

# THIENEMANNIA SPIESI SP. NOV., A CRENOPHILOUS SPECIES FROM THE SCHAPBACH QUELLE, BAVARIA, GERMANY (DIPTERA: CHIRONOMIDAE: ORTHOCLADIINAE)

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## ABSTRACT

A description of the male and female imago and pupal exuviae of *Thienemannia spiesi* sp. nov. is provided based on material collected in the Schapbach Quelle (spring), Bavaria, Germany. This description increases the total number of species known worldwide in the genus to eleven. The new species, *T. spiesi*, can be distinguished from other related species (except *T. libanica* Laville and Moubayed 1985) by the following combination of characters: chaetotaxy of the wing membrane, inferior volsella nose-shaped and not sinuous, gonostylus bearing a crista dorsalis, spines present on tergite VII of the pupal exuviae. Comments on its ecology and taxonomic position are provided.

**Keywords:** Diptera, Chironomidae, *Thienemannia spiesi* sp. nov., ecology, distribution

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## Introduction

The present description is based on adults, pharate adults and pupal exuviae belonging to two species of the genus *Thienemannia* Kieffer, 1909. Specimens examined belong to *T. libanica* Laville and Moubayed, 1985 (from Lebanon) and *T. spiesi* sp. nov. (from Germany) and both are closely related and considered to be sister species based on both adults and pupal exuviae. In Moubayed-Breil and Ashe (2013) *T. spiesi* sp. nov. is listed under the name *Thienemannia* sp. 1. The pupal exuviae of the new species resembles those of two recently described species: *T. corsicana* Moubayed-Breil 2013 (Moubayed-Breil 2013) and *T. valespira* Moubayed-Breil and Ashe 2013 (Moubayed-Breil and Ashe 2013). Records of *T. libanica* listed in Schacht (2010) and Sæther and Spies (2013) from Germany are referable to *T. spiesi* sp. nov. and those from elsewhere in Europe (Denmark, France, Luxembourg, Portugal, Spain) are probably misidentifications of either *T. spiesi* sp. nov. or some other related species. With the description here of *T. spiesi* sp. nov., there are now eleven valid species of *Thienemannia* Kieffer, 1909 known worldwide. The genus *Thienemannia* is known from the western Palaearctic (Europe and the Near East), the Nearctic and the Oriental Region (Ashe and O'Connor 2012).

The description of the male and female adult and pupal exuviae of *T. spiesi* sp. nov. is given based on material collected in Schapbach Quelle (30.VII.1999, altitude 1,170 m, Bavaria, Germany) which had previously been misidentified as *T. libanica*. Terminology and measurements follow Sæther (1980, 1985) and Langton and Pinder (2007) for the male adult and Sæther (1980) and Langton (1991) for pupal exuviae. Comments on the taxonomic position and ecology of the new species are given.

## *Thienemannia spiesi* sp. nov.

*Thienemannia libanica*: in Schacht (2010), misidentified.

*Thienemannia* sp. 1: in Moubayed-Breil and Ashe 2013 (Figs. 19–20, 32)

## Material Examined

Holotype: GERMANY: Bavaria, Nationalpark Berchtesgaden (BGL), Schapbach Quelle (spring), altitude 1,170 m, 30.VII.1999, 1 pharate adult male.

Paratypes: 4 pharate adults (2 males and 2 females) including 4 associated pupal exuviae (2 males and 2 females); same locality and date as holotype.

Holotype and paratypes are deposited in the collection of the Zoologische Staatssammlung (ZSM), Munich, Germany. Type material was mounted on five slides in polyvinyl lactophenol mountant.

Etymology: The new species is named *spiesi* after our colleague Martin Spies from the Zoologische Staatssammlung (ZSM), Munich, Germany, in appreciation for his assistance and the loan of material.

## Description

*Male imago* (Figs. 1a, 1e, 1f, 1h; 2a–d)  
(n = 3 pharate adult males)

A relatively small sized species (among the smallest in *Thienemannia*). Total length 1.35–1.45 mm. Wing length 1.15–1.20 mm. General colouration: contrasting dark brown to brown, especially on the thorax. Head and antenna brown including antennal and wing sheath, halteres brown. Thorax dark brown to brown, with brown mesonotal strips. Wing membrane transparent, without

shading. Legs dark brown to brown; tarsi of PI, PII and PIII blackish apically.

Head: Eyes hairy between ommatidia, hairs present along proximal half of inner eye margin (Fig. 1a). Temporal setae 2–3, including 2–3 inner verticals, 0 outer verticals, postorbitals absent. Clypeus with 14–16 setae. Palp 5-segmented, length ( $\mu\text{m}$ ) of segments: 14–16, 19–21, 34–35, 51–55, 73–75; sensilla clavata absent on third segment; last segment bearing 3 apical setae. Antenna 330–340  $\mu\text{m}$  long, 10-segmented (Fig. 1f), segments 1 to 3 globulous (respectively 32, 27, 29  $\mu\text{m}$  long); segments 4 to 8 subequal (each 29–30  $\mu\text{m}$  long); segment 9, 25  $\mu\text{m}$  long; ultimate flagellomere (Fig. 1e) 80–87  $\mu\text{m}$  long, slightly clubbed, bearing 1 long apical seta (30  $\mu\text{m}$  long), sensilla chaetica present on distal half. AR 0.32–0.35.

Thorax: Anteprepronotum with 4 lateral setae, median setae absent. Dorsocentrals 21–22; acrostichals 16–18 uni- to biserial, including 9–10 placed in front near the anteprepronotum, 7–8 distally; prealars 4–5. Scutellum with 4 setae in a single row. Preepisternum bare.

Wing (Fig. 1h, distal half): Brachiolum with 2 setae. Venation and distribution of setae on veins, membrane and cells: R, 7–8;  $R_1$ , 3–5;  $R_{2+3}$ , 9–11; An, 0;  $Cu_1$ , 0;  $r_{4+5}$ , 4;  $m_{1+2}$ , 3;  $m_{3+4}$ , 0; cu, 0; an, 0. Anal lobe weak. Squama with 1–2 setae. The distribution pattern of setae on wing cells is regarded as an important distinguishing feature to separate *T. spiesi* from other related species, especially *T. libanica*.

Legs: Spur of front tibia 23  $\mu\text{m}$  long, spurs of middle tibia 35 and 23  $\mu\text{m}$  long, spurs of hind tibia 13 and 15  $\mu\text{m}$  long; hind comb with 12 setae. Fourth tarsus ( $ta_4$ ) on PI distinctly bilobed apically, on PII and PIII weakly bilobed. Length ( $\mu\text{m}$ ) and proportions of legs:

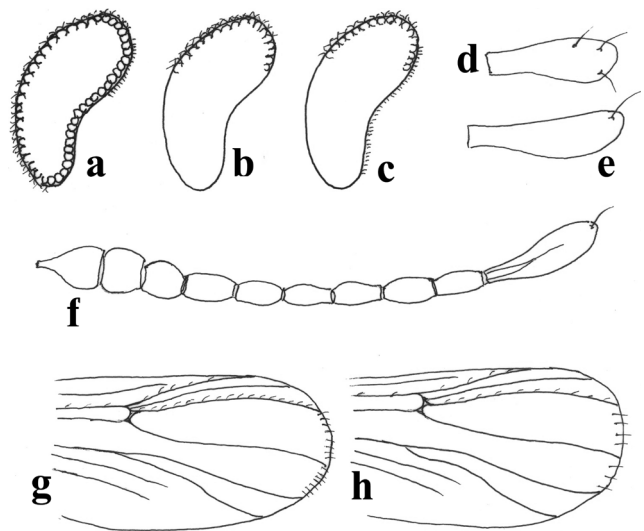
	fe	ti	$ta_1$	$ta_2$	$ta_3$	$ta_4$	$ta_5$	LR	BV	SV	BR
PI	275	310	137	91	66	43	49	0.44	2.90	4.27	1.8
PII	325	316	161	83	75	46	48	0.51	3.10	3.98	1.0
PIII	331	322	162	86	71	47	46	0.50	3.26	4.03	1.1

Hypopygium in dorsal and ventral view (Fig. 2a): Anal point 17–18  $\mu\text{m}$  long; tergite IX 61–66  $\mu\text{m}$  wide, broad with a nearly straight basal margin, bearing 9–10 setae (4 to 5 on each side of the anal point). Laterosternite IX with 2 setae. Transversal sternapodeme and phallapodeme as in Fig. 2a. Virga (Fig. 2b) semicircular and faint. Gonocoxite 112–115  $\mu\text{m}$  long, maximum width 55  $\mu\text{m}$ ; inferior volsella (Figs. 2a, 2c) 7–8  $\mu\text{m}$  long, 6–7  $\mu\text{m}$  wide, nose-shaped, outer ventral margin straight, not swollen basally. Gonostylus (Fig. 2a) 57–63  $\mu\text{m}$  long, triangular with pointed apex, bearing 5 or 6 stout orally directed setae; crista dorsalis swollen proximally; megaseta 8–10  $\mu\text{m}$  long, slightly curved apically.

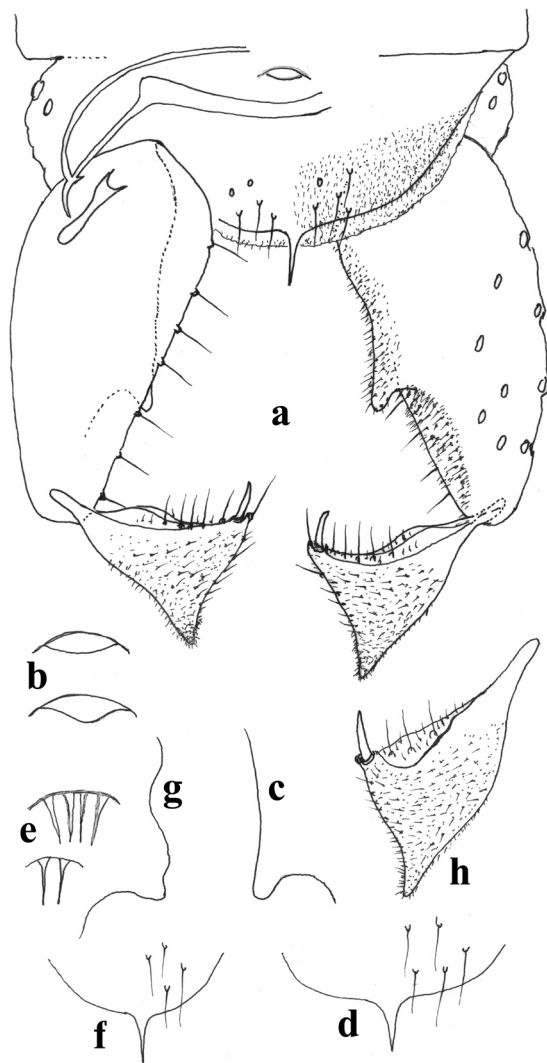
*Female imago* (Figs. 3a–e)

(n = 2, pharate adult females)

Colouration: as in the male adult except for the legs, which are brownish to dark brown including femora,



**Fig. 1** *Thienemannia* spp. Hairs on inner margin of eyes: *T. spiesi* sp. nov. (a); *T. libanica* (b), Lebanon; *T. corsicana* (c), Corsica. Last flagellomere of antenna of: *libanica* (d); *spiesi* (e). Antenna of *T. spiesi* (f). Distal half of wing (g–h) of: *libanica* (g); *spiesi* (h).



**Fig. 2** Male imago of *Thienemannia* spp. *T. spiesi* sp. nov. (a–d): hypopygium, ventral, left and dorsal, right (a); Virga (b); inferior volsella (c); tergit IX and anal point (d). *T. libanica*: two aspects of virga (e); tergit IX and anal point (f); inferior volsella (g); gonostylus (h).

tibia and tarsi. Total length 1.50–1.60 mm. Wing length 1.20–1.30 mm. Antenna length 0.165–0.175 mm.

Head: Eyes hairy, hairs present on median part of inner eye margin; temporal setae 4, including 1 inner and 3 outer verticals, postorbitals absent. Clypeus with 8 setae. Antenna (Fig. 3a) 5-segmented; length ( $\mu\text{m}$ ) of segments: 31, 33, 26, 30, 55; ultimate flagellomere moderately clubbed, bearing 1 apical seta; AR 0.18.

Thorax: Anteprenotum with 2 lateral setae, median setae absent; acrostichals 17, relatively long, starting close to anteprenotum; dorsocentrals 7; prealars 6. Scutellum with 6 setae in a single row. Preepisternum bare.

Wing: Brachiolum with 2 setae. Distribution of setae on veins, membrane and cells: R, 14;  $R_1$ , 26;  $R_{2+3}$ , 5;  $R_{4+5}$ , 13;  $Cu_1$ , 4; An, 9;  $r_{2+3}$ , 0;  $r_{4+5}$ , 23;  $m_{1+2}$ , 4;  $m_{3+4}$ , 3; cu, 0; an, 0. Anal lobe weak. Squama with 2 setae.

Genitalia in dorsal and ventral view (Figs. 3b–e): Notum with distinct rami. Gonapophysis VIII (Figs. 3b–c); dorsomesal lobe (Fig. 3b) straight, ventrolateral lobe (Fig. 3b) large; apodeme lobe (Fig. 3c) sickle-like; gonocoxite (Fig. 3d) slightly elongated, bearing 5–6 setae; tergite IX (Fig. 3e) nearly semi-circular with 9 setae; sternite VIII with 8 setae. Seminal capsules 75  $\mu\text{m}$  long, 51  $\mu\text{m}$  wide, pear-shaped. Spermathecal ducts with loops and separate openings.

#### *Pupal exuviae* (Figs. 4a–d)

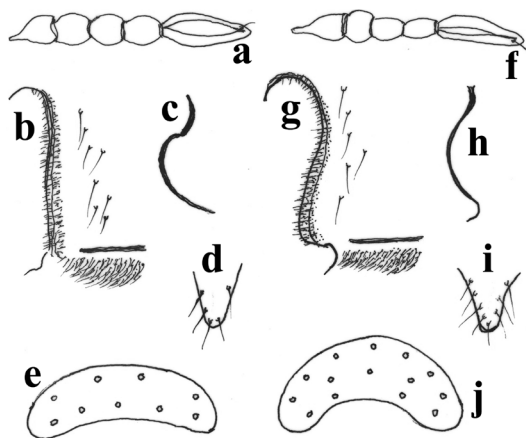
(n = 4)

Colouration: yellowish to yellow brown in general; thorax, yellowish brown with faint brown granulations near thoracic suture and dorsocentral area; antennal and wing sheaths with faint brownish shading; abdomen including anal segment brownish; with brownish apophyses; anterior area of tergites III–VIII brownish. Total length 1.40–1.50 mm.

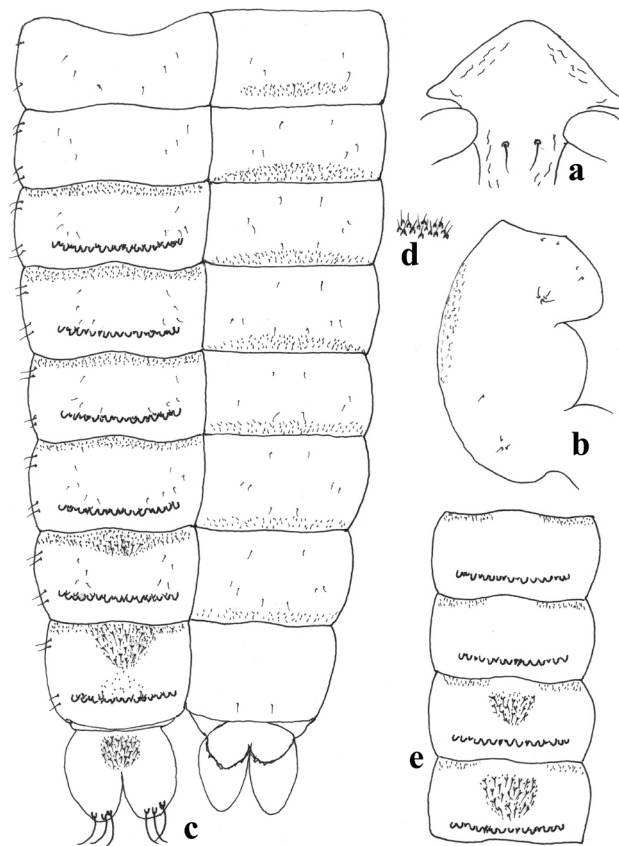
Cephalothorax (Figs. 4a–b): Frontal apotome (Fig. 4a) slightly rugulose, frontal setae 13–15  $\mu\text{m}$  long. Postorbit-

als and vertical minute and weak. Thoracic horn absent. Median anteprenotals 23 and 33  $\mu\text{m}$  long; precorneal setae 28, 33 and 21  $\mu\text{m}$  long. Dorsocentrals 9–12  $\mu\text{m}$  long, inserted as in Fig. 4b; Dc2–Dc4 inserted close together; distance between Dc1 and Dc2, 61  $\mu\text{m}$ ; Dc2, Dc3 and Dc4 equidistant, each separated by about 9  $\mu\text{m}$ .

Abdomen (Figs. 4c–d): Armament and distribution pattern of shagreen, patch of spines and spinules, chaetotaxy and lateral setation of segments as in Fig. 4c. Tergite I bare. Posterior transverse tooth row present on tergites III–VIII; tooth row on tergite II–VIII consists of 21–27 teeth in one continuous row; in general, teeth are mostly rounded at apices. Tergites II–III without anteromedian patch of shagreen or circular rows of spinulae. Transverse anterior shagreen present on tergites III–VIII consisting of spinules (III–VI), which increase medially to larger sized spines on tergites VII and VIII (8–10 spines on anterior part of tergite VII; 21–23 anteriorly and medially on tergite VIII). Anterior median circular patch of strong spinules present only on tergites VIII–IX; patch of strong spines and rows of spinules are connected on tergites VII and VIII. Sternites I–VIII bare. Conjunctives of intersegments I–VII with rows of anteriorly directed, long pointed spinules (Figs. 4c–d). Pedes spurii A and B absent. Lateral abdominal setae weak and hair-like,



**Fig. 3** Female imago of *Thienemannia* spp. *T. spiesi* sp. nov. (a–e): antenna (a), gonapophysis VIII, dorsomesal, ventrolateral and apodeme lobes (b); apodeme lobe (c); gonocoxite (d); tergite IX in dorsal view (e). *T. libanica* (f–j): antenna (f); gonapophysis VIII, dorsomesal, ventrolateral and apodeme lobes (g); apodeme lobe (h); gonocoxite (i); tergite IX (j).



**Fig. 4** *Thienemannia* spp. Male pupal exuviae of *T. spiesi* sp. nov. (a–d): frontal apotome (a); cephalothorax (b); abdominal segments I–IX with armament of tergites (left) and sternites (right) (c); details of transversal rows of orally directed long pointed spinules on conjunctives of intersegments II–VII (d). *T. libanica*: armament of tergites V–VIII (e).

consisting of reduced minute setae: tergite I with 2 setae, tergites II–VIII each with 4 setae. Apophyses brownish and relatively straight. Anal lobe 123–125 µm long, apical margin rounded; macrosetae 65–67 µm long, stout and slightly curved distally as in all *Thienemannia* pupal exuviae (Sæther 1985). Genital sac 63–67 µm long, rounded apically.

### Taxonomic Position

The most important diagnostic features used to distinguish species in the genus *Thienemannia* are: chaetotaxy of the wing including the wing membrane; shape and form of the hypopygium including that of the virga, tergite IX, inferior volsella and gonostylus.

In the male adult, distinguishing characters between *T. spiesi* and *T. libanica* include: presence of hairs on proximal area of inner lateral margin of eye in *T. spiesi* (Fig. 1a), bare in *T. libanica* (Fig. 1b); last flagellomere elongated in *T. spiesi* (Fig. 1e), distinctly clubbed in *T. libanica* (Fig. 1d); chaetotaxy of cells  $r_{4+5}$  and  $m_{1+2}$  are different in the two species (Fig. 1h, *T. spiesi*; Fig. 1g, *T. libanica*); virga not toothed in *T. spiesi* (Figs. 2a–b), bearing 2–4 spines in *T. libanica* (Fig. 2e); tergite IX wide, with a more or less straight basal margin in *T. spiesi* (Fig. 2d), rounded and tapered in *T. libanica* (Fig. 2f); inferior volsella nose-shaped in *T. spiesi* (Fig. 2c), swollen in *T. libanica* (Fig. 2g); outer margin of inferior volsella straight in *T. spiesi* (Fig. 2c), sinuous in *T. libanica* (Fig. 2g); crista dorsalis distinctly present on proximal part in *T. spiesi* (Fig. 2a), absent in *T. libanica* (Fig. 2h). In addition, the broad and more or less straight basal margin of tergite IX keys *T. spiesi* near both *T. gracilis* Kieffer, 1909 and *T. valespira*. (Moubayed-Breil and Ashe 2013, Figs. 14–15). However, a narrowed and tapered basal margin of tergite IX is found in both *T. libanica* (Fig. 2f) and *T. corsicana* (Moubayed-Breil 2013, Fig. 7).

In the female adult *T. spiesi* is separated from its sister species *T. libanica* by the following characters: the distribution of setae on wing veins, membrane and cells is quite similar to that in *T. libanica* but their number is much lower in *T. spiesi*; ventrolateral and dorsomesal lobes straight in *T. spiesi* (Fig. 3b), swollen distally in *T. libanica* (Fig. 3g); tergite IX semi-circular in *T. libanica* (Fig. 3j), less convex in *T. spiesi* (Fig. 3e).

The pupal exuviae of *T. spiesi* is distinguishable from other related species (especially *T. libanica*, *T. corsicana* and *T. valespira*) by the following characters: suture of pupal thorax bearing faint granulations in *T. spiesi* (Fig. 4b), bare in *T. libanica*, densely granulated in *T. corsicana* and *T. valespira*; anterior-median patch on tergite VII includes spinules and a few spines in *T. spiesi* (Fig. 4c), while spines are lacking in *T. corsicana* (Moubayed-Breil 2013, Fig. 12) and in *T. libanica* (Fig. 4e); transverse anterior rows of shagreen on tergites III–VIII continuous in *T. spiesi*, *T. corsicana* and *T. valespira* while it is interrupted medially in *T. libanica* (Fig. 4e). The median patch of spines on tergite VIII in *T. spiesi* (Fig. 4c) is connected to

the anterior row of shagreen while in *T. libanica* (Fig. 4e) they are disconnected and the anterior row of shagreen is interrupted.

### Ecology and Distribution

*Thienemannia spiesi* sp. nov. is currently known only from the Nationalpark Berchtesgaden in Bavaria, Germany. This new species is typically crenophilous and confined to helocrenes where shady and fresh habitats are characterized by a siliceous substratum and a low water conductivity value (Cd, 10–13 µS/cm). Larvae of this new species are typically rheophilic occurring in running water of a spring in Bavaria. Two other orthoclad species, *Heterotrissocladius zierli* Stur and Wiedenbrug, 2005 and *Tavastia alticrista* Stur and Wiedenbrug, 2005, have been described from another spring in the same national park in Bavaria (Stur and Wiedenbrug 2005). The general description of the type locality where the associated pharate adult material was collected is detailed in a recent paper by Gerecke et al. (2011). Comparative ecological data given for *T. libanica* shows that this species, from Chlefa in Lebanon, is a typically rhithrobiontic species inhabiting karstic water with a high water conductivity value (Cd, up to 300 µS/cm).

*Thienemannia spiesi* sp. nov. from Germany has been confused with *T. libanica* due to the strong resemblance between their respective pupal exuviae. However, *T. libanica* is only known with certainty from a single locality in Lebanon: the upper stream of Yammouna-Chlefa (altitude 1,100–1,200 m), which is located in the inner plain of Bekaa (Laville and Moubayed 1985). Despite extensive investigations made throughout Lebanon, *T. libanica* is still unknown and apparently absent from coastal high mountain streams located in the eastern Mediterranean, including the Levantine Province. Further doubtful and probably misidentified records of *T. libanica* have been reported, based on pupal material, from some areas located in northern, central and southern Europe (Serra-Tosio and Laville 1991, zone E4; Moubayed et al. 2000, zone 3; Moubayed-Breil 2008, zones 5b and 10; Schacht 2010; Ashe and O'Connor 2012; Fauna Europaea, Sæther and Spies 2013). Therefore, some records of *T. libanica* from Europe may refer to *T. valespira*, *T. spiesi* sp. nov. or some other related species. Occurrence of this new rheophilic species in a helocrene in Bavaria (Germany) indicates that it may be more widespread in cold high mountain springs and streams of central and southern Europe and therefore can be expected from such habitats in, for example, Austria, Switzerland, Italy and Spain.

Associated species encountered in the same locality include cold stenothermic and crenophilous elements (considered as typical helocrene species by Thienemann 1954, Lindegaard 1995, Stur and Wiedenbrug 2005, Moubayed-Breil and Ashe 2012) are: *Diamesa cinerella* (Meigen 1835), *D. macronyx* (Kieffer 1918), *Bryophaeonocladus nidorum* (Edwards 1929), *B. subvernalis* (Ed-

wards 1929), *B. vernalis* (Goetghebuer 1921), *Chaetocladus dissipatus* (Edwards 1929), *C. laminatus* (Brundin 1947), *C. suecicus* (Kieffer 1916), *Heterotrissocladius zierli*, *Parakiefferiella gracillima* (Kieffer 1922), *Metriocnemus eurynotus* (Holmgren, 1883), *Rheocricotopus effusus* (Walker 1856), *Tavastia alticrista*, *Tvetenia bavarica* (Goetghebuer 1934), *Micropsectra mendli* (Reiss 1983) and *M. sofiae* (Stur and Ekrem 2006).

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