

Ixodidae ticks in cattle and sheep in Sistan and Baluchestan Province (Iran)

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Sistan and Baluchestan,
Tick.

Summary

This survey was conducted to investigate the presence and abundance of hard tick species (Acari: Ixodidae) on cattle and sheep in Sistan and Baluchestan Province (Iran). Between 2010 and 2011, a total of 1,403 ticks was collected from 332 infested cattle and 1,480 ticks were collected from 602 infested sheep during the seasons of tick activity. The species collected from cattle were *Hyalomma marginatum* (46.04%), *Hyalomma excavatum* (25.51%), *Hyalomma anatolicum* (10.33%), *Hyalomma asiaticum* (6.34%), and ticks of the *Rhipicephalus sanguineus* group (11.76%); while the species collected from sheep were of the *Rhipicephalus sanguineus* group (34.66%), *H. marginatum* (25.60%), *H. excavatum* (27.97%), *H. asiaticum* (9.45%) and *Hyalomma scupense* (2.29%). The results show that *H. marginatum*, *H. excavatum*, as well as ticks of the *R. sanguineus* group are dominant in the surveyed area.

Zecche del genere *Ixodes* nella popolazione bovina e ovina della regione del Sistan e Baluchistan (Iran)

Parole chiave

Bovini,
Hyalomma spp.,
Iran,
Ixodidae,
Pecore,
Rhipicephalus
sanguineus,
Sistan e Baluchistan,
Zecca.

Riassunto

Tra il 2010 e il 2011 è stata condotta un'indagine per accertare la presenza e l'entità di zecche nella popolazione bovina e ovina della regione del Sistan e Baluchistan (Iran). Durante la stagione di maturità del parassita, sono stati raccolti 1.403 esemplari di zecca da 332 bovini e 1.480 da 602 ovini. Nei bovini le specie identificate sono state: *Hyalomma marginatum* (46,04%), *Hyalomma excavatum* (25,51%), *Hyalomma anatolicum* (10,33%), *Hyalomma asiaticum* (6,34%), *Rhipicephalus sanguineus* (11,76%). Negli ovini sono state identificate le seguenti specie: *Rhipicephalus sanguineus* (34,66%), *H. marginatum* (25,60%), *H. excavatum* (27,97%), *H. asiaticum* (9,45%) e *H. scupense* (2,29%). I risultati dell'indagine hanno mostrato la dominanza nella regione delle specie: *H. Marginatum*, *H. excavatum* e *Rhipicephalus sanguineus*.

Studies on the biology and distribution of ticks in Iran started in 1810 when Dupre visited this country (Telmadarraiy *et al.* 2004). Since then, the Razi Institute, Pasteur Institute of Iran, Faculties of Veterinary and School of Public Health, have all continued to work on Iranian ticks. In 1935, Brumpt conducted a study on ticks of the genus *Ornithodoros* (Telmadarraiy *et al.* 2004). Subsequently, Delpy published a paper on the family of Ixodidae genus *Hyalomma* in 1936, while Baltazard described the characteristics of *Ornithodoros* ticks (Telmadarraiy *et al.* 2004).

Ticks are among the major vectors of pathogens for animals and humans in the world. They can play a crucial role in the transmission of protozoa and bacteria, such as *Babesia*, *Theileria* and *Anaplasma* spp. (Soulsby 1986), or *Borrelia* spp., which cause the so called tick-borne relapsing fever (Telmadarraiy *et al.* 2004), an acute febrile disease which is an endemic in Iran human population. From 1997 to 2006, 1,415 cases of relapsing fever have been reported throughout the country (Arshi 2002, Masoumi *et al.* 2009). At the same time, other public health problems related to ticks are emerging in the country, as the Crimean-Congo haemorrhagic fever (CCHF), a viral haemorrhagic fever, for which cattle and ticks serve as reservoirs of the virus (Salim *et al.* 2010).

In this scenario, it is pivotal to ascertain the presence and abundance of the tick species involved in transmission as well as their geographic distribution, insofar as information related to these aspects might facilitate the control of ticks and tick-borne diseases. The aim of this study was to determine the frequency of tick infestation in cattle and sheep of Sistan and Baluchestan Province (Iran).

The Sistan and Baluchestan province (25°3' to 28°31' N and 58°48' to 63°19' E, subtropical climate) is located in the South-East, it is the largest province in Iran, with an area of 181,785 km² and a population of 2,4 million. It is surrounded by Khorassan, Kerman and Hormozgan provinces. Pakistan and Afghanistan confine with the Eastern boundaries, while its Southern border is on the Oman Sea (Figure 1). The province comprises 3 regions of differing geography: the coastal region in the South, a mountainous region in the West and the desert region in the East and North. Several localities in each region were randomly selected for the survey, the selection was based on the features of the different areas and intended to avoid statistical bias. The tick samples were collected from infested cattle and sheep using tweezers and rubber gloves, during the spring and summer of 2010 and 2011. The tick specimens were collected from animals, which grazed in open rangeland pastures. After collection, the tick samples were stored in vials with

70% ethyl alcohol. All specimens were labelled to note location, host, date and species determination. The ticks were brought to the laboratory and adults identified under a stereomicroscope according to general identification keys (Estrada-Peña *et al.* 2004, Walker *et al.* 2003).

A total of 1,403 ticks was collected from 332 infested cattle; whereas 1,480 ticks were collected from 602 sheep in the Sistan and Baluchestan Province of Iran (Table I). Six species of Ixodid ticks were recognized (Tables II and III). The most abundant species in cattle were *Hyalomma marginatum*, followed by *Hyalomma excavatum* and ticks of the *Rhipicephalus sanguineus* group; while *R. sanguineus* showed to be the most common species in sheep, followed by *H. marginatum*, *H. excavatum* and *Hyalomma asiaticum*. As noted in Tables II and III, the abundance of other species was low. It was found that the maximum numbers of ticks were collected from the perineal and chest regions of both cattle and sheep (Table I).

Ticks (Ixodidae) have a crucial role as a vector of pathogens of domestic animals in Iran, where the major losses caused by ticks are related to transmission of babesiosis, theileriosis, and anaplasmosis in ruminants (Rahbari *et al.* 2007). The collection of comprehensive information on the regional distribution and abundance of species ticks is essential. The occurrences of suitable hosts together with favourable climate conditions foster the presence of ticks and tick-borne disease in nature. Furthermore, the land exploitation occurred over the last decades has dramatically reduced the diversity of Iranian environment and significantly modified the distribution and the abundance of the tick species, which strongly adapted to domestic animals in each area. If this



Figure 1. Location of Sistan and Baluchestan Province (Iran).

Table I. Distribution of ticks in different parts of the body of sampled animals in the Sistan and Baluchestan Province of Iran, in 2010 and 2011.

| Animals | External ear (%) | Perineal and chest region (%) | Hind leg and around the eyes (%) | Udder (%) | No. of ticks |
|---------|------------------|-------------------------------|----------------------------------|------------|--------------|
| Cattle | 266 (18.95) | 932 (66.42) | 107 (7.62) | 98 (6.98) | 1,403 |
| Sheep | 305 (20.60) | 965 (65.20) | 78 (5.27) | 132 (8.91) | 1,480 |

Table II. Frequency of tick species on cattle in the Sistan and Baluchestan Province of Iran, in 2010 and 2011.

| Tick species | No. of males | No. of females | Total (%) |
|---------------------------------------|--------------|----------------|-------------|
| <i>Hyalomma marginatum</i> | 286 | 360 | 646 (46.04) |
| <i>Hyalomma excavatum</i> | 148 | 210 | 358 (25.52) |
| <i>Hyalomma anatolicum</i> | 68 | 77 | 145 (10.33) |
| <i>Hyalomma asiaticum</i> | 35 | 54 | 89 (6.34) |
| <i>Rhipicephalus sanguineus</i> group | 98 | 67 | 165 (11.76) |
| Total | 635 | 768 | 1,403 (100) |

trend continues, it is feasible that new tick species will gradually replace the one usually found in this area, making necessary to continue monitoring tick populations (Nabian et al. 2007).

In the present study, 2 genera and at least 6 species of Ixodidae ticks were found to infest cattle and sheep in the Sistan and Baluchestan area. These results are similar to those of other studies conducted in the South-East of Iran (Dehaghi et al. 2011, Mazlum 1971, Rahbari 2007, Salim 2010). Particularly, *H. marginatum* was the dominant tick in cattle, while *R. sanguineus* group ticks were dominant among sheep.

With regards to ticks infesting cattle, *Hyalomma* spp. has been found to be dominating, this result is consistent with those of other studies conducted in Iran and in Turkey (Aktas et al. 2004, Dehaghi et al. 2011, Razmi et al. 2003, Salim et al. 2010). *Hyalomma* were most abundant in each zone and especially in the desert boundary area (Rahbari et al. 2007).

Specimens of *H. marginatum* were also found in the hilly regions of Sistan and Baluchestan area with the highest percentage in the tick population; a similar pattern has been previously observed by Mazlum (Mazlum 1971). This species has also been reported in different parts of Iran, such as the Caspian Sea region, Khozestan, and Markazi Provinces (Rahbari et al. 2007).

Hyalomma anatolicum was present over widely scattered areas throughout Iran. It is a vector of the causative organism of tropical theileriosis and can transmit a variety of pathogenic organisms such as *Theileria lestoquardi*, *Theileria equi*, *Babesia*

Table III. Frequency of tick species on sheep in the Sistan and Baluchestan Province of Iran, in 2010 and 2011.

| Tick species | No. of males | No. of females | Total (%) |
|---------------------------------------|--------------|----------------|-------------|
| <i>Rhipicephalus sanguineus</i> group | 231 | 282 | 513 (34.66) |
| <i>Hyalomma marginatum</i> | 172 | 207 | 379 (25.61) |
| <i>Hyalomma excavatum</i> | 197 | 217 | 414 (27.97) |
| <i>Hyalomma asiaticum</i> | 87 | 53 | 140 (9.46) |
| <i>Hyalomma scupense</i> | 13 | 21 | 34 (2.30) |
| Total | 700 | 780 | 1,480 (100) |

caballi, *Trypanosoma theileri* and Crimean-Congo haemorrhagic fever virus (Nabian and Rahbari 2008). *Hyalomma excavatum* was more commonly found on livestock than *H. anatolicum*, in this respect it is worth mentioning that the distribution of this species from the Mediterranean steppe climatic regions of North Africa to steppe climatic regions elsewhere, including Iran and Turkmenistan, has also been reported in another study (Walker et al. 2003). *Hyalomma asiaticum* was found in this area as well. The presence of this tick has been recorded in the South-East part of Iran, near the Pakistan borders (Abbasian 1961). It has been described all over Iran, especially in the Southern and South-Western provinces (Rahbari et al. 2007). Adults attack camels, other domestic herbivores, such as wild goats, sheep and gazelles in semi-desert and desert environments (Hoogstraal and Valdez 1980). We found *H. scupense* (syn.: *detritum*) only in sheep, but other researchers assumed that adults of this tick infest cattle, horses, sheep, goats, and camels (Walker et al. 2003). The presence of this species has been described in a wide area ranging from Southern Europe to the Caspian, with outlying pockets in the mountains of Golestan National Park in the Northern part of Iran (Izadi et al. 2004), and in Khorassan, in West and East Azerbaijan, Khozestan Boushehr, Mazenderan, Gilan and in Fars provinces (Rahbari et al. 2007). In this study, *R. sanguineus* group ticks were dominant among sheep. The different species of this group, not easily distinguishable, adapted to different climatic conditions in different ecological zones with various hosts (Rahbari et al. 2007). These ticks have been previously reported (as *R. sanguineus* s.str.) from all

over Iran, especially in the Caspian Sea region, in the North-Western area of the country and in Boushehr (Rahbari et al. 2007). Regarding ticks infesting cattle and sheep, *Hyalomma* was found to be the most frequent genus in this study, as it has also been reported before in Iran (Nabian and Rahbari 2008, Rahbari et al. 2007). Since *Theileria annulata* and *Theileria lestoquardi* are both transmitted by ticks of the genus *Hyalomma* (Brown et al. 2006, Kirvar et

al. 1998), it is reasonable to expect the presence of these diseases in the examined region.

Crimean Congo Haemorrhagic fever has instead been reported in Sistan and Baluchestan province (Izadi et al. 2004). This survey showed that genus *Hyalomma*, which also includes the principal vectors of CCHF in the world, was dominant in this province. Measures to reduce its population should be considered in order to prevent CCHF epidemics.

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