

New Teratological Tick Specimens (Acari: Ixodidae) From Turkey

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ABSTRACT

During our survey on ticks parasitizing animals, two teratological tick specimens belonging to *Ixodes frontalis* (Panzer) and *Rhipicephalus annulatus* (Say) were collected from a bird and cattle, respectively. These samples exhibited unique morphological anomalies, including partial twinning of the posterior region of the idiosoma with two anal openings. To our knowledge, such teratological changes in *I. frontalis* and *R. annulatus* ticks have been reported for the first time.

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Türkiye'den Yeni Teratolojik Kene (Acari: Ixodidae) Örnekleri

ÖZET

Hayvanlar üzerinde parazit yaşam süren kene türleri hakkındaki araştırmalarımız sırasında, kuş ve sığır üzerinden *Ixodes frontalis* (Panzer) ve *Rhipicephalus annulatus* (Say) türlerine ait iki teratolojik örnek toplanmıştır. Bu örneklerin idiozomalarının arka kısmında kısmen ikiye ayrılmış olduğu ve her iki örneğinde iki anal açılığı sahip olduğu belirlenmiştir. Böyle bir teratolojik bozukluk *I. frontalis* ve *R. annulatus* türü kenelerde ilk defa belirlenmiştir.

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INTRODUCTION

The teratological specimen is described as “an abnormal specimen or a monstrosity” in the glossary of the International Commission on Zoological Nomenclature (1999). This remarkable phenomenon occurs at relatively low frequencies in nature (Balazuc 1948; Campana-Rouget 1959a,b). Many authors have documented teratological specimens of various arthropods including insects, ticks and other arthropods (Balazuc, 1948; Keskin et al., 2016; Popovici et al., 2014). However, there is still a gap in the literature concerning teratological changes in ticks specifically in Turkey.

Teratological changes in ticks were divided into two major groups which are general anomalies and local anomalies. General anomalies in ticks were categorised into asymmetry, nanism, gigantism, gynandromorphism and double monsters (as monstruosités doubles) by Campana-Rouget (1959a,b). Double monsters term was used for the bifurcation of the idiosoma or twining specimens. Campana-Rouget

(1959a) classified these monstrosities into 6 types based on degree of duplications: (Type I) single anus (median or not), posterior part of the enlarged or cordiform body; (Type II) two anuses; (Type III) two anuses, three stigmata; (Type IV) two anuses, four stigmata; (Type V) two anuses, four stigmata, two genital openings; (Type VI) two anuses, four stigmata, two genital openings, two extra legs.

In the present study, we reported two new teratological tick specimens with the partial twinning of the posterior region of the idiosoma and two anal openings. Although several authors documented double monsters in some tick species, such teratological changes in *Ixodes frontalis* (Panzer) and *Rhipicephalus annulatus* (Say) ticks have been reported in the present study for the first time.

MATERIAL and METHODS

During our survey on tick infesting animals in 2016, two teratological tick specimens belonging to *I. frontalis* and *R. annulatus* were collected from an ex.

Turdus merula L. bird and a *Bos taurus* L. (domestic cattle) hosts in Samsun and Hatay province, respectively, in Turkey. Ticks were stored in 70 % ethanol and shipped to Department of Biology, Gaziosmanpaşa University (Tokat, Turkey), for morphological identification. The external structure of abnormal ticks was examined under the stereomicroscope (MZ16, Leica, Wetzlar, Germany) and photographed with a digital camera (EOS 550D, Canon, Japan). Based on their morphological characters, ticks were identified by using identification keys of Filippova (1977, 1997). These abnormal tick samples were deposited to our tick collection at Department of Biology, Gaziosmanpaşa University, for further studies.

RESULTS and DISCUSSION

In the present study, teratological changes were observed in two tick species. The first teratologic tick species, *I. frontalis*, was collected from a *T. merula* bird in Samsun province of Turkey. According to the classification of Campana-Rouget (1959a), this sample was typically exhibiting characters of Type II double monsters (Fig. 1A). The second teratologic tick species, *R. annulatus*, was collected from a *B. taurus* cattle in Hatay province of Turkey. According to the classification of Campana-Rouget (1959a), this adult female was exhibited characters of Type II double monsters; however, the posterior region of the idiosoma of the tick has a cordiform shape (Fig. 1B).

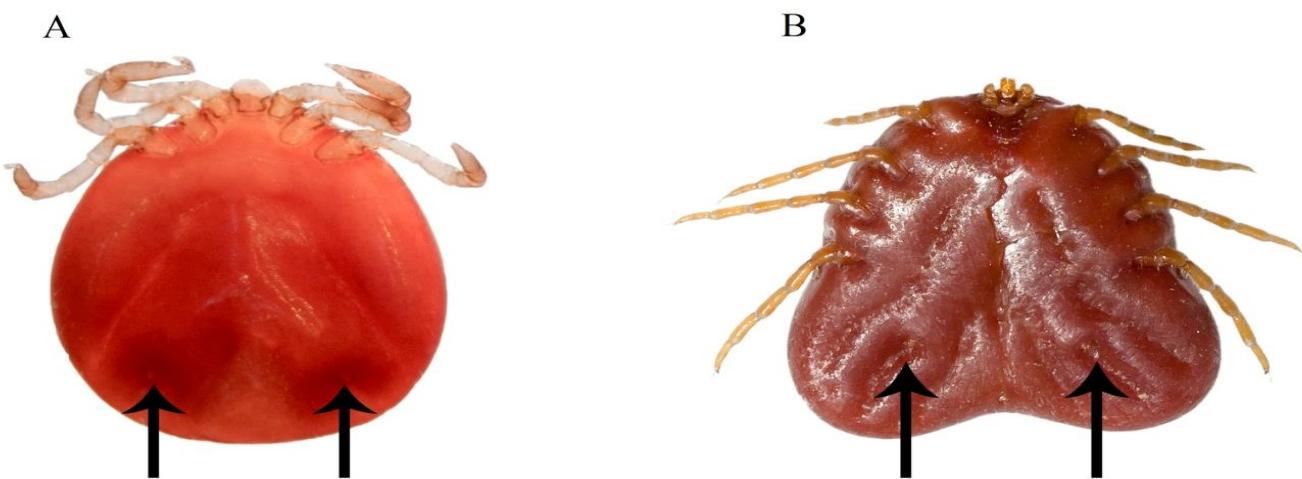


Figure 1. Teratological ticks specimens with two anuses A) *Ixodes frontalis*, B) *Rhipicephalus annulatus*

Teratological changes are rare phenomena in ticks and several biological or non-biological factors (such as mutations, chemical agents, environmental stress and host resistance) are accepted as possible causes of teratological changes in ticks (Dergousoff and Chilton 2007; Keskin et al. 2012). When compared to other anomalies, the double monsters are known as rarely observed anomalies in ticks. To date, only 81 double monster specimens belonging to 20 species, 8 genera, and 2 families have been reported (Campana-Rouget 1959a; Latif et al. 1988; Estrada-Peña 2001; Serra-Freire and Borsoi 2009; Slovák and Vidlička 2013; Ren et al. 2016).

The first case of double monsters in ticks (*Rhipicephalus sanguineus* (Latreille)) were documented by Warburton and Nuttall (1909). Twenty-six samples of *Haemaphysalis punctata* Canestrini & Fanzago ticks with double monsters were

obtained experimentally by Aboim-Inglez (1942). All of the double monsters cases until 1959 have been summarized and classified in details by Campana-Rouget (1959a). No report regarding the double monsters cases in ticks was observed between 1959 and 1988. Latif et al. (1988) detected 16 *Amblyomma variegatum* (Fabricius) larvae with double monsters. Afterward, all of these teratologic larval samples were fed on rabbits and successfully obtained Type II, Type III and Type VI adult double monsters. Estrada-Peña (2001) obtained 3 teratological *R. sanguineus* specimens in a tick laboratory colony. Their specimens (2 females and 1 nymph) had different degrees of Type II double monsters. Type II and Type IV double monsters in several tick species were reported by Slovák and Vidlička (2013). Out of these studies, there are several documentations about double monsters in ticks and all known double monster cases in ticks were listed in Table 1.

Table 1. Ticks species with two anuses reported in previous studies.

Ticks/Type	Type I	Type II	Type III	Type IV	Type V	Type VI	Total
<i>Amblyomma dissimile</i>		1N					1
<i>Amblyomma rotundatum</i>	1F						1
<i>Amblyomma variegatum</i>	16L	1N, 1F		1M			19
<i>Argas percicus</i>	1F						1
<i>Dermacentor reticulatus</i>		2F					2
<i>Haemaphysalis qinghaiensis</i>		1N					1
<i>Haemaphysalis punctata</i>	3L, 1N, 2F	6L, 3N, 2F, 1M	1F, 1M	1N, 1F	2M, 1F	2M, 1F	28
<i>Hyalomma aegyptium</i>		1F					1
<i>Hyalomma anatolicum</i>		2M					2
<i>Hyalomma anatolicum</i> x <i>Hyalomma marginatum</i>			1M				1
<i>Hyalomma dromedarii</i>		1M	1F				2
<i>Hyalomma scupense</i> (as <i>H. mauritanicum</i>)		1N	1L				2
<i>Ixodes hexagonus</i>			1L	1N			2
<i>Ixodes ricinus</i>	1L				1L, 1N		3
<i>Ornithodoros maubata</i>		1N			1N		2
<i>Rhipicephalus annulatus</i> (as <i>R. calcaratus</i>)		1F					1
<i>Rhipicephalus appendiculatus</i>		1M					1
<i>Rhipicephalus decoloratus</i>	1M	1M					2
<i>Rhipicephalus pulchellus</i>		1M					1
<i>Rhipicephalus sanguineus</i>	1L, 1N, 2F		1F, 1M	1L, 1N			8
							81

L: larva, N: nymph, F: female, M: male

Although several types of teratology in ticks was reported in Turkey (Yalvac and Ozkan, 1980; Kar et al., 2015; Keskin et al., 2016), to date, there is no report to ticks with double monsters. To our knowledge, such teratological changes in the Turkish ticks have been reported for the first time with the present study.

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