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Five new records of the genus *Trombidium* (Actinotrichida: Trombidiidae) from northeastern Turkey

Sevgi SEVSAY*, Sezai ADİL, İbrahim KARAKURT, Evren BUĞA, Ebru AKMAN
Department of Biology, Faculty of Arts and Sciences, Erzincan University, Yalnızbağ Campus, Erzincan, Turkey

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Abstract: This faunistic survey was carried out on the genus *Trombidium*, collected from northeastern Turkey in 2009–2014. Previously, only one species of *Trombidium* had been reported from Turkey. Five species of the genus *Trombidium* were identified and original drawings based on the collected materials were made. These species are new records for the Turkish mite fauna. An identification key to the adult Turkish species of *Trombidium* is also provided.

Key words: Parasitengona, Trombidiidae, *Trombidium*, new records, Turkey

1. Introduction

The family Trombidiidae Leach, 1815 includes 23 genera and 205 species in the world (Mąkol and Wohltmann, 2012, 2013). *Trombidium* is one of the most commonly known genera in the family. The geographic distribution of *Trombidium* is restricted to the Holarctic and the majority of species are known from Europe (Mąkol, 2001). This genus has 34 species (Mąkol and Wohltmann, 2012, 2013), but it has been poorly investigated in Turkey and only one species, *Trombidium rimosum*, has been reported from Turkey to date (Sevsay and Özkan, 2010).

The aim of this study is to add new records and more details to the Turkish mite fauna, and to provide a key to the adults of the *Trombidium* species known from Turkey.

2. Materials and methods

Mite specimens collected from northeastern Turkey (Bayburt, Erzincan, Gümüşhane, Trabzon, and Tokat provinces) between 2009 and 2014 were obtained directly or by pitfall traps and extracted in Berlese funnels. All specimens were transferred to rearing vials, but rearing was only successful for three species: *T. geniculatum*, *T. holosericeum*, and *T. latum*. Oviferous females were collected from the field and placed in glass vials (25 × 30 mm) containing a mixture of charcoal and plaster of Paris (9:1). In order to obtain larvae, optimal conditions were provided. The experiment was carried out at room temperature with a natural light/dark cycle (Mąkol and Sevsay, 2011). Oviferous females were transferred to 70% ethyl alcohol after oviposition. Specimens for light microscope studies were mounted on slides using Hoyer's medium (Walter and Krantz, 2009) after preservation in ethyl alcohol. For measurements and drawings a Leica DM 4000 microscope with phase contrast was used. Examined specimens were deposited in the Biology Department of Erzincan University, Turkey. Idiosomal setal designations and some descriptive terms follow Mąkol (2005, 2007). All measurements are given in micrometers.

3. Results

Family Trombidiidae Leach, 1815

Genus *Trombidium* Fabricius, 1775

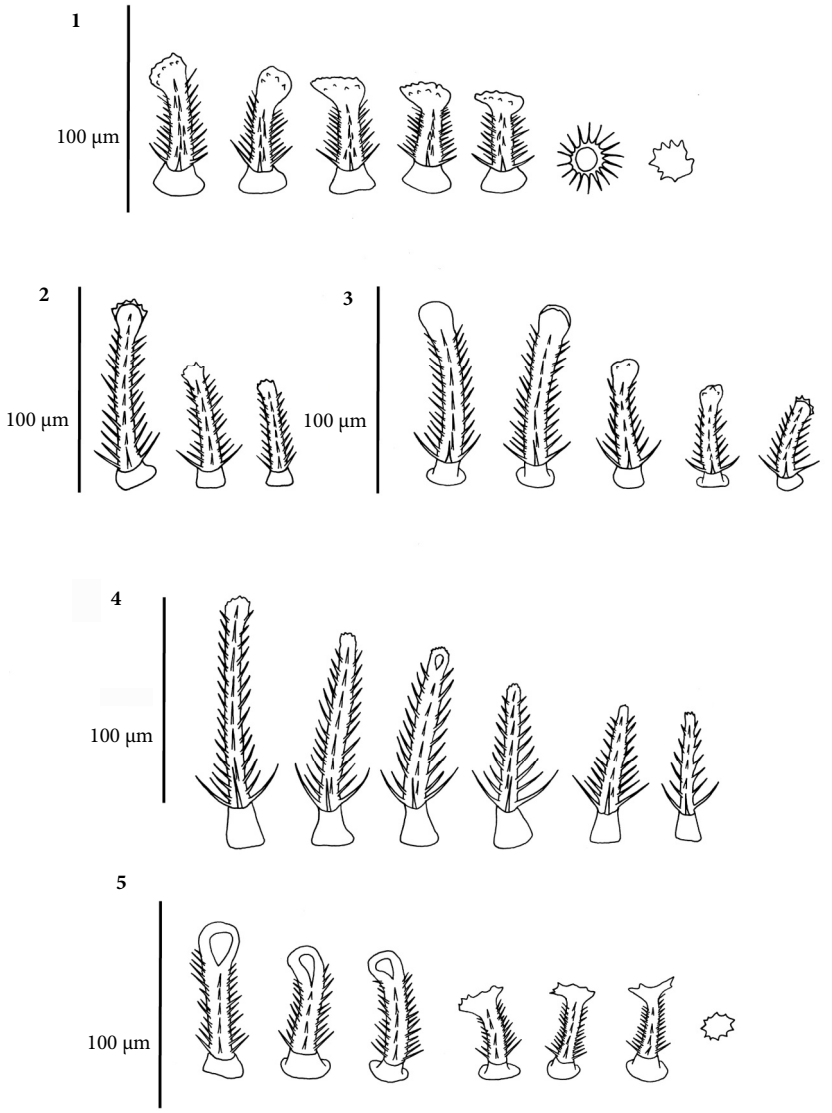
Trombidium brevimanum (Berlese, 1910)

Sericothrombium brevimanum Berlese, 1910: 365

Diagnosis. Adults: Colors in life ranging from light red to dark red. Anterior process of crista metopica not clearly terminated; posterior process rounded at termination. Two types of dorsal opisthosomal setae (*pDS*); in the first type setae (*pDS I*) widened towards the end, usually asymmetrical at termination, a few unclear tubercles at the top and with an air bubble in the distal part. The second type (*pDS II*) widened distally, usually asymmetrical, with flattened and sometimes frayed top and with much more distinct tubercles at seta termination (Mąkol, 2005) (Figure 1).

Specimens examined: Tokat, Koyulhisar town, 40°23′59″N, 37°17′18″E, alt. 550 m, 09 April 2011, 2 adults and 2 deutonymphs, litter from under *Salix* sp.

* Correspondence: ssevsay@erzincan.edu.tr



Figures 1–5. Setae *pDS I-II* **1.** *T. brevimanum*, **2.** *T. geniculatum*, **3.** *T. holosericeum*, **4.** *T. latum*, **5.** *T. mediterraneum.*

Gümüşhane, Köse town, Köse Mountain, 40°16′97″N, 39°37′84″E, alt. 1869 m, 26 May 2011, 4 adults, juicy grass (Leg. H.H. Özbek). Erzincan, Ahmediye pond, 39°52′53″N, 39°20′31″E, alt. 1978 m, 05 May 2011, 4 adults (1 of which was male) and 1 deutonymph, mossy soil, close to the pond (Leg. S. Sevsay, S. Adil). Erzincan, Ergan Mountain, Ardıçlı Lake, 39°37′54″N, 39°29′58″E, alt. 1744 m, 14 October 2011, 1 deutonymph, litter from under *Juniperus* sp. (Leg. S. Adil).

Distribution. Denmark, Finland, France, Germany, Great Britain, Italy, Norway, Poland, Russia, Spain, Switzerland (Mąkol and Wohltmann, 2012). New record for the Turkish fauna.

Trombidium geniculatum (Feider, 1955)

Teresothrombium geniculatum Feider, 1955: 172

Diagnosis. Adults: Color in life light red. Termination of anterior part of crista metopica indistinct and not reaching aspidosomal border. Dorsal opisthosomal setae with different length. The stem of *pDS I* parallel-sided with rounded top; *pDS II* covered with tubercles asymmetrically dispersed and more distinct tubercles than in *pDS I* (Mąkol, 2005) (Figure 2).

Larvae: Hypostomalae (setae *bs*) in the shape of truncate calyx, with ca. 11 or 12 finger-like extensions. Scutum and scutellum porous on the whole surface. Setae *AL* with many barbs aggregated mostly in the distal half of seta. *PL* with barbs along the whole shaft. Setae *SL* situated half length of the sclerite, covered with barbs. *f*D formula:

2(2)2-6-4-4-2. ƒV formula: 4u-2-2. ƒCx: NBN-BB-B. Legs. I: Tr (1n) - Fe (5n) - Ge (4n, 2σ, 1κ) - Ti (5n, 2φ, 1κ) - Ta (17n, 2ζ, lω, l ε); II: Tr (1n) - Fe (4n) - Ge (3n, lσ, 1κ) - Ti (5n, 2φ) - Ta (13n, 1ω, 1ε); III: Tr (1n) - Fe (4n) - Ge (3n, lσ) - Ti (5n) - Ta (12n).

Specimens examined: Trabzon, Zigana Mountain, 40°40′16″N, 39°26′17″E, alt. 2025 m, 15 May 2010, 10 adults (4 of which were male) and 3 deutonymphs were collected on mossy soil and 196 larvae were obtained by experimental rearing (Leg. S. Sevsay). Bayburt, Kitre village, 40°16′14″N, 39°52′31″E, alt. 1694 m, 05 April 2014, 1 adult, litter from under *Salix* sp. Bayburt, Kop gateway, 40°02′12″N, 40°28′50″E, alt. 2160 m, 01 May 2014, 1 adult, mossy soil, near the stream (Leg. İ. Karakurt). Bayburt, Kop gateway, 40°03′20″N, 40°27′56″E, alt. 1990 m, 21 May 2014, 2 adults, mossy soil, near the stream, and 20 larvae obtained by experimental rearing (Leg. İ. Karakurt). Erzincan, Ahmediye pond, 39°52′54″N, 39°20′19″E, alt. 2012 m, 08 May 2014, 3 adults, mossy soil, near the stream (Leg. E. Buğa).

Distribution. Norway, Poland, Romania, Spain (Mąkol and Wohltmann, 2012). New record for the Turkish fauna.

Trombidium holosericeum (Linnaeus, 1758)

Acarus holosericeus Linnaeus, 1758

Diagnosis. Adults: Color in life light red. Crista metopica prominently sclerotized and anterior part not reaching aspidosomal border. Posterior part of crista metopica relatively long. Dorsal opisthosomal setae of two types: both *pDS I* and *pDS II* with several tubercles covering rounded top, but *pDS II* covered with more protruding tubercles than *pDS I* (Figure 3).

Larvae: Setae *bs* in the shape of stout calyx with distally 13 or 14 finger-like extensions. Scutum and scutellum porous on the whole surface. *AM* setae with tiny barbs and *S* setae with few setules. Whole stem of *AL* and *PL* setae covered markedly with barbs. ƒD formula: 2(2)2-6-4-4-2. ƒV formula: 4u-2-2. ƒCx: NBN-BB-B. Legs. I: Tr (1n) - Fe (5n) - Ge (4n, 2σ, 1κ) - Ti (5n, 2φ, 1κ) - Ta (17n, 2ζ, lω, lε); II: Tr (1n) - Fe (4n) - Ge (3n, lσ, 1κ) - Ti (5n, 2φ) - Ta (14n, 1ω, 1ε); III: Tr (1n) - Fe (4n) - Ge (3n, lσ) - Ti (5n) - Ta (11n).

Specimens examined: Erzincan, Otlukbeli Lake, 40°01′15″N, 39°58′36″E, alt. 1921 m, 03 May 2009, 13 adults (3 of which were males) and 5 deutonymphs, moist soil at litter under *Juniperus* sp. (Leg. S. Sevsay). Trabzon, Zigana Mountain, 40°40′10″N, 39°26′14″E, alt. 2030 m, 15 May 2010, 3 adults, litter from under *Juniperus* sp. and mossy soil (Leg. S. Sevsay). Erzincan, Ahmediye pond, 39°52′48″N, 39°20′25″E, alt. 1980 m, 03 June 2011, 15 adults (8 of which were males) and 10 deutonymphs collected on mossy soil, near the pond, and 128 larvae obtained by experimental rearing (Leg. S. Sevsay, S. Adil). Erzincan, Otlukbeli Lake, 40°00′59″N, 39°58′48″E, alt. 1900 m, 14 June 2012, 40 adults (12 of which were males) and 8 deutonymphs, mossy soil close to the lake (Leg. S. Sevsay, S. Adil). Bayburt, Kop gateway, 40°02′12″N, 40°28′50″E, alt. 2160 m, 01 May 2014, 5 adults (1 of which was male), mossy soil, near the stream, and 26 larvae obtained by experimental rearing (Leg. İ. Karakurt). Erzincan, Ahmediye pond, 39°52′54″N, 39°20′19″E, alt. 2012 m, 08 May 2014, 13 adults (3 of which were males) and 8 deutonymphs collected on algae, near the stream, and 130 larvae obtained by experimental rearing (Leg. E. Buğa). Erzincan, Ahmediye pond, 39°52′54″N, 39°20′19″E, alt. 2012 m, 23 May 2014, 7 adults (2 of which were male), mossy soil, near the stream, and 280 larvae obtained by experimental rearing (Leg. E. Buğa).

Distribution. Algeria, Austria, Bulgaria, Czech Republic, Estonia, Finland, France, Germany, Great Britain, Greece, Hungary, Italy, Latvia, Lithuania, Moldova, Norway, Poland, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tanzania, the Netherlands, Ukraine (Mąkol and Wohltmann 2012). New record for the Turkish fauna.

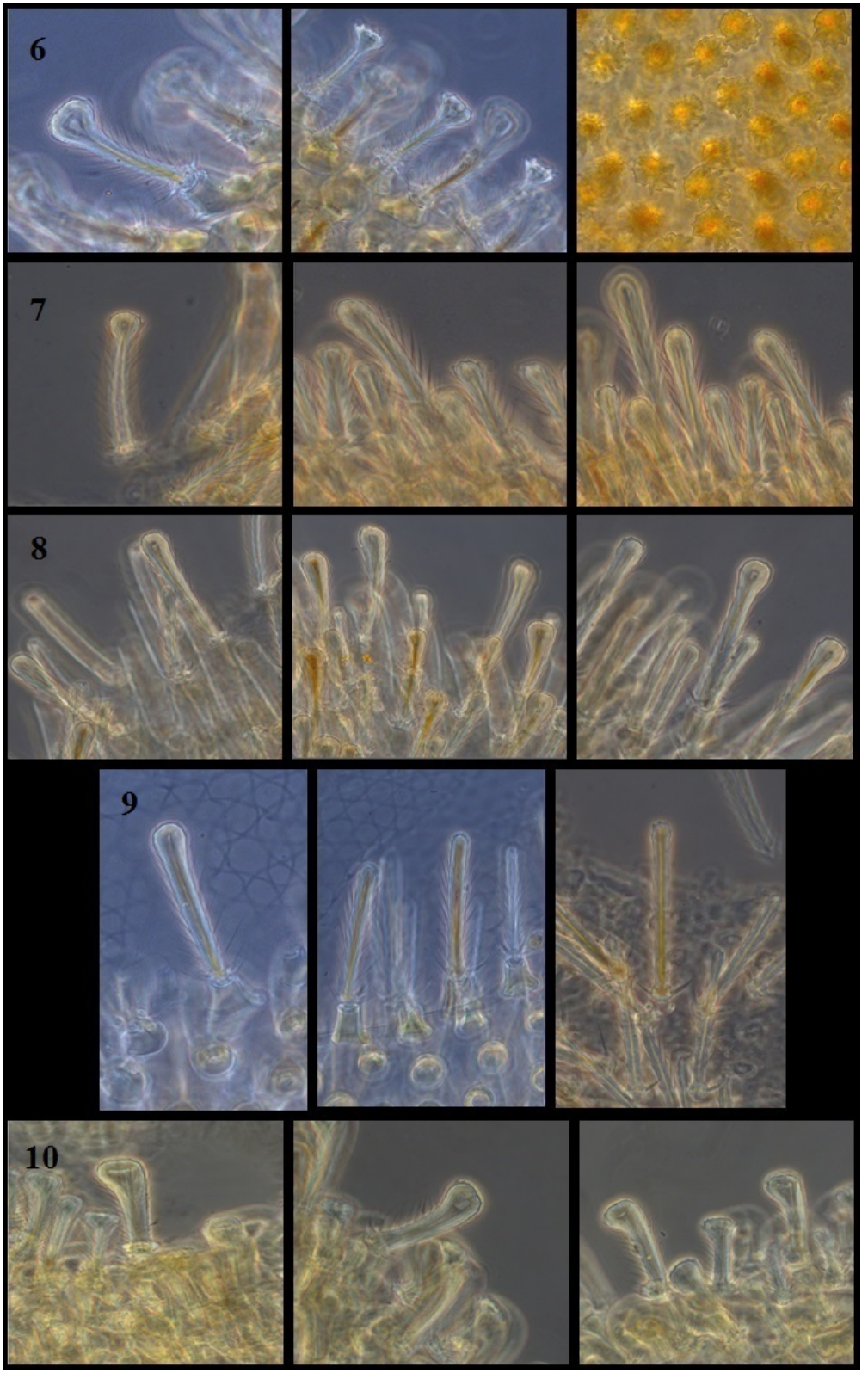
Trombidium latum C.L. Koch, 1837

Trombidium latum C. L. Koch, 1837: 15

Diagnosis. Adults: Live specimens with numerous small white spots on dorsal surface of idiosoma. Crista metopica prominently sclerotized and its anterior process narrow, with unclearly marked termination. Dorsal opisthosomal setae with different lengths, bases of setal stems of *pDS I* surrounded with very distinct and long setules. *pDS II* parallel-sided, with truncate top, also covered with tubercles (Figure 4).

Larvae: Setae *bs* in the shape of slender calyx, distally producing ca. 10 or 11 finger-like extensions. Scutum and scutellum porous on the whole surface. The whole stem of *AL* and *PL* setae covered markedly with barbs. Setae *SL* situated half length of the sclerite, covered with barbs. ƒD formula: 2(2)2-6-4-4-2. ƒV formula: 4u-2-2. ƒCx: NBN-BB-B. Legs. I: Tr (1n) - Fe (5n) - Ge (4n, 2σ, 1κ) - Ti (5n, 2φ, 1κ) - Ta (17n, 2ζ, lω, lε); II: Tr (1n) - Fe (4n) - Ge (3n, lσ, 1κ) - Ti (5n, 2φ) - Ta (14n, 1ω, 1ε); III: Tr (1n) - Fe (4n) - Ge (3n, lσ) - Ti (5n) - Ta (11n).

Specimens examined: Erzincan, Ergan Mountain, Caferli plateau, 39°38′49″N, 39°28′19″E, alt. 2127 m, 09 June 2011, 8 adults and 2 deutonymphs, litter from under *Juniperus* sp. (Leg. S. Adil). Erzincan, Ergan Mountain, Caferli plateau, 39°37′12″N, 39°28′24″E, alt. 2144 m, 15 June 2011, 46 adults (1 of which was male) and 10 deutonymphs, grassy-mossy soil. Erzincan, Ergan Mountain, Kasefe plateau, 39°37′55″N, 39°33′22″E, alt. 2052 m, 16 June 2011, 4 adults (1 of which was male) and 4 deutonymphs, mossy soil. Erzincan, Ergan Mountain, Dacirek stream, 39°36′11″N, 39°28′42″E, alt. 2068 m, 17 June 2011, 9 adults (1 of which was male) and 1



Figures 6–10. Microscope photographs of *pDS I* and *II* of *Trombidium* spp. **6.** *T. brevimanum*, **7.** *T. geniculatum*, **8.** *T. holosericeum*, **9.** *T. latum*, **10.** *T. mediterraneum*.

deutonymph collected on mossy soil close to stream and 168 larvae obtained by experimental rearing (Leg. S. Adil). Bayburt, Kop gateway, 40°02′12″N, 40°28′50″E, alt. 2160 m, 01 May 2014, 1 adult, mossy soil. Bayburt, Kop gateway, 40°02′12″N, 40°28′50″E, alt. 2160 m, 01 May 2014, 2 adults and 1 deutonymph, meadow samples. Bayburt, Kop gateway, 40°02′10″N, 40°28′29″E, alt. 2080 m, 18 May 2014, 3 adults, mossy soil near the stream, and 36 larvae obtained by experimental rearing (Leg. İ. Karakurt).

Distribution. Finland, France, Germany, Italy, Norway, Romania, Sweden, the Netherlands (Mąkol and Wohltmann, 2012). New record for the Turkish fauna.

Trombidium mediterraneum (Berlese, 1910)

Sericothrombium mediterraneum Berlese, 1910: 365

Diagnosis. Adults: Colors in life ranging from light red to dark red. Form of crista metopica strongly sclerotized. Anterior process unclearly terminated and rounded posterior process gradually expanding towards termination. *pDS I* covered with equal tubercles and with an air cavity at terminal part. *pDS II* irregular in shape at the top, with a few lobes and shorter than *pDS I* (Figure 5).

Specimens examined: Bayburt, 15th km on Erzurum road, 40°11′50″N, 40°18′35″E, alt. 1596 m, 18 April 2014, 3 adults, litter from under *Populus* sp. Bayburt, Kop gateway, 40°02′16″N, 40°30′48″E, alt. 2417 m, 18 May 2014, 2 deutonymphs, grassy soil, close to the stream (Leg. İ. Karakurt). Erzincan, Ergan Mountain, picnic area, 39°43′40″N, 39°29′23″E, alt. 1175 m, 29 October 2011, 3 adults, grassy-mossy soil (Leg. S. Adil).

Distribution. Algeria, Austria, Czech Republic, France, Great Britain, Greece, Hungary, Italy, Norway, Poland, Romania, Spain, Switzerland (Mąkol and Wohltmann, 2012). New record for the Turkish fauna.

4. Discussion

In this study, 5 species were recorded for the first time from Turkey. With the additions in this paper, the number of Trombidiidae species in Turkey has increased from 13 to 18. The morphologies of adult species of *Trombidium* are similar to each other; therefore, dorsal opisthosoma setae (*pDS*) are important diagnostic features in the genus. For this reason, in this paper we provided both photographs and drawings of the dorsal opisthosoma setae (*pDS I* and *II*) of the five species of the genus *Trombidium* (Figures 1–10).

The Turkish trombidiid species display great similarities with the general characteristics of previously known species described elsewhere. This suggests that these species show slight morphological variations. The following minor differences were detected between adults of the Turkish and European specimens. According to Mąkol (2005), the length of *pDS II* of females of *T. holosericeum* was min. 31.6 and max. 51.3, but in Turkish specimens it is min. 30 and max. 63, and the maximum length of *pDS I* of European females of *T. latum* reached 118.5 but in Turkish specimens it reached 110. Mąkol (2002) also recorded that *T. geniculatum* especially lives in forest areas. It was abundantly collected from the northeast of Turkey in forest, moss, and meadow areas. It was also indicated that *T. holosericeum* and *T. geniculatum* are broadly sympatric species.

Key to the adults of the genus *Trombidium* species known from Turkey (based on Mąkol, 2005)

1. *pDS* with rounded top in the distal part …… 2
- At least one type of *pDS* asymmetrical in the distal part ….....…….. 4

2. The longest *pDS* <110; crown-like structure around the setal stem base moderately developed ……..... 3
- The longest *pDS* >110; crown-like structure around the setal stem base distinctly developed …...……. *T. latum*

3. *pDS I* club-shaped, *pDS II* truncated ... *T. holosericeum*
- *pDS I* club-shaped, *pDS II* almost parallel-sided …… …….....……... *T. geniculatum*

4. *pDS I* slightly widened distally, with rounded, usually symmetrical termination; *pDS II* with irregular, distinctly frayed termination formed by several lob es…….....*T. mediterraneum*
- *pDS I* widened distally, usually asymmetrical termination, covered with several tubercles ……..…. 5

5. *pDS I* gradually widening towards the top, *pDS II* widened and slightly flattened at top… .....…*T. brevimanum*
- *pDS I* distinctly triangle-like (when flattened), widening at the distal part; *pDS II* not so distinctly widened, with tubercle-like protrusions at the top …… *T. rimosum*

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