating action on the host during their long blood-meal. *Amblyomma* sp. has a three-host life cycle (Kuhnert et al., 1995) and the host range is also very wide, including terrestrial mammals, particularly ungulates. Birds are rarely attacked by the adult forms, but are frequently the hosts of the immature forms (nymphs and larvae) of certain species (Piazak, 2005).

Amblyomma hebraeum is known as the South African bont tick ("bont" refers to the colored pattern on the scutum). *Amblyomma hebraeum* is grouped with *A. cohaerens* and *A. gemma*, all have flat eyes close to the margin of the scutum. The female is very similar to *A. gemma* with a complex pattern of enamel but without connections between the central and lateral spots. However, the distribution of this tick does not overlap with that of *A. gemma*. The medium and small punctations of *A. hebraeum* are fairly evenly spread over the scutum. The male has distinctive enamel ornamentation on 9 of 11 festoons, only the two outermost ones are plain. The medium sized punctuations are widespread (Walker, 2003). *Amblyomma hebraeum* is a 3-host tick utilizing certain birds and many small, medium-sized and large

mammals as hosts for its immature stags (Horak et al., 1987). Theiler (1962) records immature from many species of birds and mammals as well as a few reptiles (Theiler, 1962; Penty and Rechav, 1987). Moreover, the adults seem to prefer the larger mammals such as cattle and large wild ruminants, particularly giraffes, buffaloes, elands and rhinoceroses (Walker, 2003; Walker et al., 2014). They do, however, also infest sheep and goats but cattle are the most important domestic hosts for adults. On correlation between infestation and mass, hosts of greater than 100 kg are regularly infested while hosts below this mass are not usually infested. The number of *A. hebraeum* adults present is correlated (non-linear) with host mass (Penty and Rechav, 1987). The adults prefer the hairless areas under the tail, in the lower perineal region, on the udder, around the genitalia and in the axillae of cattle, as well as around the feet of sheep and goats (Walker et al., 2014). The larvae are found on the feet, legs and muzzle of their hosts; the nymphs attach on the feet, legs, groin, sternum and neck. On the larger ground frequenting birds, nymphs and larvae attach mainly on the head and neck. Additionally, the immature stages of them very rarely infest rodents; when they do they seem unable to engorge and usually die (Walker, 2003). The life cycle duration of *A. hebraeum* durate completes between 145 and 200 days in various hosts at 26 °C and 90% relative humidity (Penty and Rechav, 1987).

Actively feeding male *Amblyomma* spp. also release a pheromone to attract females ('aggregation/attractant pheromone'; AAP). This is a particularly important pheromone system, because Ixodid ticks

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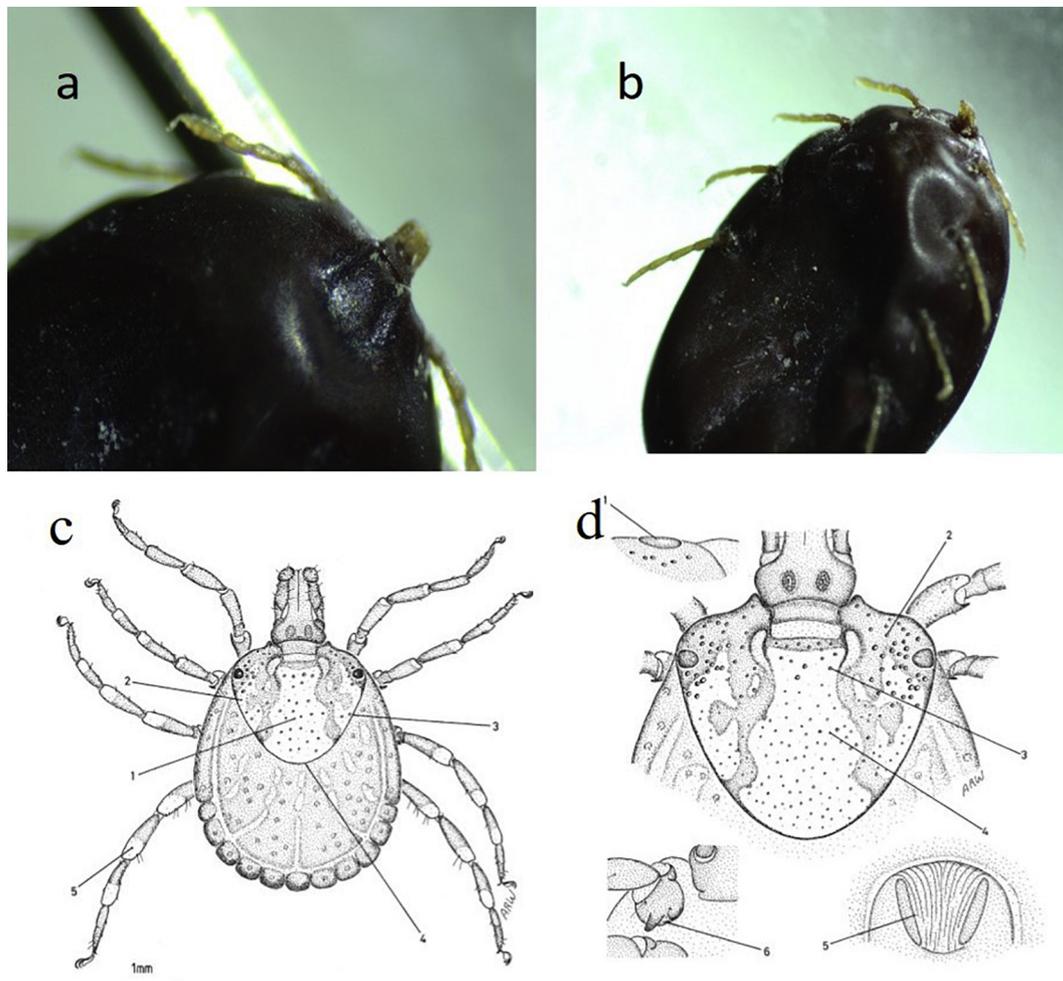


Fig. 1. Female *Amblyomma hebraeum* collected on white camel from Fars province, southern Iran; dorsal view (a), ventral view (b). Female *Amblyomma hebraeum*, dorsal views (c and d) (Walker, 2003); c: Mesial area of enamel ornamentation on scutum is large and elongate (No. 1), Lateral areas of enamel ornamentation on scutum are large and complex (No. 2), Scutum sides are convex (No. 3), Scutum posterior angle is broad (No. 4), and Leg coloration is with pale rings (No. 5). d: Scutum in center, genital aperture at bottom right and coxa 1 at bottom left; Eyes are flat (they are also close to the margin of the scutum) (No. 1), Primary punctuation sizes on scutum are small to medium (No. 2), Primary punctuation distribution on scutum is localized (between the eyes) (No. 3), Enamel colour is pink to orange (No. 4), Genital aperture posterior lips have a narrow V shape (No. 5), and Coxae 1 external and internal spur lengths are: external medium and internal short (No. 6). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

typically mate only while on the host (Anderson et al., 1998). In fact, female of *A. hebraeum* are reluctant even to attach to a host rabbit in the laboratory unless males have been feeding for at least 1 day and begin to release AAP. In the wild, *A. hebraeum* females are attracted to steers which harbor feeding males; uninfected steers are much less attractive (Anderson et al., 1998). *A. hebraeum* (Koch) is the most important vector of *Ehrlichia ruminantium* (previously named as *Cowdria ruminantium*), the causative organism of heartwater in domestic and wild ruminants in South Africa (Biguezoton et al., 2016). Heartwater is an economically important tick transmitted disease of livestock prevalent in sub-Saharan Africa and on three Caribbean islands. The causative agent, *Ehrlichia ruminantium* (a rickettsia), is transmitted by ticks of the genus *Amblyomma variegatum* following a developmental cycle within the tick (Mahan et al., 1995). Heartwater is a key economic constraint to livestock productivity in the tropics (Peter et al., 1999).

2. Materials and methods

In order to investigate ecto-parasites and the harmful arthropods of wildlife animals, several samples were taken from animal body and floor of cages in Shiraz zoo in every months of 2016. They were collected in the wildlife near Shiraz city in Fars province with a latitude of

29.7645 and a longitude of 52.6631.

For this purpose, white camels were also examined for different ecto-parasites. The ticks were removed from the anus and under the tail of the camels by forceps and were transferred to the laboratory of the Department of Medical Entomology and Vector Control at Shiraz University of Medical Sciences by glass vials containing ethanol, 70%. Morphological identification of ticks was done using keys as described by walker et al., (2003). Afterward, samples were stored at the Museum of Insecticide of Shiraz University of Medical Sciences.

3. Results and discussion

The Ticks collected from the white camels were identified as *Amblyomma hebraeum* (3 female) (Fig. 1). Briefly, *A. hebraeum* was characterized as below; flat eyes that closed to the margins of the scutum. Fairly medium and small punctations which were spread over the scutum. The presence of distinctive enamel ornamentation on 10 festoons, Lateral areas of enamel ornamentation on scutum which were large and complex, broad posterior angle in scutums, Genital aperture posterior lips with a narrow V shape, and Coxae 1 which was external and internal spur lengths and were external medium and internal short, and complex pattern of enamel with no connections between the

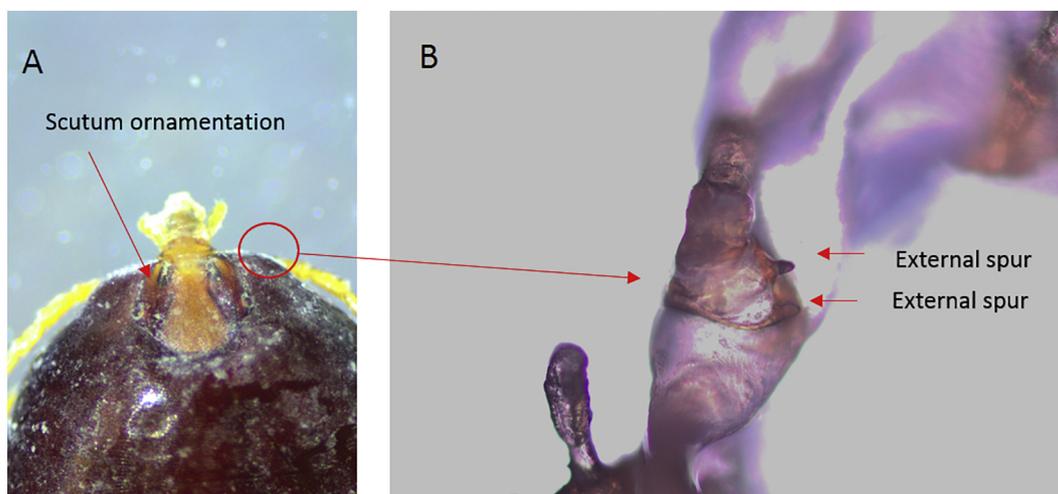


Fig. 2. Female *Amblyomma hebraeum* collected from Fars province; (A), female scutum ornamentation; (B), External and internal spur on coxa1 of *A. hebraeum* (external spur is medium and internal spur is short).

central and lateral spots in females (Fig. 2).

This tick needs heat and moisture and has already been found along the coast of South Africa. Most cases have been found in eastern Swaziland, southern Mozambique, eastern Botswana, and in southern and eastern Zimbabwe (Bryson et al., 2000; Mahan et al., 1995; Peter et al., 1999). In Africa, some investigations were focused on population dynamic and ecology of Ixodidae ticks such as *A. hebraeum* (Norval, 1977; Horak et al., 2011). Furthermore, their seasonal activities were studied in cattle in Zimbabwe, and it revealed that all stages of *A. hebraeum* were infective in life cycle of cattle, and ticks adults and nymph stages were active over the entire range of temperature and humidity (Norval et al., 1991).

In Iran, a tick study was carried out in four different geographical areas by Rahbari et al. (2007). Totally, About 1500 sheep, 1200 goats and 500 cattle of 12 herds in different provinces were examined for tick infestation. The occurrence of ticks on cattle, sheep and goats were 62, 55 and 57%, respectively. Genus of *Rhipicephalus*, *Haemaphysalis* and *Dermacentor* were found in the mountainous area, whereas *Boophilus* and *Ixodes* were only presented in the Caspian region. *Hyalomma* were very abundant in each zone but especially in the mountainous area, whereas *Ixodes* were the minor genus (Rahbari et al., 2007). In our study the species of *A. hebraeum* collected from white camels was the first report of this species for Iranian ticks. Accordingly, because of the main role of *A. hebraeum* to transfer of Haertwater disease in Africa, and probable presence of various pathogenic agents such as *Ehrlichia* species in this species in different livestock animals in the country, It may be threaten to livestock health and economy of Iran, consequently, further studies are needed to determine the role of *A. hebraeum* to transfer the different agents in the country.

Conflict of interest

There were not conflict of interests.

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