



A contribution to the tick (Acari: Ixodidae) fauna of Turkey: The first record of *Ixodes inopinatus* Estrada-Peña, Nava & Petney

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ABSTRACT: Ticks are blood-sucking ectoparasites of terrestrial vertebrates. The genus *Ixodes* Latreille is the largest among hard ticks, and the members of the genus are spread around the world. In the present study, we reported presence of *Ixodes inopinatus* Estrada-Peña, Nava & Petney, 2014 in Turkey for the first time. The specimens of *I. inopinatus* (1 male, 6 females) were collected from cattle in Ordu province, Turkey.

Keywords: Hard ticks, host associations, vectors, Turkey.

Zoobank: <http://zoobank.org/4C24E3D1-8E34-4B24-B331-D9CEAF27D089>

Ticks are important ectoparasites, causing a variety of serious infectious diseases in humans and domestic animals. Turkey is a Eurasian country occupying 783,562 square kilometers including Anatolian peninsula and Thrace. The territory of Turkey lies between latitudes 35° - 43° North and longitudes 25° - 45° East and is divided into seven geographic regions. Each region has specific climate, vegetation and wild life allowing a suitable habitat for various tick species.

Turkish tick fauna is currently composed of 51 species; 43 species from family Ixodidae and 8 species from family Argasidae (Bursali et al., 2012; Kar et al., 2017; Keskin et al., 2014; Orkun and Karaer, 2018; Keskin and Erciyas-Yavuz, 2019). The genus *Ixodes* Latreille is the largest among ixodid ticks; and the members of the genus is spread around the world. To date, approximately 261 species of the genus *Ixodes* are known worldwide (Guglielmone et al., 2014, 2020; Onofrio et al., 2020), but this number are increasing with the new studies. In Turkey, to date, a total of 13 species of the genus *Ixodes* are identified: *Ixodes acuminatus* Neumann, *Ixodes arboricola* Schulze & Schlottke, *Ixodes crenulatus* Koch, *Ixodes eldaricus* Djaparidze, *Ixodes festai* Tonelli-Rondelli, *Ixodes frontalis* (Panzer), *Ixodes gibbosus* Nuttall, *Ixodes hexagonus* Leach, *Ixodes laguri* Olenev, *Ixodes redikorzevi* Olenev, *Ixodes ricinus* (L.), *Ixodes simplex* Neumann, and *Ixodes vespertilionis* Koch (Bursali et al., 2012; Keskin et al., 2014; Kar et al., 2017; Orkun and Karaer, 2018; Keskin and Erciyas-Yavuz, 2019).

During our parasitological survey on ticks in the Black Sea Region of Turkey, we collected a number of *Ixodes* ticks (12 males, 49 females, 5 nymphs) on domestic cattle in 2006 from Ordu Province. This province is located the coastal strip of the Black Sea Region of Turkey. It has a temperate and humid climate. The mean annual precipitation is 1152 mm, and the precipitation regime is the Black

Sea Rainfall Type. The mean annual temperature is 13.8 °C. On average, 143 days of the year are rainy. The average relative humidity is 74.7% (Karaman et al., 2012). All of them were placed into labeled small plastic tubes containing 70% ethanol and sent to Acarology Laboratory, Department of Biology, Tokat Gaziosmanpaşa University, Tokat, Turkey. Using of descriptions and identification keys given by Filippova (1977) and Estrada-Peña et al. (2017), ticks were identified as *I. ricinus* (11 males, 43 females, 5 nymphs), and *Ixodes inopinatus* Estrada-Peña, Nava, and Petney (1 male and 6 females). This is the first report of *I. inopinatus* in Turkey.

Ixodes inopinatus has been described among the specimens of *I. ricinus* specimens (Estrada-Peña et al., 2014). It is share some morphological features with other Palearctic *Ixodes* species; therefore *I. inopinatus* might have been historically confused with and erroneously reported as Palearctic *Ixodes* species, especially *I. ricinus* (Estrada-Peña et al., 2014; Chitimia-Dobler et al., 2018). Presence of *I. inopinatus* has been documented from Austria, Portugal, Romania, Spain, and Tunisia.

Adults of *I. inopinatus* can be separated from the most related species, *I. ricinus*, by the combination of following characters. Punctations on the dorsal scutum are larger and conscutal setae are longer in the male of *I. inopinatus* than in *I. ricinus*. In addition, the pre-genital and median plates in *I. inopinatus* are with larger and deeper punctation than in *I. ricinus*. Male of *I. inopinatus* has only one row of lateral conscutal setae (the second row can be observed only in the central part of idiosoma) between the lateral margin of the idiosoma and the marginal groove (Figs 1A, B), whereas there are several rows of lateral conscutal setae in *I. ricinus* (Figs 2A, B). The females of *I. inopinatus* have deep and large punctations in the central field of the scutum, which

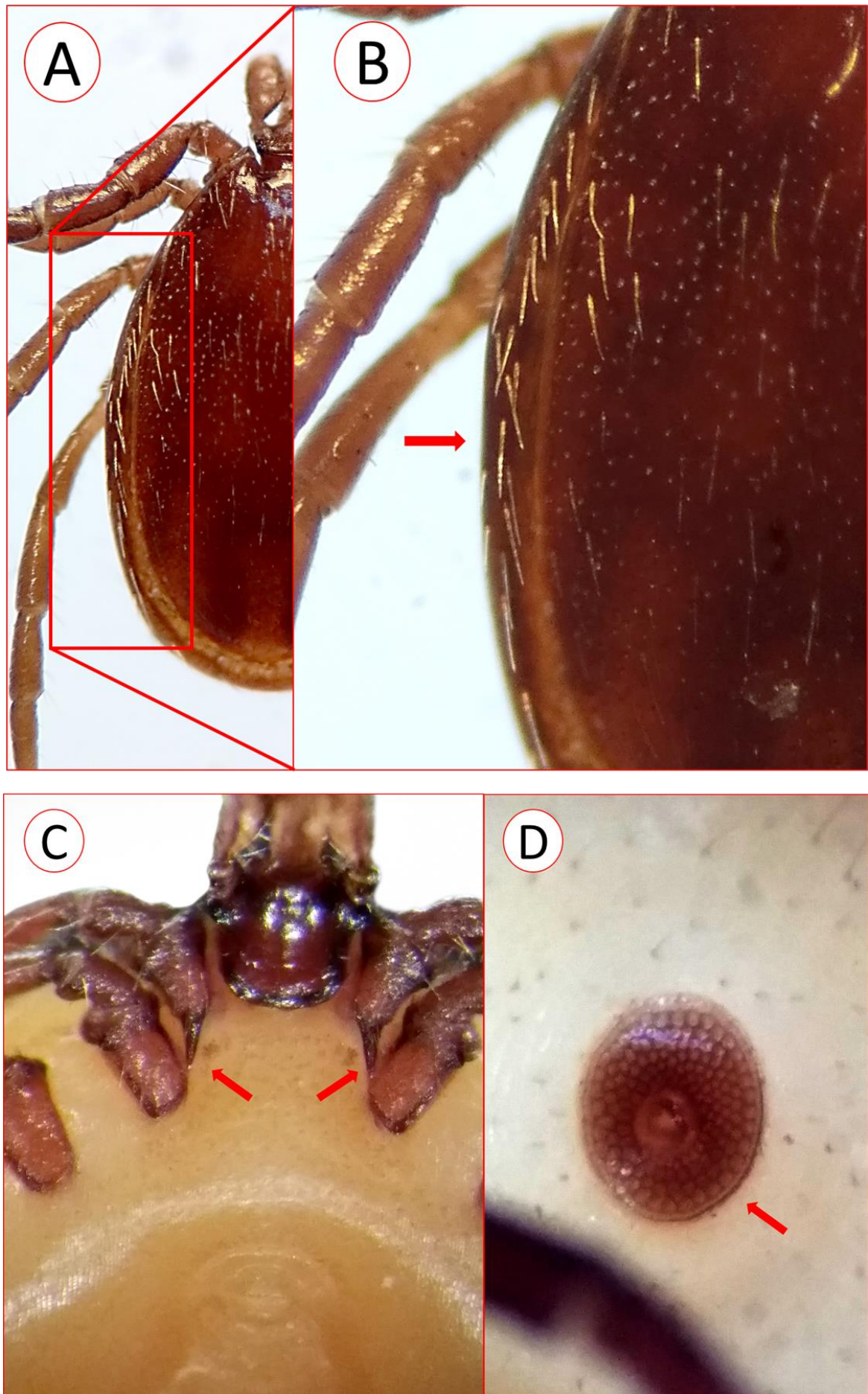


Figure 1. *Ixodes inopinatus* **A.** Dorsal view of male, **B.** One row of seta in the lateral margin of the conscutum of male, **C.** Internal spurs of coxa I of female, **D.** Spiracular plate with four concentric rows goblets of female.

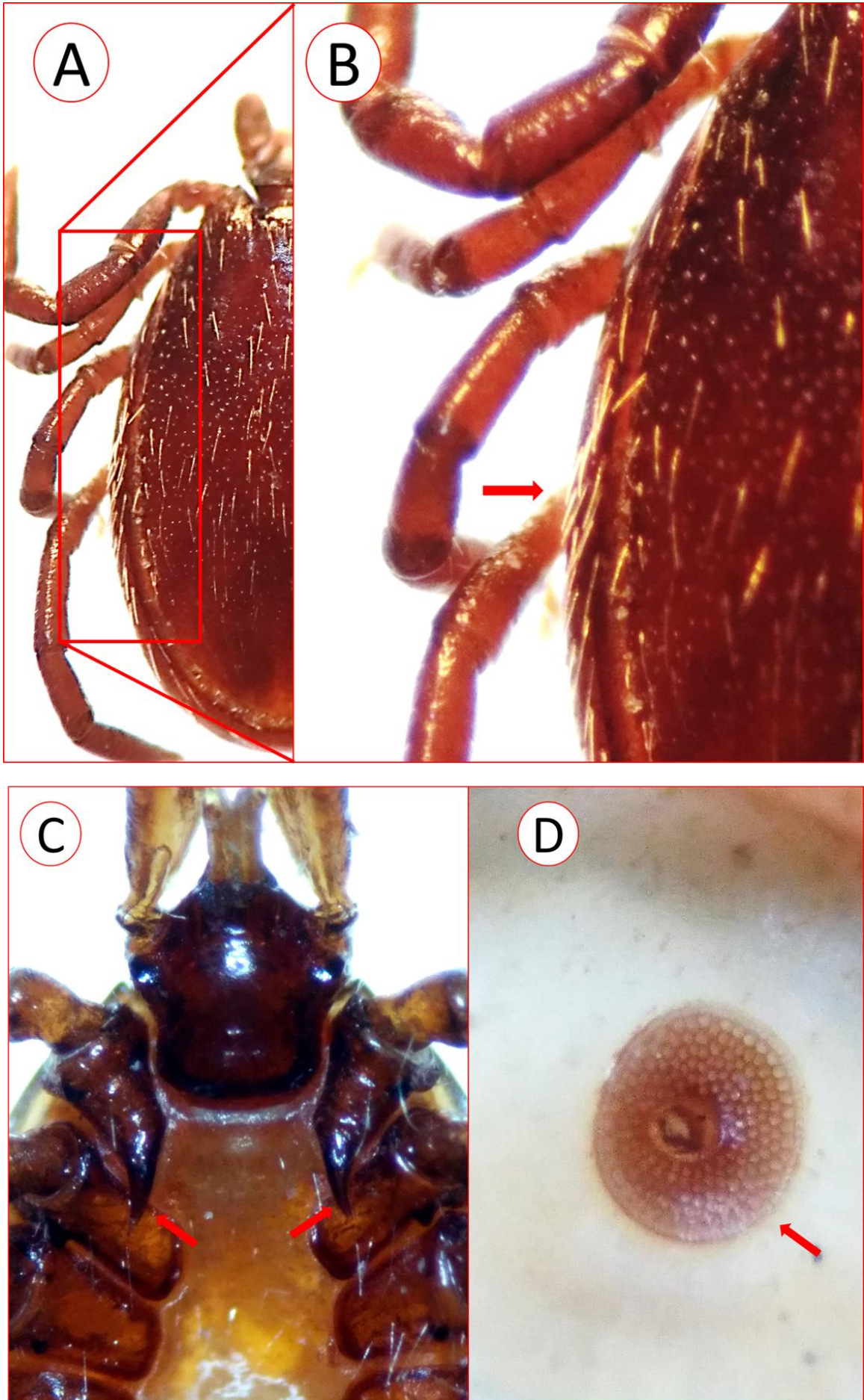


Figure 2. *Ixodes ricinus* A. Dorsal view of male, B. Several rows of setae in the lateral margin of the conscutum of male, C. Internal spurs of coxa I of female, D. Spiracular plate with concentric five rows goblets of female.

are less numerous and almost inconspicuous in *I. ricinus*. The internal spur on coxa I has a long tapering pointed internal spur reaching coxa II in *I. inopinatus* (Fig. 1C), but is longer, curved and touching coxa II in *I. ricinus* (Fig. 2C) (the internal spur of coxa I only in females is a feature of diagnostic importance). In the female of *I. inopinatus*, there are four concentric rows of goblets in the spiracular plate (Fig. 1D), while there are (5 or 6 rows) in the female of *I. ricinus* (Fig. 2D). The more detailed morphological comparison of *I. ricinus* and *I. inopinatus* has been given by Estrada-Peña et al. (2014) and Chitimia-Dobler et al. (2018).

As previously reported, *I. inopinatus* is a species that replaces *I. ricinus* in drier areas, but a recent study shown that both species can be found sympatric in the humid areas (Younsi et al., 2020). In the present study, *I. inopinatus* and *I. ricinus* were collected from Ordu province. This province has a humid climate in nearly whole year. Therefore, this study supports the hypotheses of Younsi et al. (2020) about the sympatric distribution of *I. inopinatus* and *I. ricinus* ticks in the humid areas. In previous reports, specimens of *I. inopinatus* have been mainly collected by flagging from the vegetation and from some host animals, such as lizards, foxes and sheep (Estrada-Peña et al., 2014; Chitimia-Dobler et al., 2018; Hauck et al., 2019). To the best of our knowledge, *I. inopinatus* was collected from cattle, for the first time, from Turkey.

We strongly suggest that tick specimens identified as *I. ricinus* in tick collections should be re-examined based on the current taxonomic concepts. The medical importance of *I. inopinatus* is also currently unknown; therefore, new studies should be aimed at the presence and prevalence of tick-borne pathogens in *I. inopinatus*.

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Conflict of interest

No potential conflict of interest was reported by the authors.

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