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Research Article

First Description of Larva of *Trombidium rimosum* C. L. Koch, 1837 (Acari: Trombidiidae) From Turkey

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Abstract

Trombidium rimosum Koch, 1837 which shows distribution in Europe, has been known only to postlarval forms to date. In this study, for the first time, larvae of *T. rimosum* are described and illustrated from Turkey. All larvae were obtained by experimental rearing from field-collected females. Also, an abnormality was noted for the larvae of this species.

Keywords: *Trombidium*, larva, first description, abnormality

Trombidium rimosum C. L. Koch, 1837 (Acari: Trombidiidae) larvalarının ilk kez Türkiye'den tanımlanması

Öz

Avrupa'da yayılım gösteren, *Trombidium rimosum* Koch, 1837 türü şimdiye kadar sadece ergin formlarından bilinmektedir. Bu çalışmada, ilk kez, *T. rimosum* larvaları Türkiye'den tanımlanmış ve çizimleri verilmiştir. Tüm larvalar, araziden toplanan dişi bireylerden, elde edilmiştir. Ayrıca bu türün larvalarına ait bir morfolojik farklılık belirlenmiştir.

Anahtar Kelimeler: *Trombidium*, larva, ilk tanımlama, anormallik

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1. Introduction

Trombidium Fabricius, 1775 is represented by 36 species (Sevsay et al., 2020). Twelve of them are known from both postlarval and larval stage, of which 12 larvae and 12 from active postlarval forms (Mąkol and Wohltmann, 2012; Mąkol and Wohltmann, 2013; Saboori et al., 2017; Sevsay et al., 2020). However, only seven species of *Trombidium* were reported by Sevsay et al. (2016), Sevsay (2017) and Sevsay et al. (2020) from Turkey. Among them, three species (*Trombidium brevimanum* (Berlese, 1910), *Trombidium mediterraneum* (Berlese, 1910) and *Trombidium rimosum* Koch, 1837) are known based on their postlarval forms. In contrast, *Trombidium demirsoyi* Sevsay and Buğa, 2020 only known as larvae, three species (*Trombidium geniculatum* (Feider, 1955), *Trombidium holosericeum* (Linnaeus, 1758) and *Trombidium latum* Koch, 1837) known as both postlarval and larvae. The neotype designation of *T. rimosum* was provided based on adult form by Mąkol (2005), and this species known only based on adults, so far. This study contains first detailed descriptions of the larvae of *T. rimosum* based on individuals obtained from field-collected females in laboratory conditions.

2. Material and methods

Active postlarval forms were collected directly from Bayburt province (40º26′N 40º07′E 2220 m a.s.l., the soil surface, on a humid litter, 01.05.2013), Turkey. Ovigerous females collected in the field were placed in glass vials (25 × 35 mm) that contained a mixture of charcoal and plaster (9:1). The females were transferred to 70 % ethyl alcohol after oviposition. Larvae were obtained from the eggs laid by the females. The eggs were provided 2 – 3 ml of distilled water once every three days, added to the substratum to maintain humidity. The glass vials were kept at room temperature (22 – 25 °C). Specimens (1 ♀, 15 larvae) were mounted on slides using Hoyer's medium as suggested by Walter and Krantz (2009). Examined materials were preserved in 70 % ethyl alcohol. The morphological terminology and abbreviations follow Mąkol (2005). For measurements, photographs and drawings an Olympus BX63 microscope was used. All measurements are given in micrometers (μm).

Results

Family: Trombidiidae Leach, 1815

Genus: *Trombidium* Fabricus, 1775

***Trombidium rimosum* Koch, 1837**

Diagnosis: Adults (Figures 1 A – D) (For more information see Mąkol, 2005). Crista metopica with rounded sensillary area and relatively wide posterior process. Dorsal setae distinctly widened in the distal part, setal stems almost parallelsided, densely covered with setules. *pDS* I with asymmetrical (hammer-like) termination accommodating a big air chamber. *pDS* II slightly asymmetrical with termination producing several tubercles (Mąkol, 2005). Genital opening with three pairs of genital acetabula. Tarsus I elongate, tibia I shorter than tarsus I.

Description: Adults (see Mąkol, 2005).

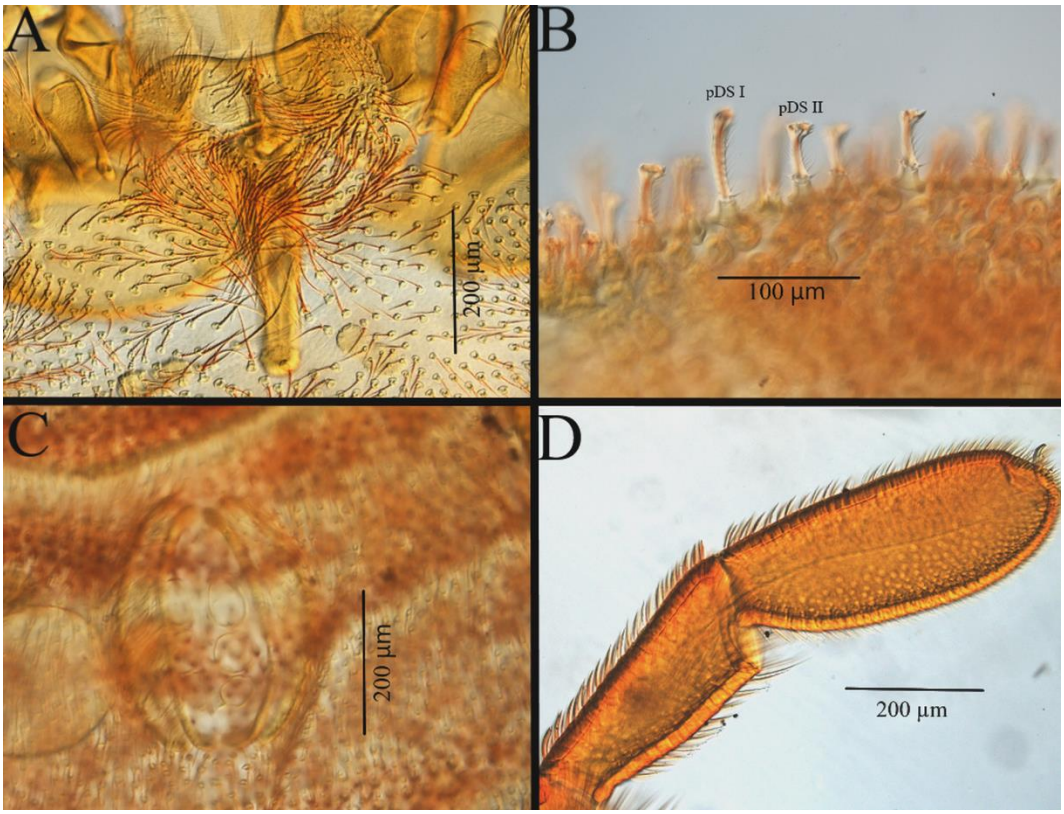

Figure 1. *Trombidium rimosum* Koch, (female), A. Crista metopica region B. *pDS* I and *pDS* II C. Genital opening D. Tibia and tarsus I.

Diagnosis: Larvae. Setae *bs* (hypostomalae) relatively long (20 – 30) in the shape of simple, narrowing apically with distinct setules. Scutum longitudinally striate up to in ca. 1/5 length, anteriorly and whole remaining part punctuate. *SL* setae placed on ca. 1/3 – 1/4 length of scutellum, anteriorly. *f*D formula: (2)4-6-4-4-2. All tarsi terminated two claws and a slender claw-like empodium. Anterior claw of tarsus III reduced.

Description: Larvae. Standard measurements in Table 1. All larvae reared from eggs laid by the females under laboratory conditions. Colours of living forms are red.

Idiosoma. Scutum longitudinally striate up to in ca. 1/5 length, anteriorly and whole remaining part punctate. *AM* setae with a few barbs, *AL* and *PL* setae barbed. *PL* longer than *AL*. Sensillae (*S*) with a few minute barbs. Two pairs of eyes that include double lens, situated at level between scutum and scutellum. Anterior lens larger than posterior one. Scutellum bears one pair of barbed setae c_1 that they placed on ca. 1/3 – 1/4 length of scutellum, anteriorly. All dorsal setae situated on small plates, barbed and arranged in five rows. *f*D formula: (2)4-6-4-4-2 (c_1-c_3, d_1-$_3$, e_1-$_2$, f_1-$_2$, h_1) (h_1 setae longer than others) (Figure 2). Claparéde's organs situated between coxae I and coxae II. *f*Cx formula: BB-BB-B. *1a* setae with a few minute barbs and other coxal setae clearly setules. One pair of barbed intercoxal setae *3a* placed between coxal plates III. Posteriorly following four barbed setae situated on plates anterior and lateral to anal opening. Ventral setae barbed and arranged in three rows. *f*V formula: 4u-2-2

Table 1. Comparison of morphometric data of larvae of *Trombidium rimosum* Koch, 1837 and *Trombidium brevimanum* (Berlese, 1910) (n= 15).

Character	***T. rimosum* (Min- Max)**	***T. brevimanum* (Min- Max) (Mąkol, 2005)**
L	260-340	264.6-347.6
W	165-205	154.0-185.6
L/W	1.38-1.78	1.7-2.0
AA	57-63	51.5-59.4
AW	91-101	99.0-104.9
PW	89-105	97.0-106.9
SB	70-75	65.3-83.2
ASB	80-82	77.2-87.1
PSB	35-41	35.6-43.6
SD	117-120	114.8-124.7
AP	17-23	27.7-33.7
AM	41-49	39.6-47.5
AL	33-44	43.6-53.5
PL	58-65	61.4-75.2
S	78-89	71.3-87.1
MA	48-52	43.6-53.5
HS	55-60	45.0-56.0
LSS	132-145	116.0-130.0
SL	62-70	50.0-60.0
DS_MIN	26-32	28.0-42.0
DS_MAX	48-60	50.0-63.0
Cx_I	50-65	49.0-58.0
Tr_I	30-35	33.0-40.0
Fe_I	38-42	38.0-47.0
Ge_I	23-25	22.0-29.0

Ti_I	30-35	33.0-40.0
Ta_I	56-59	56.0-70.0
LEG I	239-254	248.0-272.0
Cx_II	52-60	44.0-60.0
Tr_II	35-40	32.0-40.0
Fe_II	35-40	35.0-44.0
Ge_II	20-23	18.0-26.0
Ti_II	30-35	32.0-37.0
Ta_II	50-53	54.0-65.0
LEG II	218-237	234.0-255.0
Cx_III	50-57	44.0-53.0
Tr_III	35-40	36.0-41.0
Fe_III	40-41	37.0-46.0
Ge_III	20-21	18.0-25.0
Ti_III	30-35	35.0-44.0
Ta_III	45-48	48.0-59.0
LEG III	205-228	232.0-255.0
IP	682-746	726.0-778.0

(last pair setae=h_2 longer than others). Ventral setae slightly thinner than dorsal setae. Anal opening without sclerite (Figure 3).

Gnathosoma. Setae *bs* in the shape of relatively long and simple, narrowing apically with setules (Figure 4). Cheliceral blades with a small tooth. Adoral setae (*or*) short and smooth. Palpal femur with one small spine-like seta. Palpal tibia with three setae: one long with minute barbs, one nude, one short and nude. Palpal tibial claw bifid. Palpal tarsus with one solenidion, two eupathidia, four setae with barbed (Figure 5). *f*Pp formula:0-N-0-BNN-4Bζζω.

Legs. (Figures 6 A – F) Legs setal formula: [I] Tr (1B) – Fe (5B, 1N) – Ge (4B, 2σ, 1κ) – Ti (5B, 2φ, 1κ) – Ta (16-17B, 2ζ, 1ω, 1ε); [II] Tr (1B) – Fe (4B) – Ge (3B, 1σ) –

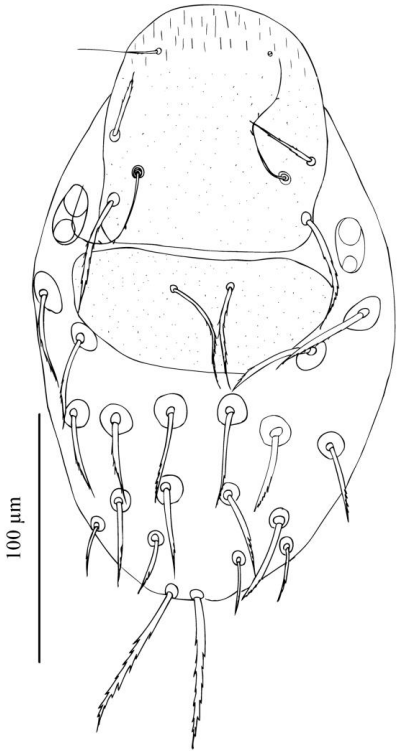

Figure 2. *Trombidium rimosum* Koch, (larvae), I Idiosoma, dorsal view

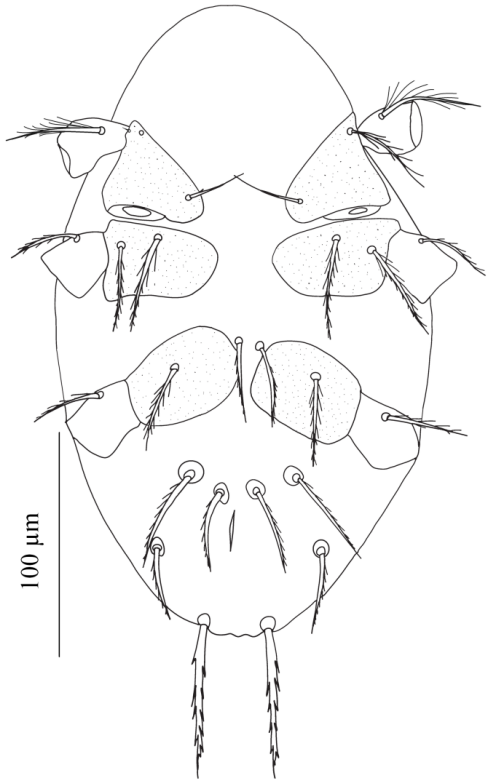

Figure 3. *Trombidium rimosum* Koch (larvae), Idiosoma, ventral view

Ti (5B, 2φ) –Ta (13 B, 1ω, 1ε); [III] Tr (1B) – Fe (3B, 1N) – Ge (2B, 1σ) – Ti (5B) – Ta (13B).

All tarsus terminated two claws and a slender claw-like empodium. Anterior claw of tarsus III reduced. Two accessory setae (one long and the other short) on Ta III terminated.

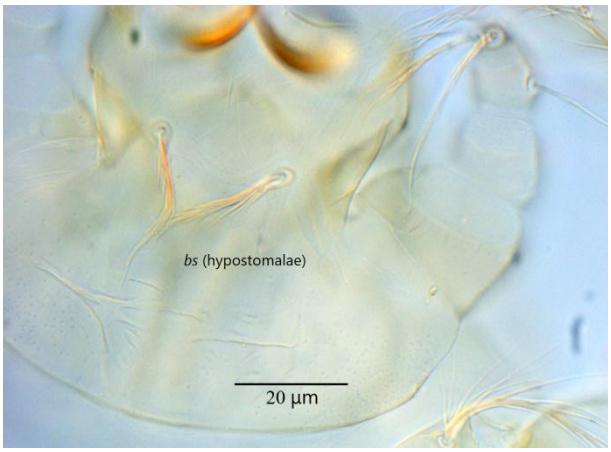

Figure 4. *Trombidium rimosum* Koch, (larvae), *bs* setae.

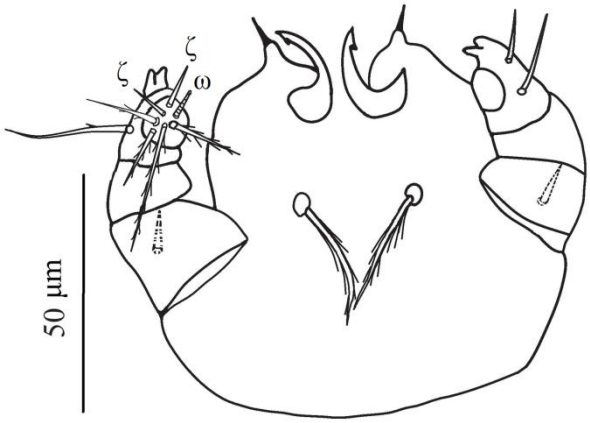

Figure 5. *Trombidium rimosum* Koch, (larvae), Gnathosoma

Distribution: Austria, Bosnia and Herzegovina, Czech Republic, France, Germany, Hungary, Italy, Poland (Mąkol and Wohltmann, 2012).

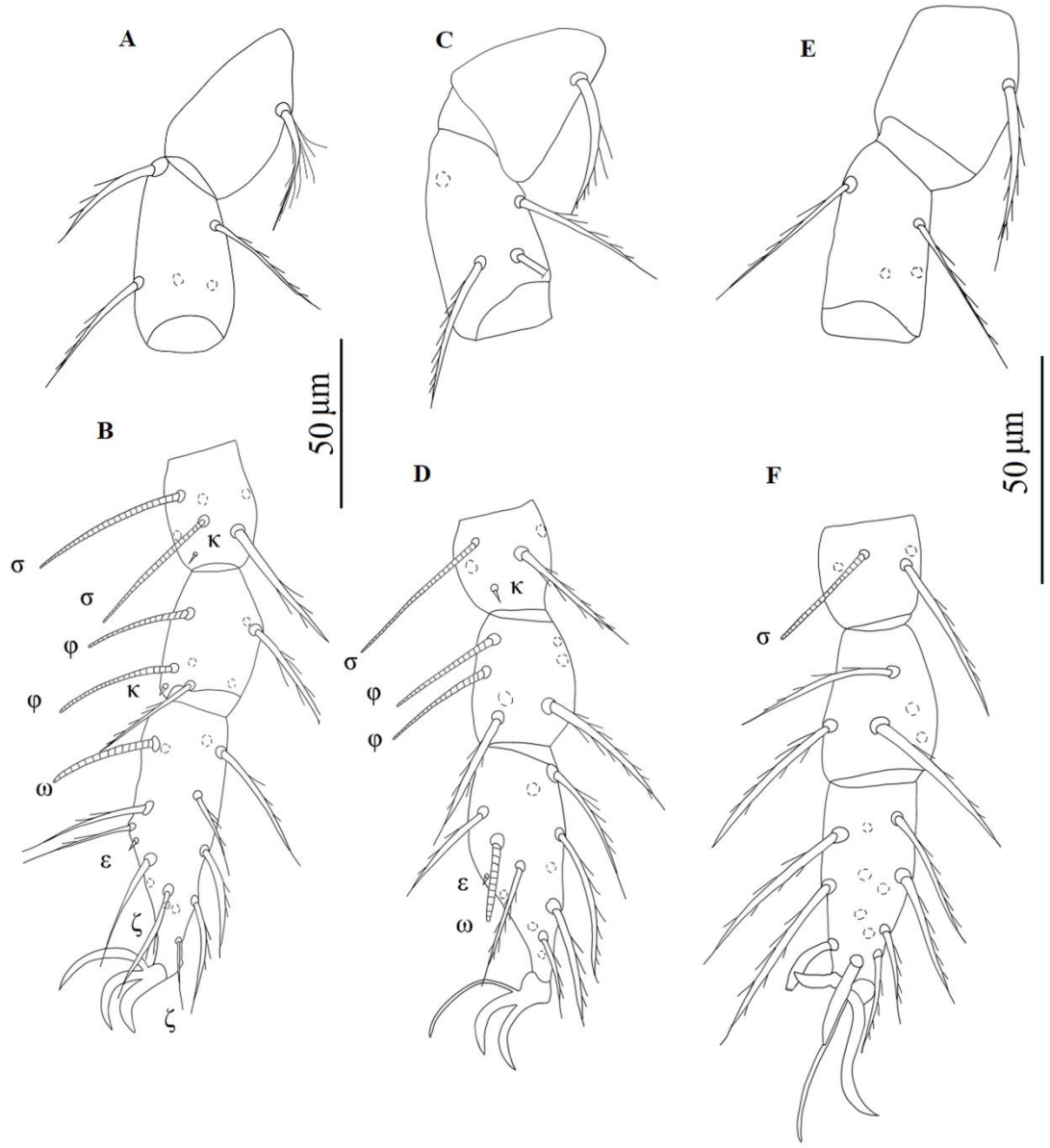

Figure 6. *Trombidium rimosum* Koch, (larvae), A. Leg I (trochanter – femur) B. Leg I (genu – tarsus) C. Leg II (trochanter – femur) D. Leg II (genu – tarsus) E. Leg III (trochanter – femur) F. Leg III (genu – tarsus).

Discussion:

Among both larvae and adults of the species belonging to the genus of *Trombidium*; *T. rimosum* closely similar to *Trombidium brevimanum* (Berlese, 1910). End of *pDS* I more asymmetrical (hammer-like) in shape in adults *T. rimosum* while they slightly asymmetrical in *T. brevimanum*. Whole stem of *pDS* I of adults of *T. rimosum* almost parallelsided but they gradually widening towards the top in *T. brevimanum* (Mąkol, 2005). Idiosoma densely covered with purple setae in adults of *T. brevimanum* (Mąkol, 2005) but in *T. rimosum* purple setae absent on idisoma.

The shape of the *bs* setae are important in determining larval species of *Trombidium*.

The larvae of *T. rimosum* differ from other larvae of *Trombidium* by the shape of the *bs* setae. The *bs* setae long (20 – 30) and with distinct 8 – 10 setules. With respect to larvae of *T. rimosum* closely similar larvae of *T. brevimanum*. However, *bs* setae of *T. rimosum* longer than of *T. brevimanum*. The length of *bs* setae of *T. brevimanum* not stated but according to Figure 11 in Mąkol (2005) ca. 10 (op. cit., p. 56). Also, *bs* setae of *T. rimosum* with 8 – 10 setules but in *T. brevimanum bs* setae with 3 – 4 setules (Mąkol, 2005). Moreover, h_1 setae placed on separate sclerite each one in *T. rimosum* but they placed on common sclerite in *T. brevimanum* (Mąkol, 2005). In terms of shape of the *bs* setae, larvae of *Trombidium rimosum* also similar to *Trombidium botovicum* Haitlinger, 2004, *Trombidium breei* Southcoot 1986, *Trombidium carpaticum* (Feider , 1950), *Trombidium hungaricum* Kobulej 1957 and *Trombidium teres* (André, 1928). Setae c_1 placed on ca. 1/3 – 1/4 length of scutellum, anteriorly in *T. rimosum*. But they situated at the anterior 1/2 of scutellum in *T. breei*, *T. hungaricum* and *T. teres* (André, 1928; Southcott, 1986; Saboori et al., 2017). Number of ventral setae (excluding h_2 setae) 6 in *T. rimosum* while 4 setae in *T. botovicum* and 2 setae in *T. carpaticum* (Haitlinger, 2004; Saboori et al., 2017).

On the other hand, various morphological abnormalities have been observed in terrestrial parasitengona mites in a series of studies to date (e.g. Mąkol and Łaydanowicz, 2006). In one of the 15 larval slides examined, we observed 3 *AL* setae (instead of 2) on the scutum (Figure 7).

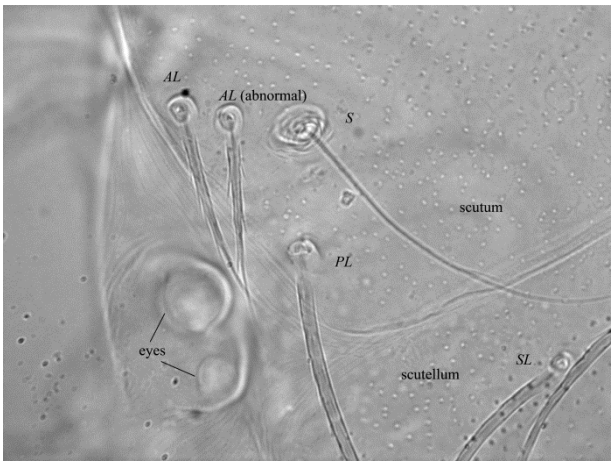

Figure 7. *Trombidium rimosum* Koch, (larvae), abnormal number of *AL* setae.

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