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Status of *Haemaphysalis* tick infestation in domestic ruminants in Iran

Sadegh RAHBARI*, Sedigheh NABIAN, Parviz SHAYAN
and Hamid Reza HADDADZADEH

Department of Parasitology, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran

Abstract: The geographical distribution and ecological preferences of *Haemaphysalis* in domestic animals in Iran were studied 4 times a year from April 2003 to March 2005. A total of 1,622 ixodid tick specimens were collected from 3 different zones. Among them, 108 (6.7%) *Haemaphysalis* ticks, consisting of 6 species, were identified; *H. punctata* (3.4%), *H. parva* (0.5%), *H. sulcata* (0.6%), *H. choldokovskyi* (1.7%), *H. concinna* (0.06%) and *Haemaphysalis* sp. (0.6%). *H. punctata* was the most abundant species, whereas *H. concinna* was the rarest species collected in humid and sub-humid zones on cattle, sheep and goats. *H. choldokovskyi* was principally collected from sheep and goats grazed in cold mountainous areas. The infested areas consisted of Caspian Sea (Guilan, Mazandaran, Golestan, and central provinces), mountainous (Azarbaiejan, Ardebil, Kohgilouyeh, and Kordestan) and semi-dessert (Khorasan, Semnan, Kerman, Sistan, and Baluchestan) zones. The Caspian Sea zone (23.6%) was the most highly infested region. The results show that various species of *Haemaphysalis* ticks infest domestic ruminants in Iran and each tick species show characteristic geographical distributions.

Key words: *Haemaphysalis*, tick, domestic ruminants, Iran

INTRODUCTION

Ticks (Ixodidae) play a significant role as a vector of pathogens of domestic animals in Iran. The major losses caused by ticks are related to transmission of babesiosis, theileriosis, and anaplasmosis in ruminants. The distribution of tick species that are able to infest animals in Iran is briefly reviewed on the basis of published records. The tick studies were started by Delpy (1936) in Iran. Later, Abbasian (1961) and Mazlum (1971) described a list of adult ticks collected from domestic animals in different regions. Filipova et al. (1976) presented data for 642 ixodid tick larvae and nymphs taken from small mammals, chiefly rodents in different zoogeographical zones of Iran. Hoogstraal and Wassef (1979) and Hoogstraal and Valdez (1980) studied ixodid ticks parasitizing wild sheep and goat in Iran with focusing on maintaining natural foci of many hazardous diseases of humans. Rahbari (1995) published ecological aspects of various species of ticks encountering domestic animals in northwest of Iran. Razmi et al. (2002) published a list of tick species of domestic animals in northeast of Iran. However, there still seems to be a gap in our knowledge about the distribution of tick species in Iran. Therefore, the objective of this study was to determine the species of *Haemaphysalis* ticks infesting ruminants and its geographical distribution in Iran.

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*Corresponding author (e-mail: srahbari@ut.ac.ir)

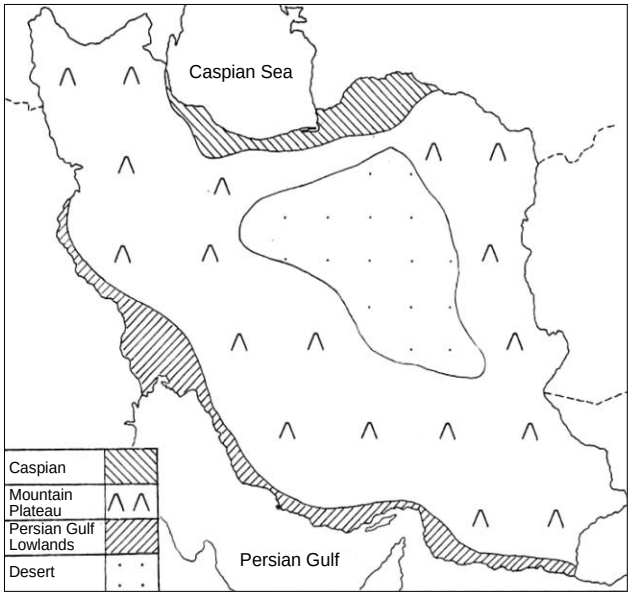

Fig. 1. Four different geographical zones of Iran.

MATERIALS AND METHODS

Epidemiological studies on parasitic diseases of animals in Iran have been divided into 4 ecological zones (Skermann and Hillard, 1966). These localities are shown in Fig. 1. The tick specimens were collected from animals which grazed in open rangeland pastures in 4 ecological zones, which consist of Caspian Sea zone in the north, mountainous area extended from northwest to southeast, Persian Gulf lowlands, and semi-dessert area in central part of Iran. Tick sampling was carried out randomly on 629 sheep, 336 goats and 151 cattle, and from the whole body of each animal. Collected ticks were counted and preserved in 70% alcohol. The speciation was done by using the identification key of Delpy (1938) and Walker et al. (2003).

RESULTS

Tick collection was started from the late April of 2003, and continued almost to the middle of March 2005. During this period, a total of 2,170 ixodid tick specimens were collected from cattle, sheep, goats, and camels in 4 different zones. *Haemaphysalis* ticks were not found from Persian Gulf zone. From the other 3 zones, a total of 1,622 ixodid ticks, including 108 (6.7%) *Haemaphysalis* ticks, were collected. The infested areas for *Haemaphysalis* consisted of Caspian Sea areas (Guilan, Mazandaran, and Golestan provinces), mountainous areas (Azarbaiejan, Ardebil, Kohgilouyeh, and Kordestan provinces) and semi-dessert zones (Khorasan, Semnan, Kerman, Sistan, and Baluchestan provinces). The Caspian Sea zone was the most highly infested region (23.6%).

Species diversity of *Haemaphysalis* ticks among ixodid tick population in 3 zones was summarized in Table 1. A total of 6 species of *Haemaphysalis* were identified on ruminants, when they were reared on pastures in Iran; *H. punctata* (3.4%), *H. parva* (0.5%), *H. sulcata* (0.6%), *H. choldokovskyi* (1.7%), *H. concinna* (0.06%), and *Haemaphysalis* sp. (0.6%). *H. punctata* was the most abundant species, whereas *H. concinna* was the rarest species collected in humid and sub-humid zones on cattle, sheep and goats. *H. choldokovskyi* was principally collected from sheep and goats grazed in cold mountainous areas.

Table 1. The distribution of *Haemaphysalis* species in 3 different geographical zones

Geographical zone	No. of ixodid ticks	*Haemaphysalis* (Total)		*H. sulcata*		*H. punctata*		*H. parva*		*H. concinna*		*H. choldokovskyi*		*Haemaphysalis* sp.[a)]	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
I	140	33	23.6	0	0.0	22	15.7	2	1.4	1	0.7	8	5.7	0	0.0
II	608	28	4.6	0	0.0	25	4.1	4	0.7	0	0.0	14	2.3	2	0.3
III	874	47	5.4	9	1.0	8	0.9	2	0.2	0	0.0	5	0.6	7	0.8
Total	1,622	108	6.7	9	0.6	55	3.4	8	0.5	1	0.06	27	1.7	9	0.6

[a)]Species undetermined.

DISCUSSION

The land exploitation of these 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. If this trend continues, it is possible to hypothesize that some new records of tick species will gradually replace most of the others. This hypothesis seems to be confirmed by continued observations on tick populations in any content. However, it is attempted to compare the obtained results in this study with the past documented reports.

The tick species, *H. choldokovskyi*, is commonly found in sheep pastured in surroundings of Caspian Sea, mountainous, and semi-dessert zones in Iran. There is no report of attempts to isolate any pathogenic agent from this species, and there is also a gap of knowledge about its biological aspects. Delpy (1938) concluded that this species is distributed in high altitude territories (20°-60°E, 30°-45°N). *H. parva* is a rare species encountered in Iran, and found in Caspian Sea, mountainous, and semi-dessert zones. The immature stages are frequently found on small rodents, such as social vole (Filipova et al., 1976). The adults are frequently found on sheep and goats (Mazlum, 1971). Carnivora are also the host for adults (Hoogstraal and Wassef, 1979). Hoogstraal and Valdez (1980) previously identified this species from wild sheep, and they believed that the range of this species extends to Italy and also to some parts of Libya. This tick has been known to transmit *Theileria sergenti* and Crimean-Congo hemorrhagic fever virus (Shchelkanov et al., 2005).

The species, *H. punctata*, was recorded throughout rocky mountain slopes of Caspian Sea zone and in parts of the mountainous area in wooded, brushy locations (Mazlum, 1971). But in recent years, this species has been expanding its range in most provinces in Iran. The larvae feed on small animals, such as the great gerbil, and the nymphs also feed on small mammals and birds (Filipova et al., 1976), while we found that the adults prefer cattle and sheep. This species is well known as the vector of ovian babesiosis (Lewis and Herbert, 1980) and *Babesia major* strains (Yin et al., 1996). It has also been demonstrated that *H. punctata* carries *Rickettsia siberica* (Chen et al., 1998) and causes tick paralysis (Harwood and Maurice, 1979).

Another species, *H. sulcata*, is widely distributed in Iran. It is commonly found from northeast to southeast in semi-dessert zones. Grebenyuk (1966) showed its wide distribution in India, southern USSR, and from southwestern Asia to the western Mediterranean area. Recently, Bouattour et al. (1999) reported *H. sulcata* from humid and sub-humid zones on cattle and sheep in Tunisia. The larvae feed on a variety of rodents (Filipova et al., 1976), whereas the nymphs feed on many small and large animals. Adults are usually found on larger animals, such as wild and domestic sheep, goats, cattle, horses, and camel (Hoogstraal and Valdez, 1980). This tick is known to be a vector for *Anaplasma ovis* (Walker et al., 2003).

The rarest species, *H. concinna*, is found in the east of the Caspian Sea zone to southern mountainous areas. This tick is less commonly encountered than the others. It is, however, relatively common in sheep pasture regions. This tick is highly host-specific for wood mice, but occasionally found on Persian jirds, turkestan rats, and house mice (Filipova et al., 1976). Delpy (1938) found the adult ticks on sheep, cattle and horses in mountainous areas of Caspian zone, but Mazlum (1971) emphasized that cattle could be the most important host for adult ticks. *H. concinna* was found infected with rickettsiae of spotted-fever group (Sreter-Lancz et al., 2006), but it is considered not an important vector. Examining the *H. concinna* collected in Kazakhstan revealed *Anaplasma bovis* (Shpynov et al., 2004a) and *Rickettsia hulinii* (Shpynov et al., 2004b) in these ticks. The ability of *H. concinna* to transmit *Borrelia* was determined under laboratory conditions in China (Sun and Xu, 2003). This tick was also found to be infected with the causative agents of tularemia (Khazova and Iastrebov, 2001).

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