Bryophaenocladius adigensis sp. n., a new species from the Italian Alps (Chironomidae, Orthocladiinae)

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Abstract

Bryophaenocladius adigensis sp. n., is diagnosed and described based on two male adults material collected in the Sardagna stream, near the city of Trento (Northern Italy). Although the male of *B. adigensis* sp. n. shows some morphological affinities with other *Bryophaenocladius* species (*B. aestivus*, *B. flexidens*, *B. muscicola*, *B. subvernalis* and *B. thaleri*), it exhibits a combination of unique characters that make it a different species: palpomere 3 with 3 typical sensilla coeloconica; absence of antepronotal setae; antennal ratio= 0.86; tergite IX and anal point without lateral expansion; aedeagal lobe typically sub-oval; virga consisting of 2 curved unequal spines; distal part of gonocoxite with a vertical row of setae; inferior volsella, long nose-like shaped, distal part spatulate with 2 characteristic pre-apical setae, median part bare. Currently, about 42 *Bryophaenocladius* species are reported from Europe, of which only 11 are known from Italy. Consequently, the description here of *B. adigensis* sp. n. increases the total number in the genus to 12 from this country. Based on type-locality features, we can consider *B. adigensis* sp. n. as typical of mountain streams fed mainly by groundwater.

Introduction

An extensive material collected with a sweep net in the Sardagna stream, a tributary of the River Adige the city of Trento (Northern Italy), revealed the presence of a new species of the genus *Bryophaenocladius*, *Bryophaenoladius adigensis* sp. n. The genus *Bryophaenocladius* was stated by Thienemann in 1934 with *Orthocladius muscicola* Kieffer, 1906 as type species. To date, more than 100 species have been recorded all over the world of which 42 in Europe and 11 in Italy (Rossaro et al. 2019), now 12.

Based on a consistent literature on *Bryophaenocladius* species from Europe and neighbouring areas (Brundin 1947, 1956; Strenzke 1957; Sæther 1973; Sasa 1985, 1996; Tuiskunen and Lindeberg 1986; Armitage 1987; Caspers and Reiss 1987; Cranston and Armitage 1988; Cranston et al. 1989; Sasa and Okazawa 1992; Willassen 1996; Sasa and Suzuki 2000, 2001; Kaczorowska and Gilka 2002; Makarchenko and Makarchenko 2006, 2009, 2012; Langton and Pinder 2007; Du et al. 2011; Ashe and O'Connor 2012; Sæther and Spies 2013; Rossaro et al. 2019; Moubayed and Lods-Crozet 2022; Moubayed and Langton 2023). *B. adigensis* sp. n. can be considered to be local biogeographic element. Taxonomic remarks on related *Bryophaenocladius* species, with comments on the ecology and geographical distribution of the new species are given.

Material and methods

Material is composed of 2 male adults collected in the Sardagna stream (Northern Italy), using a sweep net, and then preserved in 80-85% ethanol. The methodology of mounting and conservation of the holotype and paratype material is provided in Moubayed and Langton (2019, 2023). Morphological terminology and measurements follow those of Sæther (1980) and Langton and Pinder (2007).

Results

Bryophaenocladius adigensis sp. n.

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Type material

Holotype: 1 male adult, Italy, Trentino Province, River Adige, Sardagna stream, 45° 26' 58.78" N, 10° 58' 52.7" E, 194 m a.s.l., leg. J. Moubayed and P. Ashe, 11.VII.2017. Mounted on 1 slide,

deposited in the entomological collection of the MUSE-Museo delle Scienze, Trento, Italy (Accession number: cINV0017).

Paratype: 1 male adult, same locality and data as for holotype, deposited in the collection of the first author.

Etymology

The species 'adigensis' is named after the second longest river in Italy, the Adige River, which crosses the Trentino-Alto Adige and Veneto Regions in northern Italy and of which the Sardagna stream is a tributary.

Diagnostic characters

Head. Antenna 910 µm long, last flagellomere 420 µm long, AR 0.86; clypeus smoothly sub-rectangular to square-like shaped, with 6 setae in 3 rows; palpomere 3 with 3 characteristic sensilla coeloconica. Thorax. Lobes of antepronotum not gaping, lateral antepronotals absent; acrostichals 17 starting close to scutum. Wing. Squama with 9 setae; veins: R4, located on proximal half; remaining veins bare; squama with 9 short setae in 1 row. Legs. Sensilla chaetica on tibia and tarsomeres ta_1-ta_5 of PI, present only on tarsomeres of PII-PIII. Abdomen. Tergite IX without anal tergite bands, dorsal margin bent downwards; anal point triangular, without lateral expansions. Virga composed of 2 curved unequal spines. Phallapodeme well-developed, aedeagal lobe ellipsoid, basal expansion short. Gonocoxite with characteristic sclerotization on basal junction; setiferous dorsal area with 6 stout setae on distal part, median part bare. Inferior volsella long nose-shaped, spatulate apically and bearing 2 characteristic pre-apical setae. Gonostylus without posterior projection, posterior margin distinctly rounded; crista dorsalis present (visible in lateral view).

Description

Male adult

(n = 2; Figs 1A-L)

Medium sized species. Total length (TL) 2.45 mm. Wing length (WL) 1.70 mm. TL/WL = 1.44. General colouration contrasting pale brown to dark brown-blackish. Head dark brown to blackish, antenna pale brownish; thorax contrasting brown to dark brown with blackish mesonotal stripes, scutellum brownish with blackish margins; legs uniformly brownish; abdomen brownish, anal segment contrasting from pale brown to dark brown.

Head. Eyes bare. Frontal area without tubercles; margins of vertex slightly thinner at base; coronal triangle (Fig. 1A) smoothly heart shaped, coronal 4; temporals 9 including 6 inner and 3 outer verticals. Antenna 13-segmented, 910 µm long, last flagellomere 420 µm long, AR 0.86; antennal groove reaching segment 3. Clypeus (Fig. 1B) smoothly sub-rectangular to square-shaped, nearly equal sides (each of 85 µm long), with 6 setae in 3 rows. Palp 5-segmented, palpomere 3 (Fig. 1C) with 3 sensilla clavata and 3 sensilla coeloconica; length (in µm) of segments: 35, 48, 75, 75, 135; segments 3 and 4 subequal.

Thorax. Antepronotum well developed, antepronotal lobes (Fig. 1D) not gaping, dorsal part distinctly thinner, not pointed, all antepronotals typically absent; acrostichals 17 in 1–2 rows, starting close to antepronotum; dorsocentrals consist of 7 not decumbent setae in 1 row; prealars 3; humeral pit absent; supraalars absent; scutellum with 6 uniserial setae (3 on each side of the midline).

Wing. Brachiolum with 1 seta; subcosta overreaching fork of radius; costal expansion 55 µm long. Membrane with coarse punctuation. Distribution of setae on veins: R, 4, located on proximal half; remaining veins bare; squama with 9 short setae in 1 row.

Legs. Sensilla chaetica on: tibia and tarsomeres ta_1–ta_5 of PI, only on tarsomeres of PII-PIII. Length (in µm) and proportions of leg segments as in Table 1 (n = 1).

Abdomen. Hypopygium in dorsal and ventral view as in Figs 1F-G (1F, dorsal; 1G, ventral with tergite IX and anal point omitted). Tergite IX in dorsal and lateral view (Figs 1F, H: 1F dorsal, 1H, lateral), broadly sub-circular with rounded posterior margin; dorsal margin without hump, regularly arched when viewed laterally; anal tergite bands absent (Figs 1F, H); presence of 8 setae close to the posterior margin (4 on each side of anal point). Laterosternite VIII with 14 lateral setae (7 on each

Table 1. Male adult of *Bryophaenocladius adigensis* sp. n. Length (µm) and proportions of prothoracic (PI), mesothoracic (PII) and metathoracic (PIII) legs (n = 1).

	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	SV	BR
PI	610	635	415	340	235	155	90	0.66	2.03	2.97	2.60
PII	645	605	285	185	135	105	85	0.47	3.0	4.39	3.0
PIII	680	740	330	235	190	120	100	0.45	2.71	4.30	3.20

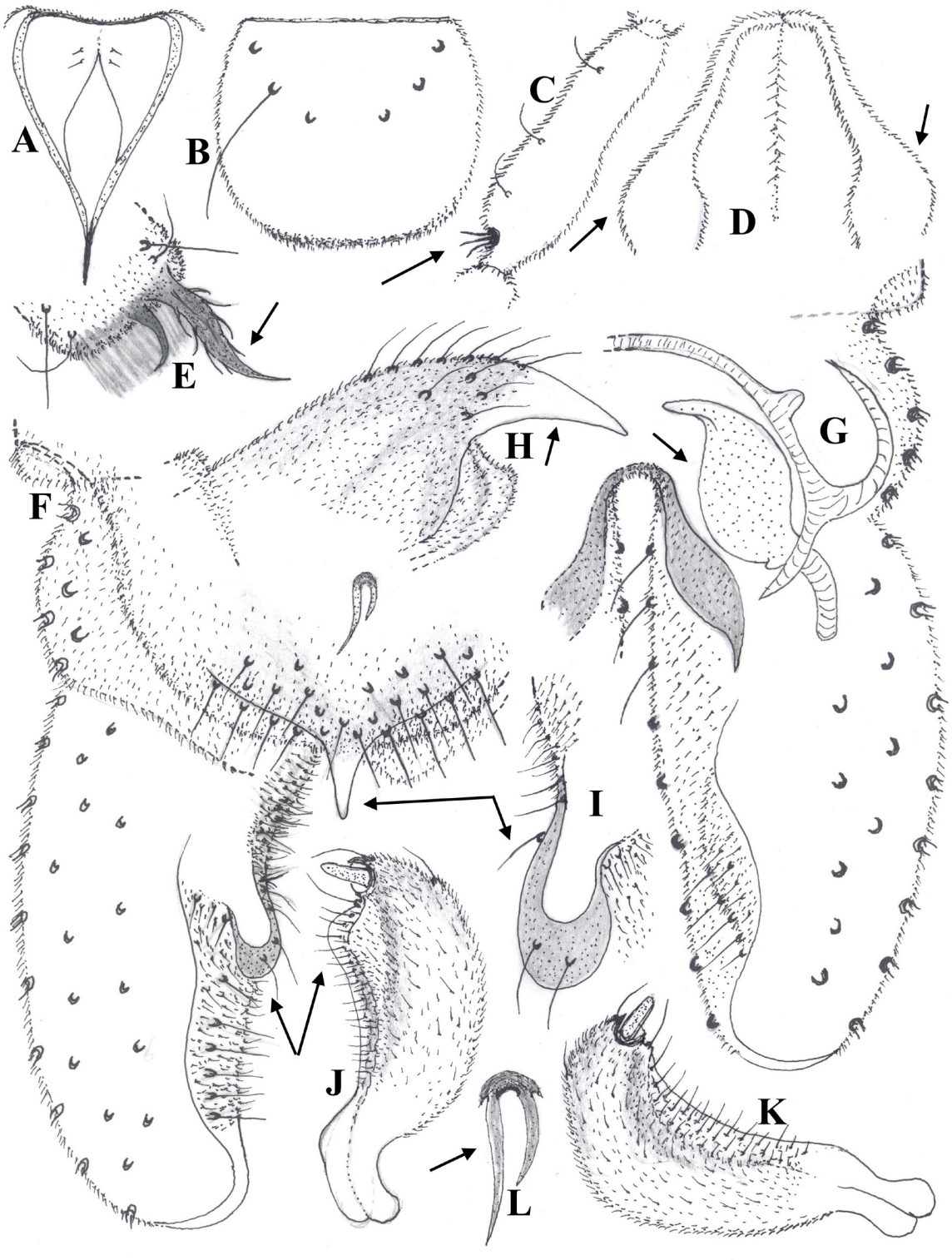

Figure 1. Male adult of *Bryophaenocladius adigensis* sp. n. A) coronal triangle; B) clypeus; C) palpomere 3; D) lobes of antepronotum; E) tibial spurs of PIII; F-G) hypopygium in dorsal and ventral view; H) tergite IX and anal point, lateral; I) inferior volsella, right side; J-K) gonostylus at right and acute angle; L) virga. The arrows indicate some distinguishing characters.

side). Anal point in dorsal and lateral view (Figs 1F, H) 15 µm long, 40 µm maximum width at base, triangular and short, apex rounded; lateral expansions absent; with about 16 setae. Virga (Figs 1F, L) consists of 2 curved spines, about 35 and 20 µm long. Transverse sternapodeme not projecting, rounded; lateral sternapodeme short. Phallapodeme well-developed, basal expansion short; aedeagal lobe large, distinctly ovoid to ellipse-like. Gonocoxite (Figs 1F-G) 180 µm long, 65 µm maximum width, rounded apically; superior volsella low lobe shaped; ventral side (Fig. 1G) with characteristic short sclerotization on basal junction, distal part with a characteristic setiferous lobe, inner margin with 9-10 stout setae; setiferous dorsal area well developed, only proximal and distal parts densely covered with setae, median area bare, distal part bearing 6 characteristic setae in a vertical row. Inferior volsella (Figs 1F, I) about 65 µm long, 15-20 µm maximum width; long nose-like shaped, strongly bent downwards; apical part spatulate with 2 distinct pre-apical short setae, median area bare. Gonostylus (Figs 1J-K) about 75 µm long and 25 µm maximum width, without posterior projection; anterior side covered with short and long fine setae; posterior margin distinctly rounded; crista dorsalis (Fig. 1J) low lobe-like, clearly visible in lateral view; megaseta well-developed. HV = 3.27; HR = 2.40.

Female adult, pupal exuviae and Larva:

unknown.

Faunal data and taxonomic remarks

Based on recently published faunal data on known *Bryophaenocladius* species from Europe (Tuiskunen and Lindeberg 1986; Armitage 1987; Caspers and Reiss 1987; Willassen 1996; Kaczorowska and Gilka 2002; Langton and Pinder 2007; Ashe and O'Connor 2012; Sæther and Spies 2013; Moubayed and Lods-Crozet 2022, Moubayed and Langton 2023), currently, there are about 42 known species from Europe, of which only 11 are reported from Italy (Rossaro et al. 2019). Consequently, the description here, of *B. adigensis* sp. n., increases the total number in the genus to 12 from this country.

Although some morphological similarities are observed between *B. adigensis* sp. n. and other related members of the genus, namely *B. aestivus* (Edwards, 1929), *B. flexidens* (Brundin, 1947), *B. muscicola* (Kieffer, 1906), *B. subvernalis* (Edwards, 1929) and *B. thaleri* Willassen, 1996, a combination of some morphological distinctive characters found in the male adult are highlighted in the following differentiating characters, which will separate the new species from other related congeners: coronal triangle (Fig. 1A) heart-shaped; clypeus (Fig. 1B) smoothly square-like; palpomere 3 (Fig. 1C) with 3 typical sensilla coeloconica; antepronotals (Fig. 1D) absent; tergite IX and anal point (Figs 1F, H) without lateral expansion; anal tergite bands absent; anal point (Figs 1F, H) triangular; aedeagal lobe of phallapodeme (Fig. 1G) typically sub-oval; virga (Figs 1F, L) consisting of 2 curved unequal spines; gonocoxite with characteristic sclerotization on basal junction, distal part with a vertical row of stout setae on both dorsal and ventral sides; distal part of gonocoxite (Fig. 1 F) with a vertical row of setae; inferior volsella (Figs 1F, I), long nose-like shaped, distal part spatulate with 2 characteristic pre-apical setae, median part bare.

Ecology geographical distribution

Male adults of *B. adigensis* sp. n. were collected around the riparian zone of Sardagna stream, at 194 m a.s.l., about 50-100 m upstream of the

Figure 2. Type-locality of *Bryophaenocladius adigensis* sp. n.. The Sardagna stream (left), the confluence between Rio Sardagna and the Adige River (right).

confluence with the Adige River in Trento (Fig. 2). Sardagna is a mountain stream, fed mainly by groundwater, its source is located in the Sardagna village, from which it waterfalls down to Trento. The stream is characterised by hard and basic water, with a conductivity of 320-415 µS/cm and a pH of 8.0-8.6, and chilly waters, with a temperature ranging from 7 to 12-14°C from spring to autumn. Enriched substratum with submerged and emergent bryophytes, humus, deciduous wood and tree bark present the riparian zone of the stream are believed to represent the most favourable microhabitats for the larvae, as typical for larvae of this genus known to be semi-terrestrial in groundwater-fed streams (Lindegaard 1995, Lencioni et al. 2011).

Geographical distribution of *B. adigensis* sp. n. is currently restricted to its type-locality.

Acknowledgements

The adults of *B. adigensis* sp. n. were coughed in July 2017 during the XX Symposium on Chironomidae held in Trento, Italy, by the first author and Patrick Ashe to whose memory the authors dedicate this work. Environmental data and photos of the stream were taken by Francesca Paoli (MUSE).

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Article submitted 7. December 2022, accepted by Richard Cornette & Torbjørn Ekrem 31. March 2023, published 29. December 2023.