

A new species of the genus *Trombidium* (Acari: Trombidioidea) parasitic on a spider species in Turkey

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ABSTRACT: *Trombidium demirsoyi* sp. nov. Sevsay and Buğa is described and illustrated from larvae collected as ectoparasites on *Zodarion thoni* Nosek, 1905 and off-host from the soil in Çanakkale Province, Turkey. This is the first record of a species of the spider family Zodariidae as a host for an ectoparasitic larva of a *Trombidium* Fabricius species.

Keywords: Araneae, ectoparasite, host-parasite association, Parasitengona, Trombidiidae.

Zoobank: <http://zoobank.org/E711284A-83A1-45B0-8175-2124D285F553>

INTRODUCTION

Parasitengona is one of the largest and most diverse mite groups. There are over 11 000 described (nominal) species from more than 80 families and 14 superfamilies (Gabryś et al., 2011; Walter and Proctor, 2013). Mites of the family Trombidiidae (Acari: Parasitengona) are ectoparasitic in their larval stage and predatory in their active, postlarval stages (deutonymph and adult). They feed on a variety of arthropods so may have economic importance (Robaux, 1974; Welbourn, 1983). The genus *Trombidium* Fabricius, 1775 includes known 35 species widely distributed across the world, of which 12 are known only from larvae, 11 from active post-larval instars, and 12 from both (Mağol and Wohltmann, 2012, 2013; Liu and Zhang, 2016; Saboori et al., 2017). Six species of the genus *Trombidium* have been reported from Turkey, of which three species, *T. geniculatum*, *T. holosericeum* and *T. latum*, are known only from the larvae (Sevsay, 2017).

Ectoparasitic larvae of *Trombidium* spp. have been recorded from a variety of arthropod hosts, including Araneae, Coleoptera, Dermoptera, Diptera, Hemiptera, Hymenoptera, Lepidoptera, Mecoptera, Orthoptera, Opiliones and Pseudoscorpiones, and Thysanoptera (Tomić et al., 2015; Felska et al., 2018). The spider families Linyphiidae, Philodromidae, Tetragnathidae and Theridiidae are common hosts for larvae of *Trombidium brevimanum* (Berlese, 1912), which is restricted to arachnids (Mağol and Felska, 2011). *Trombidium* spp. have been recorded as parasitic on thirteen spider families, namely Agelenidae, Araneidae, Argiopidae, Clubionidae, Corinnidae, Dictynidae, Linyphiidae, Lycosidae, Philodromidae, Pisauridae, Tetragnathidae, Theridiidae and Thomisidae (Welbourn and Young, 1988; Fain and Jocqué, 1996; Felska et al., 2018).

This report is the first record of the spider family Zodariidae as a host for ectoparasitic *Trombidium* Fabricius larvae. This study aimed to describe a new species of larval *Trombidium* Fabricius, 1775 (Acari: Trombidiidae)

collected from males of *Zodarion thoni* Nosek, 1905 (Araneae: Zodariidae) and also free living in the soil.

MATERIALS AND METHODS

Two adult male spiders were collected in pitfall traps (39°32'12"N, 26°33'52"E, 70 m a.s.l.) in Çanakkale Province, Turkey. The six engorged *Trombidium* larvae were treated with 10% KOH before clearing and mounting on glass microscope slides, using Hoyer's medium (Walter and Krantz, 2009). Their measurements were taken and the drawings were done by using a BX63 phase contrast Olympus microscope equipped with a drawing tube, and the digital photographs were taken with a DP73 camera mounted on the microscope. The three specimens used for scanning electron microscope (SEM) studies were preserved in 95% alcohol, dehydrated in a graded alcohol series, transferred to hexamethyldisilazane (Fluka Chemicals) and then imaged with an FE-SEM (FEIQUANTA 450). The terminology and abbreviations follow Mağol (2007), and measurements are given in micrometers (µm). The type material is deposited in the Acarology Laboratory of Erzincan Binali Yıldırım University, Erzincan, Turkey (EBYU).

RESULTS

Family Trombidiidae Leach, 1815

Genus *Trombidium* Fabricius, 1775

Type species. *Acarus holosericeus* Linnaeus, 1758

Trombidium demirsoyi sp. nov. Sevsay and Buğa

Diagnosis

Larvae: Hypostomalae setae (*bs*= subcapitular setae) short in the shape of crown, with equal length, finger-like protrusions. Solenidion on tarsus I situated at ca. 2/3 length of the segment. Setae on scutellum situated at half length of the sclerite. *AM* setae nude.

Post larval instars unknown.

Description

Larva (n = 11): Measurements are given in Table 1 (the given measurements are average values from six specimens). Live specimens red, and with dark red eye spots.

Gnathosoma. Hypostomatae setae (*bs*) stout, crown-like, regularly arranged, distally ca. 10 equal length, finger-like protrusions (Figs 1, 8, 9). Cheliceral blade curved posteriorly, with a small distal tooth-like process on the internal edge of blade. Subcapitulum punctate. Palptibial claw divided entire length. Palpal femur with one nude seta. Palptibia with three setae; two barbed setae (proximal seta distinctly longer than the distal seta), and one nude seta shorter than the others. On palpal tarsus; one long seta with distinct barbs, two short setae with short and sparse barbs, two eupathidia and a solenidion (Figs 2, 10). The pedipalp formula: 0-N-0-BBN-BBBζζω(?ω).

Idiosoma. Scutum and scutellum porous on the whole surface. Scutum rounded anteriorly, posterior border straight and posterior corners rounded (Fig. 3). Anterior part of scutum longitudinally striated and continues slightly to rear of chitinous bar (tear-like). Setae; *AM* nude (Fig. 11), *AL* covered with very fine setulae, *PL* barbed. Sensilla (*S*) located at equal distance to *AL* and *PL* setae. Scutellum bears one pair of barbed *c*₁ setae (45-52) situated at the middle of the sclerite. Scutum and scutellum of the same width (Fig. 12). Two pairs of eyes at the level of posterior edge of scutum. Anterior lens larger in diameter than the posterior lens (anterior 10, posterior 7). All dorsal setae with barbs. Setae in rows C-F situated on small sclerites, with barbs covering the whole shaft. Setae *h*₁ located on a common sclerite. *fD* formula: (2)4-6-4-4-2.

Ventral surface of idiosoma with one pair of intercoxal setae (*3a*) between coxae III (Fig. 4). Coxal fields punctate. *fCx*= NBN-BB-B (including supracoxal seta). Supracoxala and seta *1a* smooth (forked on the right side of the holotype), *1b* distinctly barbed. Setae on coxae II and III barbed. *fV* = 4u-2-2.

Legs. Leg segmentation formula: 6-6-6. Leg setal formula: Leg I (Fig. 5): Tr (1n)- Fe (5n)- Ge (4n, 2σ, 1κ)-Ti (5n, 2φ, 1κ)- Ta (16n, 1ω, 1ε, 2ζ). Leg II (Fig. 6): Tr (1n)- Fe (4n)- Ge (3n, 1σ, 1κ)- Ti (4n, 2φ)- Ta (12n, 1ω, 1ε). Leg III (Fig. 7): Tr (1n)- Fe (5n)- Ge (3n, 1σ)- Ti (5n)- Ta (11n).

Solenidion (ω) on tarsus I situated at ca. ²/₃ length of the segment. The posterior claw on tarsus III modified, reduced in length and slightly displaced towards the lateral side of tarsus. Tarsus III with short ensiform seta and an accessory sword-like seta. The stylostome (a feeding canal formed within the host tissues) of the engorged larvae quite distinctive (Fig. 13).

Type material

Holotype and paratypes larvae were collected from two adult male *Zodarion thoni* (one larva from one spider and four larvae from the other) captured by pitfall trapping, and six larvae, off-host, were extracted from soil samples with a Berlese funnel. All specimens were collected from

the same field in Çanakkale Province, Turkey by M. Elverici on 6 June, 2016. He also identified the spider.

Etymology

This species is named in honour of Emeritus Professor Ali Demirsoy (Hacettepe University) for his efforts to develop entomology, evolutionary biology and zoology in Turkey.

DISCUSSION

Trombidium demirsoyi sp. nov. Sevsay and Buğa differs from all other species of *Trombidium* in the shape of its *bs* setae. There are three different shapes of hypostomatae setae (*bs*) in *Trombidium* (Mağol, 2002). The first type is simple, with several branches and with slightly thickened and apically narrowing stem. The second type is stout, terminating brush-like. The third type is in the shape of a truncate calyx, with ca. 10-14 finger-like, sharply terminated protrusions of different length distally. Species with the third type are *Trombidium holosericeum* (L., 1758), *T. geniculatum* (Feider, 1955) and *T. latum* C.L. Koch, 1837. *Trombidium demirsoyi* sp. nov. is most similar to *T. latum* but differs from these species in the following character states: crown shaped setae *bs* with ca. 10 equal length, finger-like protrusions distally (vs. *bs* in the shape of calyx, finger-like protrusions differ in length in distal part, the number of protrusions is ca. 13-15 in *T. holosericeum*, ca. 11-12 in *T. geniculatum*, both of which have stouter hypostomatae setae, whereas *T. latum* hypostomatae has ca. 10 slenderer protrusions. The other differences include shorter *bs* (6.5-7.2 vs. 14-22); *AM* setae nude (vs. barbed), shorter *AM* (36-45 vs. 53-65); scutum and scutellum of equal width (vs. wider scutellum); *h*₁ on a common sclerite (vs not located in *T. latum*) and shorter *h*₁ (70 vs. 88-105); shorter LSS (100-108 vs. 131-153); shorter ASB (69-77 vs. 87-97); more barbed setae on palp tarsus (3 vs. 1-2); and solenidion (ω) on tarsus I situated at ca. ²/₃ length of the segment in *T. demirsoyi* sp. nov. (vs. ¹/₄ length of the segment in others) (Mağol, 2001, 2002, 2005).

The larvae of Trombidiidae occur most frequently on spiders where they attach to the prosoma and opisthosoma, with an apparent tendency to occupy sites close to the pedicel (Mağol and Felska, 2011). *Trombidium demirsoyi* sp. nov. had the same attachment sites. One larva was attached to the pedicel of its host whereas four larvae from another host were attached close to pedicel.

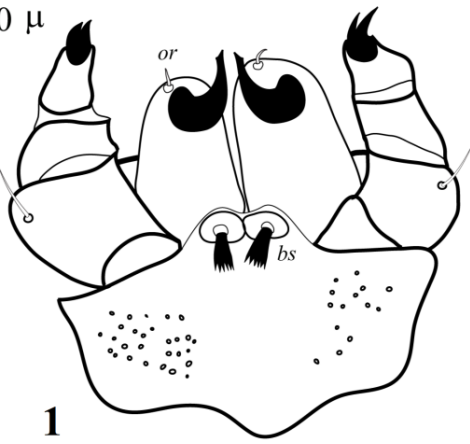
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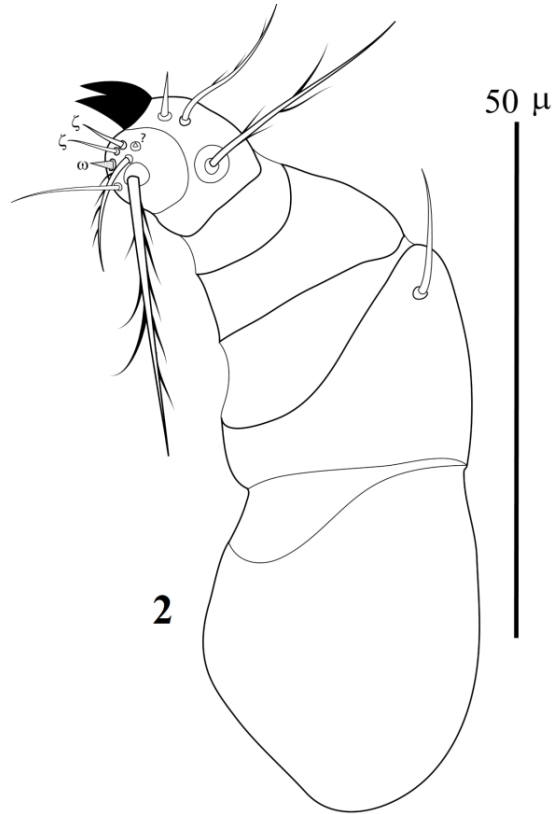
Table 1. Morphometric data for the larvae of *Trombidium demirsoyi* sp. nov.

Characterz	Holotype	Paratype 1	Paratype 2	Paratype 3	Paratype 4	Paratype 5	Mean
L	498	617	968	501	-	-	646
W	344	423	701	442	-	-	478
L/W	1.44	1.45	1.38	1.33	-	-	1.40
AA	58	66	50	56	-	-	58
AW	102	94	92	97	92	94	95
PW	100	96	98	99	94	95	97
SB	72	67	68	68	63	64	67
ASB	76	76	77	77	69	77	75
PSB	36	35	35	36	35	33	35
SD	112	111	112	113	104	100	109
AP	32	30	30	29	27	27	29
AM	43	34	43	45	36	37	40
AL	45	42	43	47	36	40	42
PL	63	60	61	60	51	57	59
PL/AL	1.4	1.42	1.42	1.28	1.42	1.42	1.39
S	70	70	64	49	61	59	62
MA	40	37	39	40	40	41	40
HS	42	49	43	43	43	43	44
LSS	108	108	106	107	100	104	106
SL	48	48	52	53	41	42	47
SS	25	29	28	28	25	28	27
DS_MIN	33	35	32	35	32	-	33
DS_MAX	49	49	48	55	46	-	49
bs	7.2	6.6	7.2	6.5	6.9	6.5	6.7
Cx_I	48	47	47	49	47	58	49
Tr_I	32	32	32	33	33	27	32
Fe_I	40	45	43	42	43	38	42
Ge_I	27	27	27	26	26	28	27
Ti_I	36	39	32	36	35	36	36
Ta_I	54	62	56	63	58	59	59
LEG I	237	252	237	249	242	246	244
Cx_II	47	49	48	51	52	52	50
Tr_II	33	37	34	32	31	29	33
Fe_II	41	41	40	43	42	37	41
Ge_II	26	24	23	23	23	22	24
Ti_II	31	37	32	35	32	35	34
Ta_II	56	54	51	57	55	56	55
LEG II	234	242	228	241	235	231	235
Cx_III	48	51	50	47	48	-	49
Tr_III	35	34	32	29	31	-	32
Fe_III	43	47	40	44	38	-	42
Ge_III	21	22	23	19	22	-	21
Ti_III	38	40	-	42	35	-	39
Ta_III	48	49	-	51	46	-	49
LEG III	233	243	145	232	220	-	215
IP	704	737	610	722	697	477	658

50 μ

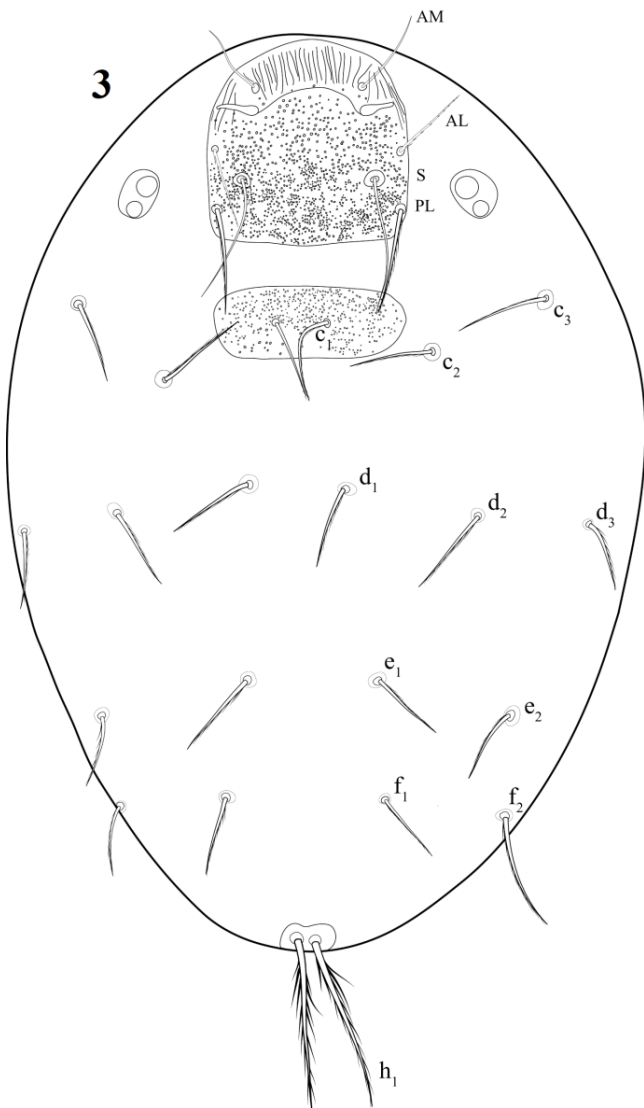


1



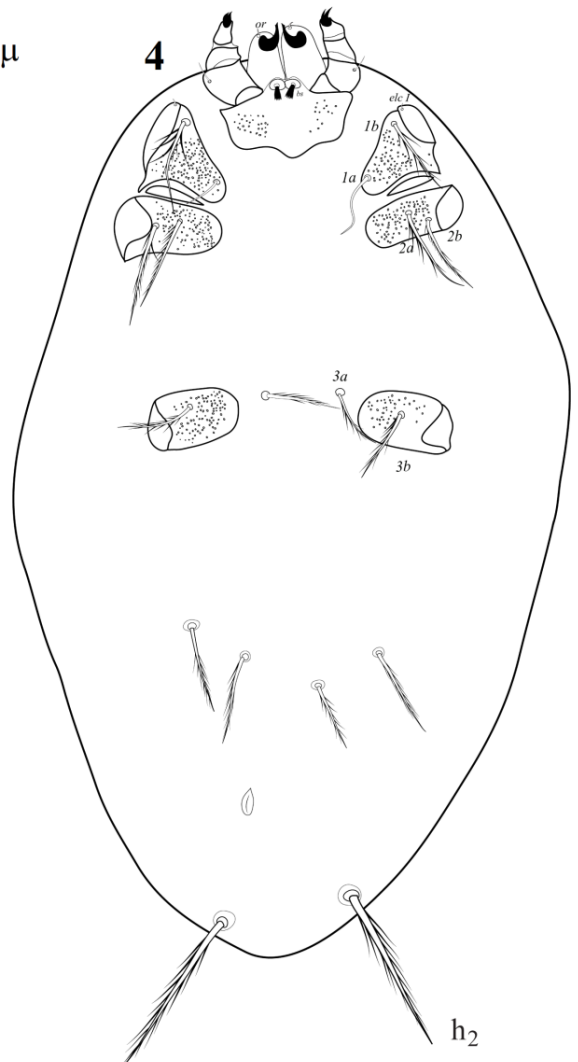
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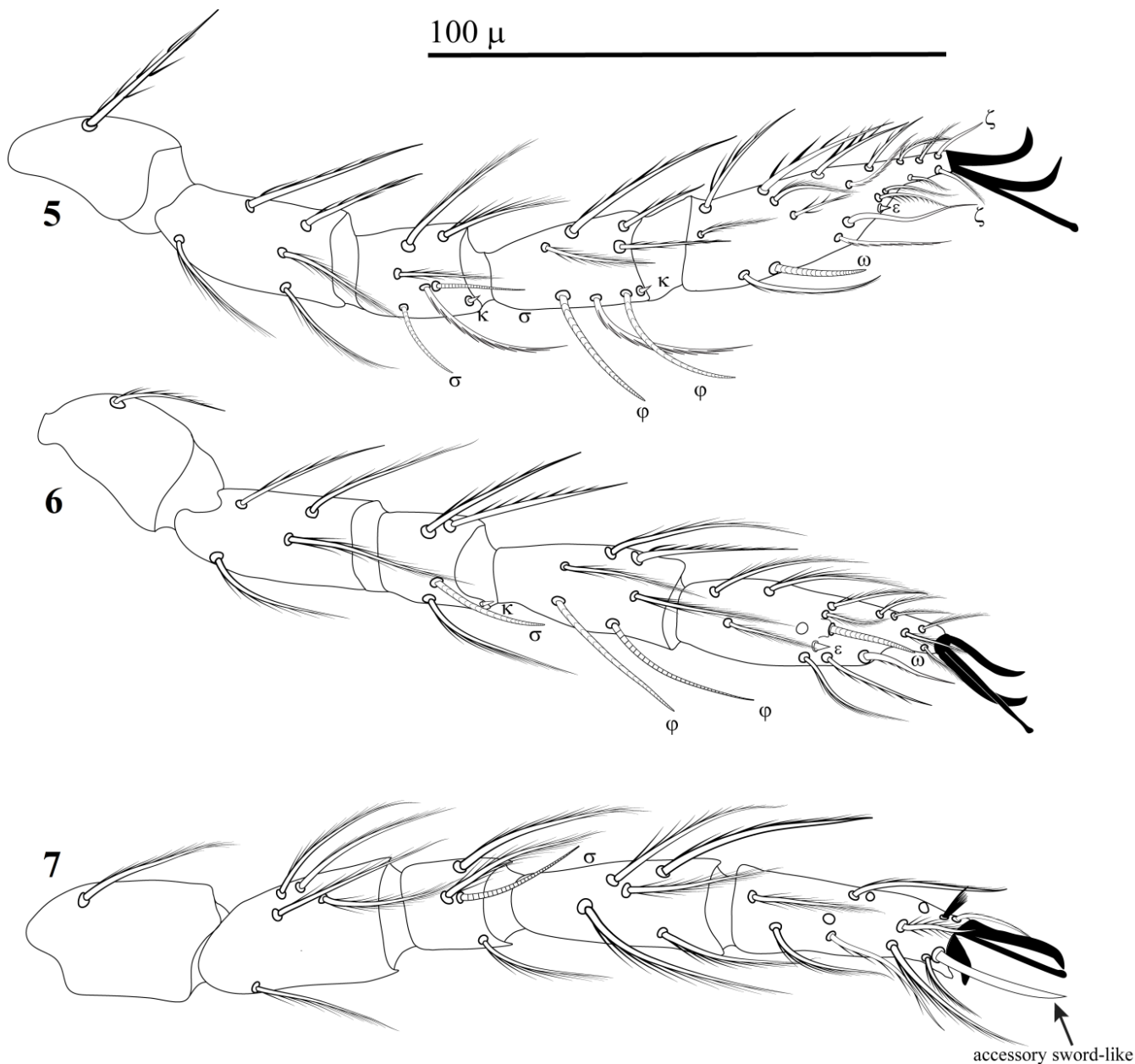


200 μ

4



Figures 1-4. *Trombidium demirsoyi* sp. nov. (Larva). 1. Gnathosoma, 2. Palp, 3. Idiosoma (dorsum), 4. Idiosoma (venter).



Figures 5-7. *Trombidium demirsoyi* sp. nov. (Larva). 5. Leg I, 6. Leg II, 7. Leg III.

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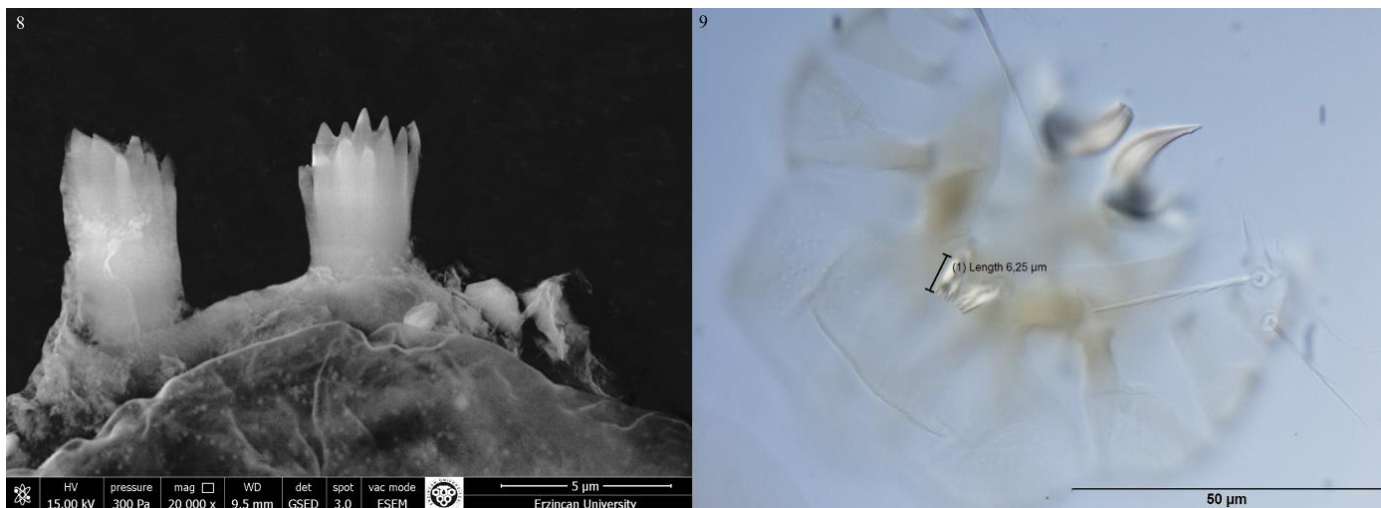
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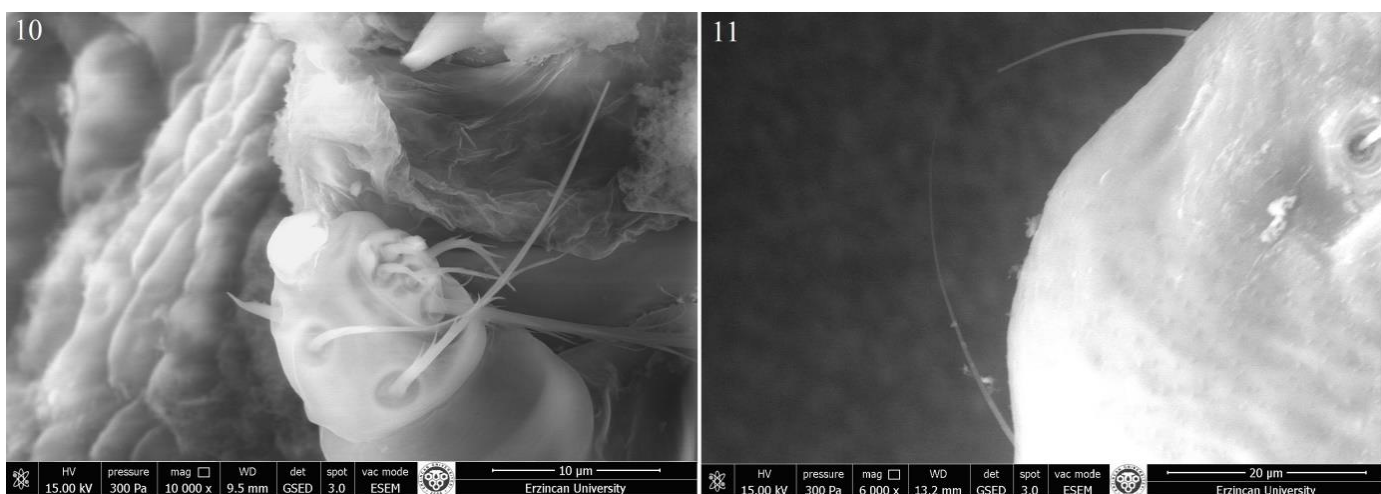
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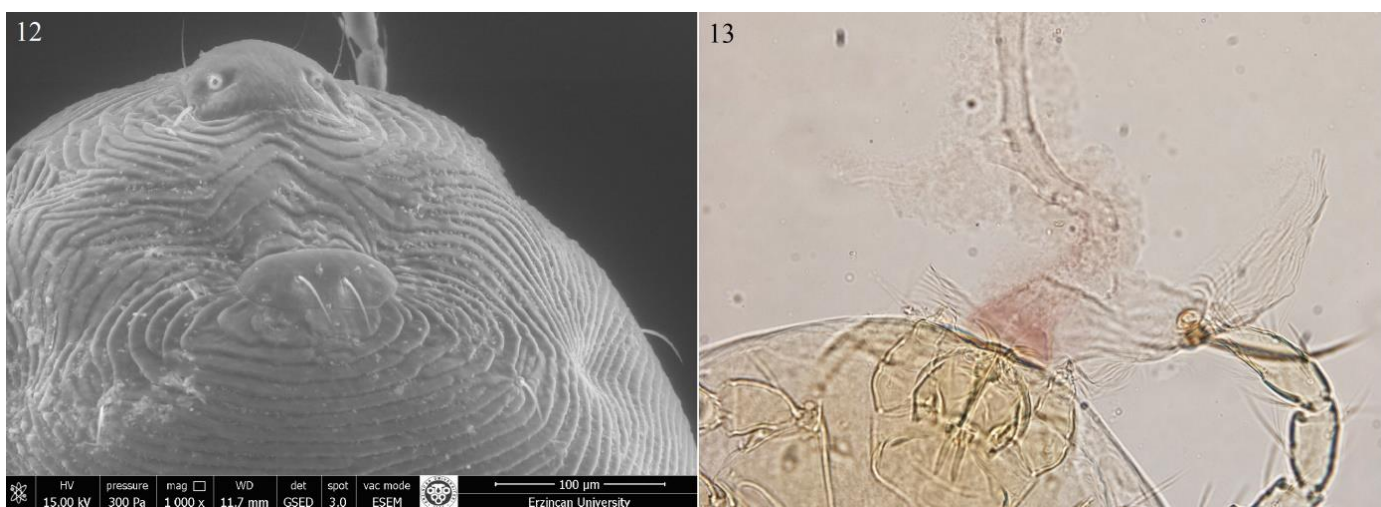
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Figures 8-9. *Trombidium demirsoyi* sp. nov. (Larva). 8. Hypostomalae seta (*bs*), SEM micrograph, 9. Hypostomalae seta (*bs*), light microscope.



Figures 10-11. *Trombidium demirsoyi* sp. nov. (Larva). 10. Palp, ventral aspect, 11. AM setae.



Figures 12-13. *Trombidium demirsoyi* sp. nov. (Larva). 12. Scutum and scutellum, SEM micrograph, 13. Stylostome, light microscope.

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