

A REDESCRIPTION OF *TROMBIDIUM HOLOSERICUM* (LINNAEUS, 1758) (ACARI: ACTINOTRICHIDA: TROMBIDIOIDEA) WITH CHARACTERISTICS OF ALL ACTIVE INSTARS AND NOTES ON TAXONOMY AND BIOLOGY

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Abstract.— A detailed redescription of *Trombidium holosericeum* (L.), based on female is given. Characteristics of larvae, deutonymphs and adults as well as the data on their biology are provided. The selected neotype is a female, from which larvae have been obtained by experimental rearing. *Teresothrombium* is regarded as a new synonym of *Trombidium*. *T. latum* Koch, 1837 is a synonym of *T. holosericeum*, whereas *T. latum* s. Oudemans (1910, 1937), André (1926), Thor and Willmann (1947) – a synonym of *T. rimosum* Koch, 1837. *T. holosericeum* displays an almost edaphic life style except during mating and the parasitic phase of larvae. The life cycle is uni- to semivoltine, females may be iteroparous. Data on host range of larvae and physiological properties of eggs and protonymphs are given.



Key words.— Acarology, taxonomy, biology, life-history, neotype, Trombidiidae, *Trombidium*, *T. holosericeum*.

INTRODUCTION

Trombidium holosericeum is a member of a Holarctic genus including at present 34 nominal species. The systematic division of the genus has undergone several changes for many years and still, up to the present, has remained unclear. *T. holosericeum* was described by Linnaeus as *Acarus holosericeus* L. on the basis of the specimen representing an active postlarval stage and, since then, has been regarded as the most common member of the genus, recorded from many places in the Palaearctic.

Erection of the genus *Trombidium* by Fabricius (1775) was not accompanied by designation of its type species. The latter was done by Latreille (1810), who selected *T. holosericeum* as a type (type by subsequent designation, Opinion 104, 1928).

For many years *T. holosericeum* has remained known only from active postlarval stages. The attempts to correlate them with larvae, made by many authors, have not resulted in description of all stages of that species. Further history of *Trombidium* and *T. holosericeum* as well as some nomenclature problems were discussed by Vercammen-Grandjean (1973), Newell (1979), Southcott (1986) and Makol (1996).

The present paper contains data on taxonomy and biology of *T. holosericeum*. We hope that a comprehensive description of active life stages and biological data con-

cerning all instars will also serve as a reference in the process of differentiation of other species belonging to that genus.

MATERIAL AND METHODS

The material for present studies was collected at various localities in Europe (see the list of localities). The morphometric data of all the specimens mentioned in the list served for taxonomic description. Other data concerning distribution are not included in the list. The localities in Poland were assigned to physico-geographical mesoregions according to Kondracki (1994).

The following collecting methods were used: hand picking, pitfall traps, litter sifting and extraction in Berlese funnels. Larvae were additionally captured using an electric sucking trap and a sweep net (mesh 100 µm).

The specimens used for morphological measurements are of the following origin: 1. larvae attached to the hosts, collected in the field, 2. larvae reared from eggs deposited by adults collected in the field, 3. deutonymphs reared from larvae, 4. deutonymphs collected in the field, 5. adults collected in the field.

For rearing and parasitism experiments containers filled with charcoaled Plaster-of-Paris (glass vials: 40×30 mm and polystyrene boxes: 25×25×20 mm for the material from Poland and Germany, respectively) were used.

Saturated air humidity was achieved by addition of water to the substratum as required. Individuals were kept isolated at 20°C (\pm 1°C) with a 12h/12h light/dark cycle. Exceptions to the above are mentioned in the text. Larvae were tested for phototactic and geotactic responses using glass tubes (10 cm long, 2.5 cm in diameter), illuminated with a light source from alternating positions (phototaxy) or kept dark (geotaxy). Parasitism experiments (applies to samples from Germany only) were carried out in plastic boxes (100 × 100 × 100 mm) with the bottom covered with 1 cm charcoaled Plaster-of-Paris. Stones and pieces of plants (previously checked for the presence of eggs) were added to lift up and vary the surface; 100–200 larvae were exposed to 2–3 individuals of a potential host species. Fresh body mass of specimens was determined using a microbalance (Sartorius 4504MP8, \pm 0.2 μ g); freshly emerged larvae were measured in groups of 10 individuals, all other specimens were measured individually. The experimental design to examine desiccation resistance is described in Wohltmann (1998). All individuals were checked daily during the course of the experiments.

Specimens originating from Poland and Finland were macerated in Nesbitt's fluid after preservation in ethyl alcohol and then fixed on microscope slides in Faure's fluid. Specimens collected in Germany were cleared in lactic acid and mounted in polyvinyl-lactophenol. Drawings and measurements were made in Jenaval and Biolar (material from Poland and Finland) and Axiophot, Zeiss (material from Germany), respectively. Several specimens were used for scanning electron microscope studies. Photographs of selected structures (1. Figs 18, 19; 2. Figs 20–28; 3. Figs 30a, 31) were taken in SEM (1. JEOL JSM 5200; 2. SEM LEO 435 VP; 3. Philips SEM 515) after drying in critical point (1. Polaron, Watford, England; 2. Balzers CPD 010; 3. BAL-TEC CPD 030) and coating with gold (1. SEM Coating Unit PS 3, BIO-RAD; 2. Edwards Scancoat Six, Pirani 501; 3. Balzers SCD 040). Terminology applying to morphological structures was adopted after Robaux (1974) [R], Southcott (1961, 1986) [S] and Gabryś (1992) [G]. In several cases new abbreviations or some modifications of some existing terms were introduced [*].

The following abbreviations denote characters:

- ζ – eupathidium [R]
- ε – famulus [R]
- σ – solenidion on genu [R]
- ω – solenidion on tarsus [R]
- ϕ – solenidion on tibia [R]
- κ – vestigiala [R]
- fch* – formula describing the division and chaetotaxy of chelicera in larvae [R]
- fcc* – formula describing the chaetotaxy of coxa in larvae [R]
- fd* – formula describing the number of rows of setae and number of setae in a particular row on dorsum of opisthosoma in larvae (without setae on scutellum) [R]
- fPp* – formula describing the division and chaetotaxy of pedipalp in larvae [R]
- fst* – formula describing the chaetotaxy of sternal region, between coxae (epimera) [R]

- fV* – formula describing the number of rows of setae and number of setae in a particular row on ventrum of opisthosoma in larvae [R]
- AA – distance between the bases of AM setae [R]
- AL – non-sensillary seta of the 2nd pair (or the length of) on scutum in larvae [R]
- AM – non-sensillary seta of the 1st pair (or the length of) on scutum in larvae [R]
- AP – distance between the bases of AL and PL setae [R]
- ASB – distance between the anterior margin of scutum and the level of bases of S setae [R]
- AW – distance between the bases of AL setae [R]
- B – barbed seta on palps [R]
- bFe – basifemur (or the length of) [S*]
- bs – subcapitular seta, hypostomala [R, S]
- Ch – length of internal edge of cheliceral claw [*]
- CML – length of crista metopica [G]
- CMW – width of crista metopica [G]
- cs – adoral seta [R]
- Cx – coxa (or the length of) [R*]
- DN – deutonymph
- DS – dorsal setae (or the length of) [S]
- E – length of eye stalk in active postlarval forms [*]
- Fe – femur (or the length of) [S]
- Ge – genu (or the length of) [S]
- GOP – genital opening [*]
- HS – length of scutellum [R]
- IP – index pedibus; the total length of legs (including coxae) [R*]
- L – body length, without gnathosoma
- l – length
- l/w – length by width
- LSS – width of scutellum [R]
- LV – larva
- MA – distance between the bases of AM and AL setae [R]
- N – nude (not specialized) seta on palps [R]
- n – normal (not specialized) seta, nude or barbed, on legs [R]
- PaTa – palptarsus (or the length of) [S]
- pDS – posterodorsal setae (or the length of) on opisthosoma (pDS I, pDS II – posterodorsal setae of first and second type, respectively) [S*]
- PL – non-sensillary seta of the 3rd pair (or the length of) on scutum in larvae [R]
- PSB – distance between the level of bases of S setae and the posterior margin of scutum [R]
- PW – distance between the bases of PL setae [R]
- S – sensilla (or the length of) on crista metopica in active postlarval forms and on scutum in larvae [R]
- SB – distance between the bases of sensillary setae of crista metopica in active postlarval forms and of scutum in larvae [R]
- SL – non-sensillary seta (or the length of) on scutellum [R]
- SS – distance between the bases of SL setae [R]
- Ta – tarsus (or the length of) [S]
- tFe – telofemur (or the length of) [S*]
- Ti – tibia (or the length of) [S]
- TiCl – palptibial claw (or the length of) [*]
- Tr – trochanter (or the length of) [S]
- W – body width
- w – width

L and W, contrary to other characters, are not of crucial importance, as they show a significant variability range, affected by various factors (e.g. physiological condition, way of mounting the specimen).

All metric characters are given in micrometers. In calculation of the mean value, standard deviation and variability coefficient of particular characters, biometrical data of the neotype were included. Values given in brackets in species description apply to the metric characters (mean value, minimum–maximum, number of specimens observed) not included in standard measurements.

LIST OF LOCALITIES

In listing localities from Roztocze Upland (localities 31–38) we partly followed Gabryś and Małkol (1994). Locality in Bielska Plain (43) is given after Małkol and Gabryś (1999). All other localities from Poland are cited after Małkol (1998b). Data are given according to the following scheme: locality; sample date; collector; number of instars (code numbers).

POLAND

Dolina Dolnej Odry [Lower Odra Valley]

1. Bielinek nad Odrą [Bielinek on the Odra River] nature reserve

A/. Querceto-Lithospermetum subboreale; 24–26.10.1987; L. Buchholz; 4 DN (PL/1843, PL/1844, PL/1902, PL/1909)

B/. Fraxinio-Ulmetum; 24–26.10.1987; L. Buchholz; 1 ♀ (PL/1845)

C/. Fraxinio-Ulmetum; 14–16.11.1987; M. Bunalski, L. Buchholz; 2 DN (PL/1327, PL/1849)

D/. edge of *Acer campestre* ravine, on soil surface; 12.4.1991; M. Bunalski; 1 ♀ (PL/1900)

E/. beech forest, on path; 5.7.1985; G. Gabryś; 1 ♀ (PL/1907)

2. Olszyna Źródłiskowa nature reserve ad Lubiechów, on path; 6.7.1985; G. Gabryś; 6 ♀♀ (PL/1911, PL/1912, PL/1913, PL/1916, PL/1917, PL/1918)

Wybrzeże Słowińskie [Słowińskie Coast]

3. Darłówko ad Darłowo

A/. edge of alder and pine forest; 7.5.1985; G. Gabryś; 1 ♀ (PL/1429)

B/. alder stand at the seashore, in sod and moist litter; 4.5.1985; G. Gabryś; 2 ♂♂ (PL/1549, PL/1550)

C/. marshy pine forest; 4.5.1985; G. Gabryś; 3 ♀♀ (PL/1568, PL/1570, PL/1571), 3 ♂♂ (PL/1569, PL/1572, PL/1573)

D/. pine forest, in grass and soil; 5.5.1985; G. Gabryś; 2 ♀♀ (PL/1558, PL/1559), 3 ♂♂ (PL/1556, PL/1557, PL/1560)

E/. pine forest, in grass and litter; 6.5.1985; G. Gabryś; 5 ♀♀ (PL/1561, PL/1564, PL/1565, PL/1566, PL/1567)

Równina Gorzowska [Gorzów Plain]

4. vicinity of Barlinek, on the lake Sitno, litter in mixed forest; 15.7.1991; G. Gabryś; 1 ♀ (PL/1235)

Kotlina Gorzowska [Gorzów Valley]

5. Radolin ad Trzcianka; litter in deciduous forest (*Quercus* sp., *Alnus* sp., *Corylus avellana*), close to the river; 15.7.1968; Cz. Błaszak; 1 DN (PL/1817)

Równina Wrzeńska [Września Plain]

6. Promno ad Poznań; on Dębieckie lake, transitional zone between alder stand and mixed forest, litter; 20.5.1960; J. Rafalski; 1 DN (PL/1950)

Wysoczyzna Kaliska [Kalisz Upland]

7. Krotoszyn; in manure; 26.5.1984; J. Turzański; 1 ♀ (PL/1825)

Kotlina Żmigrodzka [Żmigród Valley]

8. Wzgórze Joanny [Joanna's Hill] nature reserve; dry litter with *Vinca minor*; 27.4.1993; J. Małkol, G. Gabryś; 1 ♂ (PL/1668)

Kotlina Milicka [Milicz Valley]

9. Ruda Milicka; on path, close to the pond; 7.5.1989; G. Gabryś; 2 ♀♀ (PL/1690, PL/1691), 1 ♂ (PL/1692)

Wzgórza Ostrzeszowskie [Ostrzeszów Hills]

10. on the way Marcinki – Syców; ca 1 km from the road Warszawa – Syców; close to the old abandoned house, in moss, under broken pieces of roof tiles; 7.5.1994; J. Małkol; 1 ♂ (PL/1831)

Pradolina Wroclawska [Wrocław Ancient Valley]

11. Wrocław

A/. garden at Mickiewicza street, on soil surface; 28.4.1991; J. Małkol; 2 ♀♀ (PL/1057 [H27/1991], PL/1201 [H29/1991])

B/. larvae obtained (3.6.1991) by experimental rearing from female PL/1057 [H27/1991] (see the list of localities 11A); 19 LV (PL/2288, PL/2289, PL/2290, PL/2291, PL/2292, PL/2293, PL/2294, PL/2295, PL/2296, PL/2297, PL/2298, PL/2299, PL/2300, PL/2301, PL/2302, PL/2303, PL/2304, PL/2305, PL/2306)

C/. garden at Mickiewicza street, on soil surface; ?6.1990; J. Małkol; 1 ♂ (PL/2198)

D/. Wrocław – Biskupin; garden; 20.6.1985; W. Kornalewicz; 6 ♀♀ (PL/1882, PL/1883, PL/1888, PL/1891, PL/1896, PL/1899), 1 ♂ (PL/1886)

E/. Wrocław – Biskupin; on soil surface, by the wall; 11.4.1985; G. Gabryś; 1 ♂ (PL/2207)

F/. Wrocław – Leśnica; at the tram terminus, patch of vegetation of dry-ground forest type; 1.5.1992; G. Gabryś; 2 ♂♂ (PL/1672, PL/1674)

G/. Wrocław – Swojec; allotment garden; 27.05–2.07.1985; W. Kornalewicz; 2 ♀♀ (PL/1682, PL/1683), 1 ♂ (PL/1684)

12. Radwanice ad Wrocław; inflows on the pond shore; 16.5.1984; L. Borowiec; 1 ♀ (PL/1700), 1 DN (PL/1702)

Równina Wroclawska [Wrocław Plain]

13. Magnice ad Wrocław; in the apiary, under the *Malus* sp. tree; 31.3.1994; P. Chorbiński; 2 ♀♀ (PL/2139, PL/2141), 2 ♂♂ (PL/2143, PL/2144)

Równina Opolska [Opole Plain]

14. vicinity of Lubliniec; compost fertilized soil; 1.5.1985; R. Dobosz; 1 ♂ (PL/1357)

Kotlina Warszawska [Warszawa Valley]

15. Łomna ad Warszawa; allotment garden, on bed; 25.4.1984; L. Borowiec; 1 DN (PL/2019)

Dolina Środkowej Wisły/ Równina Warszawska [Central Vistula Valley/ Warszawa Plain]

16. Warszawa – Rakowiec; allotment gardens; in compost and on vegetable beds; clayey soil; 24.4.1984; E. Nowakowski; 1 DN (PL/1000)

Równina Piotrkowska [Piotrków Plain]

17. Spała nature reserve ad Piotrków Trybunalski; on the trunks of old trees; 18.5.1985; B. Soszyński; 2 ♀♀ (PL/1342, PL/1343)

Równina Łukowska [Łuków Plain]

18. Jata nature reserve ad Łuków; Tilio-Carpinetum; on the trunk of hornbeam; 7.5.1983; U. Skowerska; 2 ♀♀ (PL/1346, PL/1347)

Masyw Ślęży [Ślęża Massif]

19. at the foot of Radunia mountain, on the side of Tąpadła pass, mixed forest; sod with *Juncus* sp. and litter; 2.5.1987; G. Gabryś; 1 DN (PL/1634)

20. Sobótka Zachodnia; tourist trail, 300 m from the railway station by the wall; 26.4.1986; G. Gabryś; 1 ♂ (PL/2031)

Obniżenie Otmuchowskie [Otmuchów Depression]

21. Skalki Stoleckie [Stoleckie Rocks] nature reserve ad Ząbkowice Śląskie; xerothermic meadow with *Sarothamnus scoparius*; slope with trees; 20.6.1989; J. Makoł, G. Gabryś; 1 ♀ (PL/1791)

Góry Kaczawskie [Kaczawskie Mts.]

22. Wojcieszów; 24.4.1993; K. Bullman; 1 ♂ (PL/1434)

Góry Stołowe [Stołowe Mts.]

23. vicinity of Pasterka; on path in *Picea* forest; 24.5.1989; J. Makoł; 1 ♂ (PL/1795)

Pogórze Orlickie [Orlickie Foothills]

24. Taszów ad Lewin Kłodzki

A/. surroundings of hunting hut; *Populus tremula* litter; 2.5.1992; J. Makoł, G. Gabryś; 2 ♂♂ (PL/1798, PL/1800)

B/. on path, on the side of cultivated field, under stones; 2.5.1992; J. Makoł, G. Gabryś; 1 ♂ (PL/1785)

Góry Orlickie [Orlickie Mts.]

25. Zieleniec; meadow with single trees on sunny slope; 18.6.1991; Z. Klukowski; 1 ♂ (PL/1794)

Kotlina Kłodzka [Kłodzko Valley]

26. Puchaczówka pass, on the way between Bystrzyca Kl. and Stronie; sod on mountain meadow; 23.5.1983; G. Gabryś; 1 DN (PL/1781)

Masyw Śnieżnika [Śnieżnik Massif]

27. Kletno and vicinities

A/. slope covered with herbaceous vegetation; 16.6.1993; G. Gabryś; 1 ♀ (PL/1796)

B/. Kletno; trunks on Kleśnica stream, in moss; limestone debris; 50 m from the entrance to Bear Cave; 29.4.1994; M. Pakiet; 1 ♀ (PL/2408 [H171/1994])

C/. larvae obtained by experimental rearing (3.6.1994) from female PL/2408 [H171/1994] (see the list of localities 27B); 27 LV (PL/2374, PL/2375, PL/2376, PL/2377, PL/2378, PL/2379, PL/2380, PL/2381, PL/2382, PL/2383, PL/2384, PL/2385,

PL/2386, PL/2387, PL/2388, PL/2389, PL/2390, PL/2391, PL/2392, PL/2393, PL/2394, PL/2395, PL/2396, PL/2397, PL/2398, PL/2399, PL/2400)

Chełm [Chełm]

28. Łubie Dolne ad Pyskowice; Tilio-Carpinetum; litter and rotten wood; 11.5.1985; G. Gabryś; 1 ♀ (PL/2072), 2 ♂♂ (PL/2071, PL/2076)

29. Łubie Górne ad Pyskowice

A/. Tilio-Carpinetum; inflows on the stream shore; 11.5.1985; G. Gabryś; 3 ♀♀ (PL/2092, PL/2093, PL/2095)

B/. Tilio-Carpinetum; litter; 11.5.1985; G. Gabryś; 1 ♀ (PL/2077), 1 ♂ (PL/2078)

Wyżyna Katowicka [Katowice Upland]

30. Gliwice

A/. garden at Gen. Andersa street; 16.4.1986; G. Gabryś; 1 DN (PL/2066)

B/. garden at Gen. Andersa street; in soil and on soil surface; 10.5.1986; G. Gabryś; 1 ♀ (PL/2114), 3 DN (PL/2118, PL/2119, PL/2123)

C/. garden at Gen. Andersa street; in soil; 7.4.1984; G. Gabryś; 1 ♂ (PL/2185)

D/. garden at Gen. Andersa street; in soil; 17.5.1984; G. Gabryś; 1 ♂ (PL/2186)

E/. Sienkiewicza street; dry leaves on lawn, close to the wall; 1.4.1994; G. Gabryś; 4 ♂♂ (PL/2150, PL/2153, PL/2154, PL/2156)

F/. cementary at Gen. Andersa street; litter and sod; 12.5.1985; G. Gabryś; 3 ♂♂ (PL/2131, PL/2132, PL/2133)

Roztocze Zachodnie [Western Roztocze Upland]

31. Lipowiec ad Zwierzyniec; transitional grass (mesoxerothermic); 14.6.1989; L. Borowiec; 1 ♀ (PL/598)

Roztocze Środkowe [Central Roztocze Upland]

32. Zwierzyniec

A/. surroundings of the house – PAS research station; under stones and leaves; 21.4.1986; G. Gabryś; 1 ♂ (PL/16)

B/. Surroundings of the house – PAS research station; under stones and leaves; 22.4.1986; G. Gabryś; 2 ♂♂ (PL/15, PL/956)

C/. park; inflows and litter on the Wieprz river bank; 10.6.1988; G. Gabryś; 2 ♀♀ (PL/388, PL/389), 1 ♂ (PL/386)

33. vicinity of Zwierzyniec; meadow on the Wieprz river; 22.5.1986; W. Jędrzyckowski; 1 ♂ (PL/20)

34. Roztoczański National Park, Bukowa Góra [Beech Mountain] nature reserve; 2.6.1987; D. Iwan; 1 ♀ (PL/954)

35. Dziewcza Góra; meadow with herbaceous vegetation; 9.6.1989; M. Bunalski; 1 ♀ (PL/270)

36. Nad Tanwią [On the Tanew River] nature reserve, ad Susiec; grazed meadow; 13.6.1987; G. Gabryś; 1 ♀ (PL/957)

Roztocze Wschodnie [Eastern Roztocze Upland]

37. vicinity of Hrebennie; mixed coniferous forest; litter; 22.4.1986; G. Gabryś; 1 ♂ (PL/30)

38. Płazowska Mountain; mesoxerothermic vegetation on limestone ground; 13.6.1987; D. Iwan, G. Gabryś; 1 ♂ (PL/1442)

Nizina Nadwiślańska [Nadwiślańska Lowland]

39. Sandomierz; slope on the way to city market; 16.6.1987; G. Gabryś; 1 ♀ (PL/1585)

Pogórze Wiśnickie [Wiśnickie Foothills]

40. Lipnica Murowana; multispecies mixed forest, on the river bank, close to the Za Dworem [behind the Manor House] spring; litter; 1.5.1986; G. Gabryś; 2 DN (PL/1576, PL/1577)

Bieszczady Zachodnie [Western Bieszczady Mts.]

41. Dołżyca ad Lesko; Solinka terrace, under stones; 4.5.1965; W. Starega; 2 ♀♀ (PL/1011, PL/1012), 2 ♂♂ (PL/1009, PL/1014)
42. Wołosate terrace; under stones; 26.4.1965; W. Starega; 1 ♀ (PL/1008)

Równina Bielska [Bielska Plain]

43. Białowieża Primeval Forest, Białowiecki National Park; Tilio-Carpinetum in the S part of strict nature reserve; in soil, at trees; 29.6.1961; B. Burakowski; 1 ♀ (PL/1534)

GERMANY**Bremerhaven, Northern Germany**

44. Osterviertelsmoor

A/. margins of oak – birch forest adjacent to a fresh meadow, 10 cm deep in the soil; 7.3.1989; A. Wohltmann; 1 ♂ (TH270389A1)

B/. fresh meadow; LV parasitic on Miridae and Ichneumoniidae; 21.7.1989; A. Wohltmann; 2 reared DN (TH210789L1, TH210789L2)

C/. fresh meadow; LV parasitic on Miridae and Ichneumoniidae; 30.7.1989; A. Wohltmann; 3 reared DN (TH300789L2; TH300789L4; TH300789L5)

D/. fresh meadow; LV parasitic on Cantharidae 03.08.1989; A. Wohltmann; 1 reared DN (TH030889L2)

E/. fresh meadow; LV parasitic on Brachycera and Miridae; 11.8.1989; A. Wohltmann; 3 reared DN (TH110889L2L; TH110889L2R; TH110889L3)

F/. margins of oak – birch forest, on litter; 1 ♀; 01.4.1990; A. Wohltmann; 2 LV reared from eggs (TH290491E1; TH290491E2)

G/. on litter; 16.5.1990; A. Wohltmann; 1 DN (TH160590DN)

H/. eggs 10 cm in the soil; 17.6.1990; A. Wohltmann; 1 reared LV (TH170690E)

I/. oak-birch forest; 1 LV parasitic on Aphididae; 15.8.1990; A. Wohltmann; 1 reared DN (TH150890L)

J/. 1 adult in soil; 06.4.1991; A. Wohltmann; 1 ♀ (TH060491A1), 1 LV reared from eggs (TH080491E)

45. house garden in Langen

A/. on soil surface; 08.3.1989; A. Wohltmann; 1 ♂ (TH080389A)

B/. 1 adult on soil surface; 27.3.1989; A. Wohltmann; 1 ♀ (TH270389A2), 1 LV reared from eggs (TH070489E)

Stoteler Wald, Bremen, Northern Germany

46. near forest margins, on soil surface; 10.5.1988; R. Olomski; 4 ♀♀ (TH100588A1-4)

Drepte between Bremerhaven and Bremen, Northern Germany

47. beneath bridge, on stones; 07.6.1996; A. Wohltmann; 1 ♀ (TH070696A)

Charlottenhorst, Mecklenburg-Vorpommern, Northern Germany

48. house garden

A/. adults, 10 cm deep in soil; 15.2.1998; P. Lederer; 2 ♀♀ (TH150298A2, TH150298A3), 2 ♂♂ (TH150298A1, TH150298A4), 1 LV reared from eggs (TH020398E)

B/. adults, 10 cm deep in soil; 21.2.1998; P. Lederer; 1 ♀ (TH210298A), 1 LV reared from eggs (TH250398E)

Großbeeren, Berlin

49. ruderal area near cultivated field

A/. larvae parasitic on Miridae and Cantharidae; 23.7.1996; A. Wohltmann; 1 LV (TH230796L), 1 reared DN (TH230796LA)

B/. larvae parasitic on Miridae; 30.7.1996; A. Wohltmann; 1 reared DN (TH300796L15)

50. margins of fenn wood

A/. larvae parasitic on Miridae; 24.7.1996; A. Wohltmann; 2 reared DN (TH240796L3, TH240796L5)

B/. larvae parasitic on Brachycera and Miridae; 20.7.1998; A. Wohltmann; 2 reared DN (TH200798L1-2)

National Park "Lower Odra Valley", East Germany

51. fresh meadow, adults on soil surface, 10.05.1997, S. Scheidegger; 1 ♀ (TH100597A), 1 LV reared from eggs (TH200597E2)

SCOTLAND**Wigtown, Wigtownshire**

52. adults in litter of mesoxerothermic meadow; 18.5.1998; D. Frisch; 2 ♀♀ (TH180598A1-2), 1 LV reared from eggs (TH290598E)

FINLAND**Nauvo Berghamn Boskär (666:20)**

53. hazel slope; 30.5.–24.7.1990; K. Heikka & P.T. Lehtinen; 2 ♀♀ (SF/164, SF/165)

Houtskari Jungfruskär (668:17)

54. Maren-SW, grove meadow; 29.5.–23.7.1990; K. Heikka, P. T. Lehtinen; 1 ♂ (SF/233)

Parainen Sydmo Ippos (669:23)

55. deciduous forest; 24.5.1967; P. T. Lehtinen; 1 ♂ (SF/155)

Kuusisto (670:25)

56. Manor House, edge of deciduous forest, at the side of road; 28.5.1995; J. Małkol, G. Gabryś, P.T. Lehtinen; 3 ♂♂ (SF/1020, SF/1021, SF/1031), 2 DN (SF/1016, SF/1019)

Kankaanpää Makkaramäki (686:25)

57. in the yard; 9.7.1981; R. Niemi; 1 ♀ (SF/284)

TAXONOMY

The lists of synonyms of *Trombidium* and *T. holosericeum* are suggested by authors and adequate to the present state of knowledge. However, the complete lists can be provided only after the analysis and redescription of other *Trombidium* spp. and re-examination of the type material.

***Trombidium* Fabricius, 1775**

Acarus Linnaeus, 1758 (part)

Trombidium Fabricius, 1775

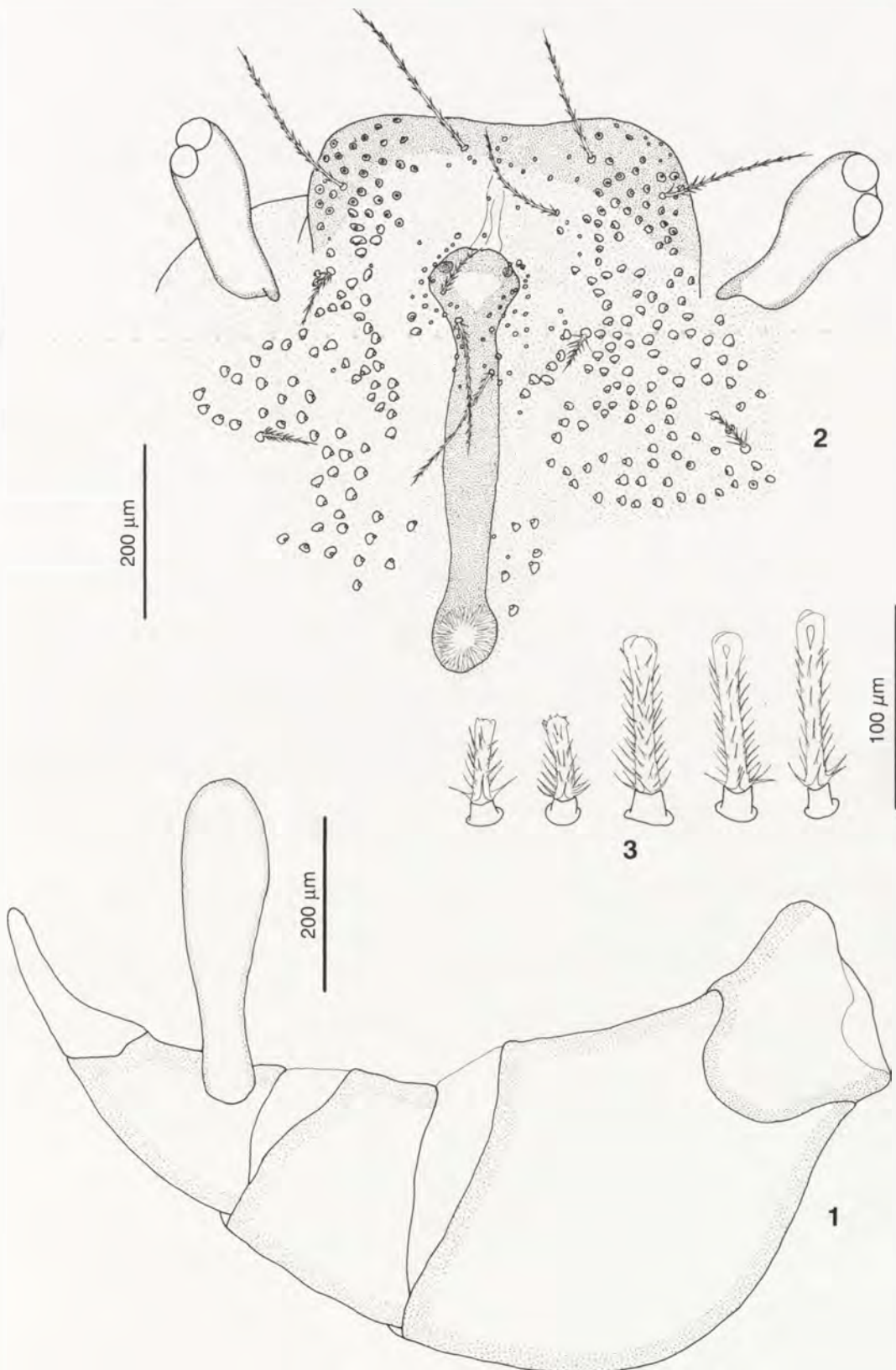
? *Atomus* Latreille, 1795 [LV]

Metathrombidium Oudemans, 1909 [LV]

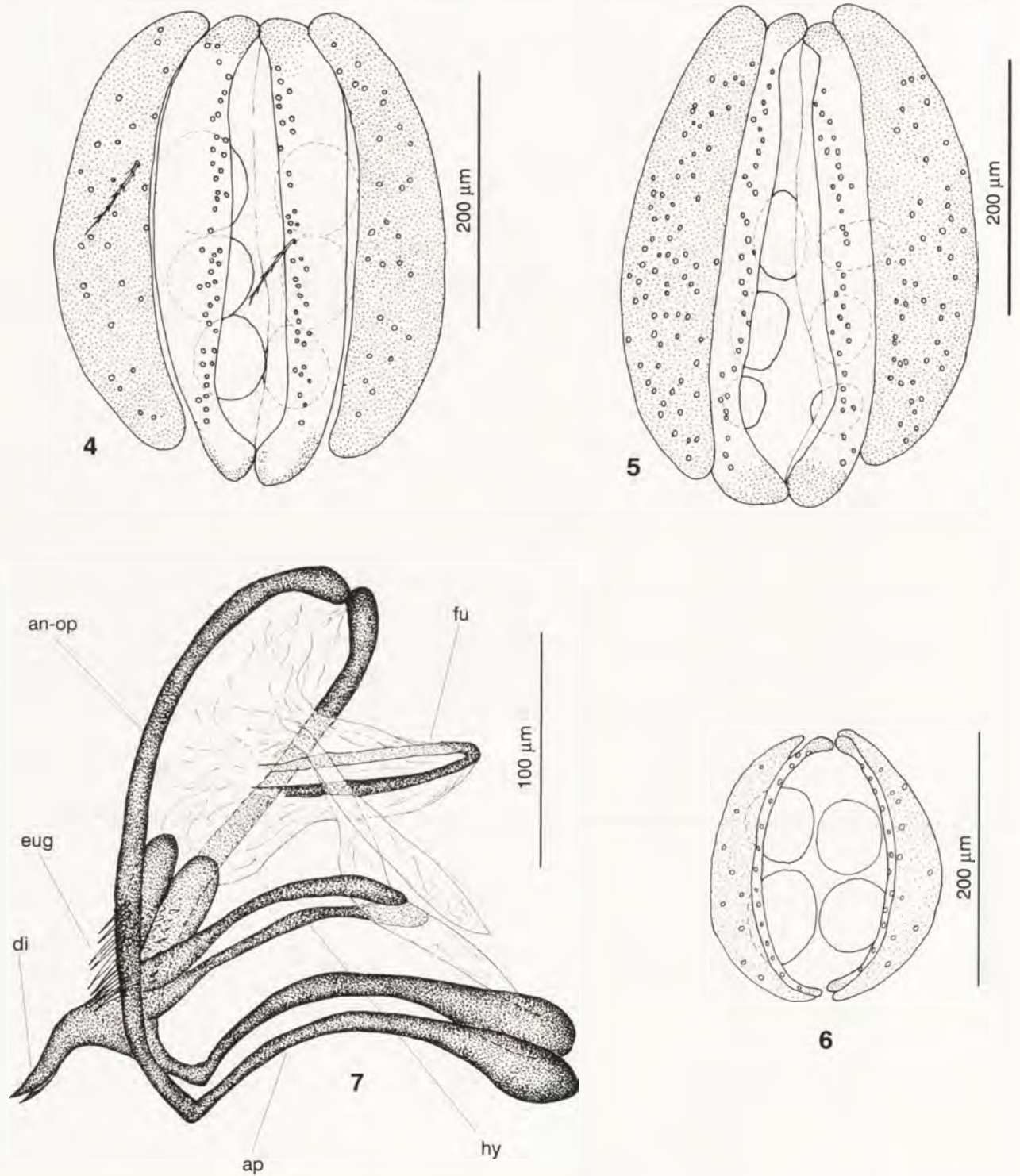
Trombidium (*Eutrombidium*) Verdun, 1909 [LV]

Character	Sex/Instar	Number of specimens	Mean	Minimum	Maximum	Standard deviation	Coefficient of variation
L	Females	37	3373.85	2464.00	4974.20	575.98	17.07
	Males	41	2374.54	1463.00	2926.00	324.04	13.65
	Deutonymphs	17	1555.40	1124.20	2310.00	369.76	23.77
W	Females	31	2536.50	2032.80	3388.00	369.68	14.57
	Males	41	1843.87	1185.80	2310.00	245.07	13.29
	Deutonymphs	17	1161.33	785.40	1617.00	270.87	23.32
L/W	Females	31	1.30	1.14	1.61	0.12	9.23
	Males	39	1.28	1.10	1.44	0.08	6.25
	Deutonymphs	17	1.35	1.14	1.51	0.12	8.89
CML	Females	61	434.20	308.10	554.00	57.43	13.23
	Males	37	322.69	201.45	398.95	49.60	15.37
	Deutonymphs	30	204.49	106.00	272.55	45.93	22.46
CMW	Females	10	100.70	75.00	167.00	25.80	25.62
	Males	4	94.50	79.00	110.00	15.29	16.18
	Deutonymphs	13	51.23	35.00	66.00	8.84	17.26
S	Females	15	320.90	242.00	360.00	32.29	10.06
	Males	12	270.35	217.80	308.10	28.77	10.64
	Deutonymphs	14	174.50	110.00	229.00	36.43	20.88
E	Females	63	202.28	169.85	229.00	14.21	7.02
	Males	48	166.89	122.45	193.55	15.10	9.05
	Deutonymphs	32	94.50	42.00	130.35	21.88	23.15
SB	Females	48	67.92	51.35	90.85	9.94	14.63
	Males	40	54.66	35.55	67.15	6.91	12.64
	Deutonymphs	17	40.20	31.60	55.30	6.87	17.09
Ch	Females	64	153.23	102.70	229.00	20.33	13.27
	Males	50	127.66	86.90	172.00	14.14	11.08
	Deutonymphs	32	84.97	62.00	110.00	14.22	16.74
Ti CI	Females	70	170.32	118.50	238.00	24.87	14.60
	Males	49	146.93	90.85	189.60	22.90	15.59
	Deutonymphs	37	94.84	57.00	126.40	14.50	15.29
Pa Ta	Females	71	300.90	220.00	402.90	36.41	12.10
	Males	49	240.59	169.85	316.00	28.73	11.94
	Deutonymphs	36	125.21	70.00	177.75	25.57	20.42
p DS I	Females	57	85.88	71.10	106.65	10.32	12.02
	Males	46	72.06	57.42	86.90	5.80	8.05
	Deutonymphs	20	48.29	39.50	59.25	5.68	11.76
p DS II	Females	57	42.94	31.60	51.35	4.06	9.45
	Males	46	35.34	23.76	51.35	5.33	15.08
	Deutonymphs	20	24.49	19.75	31.60	4.72	19.27
pDS I/II	Females	57	2.02	1.38	3.12	0.33	16.34
	Males	46	2.08	1.38	3.00	0.31	14.90
	Deutonymphs	20	2.01	1.50	2.50	0.29	14.43
GOP I	Females	73	388.84	319.95	474.00	34.68	8.92
	Males	53	390.24	288.35	454.25	35.57	9.11
	Deutonymphs	31	155.82	88.00	217.25	36.83	23.64
GOP w	Females	59	314.13	217.25	438.45	44.99	14.32
	Males	48	265.80	201.45	335.75	32.18	12.11
	Deutonymphs	20	140.82	94.80	197.50	30.71	21.81
GOP l/w	Females	59	1.26	0.82	1.66	0.16	12.70
	Males	47	1.49	1.19	1.90	0.18	12.08
	Deutonymphs	20	1.24	1.00	1.55	0.15	12.10
Ti I	Females	78	495.49	338.80	670.00	68.85	13.90
	Males	57	389.94	277.20	477.40	45.74	11.73
	Deutonymphs	37	195.47	114.00	277.20	41.85	21.41
Ta I I	Females	78	682.91	508.20	877.80	81.80	11.98
	Males	57	598.21	431.20	739.20	66.03	11.04
	Deutonymphs	37	283.15	158.00	415.80	65.04	22.97
Ta I w	Females	64	241.19	169.40	338.80	31.55	13.08
	Males	51	203.92	147.00	261.80	23.80	11.67
	Deutonymphs	20	139.26	102.70	169.40	18.18	13.05
Ta I l/w	Females	64	2.90	2.39	3.54	0.28	9.66
	Males	51	2.98	2.53	3.69	0.26	8.72
	Deutonymphs	20	2.27	2.00	3.00	0.24	10.57

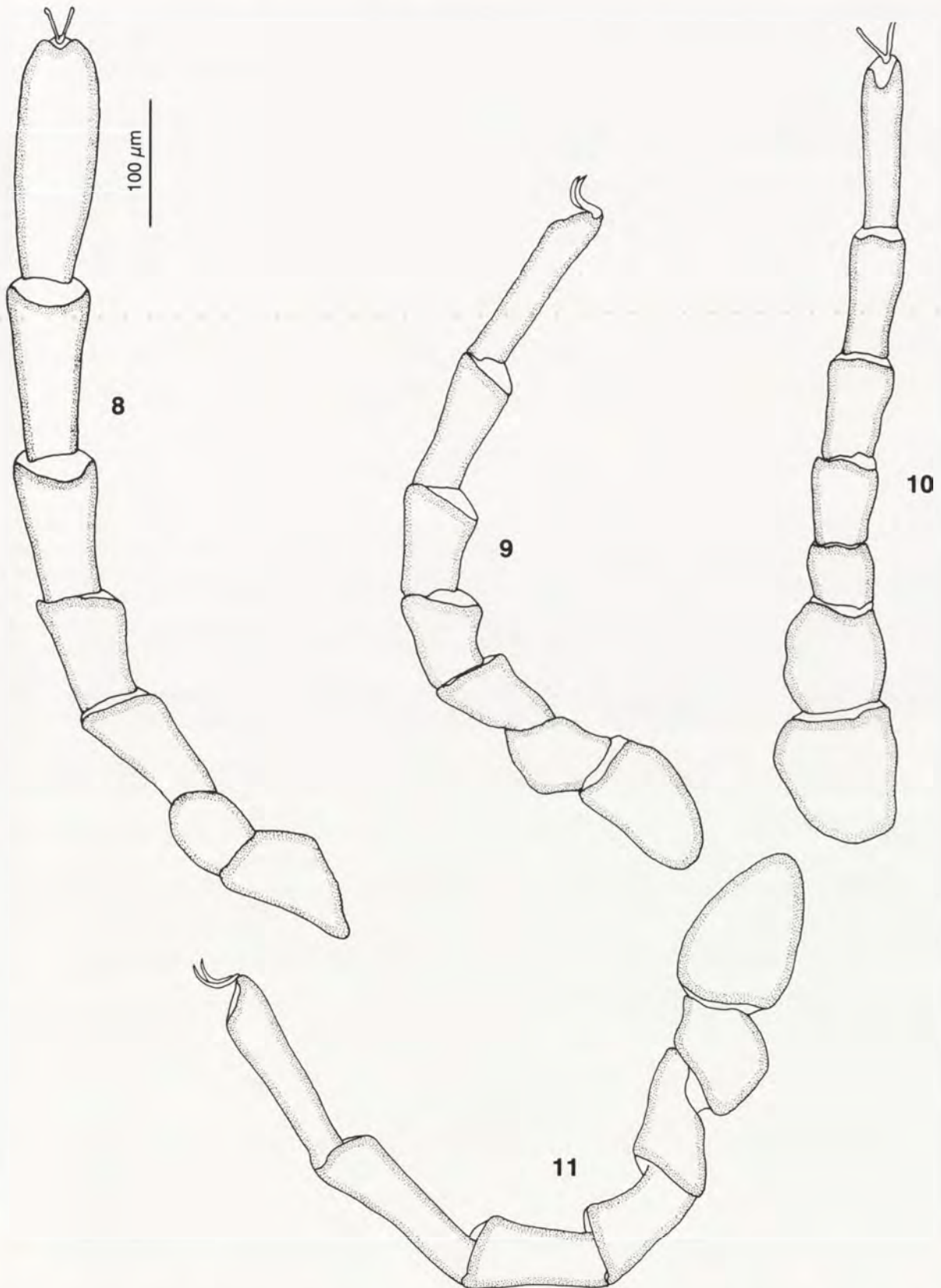
Table 1. *T. holosericeum*. Metric characters of deutonymphs and adults.



Figures 1–3. *T. holosericeum* (Linnaeus, 1758), female, neotype. (1) Palp, (2) aspidosoma (circle-shaped marks, except for two bases of sensillae on crista metopica, indicate normal setae), (3) dorsal opisthosomal setae.



Figures 4–7. *T. holosericeum* (Linnaeus, 1758). (4) Female genital opening, (5) male genital opening, (6) nymph genital opening, (7) male genital apparatus, an-op – anellus-operculum, di – diverticulum, ap – apodeme, hy – hypoapodeme, fu – furca, eug – eugenital setae. Circle-shaped marks in Figs 4–6 indicate normal setae.



Figures 8–11. *T. holosericeum* (Linnaeus, 1758), female, neotype, legs without chaetotaxy. (8) Leg I, (9) leg II, (10) leg III, (11) leg IV.

Sericothrombium Berlese, 1910

Trombidium (*Teresothrombium*) Feider 1951 [LV] syn. nov.

Trombidium (*Holothrombium*) Feider, 1951 [LV]

Teresothrombium: Feider 1952, 1955

Trombidium (*Teresothrombium*): Southcott 1986

Type species. *Acarus holosericeus* L.

See also: Thor and Willmann 1947, Southcott 1986

Trombidium holosericeum (Linnaeus, 1758)

? *Acanus parasitius* de Geer, 1778 [LV]

Trombidium latum Koch, 1837 syn. nov.

? *Thrombidium poriceps* Oudemans, 1904 [LV]

Non *T. latum* s. Oudemans 1910, 1937; André 1926; Thor and Willmann 1947

Sericothrombium scharlatinum Berlese, 1912

See also: Thor and Willmann 1947 and "Discussion on taxonomy" in this paper.

Diagnoses

Adult. Eyes on slightly curved peduncles. Crista metopica relatively narrow and long. Dorsal opisthosomal setae of two types: longer – pDS I – in the shape of club and with rounded top; shorter – pDS II – with slightly flattened top, covered with more protruding tubercles than in pDS I. In males dorsal setae wider at the distal end and more truncated than in females. The proximal end of pDS surrounded by elongated setules. Genital plates of females and males similar in size (see data in Table 1). Three pairs of genital acetabula. Two parallel rows, each formed of 9 eugenital setae, at the basis of anellus-operculum complex of male genital apparatus.

T. holosericeum belongs to the group of species, in which adults have all dorsal opisthosomal setae at least parallelsided or widened at the top and differentiated into two types, both with respect to the length and shape. It differs from most other members of that group in the length of dorsal setae. *T. holosericeum* is similar to *T. geniculatum* Feider, 1955, from which it can be distinguished by the size of male genital plate (in males of *T. geniculatum* the plate is almost 1.5× bigger than in females).

Deutonymph. Two pairs of genital acetabula. The shape of eyes, crista metopica and dorsal setae – as in adult. For further differences between deutonymph and adult – see descriptions.

Larva. Setae *bs* with the proximal part in shape of calyx and 13–14 finger-like branchlets of different length in the distal part. *fP_p* formula: 0-N-0-NNN-BBNζζωω. Palptibial claw divided on entire length. Setae on scutellum situated at half length of the sclerite. *fD* formula: 2-2-6-4-4-2; *fV* formula: 4-2-2. Solenidion (ω) on Ta I situated at 1/4 length of the segment.

Larva of *T. holosericeum* differs from other *Trombidium* species in the shape of *bs* setae. Among those e.g. *T. brevimanum* (Berlese, 1910) has simpler hypostomatae, narrowing in the apical part, with several setules along the stem (Wohltmann 1999b).

Descriptions

Adult. Standard measurements in Table 1. Color in life red. Idiosoma trapezoidal, with distinct "shoulders" and well-marked incision at the posterior end.

Gnathosoma. Two-segmented chelicerae and robust palps (Fig. 1) present. Cheliceral blade serrated in the distal half of its inner edge. A pair of stigmata located halfway the cheliceral shaft, between chelicerae. Stigmata jointed with broad trachea, which widen to form an aerial sac, from which several small tracheae originate. Palptibia with at least 1 long tectal eupathidium. Palptarsus slightly extending behind the termination of palptibial claw, with numerous solenidia (Figs 18, 19).

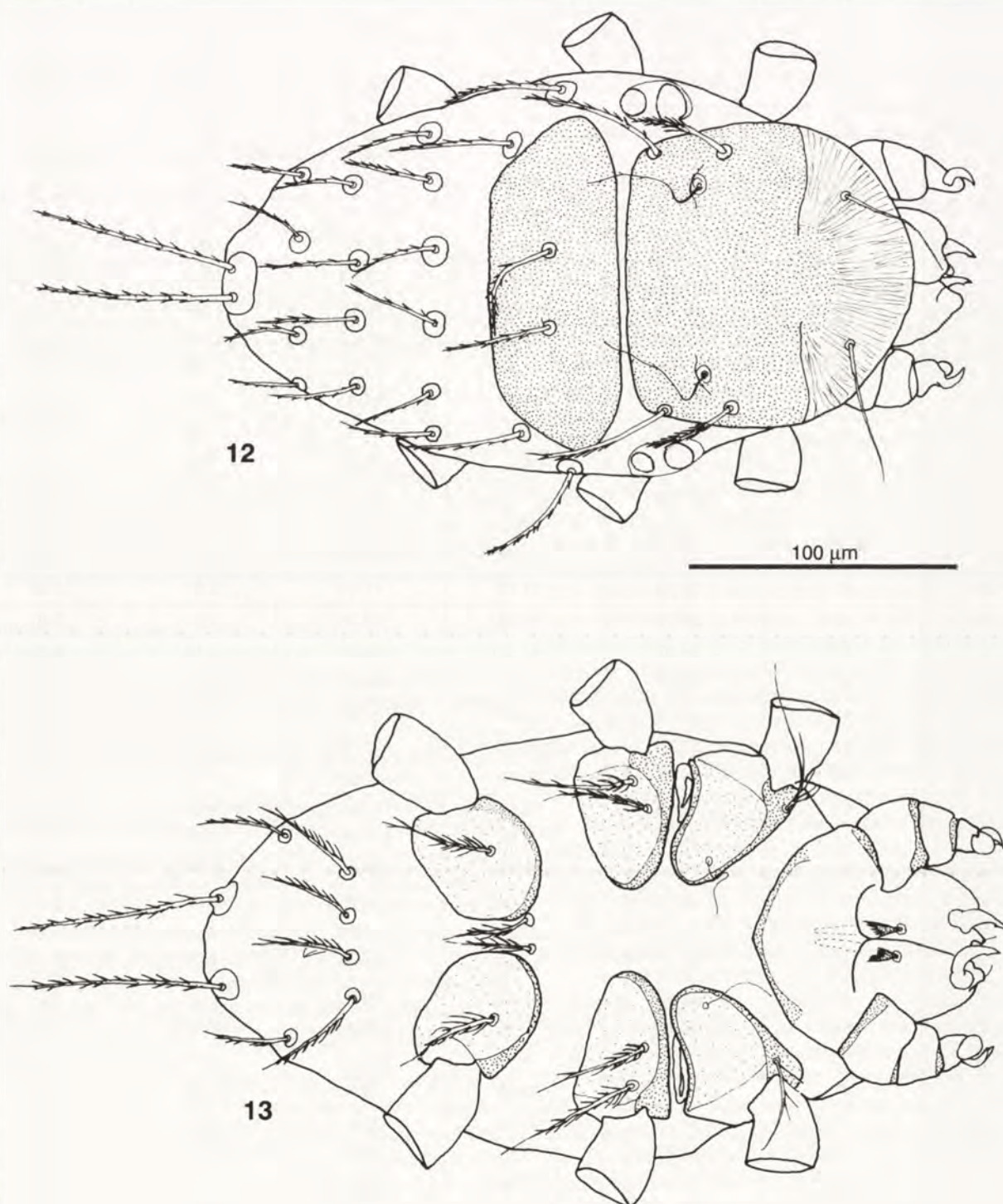
Dorsal side of idiosoma. Crista metopica relatively narrow and long (Fig. 2). The anterior process of crista with no clearly marked termination. Sensillary area widened; sensillary setae covered with fine setules (Fig. 20). Eyes on slightly curved peduncles. Idiosomal setae of different shape, all situated on trunk-shaped bases and covered with branchlets. Setae on aspidosoma narrowing apically. Posteriad, from the border aspidosoma – opisthosoma, setae gradually pass into club-like, parallelsided, and then into terminally distended. Posterodorsal opisthosomal setae (Figs 3, 21) of two types: longer pDS I in the shape of club and with several tubercles covering rounded top (Fig. 22); shorter pDS II with slightly flattened top, covered with more protruding tubercles than in pDS I (Fig. 23). The proximal end of pDS surrounded by elongated setules, forming an asterisk-like ring. In males dorsal setae wider at the distal end and more truncated than in females.

Ventral side of idiosoma. Setae tapered towards apex in the anterior part of the body, pass into slightly thicker and blunted towards the opisthosomal termination. At the end of opisthosoma all ventral setae parallelsided, with rounded top. Genital opening at the level of coxae III/IV. Three pairs of genital acetabula. Epivalval and centrovalval setae covered with setules (Figs 4, 5, 24). Male genital apparatus (Fig. 7) with two parallel rows, each formed of 9 eugenital setae, at the basis of anellus-operculum complex. Anal pore posterior to genital opening, longitudinal.

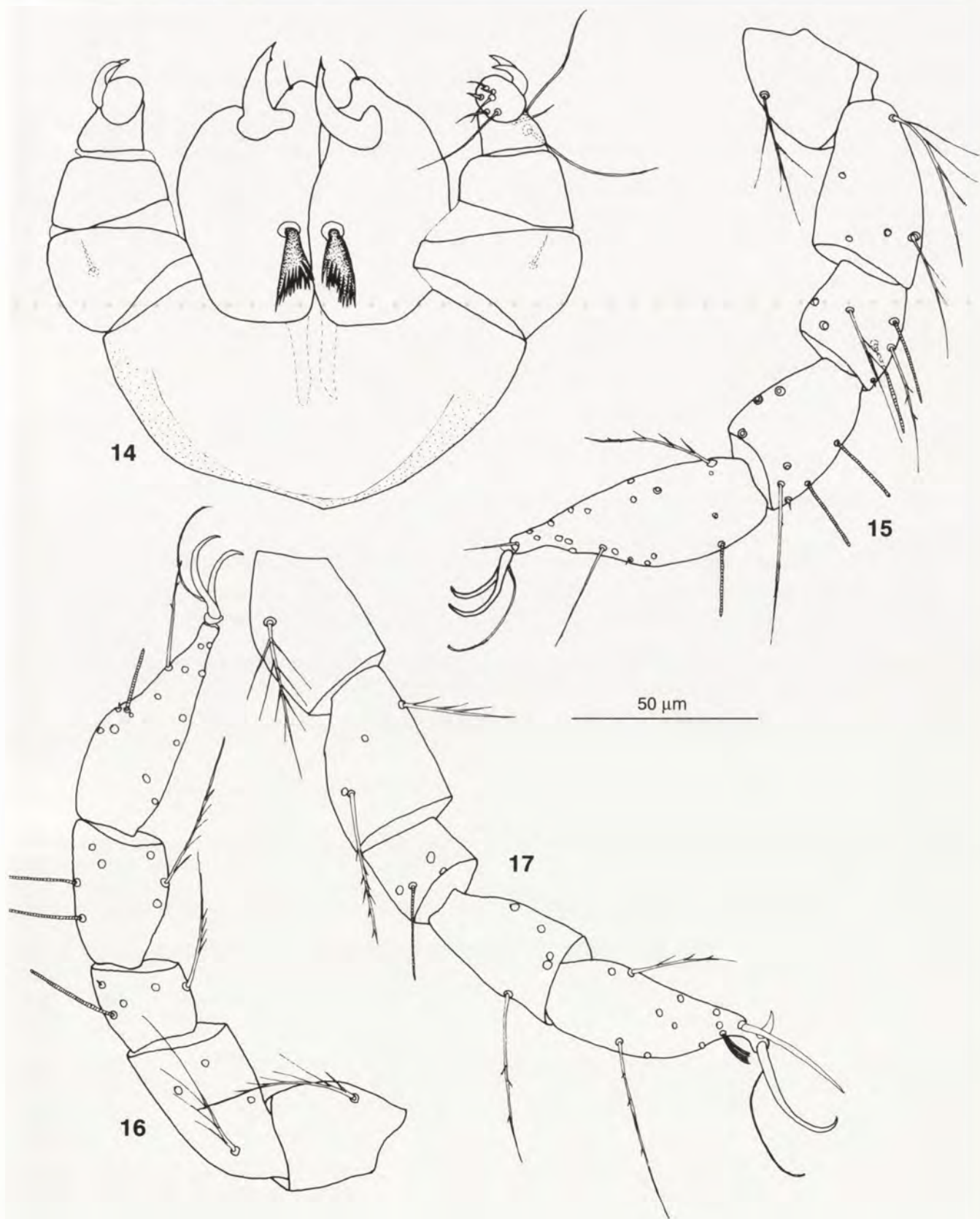
Legs I–IV (Figs 8–11). Leg segmentation formula: 7-7-7-7. Femur divided into basifemur and telofemur. All segments densely covered with setae. Normal setae narrowing apically, with setules. Specialized setae on legs: leg I – telofemur with 0–1 solenidion, genu with 10–26 solenidia, tibia with 5–9 microsetae (κ) and several solenidia, tarsus with numerous solenidia; leg II – telofemur with 1 solenidion, genu with 1κ and 4–14 solenidia, tibia with 8–17 solenidia, tarsus with numerous solenidia; leg III – telofemur with 1 solenidion; genu with 8–20 solenidia, tibia with 2κ and 15–26 solenidia, tarsus with numerous solenidia; leg IV – telofemur with 0–1 solenidion, genu with 8–32 solenidia, tibia with 1κ and 20–35 solenidia, tarsus with 5–10 solenidia. Microsetae κ (when present) always in antero-dorsal position. Solenidia on tarsus I distributed all over the surface; in other leg segments (including tarsi II–IV) solenidia

Character	Number of specimens	Mean	Minimum	Maximum	Standard deviation	Coefficient of variation
L	29	298.50	284.40	316.00	9.49	3.18
W	29	179.79	169.85	189.60	5.84	3.25
L/W	29	1.66	1.56	1.78	0.06	3.61
AA	34	68.27	61.38	75.00	2.98	4.36
AW	36	113.74	108.00	118.80	3.35	2.95
PW	37	115.16	109.00	124.74	3.64	3.16
SB	37	83.71	79.00	91.08	2.73	3.26
ASB	37	97.76	89.10	104.00	2.92	2.99
PSB	37	34.83	29.70	40.00	3.82	10.97
AP	37	31.40	26.00	37.62	3.12	9.94
AM	36	53.29	45.54	77.00	7.24	13.59
AL	39	42.81	37.00	47.52	2.69	6.28
PL	39	67.03	59.00	77.22	4.10	6.12
S	31	58.59	45.54	68.00	5.22	8.91
MA	36	57.85	55.00	61.38	1.85	3.20
HS	41	61.23	57.00	67.32	2.51	4.10
LSS	36	150.35	125.00	158.40	6.28	4.18
SL	36	53.84	46.00	59.40	4.94	9.18
SS	35	39.41	29.00	49.50	4.61	11.70
DS_MIN	40	35.43	27.72	41.58	2.82	7.96
DS_MAX	40	56.70	44.00	63.36	5.56	9.81
CX_I	41	59.07	47.52	68.00	5.12	8.67
TR_I	41	40.27	33.66	44.00	2.11	5.24
FE_I	41	46.72	39.60	57.00	3.52	7.53
GE_I	41	25.77	21.78	31.00	2.62	10.17
TI_I	41	39.21	35.64	46.00	2.82	7.19
TA_I	41	69.46	63.36	77.00	2.69	3.87
LEG I	41	280.49	253.44	311.00	13.87	4.94
CX_II	41	59.66	51.48	70.00	3.91	6.55
TR_II	41	39.25	33.66	46.00	2.42	6.17
FE_II	40	45.12	39.60	50.00	2.12	4.70
GE_II	40	22.52	19.80	27.00	2.31	10.26
TI_II	40	37.12	33.66	40.00	1.99	5.36
TA_II	39	64.46	59.40	69.30	2.46	3.82
LEG II	38	267.97	251.42	290.00	9.83	3.67
CX_III	41	54.36	49.50	59.40	2.45	4.51
TR_III	41	43.71	37.62	48.00	2.85	6.52
FE_III	41	43.87	39.60	48.00	2.26	5.15
GE_III	40	21.45	19.80	26.00	1.81	8.44
TI_III	41	40.70	35.64	44.00	2.31	5.68
TA_III	38	57.95	51.48	65.34	2.90	5.00
LEG III	37	262.82	247.50	277.00	6.82	2.59
IP	36	811.69	754.38	870.00	28.68	3.53

Table 2. *T. holosericeum*. Metric characters of larvae.



Figures 12–13. *T. holosericeum* (Linnaeus, 1758), larva. (12) Dorsal side of the body, (13) ventral side of the body.



Figures 14–17. *T. holosericeum* (Linnaeus, 1758), larva. (14) Gnathosoma, (15) leg I (trochanter – tarsus), (16) leg II (trochanter – tarsus), (17) leg III (trochanter – tarsus). Circle-shaped marks in Figs 15–17 indicate normal setae.

(when present) restricted to dorso-lateral position, often in groups; solenidia on telofemur placed laterally.

Deutonymph. Standard measurements in Table 1. Color in life and shape of the body as in adult. Two pairs of genital acetabula (Fig. 6).

Leg I: genu with 1 microseta (κ) and 5–8 solenidia, tibia with 2–3 κ in anterior dorsal position and several solenidia, tarsus with numerous solenidia; leg II: telofemur with 0–1 solenidium, genu with 1 κ and 2–8 solenidia, tibia with 1 κ and 3–13 solenidia, tarsus with numerous solenidia; leg III: telofemur with 0–2 solenidia, genu with 2–7 solenidia, tibia with 1 κ and 2–5 solenidia, tarsus with numerous solenidia; leg IV: telofemur with 0–1 solenidium, genu with 1 κ and 4–8 solenidia, tibia with 1 κ and 4–9 solenidia, tarsus with 1–4 solenidia.

For other characters – see description of adult.

Larva. Standard measurements in Table 2. Body in life orange with red eye-spots.

Gnathosoma (Fig. 14). Setae *bs* (19.4, 18–22, $n=10$) in the shape of calyx, with 13–14 finger-like branchlets of different length in the distal part (Fig. 25). *fch* = 1–0. Cheliceral blade curved, with one small tooth-like process close to the end of internal edge of blade. Mean length of entire chelicera 73.6 (70–79, $n=10$). Setae *cs* short, acicular. *fPp* formula: 0-N-0-NNN-BBN $\zeta\zeta\omega\omega$. On palpfemur (23.64, 20–26, $n=11$) a spine-like seta placed dorsally. No setae on palpgenu (19.55, 16–21, $n=11$). Palptibia (18.36, 16–20, $n=11$) with one nude (or – in one case observed – with tiny barb) seta in ventral proximal part, one nude seta placed laterally and one short smooth seta placed dorsally. Palptibial claw (12.89, 11–15, $n=9$) divided on entire length. Palptarsus (Fig. 26) with one long seta in posterior lateral part of the segment, one shorter seta in posterior medial part, one median smooth seta in anterior lateral position, two eupathidia placed anteriorly and strongly bend backwardly (shorter than normal setae) and two solenidia (shorter than eupathids).

Dorsal side of idiosoma (Fig. 12). Scutum porous on the whole surface (Fig. 27). The effect of striation of anterior part of scutum is visible in the light microscope only (see: "Discussion on taxonomy"). AM setae with very tiny setules, covering mainly the proximal part of setal stem. The end of AM setae filiform. Sensillary setae S covered with few setules. Setae AL with many barbs aggregated mostly in the distal half of seta. PL with barbs along the whole shaft. AL always shorter than PL. Scutellum porous on the whole surface. Setae SL situated half length of the sclerite, covered with barbs. The integument on dorsal side of idiosoma plicated in wave-shaped lines. Two pairs of eyes at the level of posterior edge of scutum, each pair situated on the oval sclerite and slightly protruded above the idiosoma surface. Anterior lens (12.22, 11–16, $n=9$) larger than the posterior one (8.33, 7–10, $n=9$). *fD* formula: 2-2-6-4-4-2. Setae in rows c-f (31–53) situated on small tubercles, with barbs covering the whole shaft. The last pair (h_1) much longer (84) than the preceding setae and placed on a common sclerite.

Ventral side of idiosoma (Fig. 13). *fV* formula: 4u-2-2. The shafts of setae slightly thinner than on dorsal side of idiosoma, also covered with barbs. Mean length of setae in

1st row: 40, in 2nd row: 35. The last pair placed on separated sclerites, much longer (84) than the preceding setae. Uropore (10) surrounded with membranous valves. *fcx* = NBN-BB-B. Setae on Cx I: supracoxala (15) in antero-lateral position, close to the coxa – trochanter joint, one seta (60) with few long setules (max. 22), in antero-lateral position and one smooth seta (40) in antero-medial position. Setae on Cx II: medial (48), lateral one (48). Seta on Cx III (40). *fst* = 0-0-B. Urstigma elongated, situated between Cx I and Cx II.

Legs I–III (Figs 15–17). I: Tr (1n) – Fe (5n) – Ge (4n, 2 σ , 1 κ) – Ti (5n, 2 ϕ , 1 κ) – Ta (17n, 1 ω , 2 ζ , 1 ϵ); II: Tr (1n) – Fe (4n) – Ge (3n, 1 σ , 1 κ) – Ti (5n, 2 ϕ) – Ta (13n, 1 ω , 1 ϵ); III: Tr (1n) – Fe (4n) – Ge (3n, 1 σ) – Ti (5n) – Ta (10n). Seta on Tr I (40) with 3–6 long setules. Proximal seta on Fe I with setules much longer than in other setae. Solenidium (ω) on Ta I situated at $\frac{1}{4}$ length of the segment. On Ta III termination (Fig. 28) the posterior claw reduced to a spur-like seta, much shorter than the other claws. At the end of Ta III also an accessory sword-like seta (tip broken in Fig. 28), the length of which is comparable with the length of normally developed anterior claw, and short ensiform seta, similar in its length to the reduced posterior claw.

Type material

Neotype: female PL/1057 [H27/1991] collected in Wrocław, Poland (see locality list: 11 C) deposited in Zoologisches Institut und Zoologisches Museum der Universitaet Hamburg (ZIZMUH). Two larvae (PL/2293, PL/2294) obtained from female PL/1057 – deposited in ZIZMUH, the remaining larvae obtained from the same female – in authors collection.

Distribution

Palaearctic.

DISCUSSION ON TAXONOMY

The history of *T. holosericeum*, applying most of all to possible synonyms, is very much confused. For many years the name "*T. holosericeum*" has been used for one of the biggest *Trombidium*, originating mainly from synanthropic habitats. On the other hand, *T. holosericeum* has been described several times under different names. Because no types of *T. holosericeum* are available, and previous descriptions of active postlarval forms of *T. holosericeum* did not allow a precise differentiation of that species from other *Trombidium* spp., a safe identification of *T. holosericeum* was impossible. However, the overall resemblance of the species described in the present paper to the published description with *T. holosericeum*, the geographic distribution and the inhabited biotope type make its identity *T. holosericeum* (L.).

In 1837 Koch described *T. rimosum*. It follows from the original description that the author dealt with mites having a cordiform idiosoma, covered with short and blunted setae: "T. late cordatum, postice cinnabarinum, papillis brevibus, obtusis" (Koch 1837). Again, from the description of

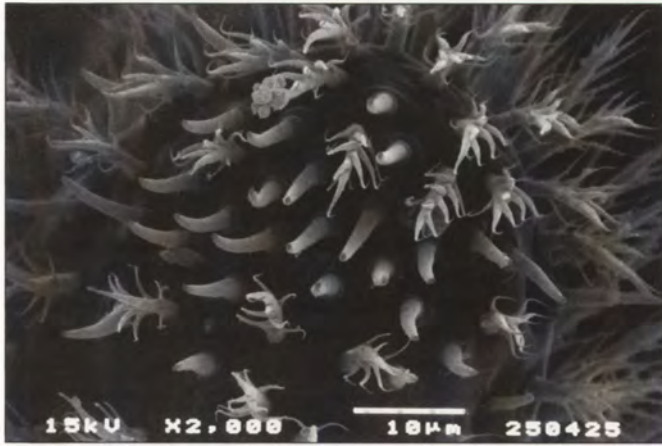


Figure 18. *T. holosericeum* (Linnaeus, 1758), adult. Distal end of palptarsus.



Figure 19. *T. holosericeum* (Linnaeus, 1758), adult. Specialized setae on palptarsus.



Figure 20. *T. holosericeum* (Linnaeus, 1758), adult. The base of S seta on crista metopica.



Figure 21. *T. holosericeum* (Linnaeus, 1758), adult. pDS setae.



Figure 22. *T. holosericeum* (Linnaeus, 1758), adult. Distal end of pDS I seta.



Figure 23. *T. holosericeum* (Linnaeus, 1758), adult. Distal end of pDS II seta.

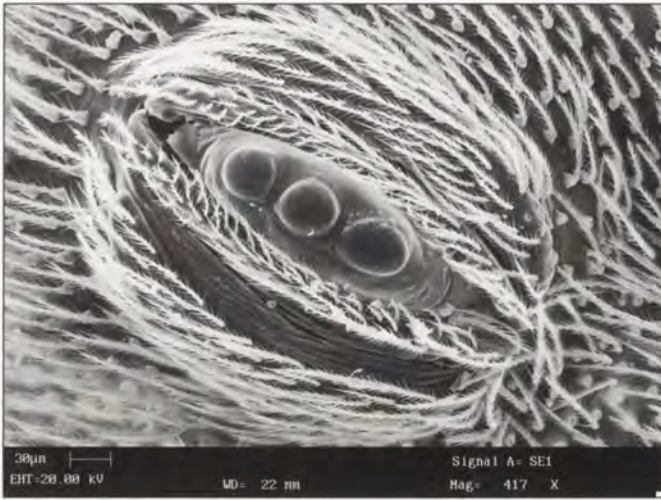


Figure 24. *T. holosericeum* (Linnaeus, 1758), adult. Genital opening.



Figure 25. *T. holosericeum* (Linnaeus, 1758), larva. Subcapitular seta (bs).

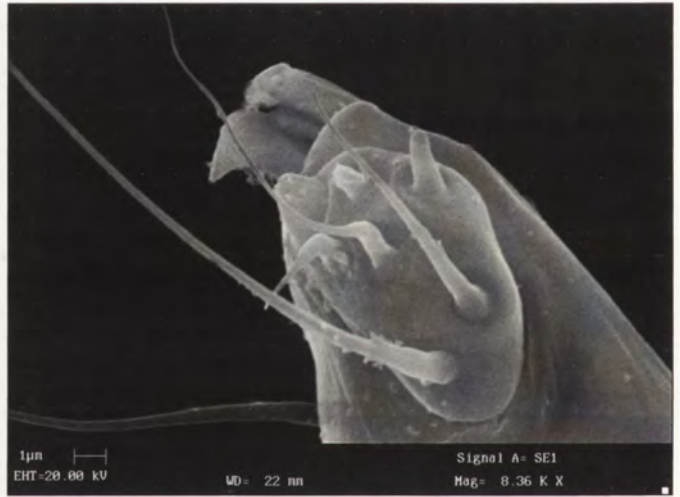


Figure 26. *T. holosericeum* (Linnaeus, 1758), larva. Palptarsus.



Figure 27. *T. holosericeum* (Linnaeus, 1758), larva. Anterior part of scutum.



Figure 28. *T. holosericeum* (Linnaeus, 1758), larva. Distal end of Ta III.

T. latum published in the same paper, it can be inferred that the representatives of the species have wide but short idiosoma, densely covered with relatively long setae: "T. occineum, breve, latum, convexum apicesubimpressum, papillis longiusculis, crassis et densis" (Koch 1837). In 1910 Oudemans pointed out at the similarities between *T. rimosum* and *T. holosericeum*. Moreover, among differentiating characters of *T. latum*, he also listed short, distally widened setae. In one of his subsequent papers Oudemans (1937) stated that *T. rimosum* and *T. holosericeum* were similar with respect to the size and shape of the body and that *T. rimosum* was densely covered with thick and trunk-shaped setae of medium length. André (1926) considered *T. rimosum* and *T. scharlatinum* Berlese, 1912 to be synonyms of *T. degeeri* Oudemans, 1910. On the other hand like Oudemans, he recognized the presence of short setae (40), markedly widened in the distal part as one of the main diagnostic characters of *T. latum*. The diagnostic characters of *T. rimosum* given by Thor and Willmann (1947) are

in a way congruent with those which are listed for *T. latum*; for both species the authors gave the same length of setae (120–150)! Cooreman (1955), in his short characteristics of *T. latum*, supplemented by a drawing of dorsal seta, mentioned characters, which also fit the description of *T. holosericeum*. In the material studied by Cooreman, specimens with relatively long pDS I (90–100), and shorter pDS II (20–30) were present. It should be pointed out that the length and shape of dorsal setae in active postlarval stages are of the main diagnostic importance within the genus *Trombidium*. It follows from the original descriptions of *T. latum* and *T. rimosum* that the former species has longer setae, and the latter – shorter ones. Because of recurrent misidentifications of *T. latum* and *T. rimosum* made by many authors (except for Cooreman) and with respect to the Article 49 of ICZN rules, the names appropriate for particular taxa and congruent with the original descriptions should be restored. Therefore *T. latum* s. Oudemans (1910, 1937), André (1926), Thor and Willmann (1947) is regarded as a synonym of *T. rimosum*, whereas *T. latum* s. Koch (1837) and Cooreman (1955) becomes a synonym of *T. holosericeum*.

The attempts to find out what is the larva of *T. holosericeum* have come across several problems. Vercammen-Grandjean et al. (1977) put forward a supposition that *Acarus parasiticus* (= *T. parasiticum*) de Geer, 1778, known only from larvae, can actually represent the larva of *T. holosericeum*. Southcott (1986) was also in favour of the hypothesis. However, the idea has not finally resulted in synonymization of *A. parasiticus* with *T. holosericeum*, and, in consequence, in recognition of *Atomus* as a synonym of *Trombidium*. While studying the material from Oudemans' collection [Nationaal Natuurhistorisch Museum, Leiden, The Netherlands, slides labelled: *Atomus parasiticus* and *Metathrombium parasitica*] we could confirm the similarity between *A. parasiticus* and *T. holosericeum* larva (the latter obtained by experimental rearing).

In 1904 Oudemans described *Thrombidium* [sic!] *poriceps* based on larvae, and, in one of his subsequent publications (Oudemans 1905), he finally acknowledged it to be a synonym of *T. holosericeum*. More precise characteristics of *T. poriceps* was given by Heim and Oudemans (1904a, 1904b). *T. poriceps* was regarded as larva of *T. holosericeum* also by Feider (1951). Southcott (1986) inserted *T. poriceps* in the key to larval species of *Trombidium*, but he applied to the characters, which are also typical for larvae that we have obtained from females representing *T. holosericeum*.

The ultimate solution of the synonymization problem implies the necessity to study the type material in de Geer's collection (probably lost) and also the type specimen of *T. poriceps* in Oudemans' collection.

In 1951 Feider described the subgenus *Teresothrombium*, with the type species *Paratrombium teres* André, 1928, based on the division of anterior dorsal scutum in larvae. In 1952 the subgenus was raised by Feider to the generic rank. Southcott (1986) maintained the division pro-

posed by Feider (1951), however, he expressed some doubt as to the subgeneric criteria. On the other hand he applied to the differentiating character, such as the presence of striae on the anterior part of scutum. Our analysis of the specimens belonging to *Trombidium*, carried out both in light and scanning microscopes, has provided evidence that the striation of scutum appears only in specimens mounted on microscopic slides but is not visible in SEM (Fig. 27). In *Trombidium*, the effect of striation is, most probably, a consequence of folding of the smooth surface of scutum. This, in turn, can depend on the type of fixation and type of medium used by different authors. It should be marked here that in Microtrombidiidae, by contrast, the striation of scutum and scutellum is strictly associated with the grooved surface of sclerites. Except for the character discussed, *T. teres* (André, 1928) exhibits all the characters typical for the representatives of *Trombidium*. This is a sufficient reason to treat *Teresothrombium* as a synonym of *Trombidium*.

T. holosericeum has been recorded so far from most European countries (e.g. Great Britain (Hull 1918); Norway (Thor 1900); Finland (Krogerus 1960); France (Robaux 1966); The Netherlands (Oudemans 1897); Germany (Małol 1998a); Poland (Małol 1998b); Switzerland (Schweizer and Bader 1963); Czech Republic (Willmann 1938); Hungary (Gabryś and Małol 1991); Spain (Robaux 1967); Italy (Berlese 1912); Romania (Feider 1955)), from Asia (Russia (Thor and Uchida 1933)) and Northern Africa (Algeria (Cooreman 1956)). Some records, especially the older ones, have not been confirmed by subsequent authors, and should be treated carefully considering the similarity of *T. holosericeum* to other species (e.g. *T. geniculatum*) and the limited data on variability of particular characters.

BIOLOGY AND ECOLOGY

Field data

T. holosericeum inhabits a wide range of habitats (e.g. forests, forest edges, gardens, parks) with humid soil and moderate humidity conditions. It is not typical either for arid or for very damp microhabitats and also very scarce or absent in cultivated fields.

In the course of studies adults and deutonymphs have been captured within the space of whole year (Fig. 29), in almost all cases 5–15 cm deep in the soil. Only in the spring, during the mating period, males and females appear in great number on the soil surface. Such an appearance is usually coincident with the first warm period in March – April, when the day temperature rises above 8°C and relative air humidity stays below 80%. Males, which appear first, display high activity on the soil surface and in the litter layer; they deposit silk threads and spermatophores mainly on dry leaves. During that period the distribution of adults is rather patchy with aggregations in few places; a correlation to a particular environmental pattern is not obvious. After insemination females return to

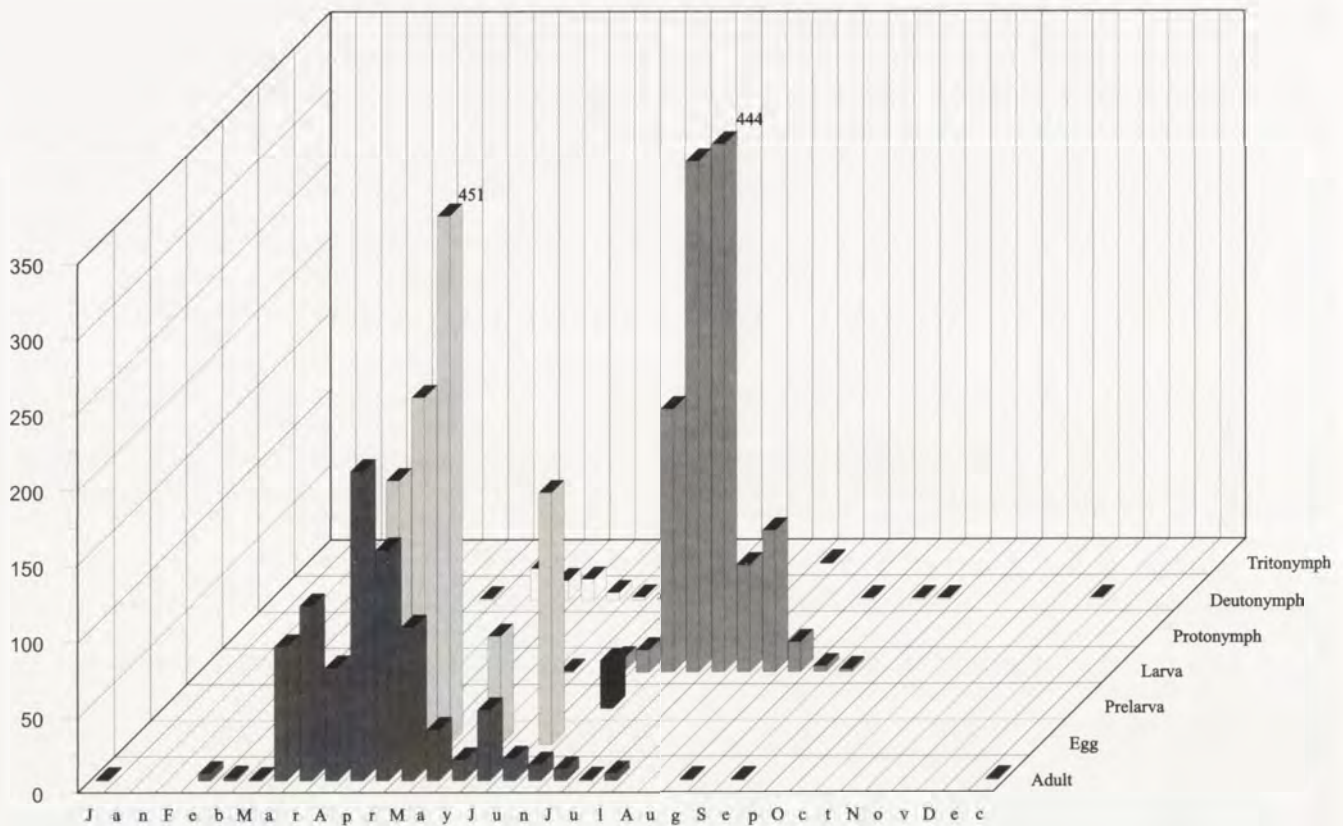


Figure 29. Phenology of *T. holosericeum*. Data derived from regular samples taken in the years 1990–1999.

the soil for oviposition. Females depositing eggs and egg clutches have been found in the field between April and June ($n=13$ clutches) at a depth of 5–10 cm. The first prelarva has been observed in June. Parasitizing larvae appear at the end of June and are abundant till mid September ($n=945$) with the peak of appearance falling on the last decade of July. Very few calyptostatic nymphs ($n=5$) have been found at a depth of 5–10 cm. No distinct differences in the phenology of *T. holosericeum* are observed while comparing the data from different years or from different localities.

Parasitizing larvae have been mainly found on nymphs and adults of Miridae (Hemiptera: Heteroptera) ($n=168$ parasitized hosts, average parasitic load 2.62 larvae, maximum 42 larvae on one host), imaginal cantharid beetles ($n=25$ hosts, average parasitic load 7.36 larvae, maximum 40 larvae on one host) and imaginal brachyceran flies (Dolichopodidae, Drosophilidae, Empididae, Lauxaniidae; $n=46$ hosts, average parasitic load 1.67, maximum 11 larvae on one host). Still larvae have been found on imagines of Hymenoptera (Cynipoidea, Chalcoidea, Ichneumoniidae; 20 hosts, 36 larvae), Homoptera (*Aphis* sp. and *Javassella* spp.; 6 hosts, 8 larvae), Tipulidae (*Limonia* spp., 2 hosts, 2 larvae), Microlepidoptera (2 hosts, 3 larvae), Mecoptera (*Panorpa communis*, 1 host, 5 larvae) and Diptera (*Culex* sp., 1 host, 1 larva). One engorged larva has been attached

to a caterpillar. Usually less than 50 % of the individuals of potential host taxa are parasitized; only in one case the extensity of invasion reached 75% of *Rhagonycha fulva* population (Coleoptera: Cantharidae). Soft cuticle is usually preferable for an attachment. In Brachycera, no further site specificity is obvious, whereas in Cantharidae most larvae have been found on soft parts of the abdomen beneath the elytra. Miridae were mainly parasitized beneath the elytra or at the ventral parts of the body, between the coxae. Larvae attached to a particular host quite often display differences in size, and thus probably also in the time of attachment.

Laboratory data

Postlarval *T. holosericeum* belong to bigger-sized Parasitengona, however, with a considerable variability in size and fresh body mass. Fresh mass of adults captured in the field varied between 0.99 – 17.4 mg (mean 5.06, $n=122$). During the reproductive phase the fresh mass of males (average 2.23 mg, 1.34–2.97, $n=21$) is generally lower than that of females (average 8.39 mg, 5.3–17.4, $n=27$). Adults and deutonymphs did not take food in the laboratory; neither eggs (tested: Collembola, Cantharidae, Staphylinidae, Gryllidae, Tipulidae, *Drosophila*, Opilioniidae) nor larvae or pupae (tested: ants, *Drosophila*, Cantharidae) were

accepted. In a few cases feeding on recently dead con-specifics has been observed. Adults display a considerable ability to survive starvation periods, the maximum starvation time at 20°C was 313 days for female. Except the reproductive period, adults try to hide in cavities of soil, where they stay quite motionless. Thereby deutonymphs and adults are able to dig even in moist Plaster of Paris. When submerged in water, adults and deutonymphs are surrounded by an air film maintained by the dense setation. The potential role of lipids can be excluded, since no hydrophobic reactions at the cuticle could be observed in deutonymphs which emerged from protonymphs submerged in water. When touched during movements, the active postlarval instars display thanatosis and remain motionless for some time with the legs bent beneath the body. Predation on *T. holosericeum* has not been observed in the field, however, in laboratory other Parasitengona, such as *Johnstoniana errans* and *Allothrombium fuliginosum* fed on *T. holosericeum* adults.

Males captured in the field deposited spermatophores in laboratory from March to May. Those captured later in

the summer or in autumn did not display any reproductive behaviour; in few cases they started to deposit spermatophores after chilling process (115 days at 5°C/ 12h light). Spermatophores and silk threads are deposited on dry substrate, only at light conditions, at temperature above 10°C and at sub-saturated relative air humidity. After being inseminated females try to burrow in the substratum. Eggs are deposited at temperatures above 10°C in one or two clutches. At disadvantageous conditions, such as hard substrate without cavities, up to four clutches were deposited. Females deposit 994 eggs on average (500–1965, n=20 females). Males captured in the spring died within 50 days after the termination the of spermatophore deposition, females usually survived for several months after the oviposition period.

The orange to reddish eggs are spherical with a diameter of 180–190 µm. Successful development takes place at temperatures above 10°C (Tab. 3) and in rather humid conditions (98% rh – submerged; Wohltmann 1998). Exposure to 5°C was lethal for eggs. The calyptostatic prelarva becomes visible after about 14 days (20°C), the development to the

		15°C	20°C	24°C
Egg to larval emergence	Time (days)	41	28	21
	Min-max (days)	38–47	24–33	–
	Number of clutches	9	22	1
Maximum survival of unfed larva	Time (days)	79	36	
	Number of clutches	2	11	
Parasitic phase of larva	Time (days)		12	–
	Number of specimens		2	–
Postparasitic active phase of larva	Time (days)	5	5	–
	Min-max (days)	1–11	1–17	–
	Number of specimens	26	67	–
Immobile postparasitic larva to deutonymph emergence	Time (days)	44	23	
	Min-max (days)	40–47	16–30	
	Number of specimens	21	50	–
Deutonymph	Time (days)		49	
	Number of specimens		1	–
Pharate deutonymph to adult emergence	Time (days)		33	
	Min-max (days)		30–40	
	Number of specimens		7	–

Table 3. Duration of various instars of *T. holosericeum* at constant temperatures.

prelarva is connected with an obvious increase in size. First larvae hatch 28 days after egg deposition, within 2–4 days all larvae from a single clutch leave the prelarval cuticle. The average fresh body mass of newly emerged larvae reached 0.0025 mg (0.0025–0.0027, $n=41$). After remaining 12–24 h near to the egg shells, larvae start to move; they display negative geotaxy and positive phototaxy. Such behaviour enables the larva to leave the soil and to reach areas with high probability of coming across the potential hosts. Only few specimens of those larvae which emerged from eggs submerged in water, were able to reach the water surface. While kept at terrestrial conditions, after getting in water droplets, larvae are often unable to escape and die. Larvae kept without potential hosts survive for a maximum of 36 days ($n=11$ clutches). Predation on *T. holosericeum* larvae has not been investigated in detail, however, predation by *Anystis* sp. (Acari: Prostigmata) and staphylinid beetles (Insecta: Coleoptera) has been observed.

In a sequence of experiments larvae originating from a single clutch were exposed to the nymphs and adults of *Stenodema* sp. (Heteroptera: Miridae), adults of *Rhagonycha fulva* (Coleoptera: Cantharidae) and adults of *Drosophila melanogaster* (Diptera: Brachycera). In all

cases the larvae attached themselves to the host and became parasitic. More active hosts, contrary to less active ones, were parasitized by a higher number of larvae. In the laboratory also an ant pupa was parasitized by a *T. holosericeum* larva, which started to engorge on this atypical host. Host recognition takes place only when larvae come into direct contact with the host's body or the proximal parts of host's legs. It has been observed several times that larvae crawled over the tarsi of potential hosts without trying to climb up the limb, and thus obviously they did not recognize the host. After 1–2 days of attachment to the host, a distinct increase in larval size was visible. During the parasitic phase, which lasted 12 days ($n=2$) in the laboratory, larvae did not change the attachment sites. In dissected hosts a stylostome (Fig. 30) has been found. A homogenous tubule secretion is surrounded by a less dense matrix secretion. The tubular system is multi-branched and blind ended, a direct connection between the lumen of the tubular system and host tissues or host hemolymph is not detectable. The structure has the same shape in all host groups (checked: Mecoptera, Brachycera, Miridae, Cantharidae). In case in which several *T. holosericeum* larvae were attached to the same host individ-

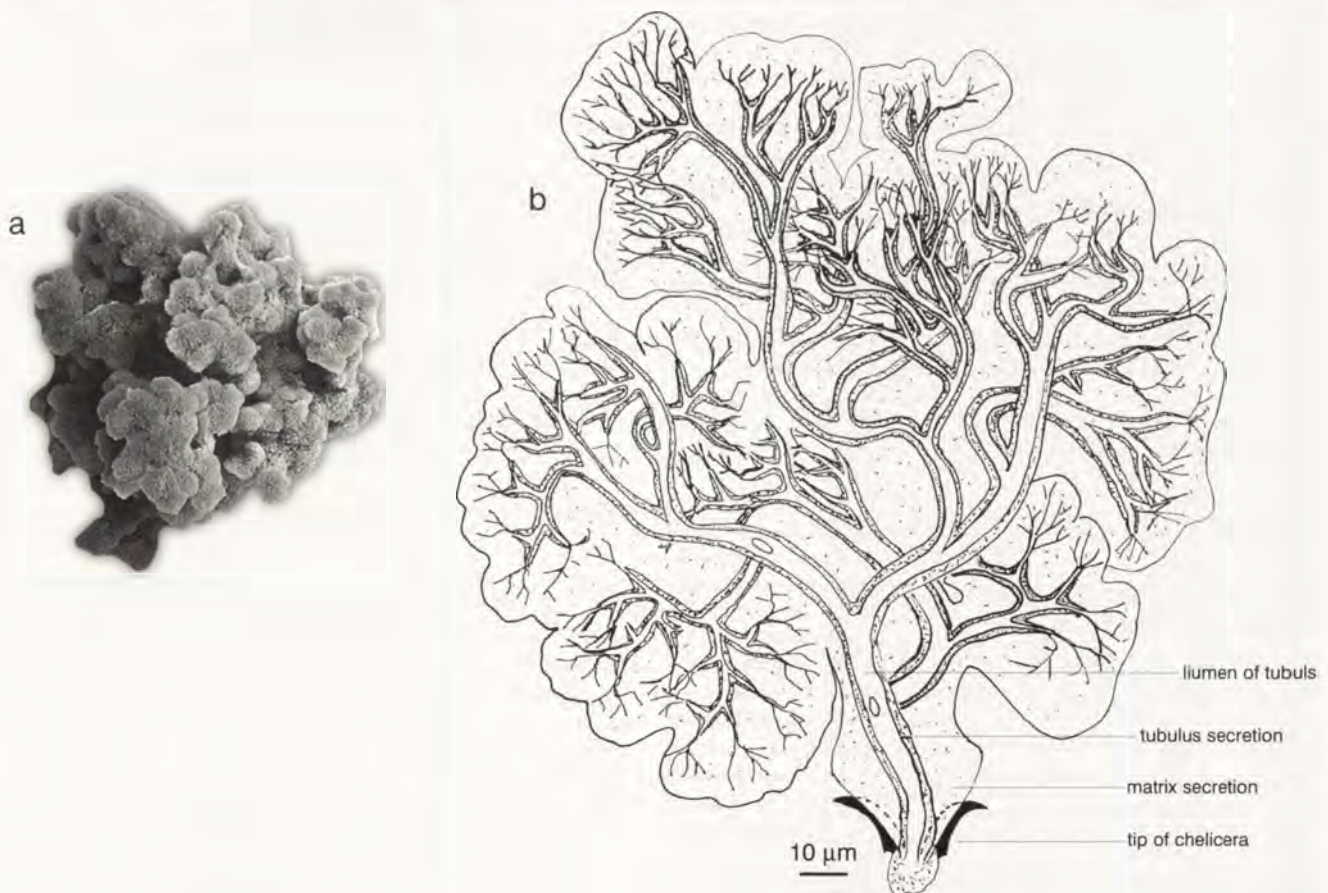


Figure 30. Stylostome of *T. holosericeum* larvae. a) SEM photograph of stylostome inside host (*Stenodema* sp.) after clearing in lactic acid, b) Drawing of stylostome from cleared host specimen (*Stenodema* sp.). All to the same scale.

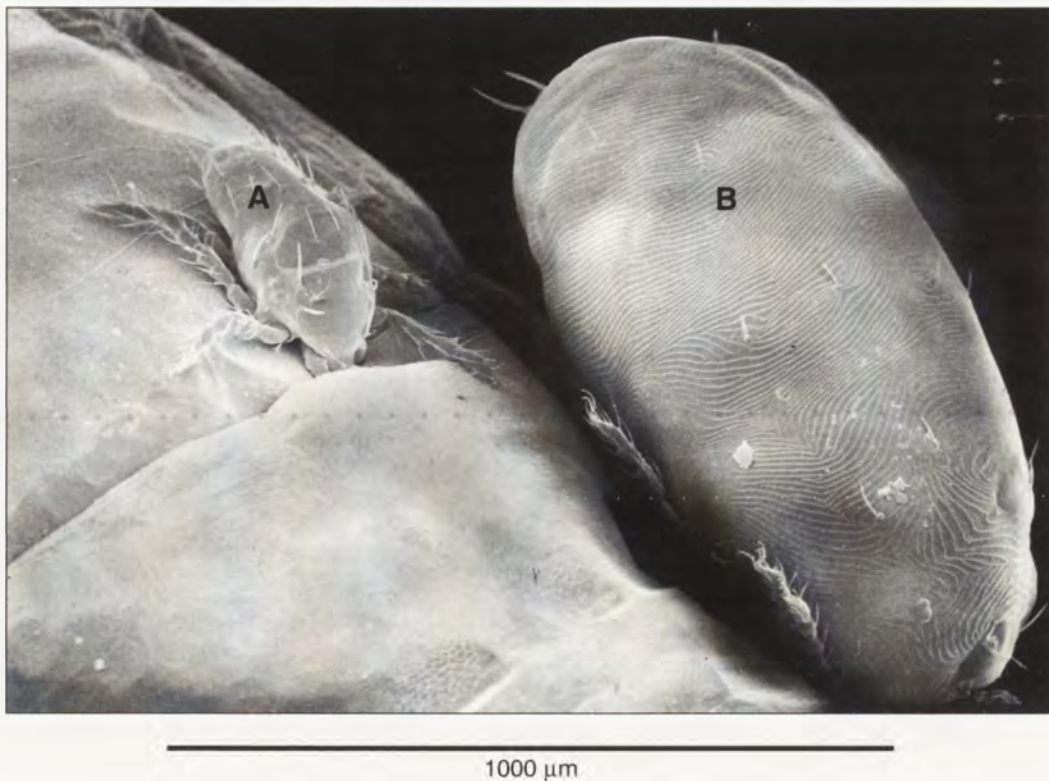


Figure 31. Neosomy in parasitic larvae of *T. holosericeum*, SEM photograph showing moderately fed (A) and heavily engorged (B) larvae parasitic on *Stenodema* sp. (Heteroptera: Miridae).

ual, stylostomes were never connected but always remained isolated from each other. The stylostome remains in the host after detachment of the larva. If the host moulted or died within 2 days after attachment of the larvae, the larvae displayed a searching behaviour to find a new host. If the host died after 7 days, larvae were unable to parasitize another host and died. Larvae, which left the host with the fresh body mass below 0.5 mg, did not develop successfully into deutonymphs, although sometimes they started to turn into protonymphs. A minimal weight increase observed in specimens which successfully developed from larvae (0.0025 mg in freshly emerged ones) into deutonymphs was of 24 times (specimen TH300796L15: 0.0593 mg as postparasitic larva, 0.0929 mg as a protonymph, 0.0644 mg as a freshly emerged deutonymph), the maximum increase observed was of 299 times (specimen TH100895L1: 0.747 mg as postparasitic larva, 1.088 mg as protonymph, 0.816 mg as freshly emerged deutonymph). In relation to the unfed larvae, the postparasitic active larvae underwent an extraordinary increase (Fig. 31) in fresh mass of 144 times ($n=49$) on an average.

After leaving the host, the fully fed postparasitic larvae are able to move slowly using their legs and peristaltic body movements. When kept on natural substrate, they always display a negative phototactic response and move into the soil (2–5 cm depth) soon after detachment. The duration of the postparasitic mobile phase of the larvae depends on the availability of suitable places to hide.

Usually the postparasitic active phase takes less than one day, but, when kept on smooth Plaster of Paris larvae remain active for up to 17 days before they finally become immobile. After the larvae become immobile and before turning into protonymphs, they expand their cuticle to a maximum. This is accompanied by an additional increase in fresh body mass for about 1.5 times. Such an increase in fresh mass has been observed in postparasitic immobile larvae exposed to 98% or higher rh. It is facilitated by water- or water-vapour uptake through the Claparèdes organs (Wohltmann 1998) as evident from concentration of a fluorescent dye (DAPI) at the Claparèdes organs of immobile postparasitic larvae kept submerged in water. At 93.5% rh and lower the larvae were unable to take up the water vapour, consequently they did not enter the protonymph stage and died. By the beginning of protonymph stage a new cuticle is formed under the old larval skin and the tissues of larval legs and gnathosoma are absorbed. The larval and protonymphal cuticles remain complete during the whole protonymphal stage, only in few cases parts of the larval gnathosoma or legs were broken off. During the protonymph stage no further mass change has been observed, the fresh body mass of protonymphs was 0.325 mg (0.059–1.088, $n=31$) on an average. Protonymphs developed into deutonymphs when submerged in water as well as when exposed to humidity of 100–98%, but not at 93% rh or lower. The deutonymphs emerged on an average 23 days after the postparasitic

larva had become immobile. The duration of this phase is correlated with the fresh mass of postparasitic larvae; light larvae develop faster than heavier ones. Protonymphs are able to survive low temperatures for a long time; a protonymph exposed for 104 days to 5°C developed into a deutonymph a few days after re-exposure to 15°C. During the emergence of the deutonymph the larval and protonymphal cuticles break in a transversal slit dorsally at the level of legs I/II. By means of peristaltic body movements and, after the legs became free, with assistance of the legs, the deutonymph leaves the old cuticle within 30 min to 2 h. The fresh mass of newly emerged deutonymphs is 0.495 mg (0.064–0.816, n=15) on an average; the loss of mass in comparison with the protonymph varies about 25%. Like adults, the deutonymphs did not accept food in the laboratory. Only in one case a deutonymph reached the tritonymph stage after 49 days. This individual had been kept together with conspecifics and probably fed on freshly dead ones. Unfed deutonymphs survived for considerable time (maximum 214 days at 15°C; maximum 811 days at 5°C). Deutonymphs captured in the field sometimes turned into tritonymphs; in six cases specimens captured in April/ May entered the tritonymph stage two months later at a constant exposure to 20°C. In two cases deutonymphs captured in June reached the tritonymph stage 2 months later at 5°C. A deutonymph captured in September survived 555 days at 5°C and started the tritonymph stage 6 days after being exposed to 20°C. Like the postparasitic larva, the quiescent deutonymph increased in size and expanded its integument before beginning of the tritonymph stage. The fresh mass of tritonymphs is 1.3991–3.253 (n=4, all females). The adults emerged on an average 33 days after the deutonymphs became immobile, in a way comparable to the state described for the deutonymphal emergence. None of the adults reared in the laboratory displayed reproductive behaviour after hatching. Adults captured in the field in summer and exposed to 5°C for 100 or more days deposit-

ed spermatophores and eggs after re-exposure to 20°C at appropriate humidity conditions.

DISCUSSION ON BIOLOGY AND ECOLOGY

As far as comparisons are possible, the data on the development and biology of *T. holosericeum* are consistent with the reports published earlier. This refers in particular to the data given by Witte (1991) on the mating behaviour (identity of specimens referred to as *T. holosericeum* checked) and to the data on life cycle and development provided by Robaux (1971). One exception concerns the feeding of postlarval active instars on eggs of Collembola (Robaux 1971), which could not be confirmed in the present study. Possibly *T. holosericeum* requires particular environmental conditions to feed, a re-evaluation and precise description of the range and way of nutrition will be indispensable to solve this problem. Additional data provided by Robaux (1971) concern development time of eggs (53–65 d at 13°C, 30–42 d at 17°C, 19–30 d at 21°C, 17–26 d at 25°C). *T. holosericeum* displays an almost edaphic life style throughout its life excluding the larva and the mating period of adults. It is well suited for such edaphic life in microhabitats characterised by only moderate changes in humidity conditions, due to its subcuticular meshwork (Alberti et al. 1981), which stabilises the cuticle, the ability to dig and the dense setation covering the body which reduces the risk of being contaminated at times when heavy rainfall occurs.

Although rearing from egg to adult has not been completed in laboratory conditions, it seems very likely that *T. holosericeum* follows the general ontogenetic pattern of Parasitengona, with calyptostatic prelarva, parasitic larva and 4 postlarval instars of which the proto- and tritonymph are calyptostatic. The great variation in size of adults and nymphs may indicate additional moulting and intermittent instars, like in *Allothrombium pulvinum* (Chen and Zhang 1991) and some Microtrombidiidae (subadults, see

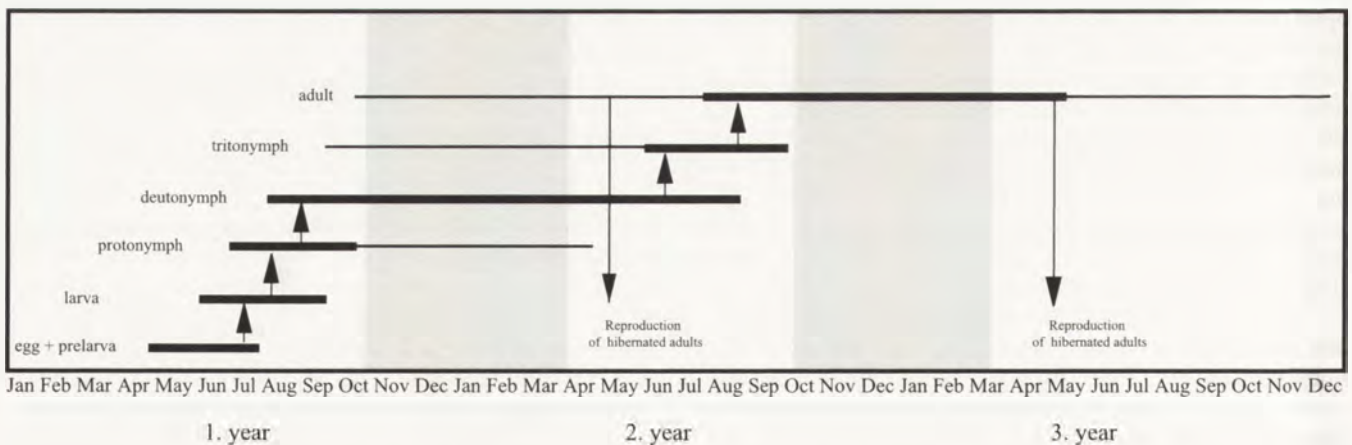


Figure 32. Hypothetical life cycle of *T. holosericeum*. Thick lines and arrows indicate life-cycle of majority of specimens.

Michener 1946, Southcott 1994), however, the fresh mass increase from protonymphs to adults is absolutely within the range known for other Trombidioidea displaying no additional moulting as confirmed by laboratory rearing (*Johnstoniana* spp., Wohltmann 1999a; *Eutrombidium trigonum*, Wohltmann et al. 1996). Thus, additional instars are rather unlikely to occur.

The life cycle of *T. holosericeum* is probably uni-semivoltine (Fig. 32). The phenological data are somewhat difficult to interpret due to the different microhabitats occupied by instars and the different collecting methods. Calyptostatic instars as well as deutonymphs and adults are surely under-represented during their edaphic phase. However, combining field data and laboratory results for development times, one can conclude that *T. holosericeum* has a rather short mating period in April – May, followed by deposition of eggs in the soil. Almost all larvae reach the deutonymph stage within the same year, but only few develop into adults and are able to reproduce in spring of the following year. Most specimens need another year to complete development and reproduce for the first time in spring of the following year. At least some females are able to repeat oviposition in the year of their first reproduction.

T. holosericeum larvae parasitize a wide range of hosts. The actual infestation rates seem more influenced by habitat preferences of potential hosts (and thus the likelihood of *T. holosericeum* coming into close contact with potential hosts) than by limitations in host recognition. Laboratory and field data clearly show that *T. holosericeum* recognizes that host instar which is actually parasitized (like most other terrestrial Parasitengona, but, in contrast to e.g. Johnstonianidae; Wohltmann et al., 1999). The minimum increase in fresh mass needed for subsequent successful development corresponds well with data known for most other Parasitengona larvae (Wohltmann 1999a). However, the average size and fresh mass increase during the parasitic phase is far beyond the usual rate of increase in Parasitengona and exceeds the range one can expect in arthropods without intermittent moulting. Such extraordinary growth is obviously facilitated by cuticle production without moulting. This phenomenon, termed neosomy, is also known to occur in female *Ixodes ricinus* (Alberti et al. 1981) and some Parasitengona larvae (Audy et al. 1972, Wohltmann 1999a, and references therein). In case of *Trombidium* spp., neosomy constitutes the key innovation, which allows females to produce large egg clutches containing numerous relatively small eggs (Wohltmann 1999a) and must be regarded as an alternative strategy to additional moulting which serves the same function.

Comparisons with published data on the biology of *Trombidium* species suffer from its uncertain taxonomic position within this genus. At the moment biological data are available for two further adequately described European *Trombidium* species, namely *T. mediterraneum* and *T. brevimanum*. The general patterns of the life cycles are comparable, in particular this applies to the almost edaphic life style, semi-univoltine life cycles, devel-

opment times and neosomy of parasitic larvae. Some data are not given but should be expected in these species too; e.g. the presence of stylostomes in hosts of *T. mediterraneum* since comparable stylostomes are present in *T. holosericeum*, *T. brevimanum* (Wohltmann 1999b) and are also known for *Allothrombium* spp. (Robaux 1971, Zhang 1998, and references therein). Differences between these species concern, in particular, the range of parasitized hosts. *T. mediterraneum* parasitizes exclusively Lepidoptera (Robaux 1971), while *T. brevimanum* larvae are restricted to web spiders (Wohltmann 1999b); both host groups are usually not parasitized by the larvae of *T. holosericeum*. Data on hosts of other *Trombidium* larvae (see Welbourn 1983) mostly refer to single cases of parasitism, which often fall into the range of potential hosts for *T. holosericeum*. In some cases misidentifications may additionally complicate the situation, e.g. reports of parasitism of *Eutrombidium trigonum* on *Oulema* spp. (Heyer 1992), which turned out to be *T. holosericeum*.

ACKNOWLEDGEMENTS

We wish to express our gratitude to Dr. Pekka T. Lehtinen, for his taxonomic advice and the possibility of taking SEM pictures (Figs 18, 19) at the Zoological Museum, Department of Biology, University of Turku, Finland, and to all collectors who provided samples of *T. holosericeum*.

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Received: January 20, 2000
Accepted: February 25, 2000

Corresponding Editor: D. Iwan
Issue Editor: D. Iwan