

First record of *Microtrombidium pusillum* (Hermann, 1804) (Acari, Microtrombidiidae) with all active stages from Turkey

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Abstract: *Microtrombidium pusillum* (Hermann, 1804) is described based on both active postlarval forms and larvae. Larvae of *M. pusillum* were obtained by experimental rearing from a field-collected female. In this study, all active stages of *M. pusillum* are described and figured based on specimens collected from grassy soil from Erzincan and Gümüşhane provinces. This species is new record for the Turkish mite fauna.

Keywords: Acari, *Microtrombidium*, Parasitengona, Trombidoidea, Turkey.

Introduction

The Microtrombidiidae are small and medium size mites with idiosoma, legs and palps densely covered with setae of, sometimes, unusual and sophisticated structure. The free-living deutonymphs and adults differ considerably from heteromorphic larvae which parasitize other arthropods (Gabryś, 1996). The genus *Microtrombidium* is composed of 57 species. Among them, 47 species are known from post-larval stages, 9 from larvae and 3 from both post-larval and larval stages (Mağol and Wohltmann, 2012; Noei et al., 2015). 12 species of this family are known from Turkey (Mağol and Wohltmann, 2012; Adil et al., 2015, 2017; Karakurt and Sevsay, 2015; Sevsay and Adil, 2015; Buğa et al., 2016; Karakurt et al., 2016). The aim of this study is to add a new record from Turkey. Notes on the biology, larval developmental time and original drawings based on the collected materials are given.

Materials and Methods

Materials of study was collected in the field by the aspirator and Berlese funnels. The mite specimens were collected in the mossy soil and litter layer. Larvae were reared from eggs deposited by adults collected in the field. Females were placed in glass vials (25×30 mm) filled with charcoaled plaster of Paris and closed with tight, semitransparent lids. They were kept at room temperature with a natural light/dark cycle. In order to maintain the

required humidity, water was added to the substratum. After death, adults were preserved in 70% ethyl alcohol and were cleared with 9% KOH prior to mounting. Specimens for light microscope studies were mounted on slides using Hoyer's medium (Walter and Krantz, 2009). Measurements were taken and drawings made under a Leica DM 4000 microscope with differential interference contrast and phase contrast.

The terminology follows Robaux (1974), Gabryś and Wohltmann (2001) (larvae) and Gabryś (1999) (postlarval forms) for the morphological terminology in the text. All measurements are given in micrometres (µm).

Results

Family Microtrombidiidae Thor, 1935

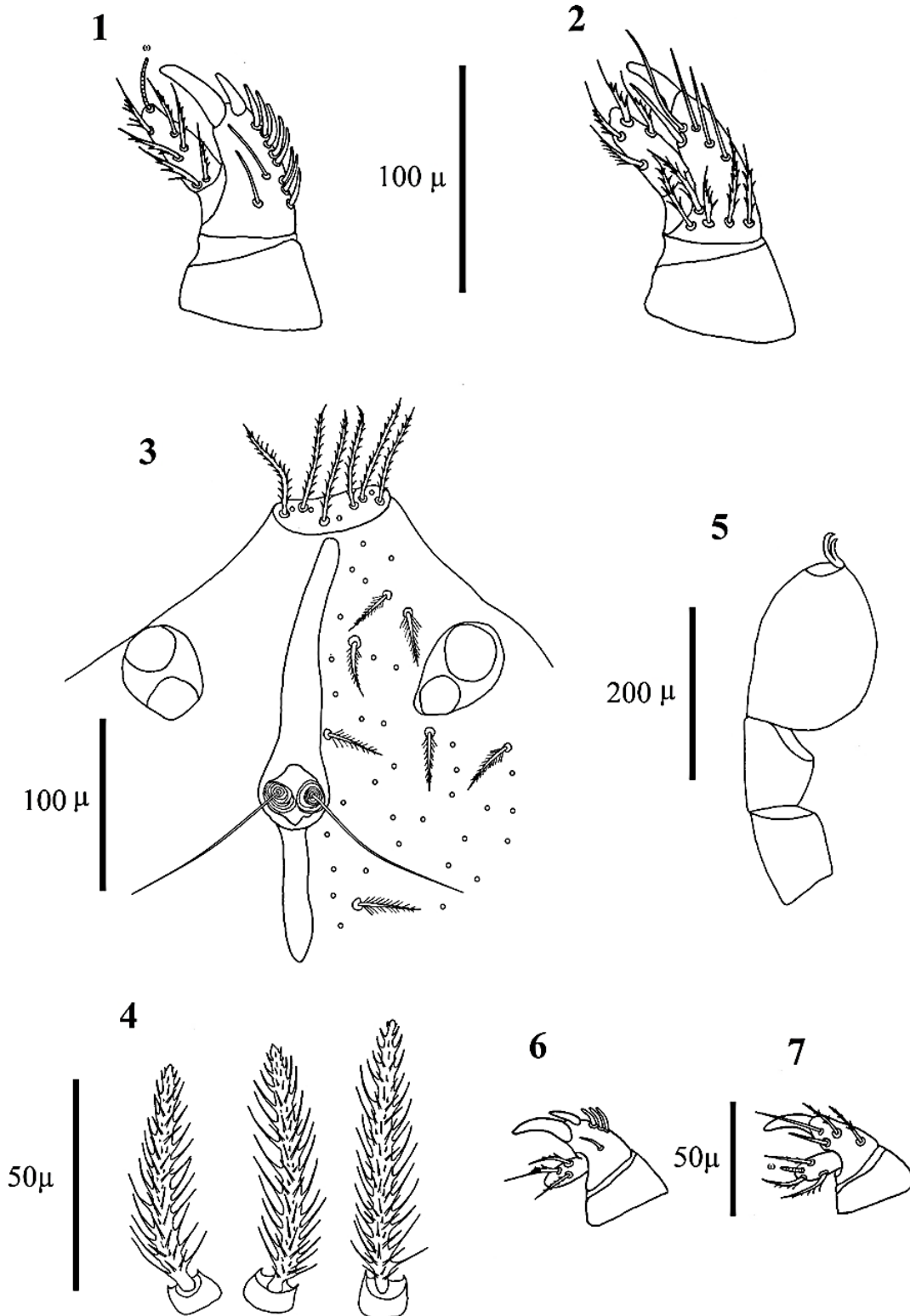
Genus *Microtrombidium* Haller, 1882

Type species. *Trombidium pusillum* Hermann, 1804

Microtrombidium pusillum (Hermann, 1804)

Adult (Figs. 1-5): Medium-sized Microtrombidiidae. The body length is 1064-1230, width 728-820. Metric data given in Table 1.

Gnathosoma: Medial face of palp tibia with two ctenidia and a radula. Distal ctenidium 2-4 strong spinisetae, paradont and proximal 2-4 spinisetae; distal much stronger than proximal one. Radula consists of 2-3 spine like stae (Fig. 1). Lateral face of palp tibia with one basidont, covered with numerous barbed and nude setae, whiplike setae situated behind base of basidont (Fig. 2).



Figures 1-7. *Microtrombidium pusillum*. Adult: (1) palp medial, (2) palp lateral, (3) crista metopica region, (4) dorsal setae (*pDS*) and (5) leg I genu-tarsus. Deutonymph: (6) palp medial and (7) palp lateral.

Palp tarsus with 1-2 solenidia terminally.

Anterior part of crista metopica narrows slightly and well sclerotized vertex which bears long, setulose 6-10

nonsensillary setae (Fig. 3); sensillary area rounded and bears two long and smooth nonsensillary setae; posterior process well-shaped, accessory posterior process absent.

Table 1. Morphometric data on adults and deutonymphs of *Microtrombidium pusillum*.

| Characters | Adults (n=5) min.-max. | Deutonymphs (n=3) min.-max. |
|---------------------|-----------------------------------|--|
| LB | 1064-1230 | 390-751 |
| WB | 728-820 | 300-576 |
| LB/WB | 1,44-1,68 | 1,2-1,5 |
| Ch BS (L) | 138-174 | 67-95 |
| Ch BS (W) | 57-72 | 36-44 |
| Ch Cl | 32-38 | 24-31 |
| PaTr (L) | 27-48 | 18-29 |
| PaTr (W) | 48-59 | 25-36 |
| PaFe (L) | 108-133 | 53-74 |
| PaFe (W) | 73-92 | 40-80 |
| PaGe (L) | 41-50 | 20-31 |
| PaGe (W) | 55-63 | 32-44 |
| PaTi (L) | 60-80 | 30-32 |
| PaTi (W) | 38-45 | 21-35 |
| Odo (L) left-right | 37-48/35-47 | 25-32/26-33 |
| Par (L) left-right | 24-25/22-26 | 15-21/14-21 |
| di Ct(n) left-right | 2-4/2-3 | 3-3 |
| pr Ct(n) left-right | 2-4/2-4 | 0-0 |
| Rad (n) left-right | 2-3/2-3 | 1-1 |
| PaTaSol(n) | 1-2 | 1-1 |
| PaTa (L) | 39-52 | 22-32 |
| PaTa (W) | 13-19 | 9-13 |
| pdS I [S] | 33-65 | 27-36 |
| pdS I [P] | 8-8 | 5-5 |
| vS [S] | 23-26 | 19-26 |
| vS [P] | 5-5 | 3-5 |
| CML | 240-274 | 112-163 |
| CMW | 21-30 | 12-13 |
| AL (n) | 6-10 | 6-6 |
| AL (L) | 51-59 | 27-34 |
| RCM | 123-139 | 53-85 |
| SAL | 40-54 | 18-37 |
| SAW | 41-53 | 29-36 |
| SB | 20-23 | 12-16 |
| SE | 135-155 | 83-85 |
| pPr | 74-80 | 29-43 |
| OL | 59-60 | 21-29 |
| OCM | 84-96 | 42-73 |
| ao | 17-27 | 11-12 |
| pO | 11-20 | 6-9 |
| O-O | 171-184 | 84-128 |
| OaD | 89-96 | 48-53 |
| OSD | 70-80 | 41-56 |
| GOp (L) | 182-223 | 57-72 |
| gs [S] | 13-21 | 8-15 |
| pgs [S] | 20-25 | 16-21 |
| An (L) | 69-82 | 41-42 |
| Cx_I | 101-126 | 53-67 |
| Tr_I | 61-82 | 36-42 |
| Bf_I | 127-169 | 48-71 |
| Tf_I | 99-132 | 37-54 |
| Ge_I | 109-131 | 41-57 |
| Ti_I | 102-139 | 44-65 |

Table 1. Continued.

| Character | Adults (n=5) min.-max. | Deutonymphs (n=3) min.-max. |
|------------|---------------------------|--------------------------------|
| Ta_I (L) | 183-229 | 91-117 |
| Ta_I (W) | 121-144 | 58-84 |
| Ta_I (L/W) | 1.51-1.59 | 1.3-1.5 |
| Leg I | 782-1008 | 412-527 |
| Cx_II | 111-130 | 47-61 |
| Tr_II | 60-89 | 30-41 |
| Bf_II | 91-114 | 50-69 |
| Tf_II | 65-76 | 28-48 |
| Ge_II | 72-91 | 29-38 |
| Ti_II | 72-102 | 31-46 |
| Ta_II | 131-153 | 62-80 |
| Leg II | 604-755 | 280-367 |
| Cx_III | 119-129 | 51-73 |
| Tr_III | 65-70 | 35-37 |
| Bf_III | 91-110 | 36-40 |
| Tf_III | 58-66 | 39-49 |
| Ge_III | 56-84 | 28-44 |
| Ti_III | 80-99 | 29-43 |
| Ta_III | 123-146 | 51-83 |
| Leg III | 600-700 | 271-364 |
| Cx_IV | 124-131 | 50-58 |
| Tr_IV | 67-99 | 25-46 |
| Bf_IV | 116-145 | 52-59 |
| Tf_IV | 87-111 | 26-50 |
| Ge_IV | 97-127 | 36-59 |
| Ti_IV | 116-150 | 41-65 |
| Ta_IV | 155-187 | 55-96 |
| Leg IV | 762-950 | 287-435 |
| IP | 2748-3413 | 1251-1639 |

Double eyes sessile, situated at edges of aspidosoma, and level with anterior part of crista metopica. Dorsal opisthosomal setae (*pDS*) of one type “*Microtrombidium* type” and uniform size (30-65), regularly setulose, with narrowing, wedge-shaped apically stem (Fig. 4).

Legs much shorter than idiosoma densely covered with setae; tarsus I swollen almost globular length/width ratio 1.51-1.59 (Fig. 5).

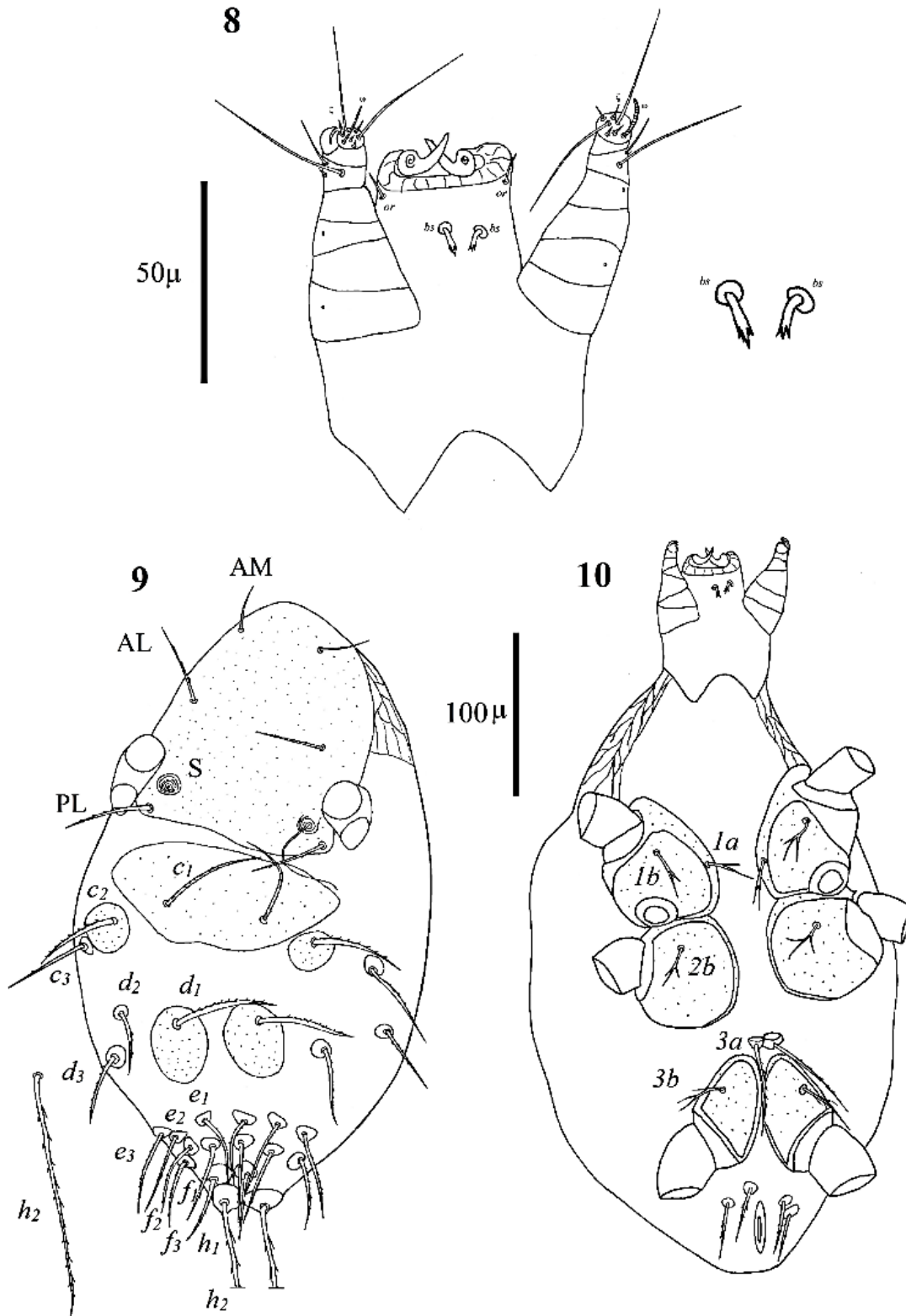
Deutonymph (Figs. 6-7): Generally smaller than adult (390-750 length, 300-576 width). Other characters as in adults. Medial face of palp tibia only one ctenidium with 2-6 spinisetae; radula consists of 1 spinelike setae (Fig. 6). Lateral face of palp tibia with one basidont (Fig. 7). Dorsal opisthosomal setae similar to those in adults but slightly shorter.

Larva (Figs. 8-13): Metric data given in Table 2. Colour in life light yellow.

Gnathosoma (Fig. 8): Movable gnathosoma with stephanostome composed of internal horseshoe-like

sclerite inserted between outer and inner cuticular sheaths. Cheliceral blade slightly curved, with hook-like projection at distal part of its internal edge. One pair of spinelike adoral setae (*or*). Ventrally a pair of thick subcapitular setae (*bs*) with digitate with 3-5 setules. Palpal setal formula: 0-N-N-NNN-NNNNNNNζω. Palp femur and genu each with one-minute spine-like seta placed dorsally. Palp tibia with one smooth long setae, one short setae and one-minute spine-like setae. Odontus divided on 2/3 of the length, bifurcate. Palp tarsus with two long and one medium-sized smooth seta, two shorter spine-like setae, one prominent solenidion, and one eupathidium.

Idiosoma, dorsum (Fig. 9): Scutum and scutellum punctuated. Scutum triangular in outline, rounded anteriorly, with almost straight posterior edge, and bent anterolaterally to the venter (stolascutum). Setae AM smooth, AL and PL smooth or with minute barbs. Setae PL thicker than AL. Sensillary setae smooth. Scutellum



Figures 8-10. *Microtrombidium pusillum*. Larva: (8) gnathosoma, (9) dorsal view and 1(10) ventral view.

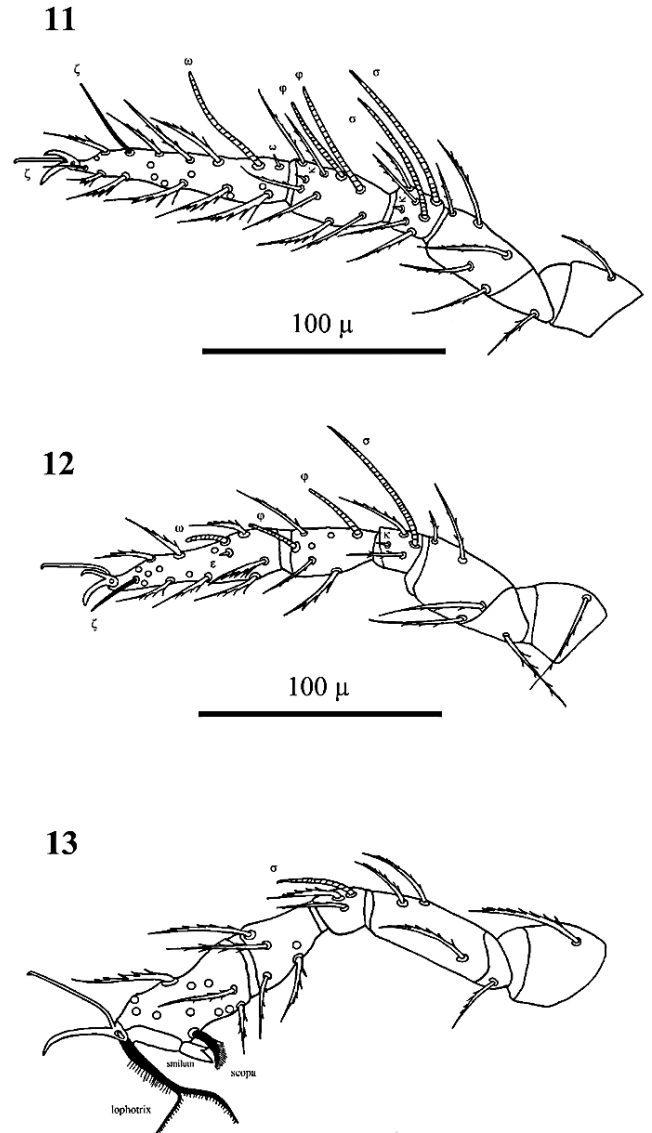
punctuated, bears one pair of barbed c_1 setae situated at posterior half of the sclerite. Paired eyes at the level of posterior part of scutum. Each pair composed of anterior

and posterior lenses and situated on sclerite. Anterior lens much larger than posterior one. Dorsal setae barbed, arranged in rows and situated on plates or platelets. fD

Table 2. Morphometric data on larva of *Microtrombidium pusillum*.

| Character | Larva (n=5) min.-max. |
|-----------|-----------------------|
| L | 341-364 |
| W | 210-230 |
| L/W | 1,49-1,73 |
| Scutum L | 123-140 |
| Scutum W | 100-125 |
| AA | 39-49 |
| AW | 73-81 |
| PW | 100-115 |
| SB | 75-87 |
| ASB | 106-119 |
| PSB | 17-20 |
| AM | 23-28 |
| MA | 46-53 |
| AL | 42-45 |
| AP | 55-58 |
| PL | 55-63 |
| S | 62-68 |
| HS | 52-57 |
| LSS | 125-138 |
| SL(=c1) | 53-58 |
| SS | 50-68 |
| DS | 39-65 |
| <i>h1</i> | 138-139 |
| <i>h2</i> | 35-38 |
| Cx I | 71-82 |
| Tr I | 32-34 |
| Fe I | 59-61 |
| Ge I | 22-24 |
| Ti I | 39-46 |
| Ta I | 85-90 |
| Leg I | 317-330 |
| Cx II | 60-63 |
| Tr II | 27-33 |
| Fe II | 54-59 |
| Ge II | 18-19 |
| Ti II | 37-38 |
| Ta II | 65-68 |
| Leg II | 265-277 |
| Cx III | 65-67 |
| Tr III | 37-43 |
| Fe III | 60-71 |
| Ge III | 24-25 |
| Ti III | 36-36 |
| Ta III | 51-55 |
| Leg III | 284-288 |
| IP | 872-883 |

formula = (2)4-6-6-6-4. C row with c_1 - c_3 (c_1 on scutellum; c_2 on enlarged oval plates; c_3 on small platelets), D row with d_1 - d_3 (d_1 on largest, oval plates), E row with e_1 - e_3 , F row with f_1 - f_3 and H row with h_1 - h_2 . Setae d_{2-3} , e_{1-3} , f_{1-3} , h_1 on small platelets. Setae h_2 long and placed on large



Figures 11-13. *Microtrombidium pusillum*. Larva: (11) leg I, (12) Leg II and (13) Leg III.

platelets.

Idiosoma, ventrum (Fig. 10): Cuticle smooth, claparède's organs placed laterally between coxae I and II. The surface of coxae punctuated. Coxa I with seta $1a$ placed in medial position and $1b$ – in lateral position. Seta $1a$ forked, seta $1b$ – with one or two setules. Supracoxala I absent. Coxa II with seta $2b$ with two or three setules. Coxa III directed postero-laterally, with seta $3b$ covered with 1–3 setules. One pair of barbed intercoxalae $3a$ near anterior margins of coxa III, on small platelets. fV formula = 2-2u. Anal opening without sclerites.

Legs (Figs. 11-13): Segmentation formula: 6-6-6. Leg chaetotaxy. Leg I: Tr (1n) – Fe (6n) – Ge (4n, 2σ, 1κ) – Ti (6n, 2φ, 1κ) – Ta (16n, 2ζ, 1ω, 1ε). Leg II: Tr (1n) – Fe

(5n) – Ge (2n, 1σ, 1κ) – Ti (5n, 2φ) – Ta (13n, 1ζ, 1ω, 1ε).
 Leg III: Tr (1n) – Fe (4n) – Ge (2n, 1σ) – Ti (5n) – Ta (11n, lophotrix, scopa). All femur divided into basi and telofemur. All normal setae on legs covered with barbs. Pretarsi I–II with paired claws (each claw trifold) and claw-like empodium (Figs. 11-12). At tarsus III termination – one scopa with short setules on dorsal side, and one strongly setulose and distally bifurcated lophotrix. Pretarsus with outer claw trifold, bearing laterally a row of small stules. Inner claw modified (smilum), smooth, bifid and directed outwardly (Fig. 13).

Specimens examined: 09 April 2015, 1 adult, Gümüşhane, Vauk Gateway, 40°22'21"N 39°48'50"E, 1801 m a.s.l., litter from under *Astragalus* sp.; 09 April 2015, 1 female, 2 adults, Gümüşhane, Kadırğa Plateau, 40°37'06"N 39°03'26"E, 1097 m a.s.l., moist grassy soil (leg S. Adil); 08 May 2016, 3 deutonymphs, Erzincan, 39°73'52"N 39°48' 35"E, 1196 m, a.s.l., grassy soil (leg E. Akman).

Distribution: Austria, France, Germany, Hungary, Italy, Montenegro, Norway, Poland, Portugal, Spain, Switzerland, the Netherlands (Mağol and Wohltmann, 2012; Haitliger and Šundić, 2015). New record for the Turkish fauna.

Biology: A female, after being collected in the field (09 April 2015) (leg S. Adil), laid eggs on the 5nd day (14 April) of being kept under laboratory conditions. The eggs were light orange, spherical and settled one by one. 14 days later (28 April) they turned into prelarvae; 6 light yellow larvae were obtained and transferred into alcohol (06 May).

Discussion

The Turkish specimens are similar the European specimens in general appearance. There are morphometric differences in body size, dorsal setae lengths and structure of dorsal setae to the adult of European specimens (Gabryś and Wohltmann, 2001). In European specimens, body size between 750-1350/475-900, the dorsal setae is 24-42, dorsal setae structure with pointed apically stem; In Turkish specimens body size between 1064-1230/728-820, the dorsal setae is 33-65 and dorsal setae structure with wedge-shaped apically stem.

The larval setal and morphological characters of Turkish specimens are match to the European specimens described by Gabryś and Wohltmann (2001). Only difference with European specimen's setae of *3a* with bifurcated; Turkish specimens with 1-3 forked.

Acknowledgments

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