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Species composition, distribution and seasonal dynamics of ixodid ticks (Ixodidae Koch, 1844) in the Karlovo area, Southern Bulgaria

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Abstract. In the Karlovo area (Southern Bulgaria) 6 species of ixodid ticks, belonging to 3 genera, including one subgenus, were identified - *Hyalomma marginatum* (Koch, 1844), *Hyalomma scupense* (Schulze, 1919), *Rhipicephalus bursa* (Canestrini & Fanzago, 1878), *Rhipicephalus sanguineus* (Latreille, 1806), *Ixodes ricinus* (Linnaeus, 1758) and *Rhipicephalus annulatus* (Say, 1821). Differences in their distribution and seasonal dynamics were found.

Key words: hard ticks, Bulgaria, Karlovo.

Introduction

Ixodid ticks (Ixodidae, Koch, 1844) are of important epidemiological and economic importance as they are vectors of the causative agents of a number of viral, rickettsial, bacterial, and protozoal diseases of humans and domestic animals (Fedonyuk et al., 2019). For this reason, periodic studies on their species composition and distribution in different regions of the world are required. In Bulgaria, they are relatively well studied (Kolarova et al, 2024). In recent years, the distribution, seasonal dynamics and invasion indices have been studied in some areas in Plovdiv region - the areas of Parvomay, Sadovo, Stamboliyski, Saedinenie, etc. (Arnaudov & Arnaudov, 2017). However, no such studies have been carried out in the northern part of the area. These facts directed us to conduct the present study. The aim was to determine the species composition, distribution and seasonal dynamics of ticks from the family Ixodidae parasitizing domestic animals in the Karlovo area.

Material and Methods

The study was conducted on the territory of the town of Karlovo and its surroundings – Sushitsa district and the localities of "Yumrukchal" and "Novi Lozya".

Karlovo (42° 37' 59.99" N, 24° 48' 0.00" E) is a town in Southern Bulgaria, located in the northern part of the Plovdiv region. Its altitude is between 392 and 612 m, with 450 m in the central part of the town. Sushitsa (42°37′58.8″ N, 24°49′58.8″ E) is a district of Karlovo, located northeast of the town center. Its altitude is about 600 m. The locality of "Yumrukchal" is situated immediately north of the town, at the foot of the Balkan Mountains. Its altitude is approximately 550 m. The locality of "Novi Lozya" is situated in the western part of the town, between the towns of Karlovo and Sopot (42°38'26 "N, 24°47'7 "E). The altitude is approximately 400 m.

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The study was conducted during the period April 2023-March 2024. Study materials were collected monthly throughout the period. The material obtained was preserved in 70% ethyl alcohol solution. Ticks were observed using a CARL ZEISS JENA binocular magnifier. Species identification was carried out by the second author based on the descriptions of Pomerancev (1950).

Results and Discussion

In the present study, 213 ixodid ticks were collected and identified. Their species composition includes 6 species belonging to 3 genera, including one subgenus - *Hyalomma marginatum* (Koch, 1844), *Hyalomma scupense* (Schulze, 1919), *Rhipicephalus bursa* (Canestrini & Fanzago, 1878), *Rhipicephalus sanguineus* (Latreille, 1806), *Ixodes ricinus* (Linnaeus, 1758) and *Rhipicephalus annulatus* (Say, 1821).

Hyalomma marginatum (synonym: *H. plumbeum* Panzer, 1796) was the most common ixodid tick in the study area (34.74% of all ticks collected). It was found to a greater extent among cattle as well as horses. It was found in all seasons and in all study biotopes. Similar high percentage of cattle infestation with this tick was found in other parts of the Plovdiv region (Arnaudov et Arnaudov, 2017). According to Georgieva (1991), *H. marginatum* is the dominant species in the Burgas region.

Rhipicephalus bursa (27.23% of all ticks collected) was also widespread in the area. It was observed throughout the study period, but most frequently during May-August with a maximum in June. This can be explained by the fact that the tick is a thermophilic species. Its main biotope is "Novi Lozya", but it was also found in "Yumrukchal" and “Sushitsa”. It prefers terrains up to 500 m a.s.l. - pastures with lush vegetation and low-stemmed forests, as well as natural meadows. In studies in other parts of the Plovdiv region, it was found to be the dominant species (Arnaudov et Arnaudov, 2017).

Rhipicephalus sanguineus (12.68% of collected ticks) parasitizes mainly dogs and cats. It is found in the urban environment of Karlovo evenly in all seasons. Single infestations of cattle with this tick were found in herds of cattle including dogs (in the "Novi Lozya" locality and Sushitsa district in June**).** In the study area, Arnaudov et al. (2022) found infestations with this species in road-killed Eastern European hedgehogs (*Erinaceus roumanicus* Barrett-Hamilton, 1900).

Ixodes ricinus infestation (14.55% of all ticks collected) was found in cattle and horses. There were two waves of infestation (spring and autumn) during the wet months (February-April and September) and its absence during the dry months. It is noteworthy that adult forms were found as early as February (and not since March, as reported in other similar studies), and pairs of ticks were observed in copulation during this month (Fig. 1). This may be explained by the warmer temperatures during the month compared to past years. Its habitats are grasslands among broad-leaved forests as well as bare ground overgrown with shrubs - above the Sushitsa district, "Novi Lozya" and "Yumrukchal" localities.

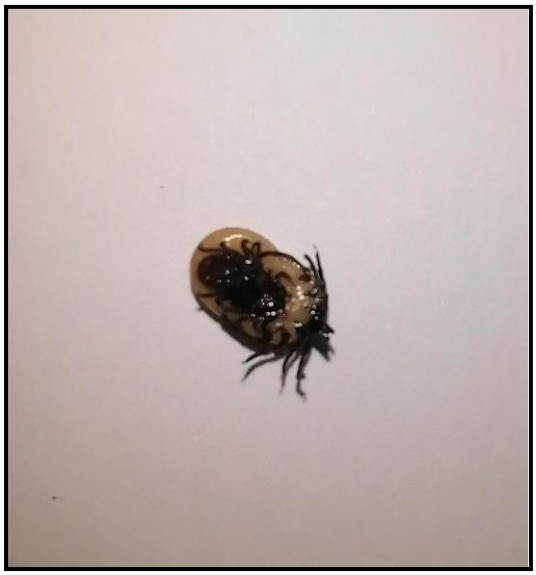

Fig. 1. Male and female specimens *I. ricinus* in copulation, catched on 03.02.2024 in Sushitsa district. Host - cattle.

Infestation with ***Rhipicephalus annulatus*** (old name *Boophilus calcaratus* (Lahille, 1905)) was found only on cattle during the spring months of April and May (8.92% of all ticks collected). The infestation of animals was associated with the growth of pasture vegetation. Its biotopes are hilly areas with southern exposure, on which lush spring vegetation develops. It is a very active spring vegetation, with a high spring flowering area, particularly in Sushitsa district and "Yumrukchal" locality. In the other study areas of Plovdiv region, it was also found in spring (Arnaudov et Arnaudov, 2017). According to Mincheva et al. (1965), *Rh. annulatus* is widespread in Bulgaria.

Hyalomma scupense (synonym *H. detritum* (Schulze, 1919)) was found as a single infestation on cattle and horses (total number-4) in the "Novi Lozya" locality. According to older data (Mincheva et al., 1965), in the Karlovo area the tick was found in hilly pastures and short-stemmed forests in the gorge of the Stryama River between the Sashtinska Sredna Gora and Sarnena Sredna Gora Forests.

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