

Ixodid ticks in Sarnena Sredna Gora – published data and new records

ATANAS ARNAUDOV^{1, 2}, DILIAN GEORGIEV²

¹University ‘Professor Dr. Asen Zlatarov’, Faculty of Public Health and Health Cares, 1. “Prof. Yakimov” bul., 8010 Burgas, Bulgaria

² University of Plovdiv, Faculty of Biology, 24Tsar Assen Street, 4000 Plovdiv, Bulgaria

Abstract. The available data from literature sources and collected material on the spreading of Ixodid ticks in Sarnena Sredna Gora Mountains are presented. A total of 13 species of 6 genera are reported (*Hyalomma marginatum* (Koch 1844), *Hyalomma scupense* (Schulze 1919), *Rhipicephalus bursa* (Canestrini et Fanzago 1877), *Rhipicephalus sanguineus* (Latreille 1806), *Rhipicephalus turanicus* (Pomeranzev 1940), *Ixodes ricinus* (Linnaeus 1758), *Ixodes laguri* (Olenev 1929), *Ixodes redikorzevi* (Olenev 1927), *Haemaphysalis sulcata* (Canestrini et Fanzago 1878), *Haemaphysalis punctata* (Canestrini et Fanzago 1878), *Haemaphysalis intermis* (Birula 1895), *Dermacentor marginatus* (Sulzer 1776) and *Boophilus calcaratus* (Lahille 1905). The data on 6 tick species have been updated. *Hyalomma marginatum* was found in most locations.

Key words: Bulgaria, Ixodidae, Sarnena Sredna Gora Mts.

Introduction

Ixodid ticks are temporary obligate bloodsucking ectoparasites in vertebrates. They have very important epidemiological and epizootological significance as reservoirs and vectors of many infectious and invasive diseases in domestic animals and humans (Jongejan et Uilenberg 2004). Therefore, their distribution has been studied by a large number of researchers in many countries (Guglielmone 2014).

In Bulgaria, there are representatives of all six ixodid tick genera that are characteristic for the continental temperate climate zone – *Rhipicephalus* (Koch 1844), *Ixodes* (Latreille 1795), *Dermacentor* (Koch 1844), *Hyalomma* (Koch 1844), *Boophilus* (Curtice 1891), and *Haemaphysalis* (Koch 1844) (Mincheva *et al.* 1965). According to Drenski (1955), approximately 32 species can be found in Bulgaria. They are described by Beron (1973-1974). Most of the studies on the tick fauna in Bulgaria, however, took place more than 4 decades ago. These studies were conducted mainly in connection to the detection of an outbreak of tick-borne encephalitis in Iskra Vill., Parvomai Municipality in 1953 (Sarbova 1956; Georgiev *et al.*, 1971, 1975; Trifonov, 1975; Arnaudov et Antov 1976; *ect.*). In recent years, studies on the distribution and species composition of ixoid ticks have been carried out by Arnaudov *et al.* (2014) and Arnaudov et Arnaudov (2017) on domestic animals in several locations in the Plovdiv region as well as by Sándor *et al.* (2021) on nestlings of Eurasian eagle owl (*Bubo bubo*, Linnaeus 1758) from south-eastern Bulgaria and Aleksandrova *et al.* (2021) on wild birds in three sites in Bulgaria.

Although there is information in the literature sources about the Ixodofauna of Sarnena Sredna Gora Mountains (Mincheva *et al.* 1965, Christov 1966) it is obsolete, fragmentary and not summarized. Therefore, in this study, we present data from our own research, as well as from the literature data on the distribution of ixodid ticks in Sarnena Sredna Gora Mountains.

IXODIDAE

Material and methods

The material for the present study was collected by Dilian Georgiev from April 2018 till July 2020 mainly by “white flag” and „mowing with a bag” methods. A small number of ticks were collected from domestic animals (dogs and cats), road-killed hedgehogs and humans. The examination of the animals for invasion was performed in the following order: head, neck, back, under the tail, groin. Total number of 50 ixodid ticks was collected.

After the collection, the tick samples were stored in a 70% ethyl alcohol solution. The collected ixodid tick specimens were observed using a CARL ZEISS JENA binocular magnifier. The species determination was performed by Atanas Arnaudov according to the descriptions of Pomerantsev (1950).

Study area. The ticks were collected from the follow localities: Dabrava Vill., Dalboki Vill., Hrishteni Vill., Kolena Vill., Lyulyak Vill., Morulei peak, Nova Zagora, Stara Zagora, Schanovo Vill, Varben Vill., and. Zmeevo Vill.

Results

In the present study, data were obtained on the distribution of 13 species of Ixodid ticks of 6 genera in Sarnena Sredna gora Mts.

Genus *Hyalomma*

Two species of this genus have been identified- *Hyalomma marginatum* (Koch 1844) and *Hyalomma scupence* (Schulze 1919) (Mincheva *et al.* 1965).

Hyalomma marginatum (syn. *Hyalomma plumbeum* Panzer, 1796) – fig. 1.

The species is widespread in Sarnena Sredna Gora (under 700 m altitude). Its biotopes are natural meadows, dry pastures, field boundaries, old alfalfa fields, and others. Its activity is highest from March to August inclusive (Mincheva *et al.* 1965).

New data: 1. April 2018, grasses and shrubs to alfalfa and fennel plantations north of Zmeevo Vill. (42°30.118' N, 25° 36. 015'E, 445 m altitude) – 1 male; 2. April 2018, deciduous forest north of Lyulyak Vill. (42°31.178' N, 25° 39. 562'E, 427 m altitude) – 1 nymph; 3. May 2018, deciduous forest north of Dabrava Vill. (42°27.303' N, 25° 35. 370'E, 516 m altitude) – 1 nymph; 4. May 2018, yard, Hrishteni Vill. (42°27.127 N', 25° 42. 189'E, 266 m altitude), from man - 1 female; 5. June 2018, deciduous forest west of Stara Zagora (42°24.498' N, 25° 32. 494'E, 389 m altitude) – 3 males; 6. June 2018, hornbeam forest from next to Dabrava Vill. (42°27.351' N, 25° 35. 131'E, 554 m altitude) – 1 male; 7. June 2018, grassy joy in an oak forest near Morulei peak (42°32.257' N, 25° 45. 261'E, 895 m altitude) – 1 male; 8. June 2018, yard, Hrishteni Vill. (42°27.127 N', 25° 42. 189'E, 266 m altitude), from man - 1 female and 1 nymph; 9. June 2018, yard, Hrishteni Vill. (42°27.127 N', 25° 42. 189'E, 266 m altitude), from cat - 1 engorged nymph; 10. April 2019, Stara Zagora, shrubs in limestone terrain (42°29.192' N, 25° 46. 166'E, 286 m altitude) – 1 male. 11. March 2020, meadow west of Kolena Vill. (42°29.162 N', 25° 42. 238'E, 312 m altitude – 1 male, 1 female and 1 nymph; 12. March 2020, dry grass next to a forest and to fields, south of Kolena Vill. (42°27.255 N', 25° 44. 128'E, 196 m altitude)- 2 males; 13. March 2020, meadow north of Nova Zagora (42°33.323 N', 25° 55. 220'E, 452 m altitude)- 2 males; April 2020, yard, Hrishteni Vill. (42°27.127 N', 25° 42. 189'E, 266 m altitude), from cat - 1 female; April 2020, meadow in a deciduous forest south of Shanovo Vill. (42°31.406' N, 25° 38. 565'E, 450 m altitude) – 1 male;

IXODIDAE

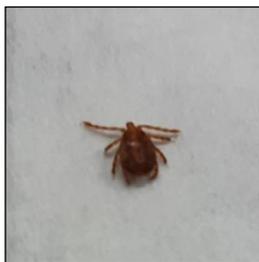


Fig. 1. *Hyalomma marginatum* Koch 1844 - male, March 2020, meadow west of Kolena Vill. (42°29.162 N', 25° 42. 238'E).

Hyalomma scupense (syn. *Hyalomma detrium* Schulze 1919)

Hyalomma scupense has been located in the villages located in the Sredna Gora Mts., near the Stryama River Gorge. Its biotopes are hilly pastures in short-stem forests. It is active in the autumn-winter period and in early spring (Mincheva *et al.* 1965).

Genus *Rhipicephalus*

Three species of this genus have been identified- *Rhipicephalus bursa* (Canestrini et Fanzago 1877), *Rhipicephalus sanguineus* (Latreille 1806) and *Rhipicephalus turanicus* (Pomeranzev 1940).

Rhipicephalus bursa – fig. 2.

This species is spreaded among pastures in areas with an altitude of up to 500 m. In Sarnena Sredna Gora Mts, part of the Stara Zagora region, it was discovered on its sunny slopes. As a result of the mobile sheep breeding, the tick was also found in the Kazanlak valley. It is active throughout the grazing period, with a maximum in June (Mincheva *et al.* 1965).

New data: 1. May 2018, deciduous forest south of Shanovo (42°31.477' N, 25° 38. 398'E, 450 m altitude) – 1 male; 2. May 2019, yard, Hrishteni Vill. (42°27.127 N', 25° 42. 189'E, 266 m altitude).



Fig. 2. *Rhipicephalus bursa* Canestrini et Fanzago 1877 – male, May 2020, deciduous forest south of Shanovo (42°31.477' N, 25° 38. 398'E).

Rhipicephalus sanguineus – fig. 3

The tick is found mainly on dogs in the villages of the region (Mincheva *et al.*, 1965). Hristov (1966) discovered a male specimen of *Lepus europeus* (Pallas 1778) in the area of Stara Zagora baths. *Rhipicephalus sanguineus* is high active in May and June.

New data: 1. July 2020, Varben Vill. (42°41.488' N, 24°96.594'E) - 1 male and 1 female on dog; 2. May 2018, road junction Hrishteni Vill. (42°44.120 N', 25° 71. 564'E, aprox. 200 m altitude) - 16 males and 3 females from 2 road-killed hedgehog.

IXODIDAE



Fig. 3. *Rhipicephalus sanguineus* Latreille 1806 - engorged female, May 2018, road junction Hrishteni Vill. (42°44.120 N', 25° 71. 564'E) from road-killed hedgehog.

Rhipicephalus turanicus – fig. 4.

It is usually found parallel to the *Rhipicephalus bursa*, but appears earlier than it (as early as March). Its activity is highest in May (Mincheva *et al.* 1965). Christov (1966) founded out this tick in the Malka Vereya Vill. on *Mus musculus* (Linnaeus 1758) and *Apodemus sylvaticus* (Linnaeus 1758).

New data: Road junction Hrishteni Vill. (42°44.120 N', 25° 71. 564'E, aprox. 200 m altitude) - 1 male from 1 road-killed hedgehog.



Fig. 4. *Rhipicephalus turanicus* Pomeranzev 1940- male, May 2018, road junction Hrishteni Vill. (42°44.120 N', 25° 71. 564'E) from road-killed hedgehog.

Genus *Ixodes*

Three species of this genus have been found in Sarnena Sredna Gora - *Ixodes ricinus* (Linnaeus 1758), *Ixodes laguri* (Olenev 1929), *Ixodes redikorzevi* (Olenev 1927).

Ixodes ricinus – fig. 5

It is spread on the northern slopes afforested with tall beech forests, including the neighboring higher wooded areas of Kazanlak valley (Mincheva *et al.* 1965). Christov (1966) found it in the area of the Stara Zagora baths on *Crocidura leucodon* (Hermann 1780) and *Apodemus sylvaticus* (Linnaeus 1758), *Mus musculus* (Linnaeus 1758), *Microtus arvalis* (Pallas 1778), as well as in Malka Vereya Vill. on *Mus musculus* (Linnaeus 1758). The activity of *Ixodes ricinus* is highest during the wet months.

New data: 1. April 2018, cave near Dalboki Vill. (42°29.190 N', 25° 46. 177'E, 272 m altitude) – 1 engorged female; 2. March 2020, dry grass next to a forest and to fields, south of the village of Kolena (42°27.255 N', 25° 44. 128'E, 196 m altitude)- 1 male; 3. March 2020, meadow north of Nova Zagora (42°33.323 N', 25° 55. 220'E, 452 m altitude)- 1 female.

IXODIDAE



Fig. 5. *Ixodes ricinus* Linnaeus 1758 – female, March 2020, meadow north of Nova Zagora (42°33.323 N', 25° 55. 220'E).

Ixodes laguri

In the study area the tick was proved by Hristov (1966) on *Citellus citellus* (Linnaeus 1766) in Malka Vereya Vill. and in the Stara Zagora baths in the nest of *Cricetulus migratorius* (Pallas 1773).

Ixodes redikorzevi

This species was found in the study area of the study by Christov (1966) on small mammals in Malka Vereya Vill. and Stara Zagora baths. The activity of *Ixodes laguri* and *Ixodes laguri* coincides with that of *Ixodes ricinus*.

Genus *Haemaphysalis*

Three species of this genus have been found in Sarnena Sredna Gora - *Haemaphysalis sulcata* (Canestrini et Fanzago 1878), *Haemaphysalis punctata* (Canestrini et Fanzago 1878) and *Haemaphysalis intermis* (Birula 1895). Ticks of this genus are found in small outbreaks.

Haemaphysalis sulcata

This species is more common in the Plovdiv part of Sarnena Sredna Gora. It was found in the foothills. Its biotopes are located on hilly areas that have pastures covered in bushes. In the Stara Zagora part of the region it is found only in biotopes located along the upper reaches of the Omurovska River. It is most active in winter (with two peaks - in December and in March (Mincheva *et al.* 1965).

***Haemaphysalis punctata* – fig. 6**

In the whole Plovdiv region, this tick was found only in Sredna Gora. In the Stara Zagora part of Sarnena Sredna Gora it is more common, compared to *Haemaphysalis sulcata*. The activity of *Haemaphysalis punctata* coincides with that of the *Haemaphysalis sulcata* (Mincheva *et al.* 1965).

New data: April 218, grasses and shrubs to alfalfa and fennel plantations north of Zmeevo Vill. (42°30.118' N, 25° 36. 015'E, 445 m altitude) – 1 male.

IXODIDAE



Fig. 6. *Haemaphysalis punctata* Canestrini et Fanzago 1878, male, grasses and shrubs to alfalfa and fennel plantations north of Zmeevo Vill. (42°30.118' N, 25° 36. 015'E).

Haemaphysalis intermis

Its prevalence is mainly focal - in broadleaf forests at altitudes of up to 500 m (Mincheva *et al.* 1965).

Genus *Dermacentor*

Only one species of this genus have been found in Bulgaria - ***Dermacentor marginatus*** (Sulzer 1776). It is found on the northern slopes in places with an altitude of over 500 m (Mincheva *et al.* 1965). Christov (1966) founded out three nymphs *Dermacentor marginatus* in 1961 in the area of Stara Zagora baths.

The tick has been active since the earliest spring (mainly in March, but also in February in mild winters). It is not detected during the hot months.

Genus *Boophilus*

Only one species of this genus have been found in Europe - ***Boophilus calcaratus*** (Lahille 1905). According to Mincheva *et al.* (1965) it is spread in the western part of Sarnena Sredna Gora and in the Chirpan hills. Its habitats are on slopes and hills with southern exposure, heavily crossed by ravines and streams with an altitude of about 750 m. Its larvae and nymphs are active all year round, and adult ticks are most active in March.

Conclusion

In Sarnena Sredna Gora are described 13 species of all six genera of Ixodid ticks inhabiting Bulgaria.

New data on the distribution of 6 species are presented (*Hyalomma marginatum*, *Rhipicephalus bursa*, *Rhipicephalus sanguineus*, *Rhipicephalus turanicum*, *Ixodes ricinus* and *Haemaphysalis punctata*). *Hyalomma marginatum* was found in most locations. One specimen of this species was even found at an altitude higher than that described in older literature (over 700 m – next to Morulei peak). This may be due to climate change in recent decades and the resulting change in tick habitats.

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IXODIDAE

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