

***Trissocladius orsinii* sp. n., a Tyrrhenian species
inhabiting high mountain helocrenes and streams
in Corsica and the Eastern Pyrenees
[Diptera, Chironomidae, Orthocla-diinae]**

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A description of associated paratype material (male and female adults and pupal exuviae) of *Trissocladius orsinii* sp. n. is provided based on specimens collected in springs and pristine lotic habitats located in high mountain areas of both Corsica (Central and Western areas, altitude 1400-1700 m) and the Eastern Pyrenees (altitude 1700-2000 m). Various diagnostic characters in the adult male (acrostichals, hind tibial comb and pulvilli absent; anal point short and sharply pointed) key the new species to the genus *Trissocladius* Kieffer, 1908. The generic diagnosis for the male imaginal stage is emended based on some features found in the new species including: - wing with weak anal lobe; - presence of setae on cell r_{4+5} ; - shape of inferior volsella; - gonostylus without an outer projection. The pupal exuviae also bear some additional generic features: dorsocentrals placed and inserted otherwise including an unusual thin and long Dc_1 , - wing sheath with a long pearl rows - minute metanotals present. This description increases the total number of European species in the genus *Trissocladius* to three (*T. brevivalpis* Kieffer, 1908; *T. heterocerus* Kieffer, 1908 and *T. orsinii* sp. n.). In the Tyrrhenian province (insular and continental areas) the genus *Trissocladius* is represented by only one species (*T. orsinii* sp. n.), which is a pyreneocorsican element. The larvae of *T. orsinii* sp. n. are exclusively rheophilic and crenophilous being confined to high mountain helocrenes and streams. Taxonomic remarks, discussion and comments on the ecology and geographical distribution of the new species are given.

***Trissocladius orsinii* sp. n., une espèce tyrrhénienne connue de sources et ruisseaux de haute montagne de Corse et des Pyrénées-Orientales (Diptera, Chironomidae, Orthocla-diinae)**

Mots-Clés : *Trissocladius orsinii* sp. n., Diptera Chironomidae, province tyrrhénienne, élément pyrénéo-corse, sources et ruisseaux de haute montagne, conservation.

Les adultes mâle et femelle et l'exuvie nymphale de *Trissocladius orsinii* sp. n. sont décrits à partir d'un matériel composé de paratypes et d'exuvies nymphales collectés dans des sources et ruisseaux de haute montagne situés en Corse (partie centrale et occidentale, altitude 1700-1400 m) et dans les Pyrénées-Orientales (2000-1700 m). Plusieurs critères taxonomiques chez l'adulte mâle (absence de soies acrostichales, de peigne tibial postérieur et de pulvilli ; pointe anale courte et pointue) correspondent au genre *Trissocladius* Kieffer, 1908. Une diagnose générique de l'imago mâle est établie à partir de certains caractéristiques.

tères additionnels découverts dans la nouvelle espèce: - lobe anal de l'aile non prononcé ; - présence de soies dans la cellule r_{4+5} ; - forme de la volsella inférieure ; - gonostylus sans projection extérieure. L'exuvie nymphale se distingue également par certains caractères génériques additionnels : mode d'insertion des dorsocentrales qui incluent une inhabituelle fine et longue soie Dc_1 ; - fourreau alaire avec une longue rangée de perles ; - présence de métanotales vestigiales. La présente description porte le nombre total d'espèces connues d'Europe appartenant au genre *Trissocladius* à trois (*T. brevipalpis* Kieffer, 1908; *T. heterocerus* Kieffer, 1908 et *T. orsinii* sp. n.). *T. orsinii* sp. n. est un élément pyrénéo-corse représentatif de la sous-région tyrrhénienne (province insulaire et continentale) qui s'ajoute aux autres éléments pyrénéocorses déjà connus. Les larves de *T. orsinii* n. sp. sont exclusivement rhéophiles et crénophiles, et sont confinées aux sources hélocrènes et aux ruisseaux de haute montagne. La position systématique, l'écologie et la distribution géographique de la nouvelle espèce sont discutées et commentées.

1. Introduction

According to data on the taxonomy and geographical distribution of the genus *Trissocladius* Kieffer, 1908 (PANKRATOVA 1970, SÆTHER 1976 and 1980a, COFFMAN et al. 1986, CRANSTON et al. 1989, ASHE & O'CONNOR 2012, SÆTHER & SPIES 2013) there are currently only two valid species known, both occurring in Europe: *T. brevipalpis* Kieffer, 1908 and *T. heterocerus* Kieffer, 1908. Of these only *T. brevipalpis* is reported from continental France (SÆTHER & SPIES 2013). The description here of *T. orsinii* sp. n. increases the total number of European species in the genus to three (*T. brevipalpis* Kieffer, *T. heterocerus* and *T. orsinii* sp. n. The imaginal stages of the new species key to the genus *Trissocladius* Kieffer based on some major features (e.g. acrostichals, hind tibial comb and pulvilli absent; anal point short and sharply pointed) but differs from the two other species by the following characters:

- wing with weak anal lobe;
- presence of setae on cell r_{4+5} ;
- shape of inferior volsella;
- gonostylus without an outer projection.

The pupal exuviae also bear some additional generic features:

- dorsocentrals placed and inserted otherwise including an unusually thin and very long Dc_1 ;
- very long pearl rows on the outer margin of wing sheath;
- minute metanotals present.

Generic diagnoses are given in the literature (SÆTHER 1980a, COFFMAN et al. 1986, CRANSTON et al. 1989) but those for the adult male, in CRANSTON et al. 1989, and pupal exuviae, in COFFMAN et al. 1986, are emended based on some characters found in the new species. A description of the male and female adults and pupal exuviae of *T. orsinii* sp. n. is given based on associated pharate material collected in high mountain springs and pristine streams located in both Corsica (upper streams of Restonica, Gravona and Porto Rivers, altitude 1400-1700 m) and the Eastern Pyrenees (upper streams of the rivers Tech, Mantet, Nohedes, Eyne and Rotja, altitude 1700-2000 m). In the Tyrrhenian Province (insular and continental areas) the genus *Trissocladius* is represented by only one species (*T. orsinii* sp. n.), which is confined to both Corsica (central and western areas) and the Eastern Pyrenees (extreme eastern areas).

Terminology and measurements follow those of SÆTHER (1980b) and LANGTON & PINDER (2007) for the imagines, and SÆTHER (1980b) and Langton (1991) for pupal exuviae. Taxonomic remarks, discussion and comments on the ecology and geographical distribution of the new species are provided.

2. Genus *Trissocladius* Kieffer, 1908, Emended Generic Diagnosis

Adult male

As in CRANSTON et al. (1989) except for the following modifications. Wing. Vein R_{4+5} bearing setae (*T. brevipalpis*, *T. heterocerus*) or without setae (*T. orsinii*); membrane without setae (*T. brevipalpis*, *T. heterocerus*) or with setae (*T. orsinii*, in cell r_{4+5}), with relatively strong punctation; anal lobe well developed, strongly protruding (*T. brevipalpis*, *T. heterocerus*) or weakly developed, not protruding (*T. orsinii*). Hypopygium. Virga consisting of a cluster of 6, moderately long spines (*T. brevipalpis*, *T. heterocerus*) or 3 small fused spines (*T. orsinii*); gonostylus with outer median to preapical corner or projection (*T. brevipalpis*, *T. heterocerus*) or without a projection (*T. orsinii*); crista dorsalis absent (*T. brevipalpis*, *T. heterocerus*) or distinct, on distal part (*T. orsinii*); megaseta long.

Pupal exuviae

As in COFFMAN et al. (1986) with the following modifications. Cephalothorax. Four dorso-centrals present, Dc_1 to Dc_4 all subequal, bristle-like, Dc_2 and Dc_3 closer to each other than to Dc_1 and Dc_4 , respectively (*T. brevipalpis*) or Dc_1 unusually thin and very long, Dc_2 to Dc_4 all subequal, spine-like, Dc_1 and Dc_2 closer to each other and Dc_3 closer to Dc_2 than to Dc_4 (*T. orsinii*). Metanotal absent in most *T. brevipalpis* specimens or 1 weak metanotal perhaps present (reported by SÆTHER 1980a) in one specimen of *T. brevipalpis* or with 1-2 weak metanotals (*T. orsinii*), metanotals not found with certainty in any other genera of Orthoclaadiinae. Wing sheath without pearl rows (*T. brevipalpis*) or with very long pearl rows along outer margin (*T. orsinii*).

3. *Trissocladius orsinii* sp. n.

Studied material

Holotype, France, Corsica: upper basin of the Restonica River (Central Corsica), Cavacciole tributary, waterfalls at the outflow of Lake Cavacciole (altitude 1500-1800 m), 1 male pharate, leg. J. Moubayed-Breil, 07.VII.1995.

Paratypes (all leg. J M-B). - Corsica (zone 4a, in MOUBAYED-BREIL & ASHE (2012)): 1 male pupal exuviae, upstream area of the Restonica River, waterfalls at the "Bergeries de Grotelle", altitude 1350-1400 m, 07.VII.1995; 1 female pharate, upstream area of the Porto River (Central and Western Corsica, altitude 1500-1600 m), 08.VII.1995; 1 female pupal exuviae, upstream area of the Gravona River, waterfall of 'Voile de la Mariée' (Central and Western Corsica, altitude 1400-1500 m), 21.IX.2014. - Pyrénées-Orientales (Eastern Pyrenees, zone 8a, in MOUBAYED-BREIL (2008)): 1 male pharate, upstream area of the Nohèdes River basin (altitude 1900-2000 m), 15.VII.1996; 2 female pupal exuviae, upstream of the Mantet River, Ressec stream (Mantet Nat. Reserve, altitude 1800-2000 m), 11.VI.2007; 1 female pharate, 3 pupal exuviae (2 male, 1 female), upstream area of the Tech River, Escardes des Rotja (Prats-De-Mollo Nat. Reserve, altitude 1700-1750 m), 11.VII.2001.

Holotype (on 1 slide) is deposited in the collections of the National Museum of Ireland, Kildare Street, Dublin 2, Ireland. Paratypes are deposited in the senior author's collection. Type material was preserved in 70% alcohol, and later mounted in polyvinyl lactophenol. For each adult, the head, thorax and abdomen were cleared in 90% lactic acid before mounting on slides.

Etymology

The new species is named *orsinii* after our colleague Dr. Antoine Orsini from the University of Corte (Corsica) who remains active as a hydrobiologist in contributing to preserving the environment and habitats of endemics species in Corsica.

Description

Male imago

(n = 2, male paratype adults; Figs 1-6, 9-14)

Small sized (smaller than *T. brevipalpis* and *T. heterocerus*). Total length 2.95-3.05 mm. Wing length 1.75-1.85 mm. General colouration contrasting brown to dark brown especially on the thorax and legs. Head, antenna and halteres brown. Thorax brown with dark brown mesonotal stripes. Legs brown; apex of femur and tibia of PI, PII and PIII darkened; tarsomeres brownish, except for contrasting blackish fifth tarsomeres of all legs. Wing with distinct dark shading.

Head. Eyes bare, elongated mediodorsally, hairs present on proximal part of inner eye margin (Fig. 1). Temporal setae 5-7, including 2-3 inner and 3-4 outer verticals, postorbitals absent. Clypeus with 14-16 setae in 3 rows. Palp 5-segmented; length (μm) of segments 25, 32, 71, 76, 92.

Antenna 855-865 μm long, 13-segmented; antennal groove reaching flagellomere 3; segments 2 and 3 globulous; segments 4 to 12 linear and nearly subequal; segments 2 to 8 progressively increasing in length; segments 10 to 12 gradually decreasing in length; ultimate flagellomere moderately clubbed, bearing a brush of curved sensilla chaetica apically. Length (μm) of segments: 29, 25, 31, 36, 42, 46, 47, 51, 50, 50, 47, 45, 305-315. AR 0.55-0.57.

Thorax. Anteprepronotum (Fig. 2) with 4-5 median setae, lateral anteprepronotals absent; acrostichals absent; dorsocentrals 6-8, uniserial; prealars 4; supraalars 0-1. Scutellum with 6 setae in a single row. Preepisternum bare.

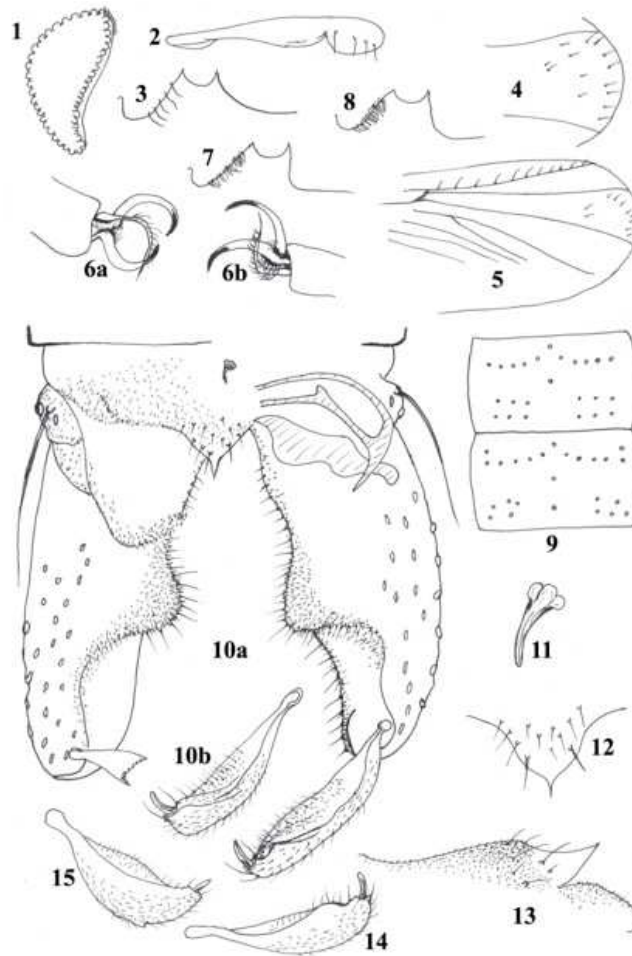
Wing (Figs 3-5). Brachiolum with 1 seta. Venation and distribution of setae on veins, membrane and cells: R, 13-15; R₁, 5-6; R₂₊₃, 9-10; Cu₁, 0; An, 0; r₄₊₅, 11-13 (Figs 4-5); m₁₊₂, 0; m₃₊₄, 0; cu, 0; an, 0. Anal lobe not protruding, relatively weakly developed (Fig. 3). Squama with 5-6 setae in a single row (Fig. 3).

Legs. Hind tibial comb absent; tarsomere 5 of PI, PII and PIII lacking pulvilli as illustrated (Fig. 6a for PI; Fig. 6b for PIII). Length (μm) and proportions of legs:

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
PI	465	570	253	150	105	83	73	0.44	3.13	4.1	2.9-3.0
PII	430	565	260	135	110	82	75	0.46	3.12	3.44	2.1-2.2
PIII	415	530	305	185	135	85	77	0.58	2.59	3.1	2.4-2.5

“LR = Length of tarsomere ta₁ divided by length of tibia (ti); BV = Combined length of femur (fe), tibia and ta₁ divided by combined length of tarsomeres ta₂-ta₅; SV = Ratio of femur plus tibia to tarsomere ta₁;

BR = Ratio of longest seta of ta₁ divided by minimum width of ta₁, measured one third from apex.”



Figures 1-15. Male imago of *Trissocladius* spp. *Trissocladius orsinii* sp. n.: hairs on inner margin of eyes (1); anteprepronotum (2). Wing: squama and anal lobe (3); two aspects of distribution pattern of setae on cell r_{4+5} (4-5); last tarsomere of PI (6a) and PIII (6b); distribution pattern of setae on tergites III-IV (9); hypopygium, dorsal (left) and ventral (right) (10a); virga (11); anal point in dorsal (10a, holotype; 12, paratype) and lateral view (13); left gonostylus in lateral view (14); right gonostylus of paratype (10b). Squama and anal lobe of wing of: *T. heterocerus* (7) after SÆTHER (1976, Fig. 50B); *T. brevipalpis* (8) after Sæther (1976, Fig. 48E). Left gonostylus of *T. brevipalpis* (15) after SÆTHER (1976, Fig. 49B).

Figures 1-15. Imago mâle de *Trissocladius* spp. *Trissocladius orsinii* sp. n. : pubescence de la membrane interne des yeux (1) ; antépronotum (2). Aile : squama et lobe anal (3) ; deux aspects du mode de distribution des soies sur la cellule r_{4+5} (4-5) ; dernier tarsomère de PI (6a) et de PIII (6b) ; mode de distribution des soies sur les tergites III-IV (9) ; hypopyge, vue dorsale (à gauche) et ventrale (à droite) (10a) ; virga (11) ; pointe anale en vue dorsale (holotype, 10a; paratype, 12) et latérale (13) ; gonostyle gauche en vue latérale (14) ; gonostyle droit, paratype (10b). Squama et lobe anal de l'aile de: *T. heterocerus* (7) d'après Sæther (1976, Fig. 50B) ; *T. brevipalpis* (8) d'après SÆTHER (1976, Fig. 48E). Gonostyle gauche de *T. brevipalpis* (15) d'après SÆTHER (1976, Fig. 49B).

Abdomen. Distribution pattern of setae on tergites III-IV as illustrated (Fig. 9). Hypopygium in dorsal and ventral view (holotype, Fig. 10a). Tergite IX sub-rectangular and broad with a nearly straight posterior margin. Anal point 160-170 μm long, short, triangular to nearly cup-like, broadened at base, uniformly narrowed and sharply pointed in both dorsal (Figs 10a, holotype; 12, paratype) and lateral view (Fig. 13), narrowed medially, base bearing 12 to 13 setae. Laterosternite IX with 3 setae. Transverse sternapodeme and phallapodeme as in Fig. 10a. Virga (Fig. 11) consists of 3 small characteristic spines, bent downwards and distinctly fused at base. Gonocoxite 180-185 μm long, maximum width 120-130 μm , slightly swollen at base, bearing a rounded inferior volsella which consists of two nearly subequal lobes; dorsal lobe about 250 μm wide, slightly larger than ventral lobe, outer margin of dorsal lobe circular and bearing several stout setae; ventral lobe 240 μm wide, less prominent with a subtriangular outer margin, also bearing stout setae. Gonostylus (holotype, Figs 10a, 14; paratype 10b) 85-90 μm long, basal margin swollen distally, bearing 6-7 stout orally directed setae; crista dorsalis distinct, located on distal part; megaseta 15-20 μm long, slender and bent inwards.

Female imago

(n = 2, female paratype adults; Figs 16-21)

Colouration as in the male adult. Total length 3.10-3.20 mm. Wing length 1.90 mm. Antenna length 271 μm . Head. Eyes bare; hairs present on median part of inner eye margin; temporal setae 5, including 5 inner and 3 outer verticals, postorbitals absent. Clypeus with 16 setae. Palp 5-segmented; length (μm) of segments: 21, 25, 67, 83, 97. Antenna (Fig. 16) 6-segmented; length (μm) of segments: 22, 40, 43, 43, 44, 79; ultimate flagellomere moderately clubbed, bearing apically a tuft of curved setae including several sensilla chaetica; AR 0.41.

Thorax as in the male. Wing. Distribution of the number of setae on veins: R, 15; R₁, 7; R₂₊₃, 10-11; R₄₊₅ 0. Cell r₄₊₅ with 11 setae. Squama with 9-10 setae.

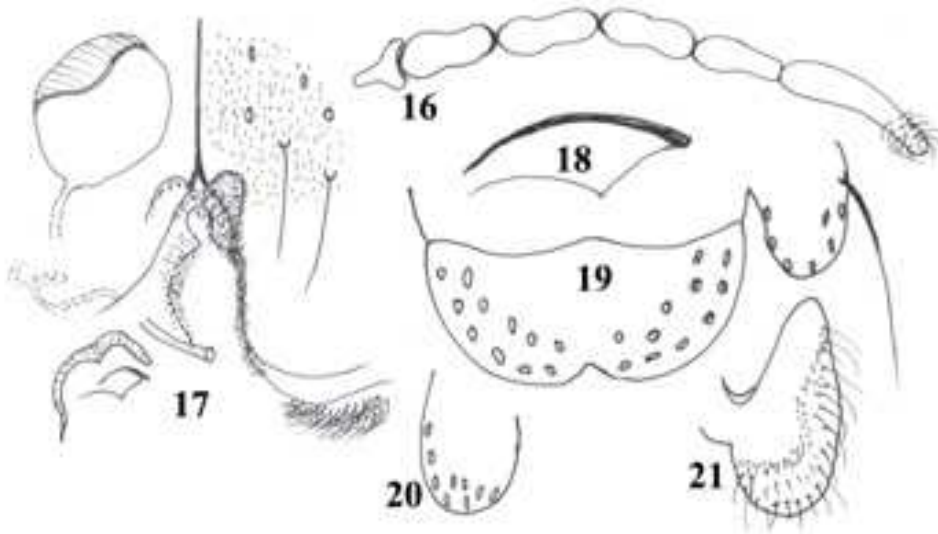
Genitalia in dorsal and ventral view as illustrated (Fig. 17). Notum 73-75 μm long, rami moderately distinct. Gonapophysis VIII including ventrolateral and dorsomesal lobes: dorsomesal lobe slightly concave proximally and weakly swollen distally; apodeme lobe (Fig. 18) nearly semi-circular. Seminal capsules almost circular, 42-45 μm long, 32-35 μm wide, sclerotized part located proximally and occupying $\frac{1}{4}$ of the total surface. Spermathecal ducts with loops and separate openings. Sternite VIII with 12 setae (6 on each side of Gonapophysis VIII). Tergite IX (Fig. 19) semicircular, partly divided posteriorly, with 22 setae (11 on each side). Gonocoxite (Fig. 20) lobe-like, elongated, bearing 9 long setae, 105-110 μm long. Cercus (Fig. 21) normally developed.

Pupal exuviae

(n = 10; figures 22-24, 26-34)

Colouration in general brownish to dark brown. Cephalothorax brown to dark brown, wrinkled to granulose in general and bearing characteristic reticulation near the thoracic suture. Frontal apotome with characteristic rugulose warts. Thorax bearing: - granulation on proximal area near anteprenotal setae; - a distinctly domed and broadened rugulose wart below the lateral anteprenotals; - dark shading on anteromedian, median and posteromedian areas; - reticulation along the anteromedian area of the thoracic suture, nearly reaching base of thoracic horn, dense and markedly visible proximally, gradually becoming indistinct posteriorly. Dorsocentral area lacking granulation. Antennal and wing sheaths with distinct brown shading; proximal inner

margin of antennal sheath bearing characteristic undulations on anteroproximal part. Abdomen including anal segment dark brown; blackish apophyses present on segments I-VI; muscles marks distinct on segments I-VII, indistinct on VIII.

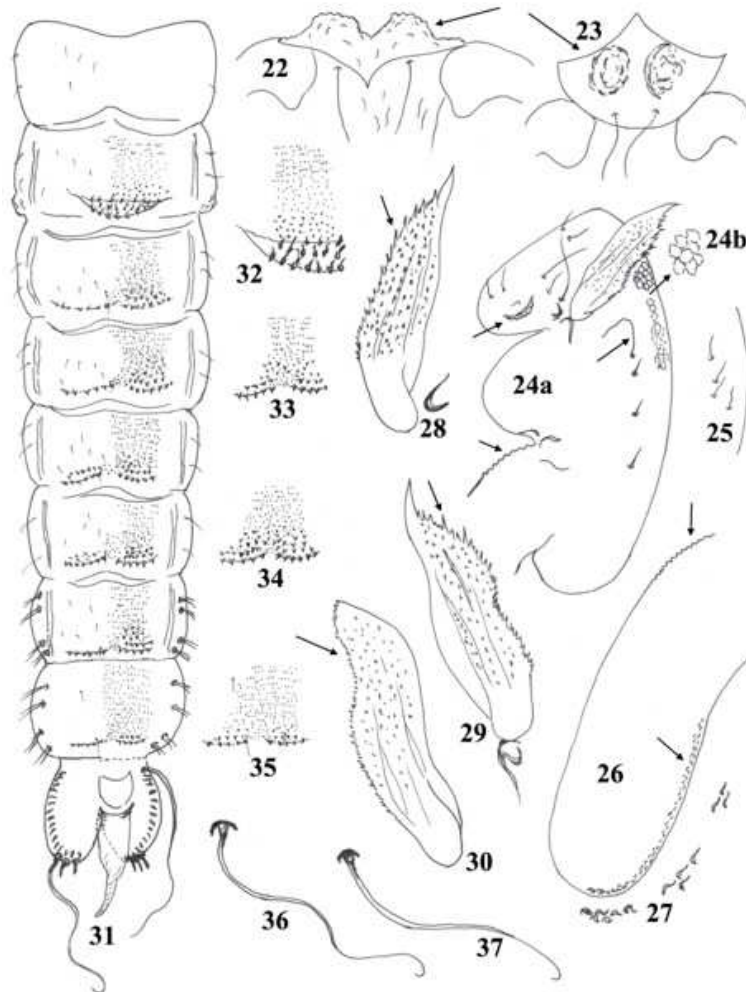


Figures 16-21. Female imago of *Trissocladius orsinii* sp. n.: antenna (16); genitalia in ventral and dorsal view (17) including gonapophysis VIII, sternite VIII and seminal capsule; apodeme lobe (18); tergite IX and right gonocoxite in dorsal view (19); left gonocoxite (20); cercus in lateral view (21).

Figures 16-21. Imago femelle de *Trissocladius orsinii* sp. n. : antenne (16) ; genitalia en vue dorsale et ventrale (17) y compris la gonapophyse VIII, le sternite VIII et la capsule séminale ; lobe de l'apodème (18) ; tergite IX et gonocoxite droit en vue dorsale (19) ; gonocoxite gauche (20) ; cerque en vue latérale (21).

Total length 3.0-3.10 mm. Thorax 0.70-0.75 mm long. Abdomen 2.30-2.35 mm long. Frontal apotome (Figs 22-23) distinctly domed and broadened bearing warts on anterior margin, frontal setae 70-80 μm long, bristle-like, not on tubercles, separated by about 50-55 μm .

Cephalothorax (Figs 24a-24b). Thorax bearing characteristic reticulation on anteromedian area, markedly visible between the thoracic horn and thoracic suture. Thoracic horn (Figs 28-29) densely spinulated, inner margin smooth, outer margin strongly toothed especially on proximal part. Median anteprenotals subequal, 65-75 μm long; lateral anteprenotals subequal, 60-70 μm long. Precorneal setae 105-115, 50-60 and 30-35 μm long. Dorsocentrals (Fig. 24a): Dc_2 placed close to Dc_1 ; Dc_1 120-130 μm long, thin, bristle-like; Dc_2 , Dc_3 and Dc_4 spine-like and subequal, 65, 85 and 70 μm long; distance between Dc_1 to Dc_2 23-25 μm ; Dc_2 to Dc_3 and Dc_3 to Dc_4 separated respectively by 61-63 and 51-53 μm . Metanotals present, consisting of 1-2 minute setae, each about 10-15 μm long. Wing sheath (Figs 24a, 26-27) bearing distinct undulations on proximal part of inner margin and characteristic long pearl rows (1-2) along the outer margin, which extend over half the length of the wing sheath.



Figures 22-37. *Trissocladius* spp., pupal exuviae. Male pupal exuviae of *Trissocladius orsinii* sp. n.: two aspects of frontal apotome (22-23); cephalothorax (24a); details of reticulation on the anteromedian area of thorax (24b); distribution pattern of pearl rows on wing sheath (26-27); two aspects of thoracic horn (28-29); armament pattern and chaetotaxy of abdominal segments I-VIII (31-35); details of armament on tergites: II (32), IV (33), VI (34) and VIII (35); shape of anal macrosetae (Corsican specimens, 36; Eastern Pyrenean specimens, 37). *T. brevipalpis*: distribution pattern of dorsocentrals (25), after SÆTHER (1980a, Fig. 3C); thoracic horn (30), after SÆTHER (1980a, Fig. 3C).

Figures 22-37. *Trissocladius* spp., exuvie nymphale. Exuvie nymphale male de *Trissocladius orsinii* sp. n. : deux aspects de l'apotome frontale (22-23) ; céphalothorax (24a) ; détails des réticulations sur l'aire antéromédiane du thorax (24b) ; mode de distribution des rangées de perles sur le fourreau alaire (26-27) ; deux aspects de la corne thoracique (28-29) ; ornementation et chaetotaxie des segments abdominaux I-VIII (31-35) ; détails de l'ornementation des tergites : II (32), IV (33), VI (34) et VIII (35) ; forme des macrosoies anales (spécimens de Corse, 36 ; spécimens des Pyrénées-Orientales, 37). *T. brevipalpis* : mode de distribution des soies dorsocentrals (25), d'après SÆTHER (1980a, Fig. 3C) ; corne thoracique (30), d'après SÆTHER (1980a, Fig. 3C).

Abdomen (Figs 31-35). Armament and distribution pattern of shagreen, patches of spinules and points, chaetotaxy and lateral setation of abdominal segments as illustrated (Fig. 31, tergites and sternites). Tergite I bare. Transverse rows on posterior margin of tergite II (Figs 31-32) 180-190 μm wide, armed with 2 (occasionally 3) rows of 21-27 hooks, orally projecting and occupying about 1/4 of segment width. Anteromedian patches of shagreen and small points present on tergites II-VIII, faint and weak on II-VII, becoming gradually more extensive on VIII. Postero-medial transverse rows of posteriorly projecting small spines (Figs 31, 32-35) are restricted to tergites III-VIII, occupying about 3/4 width of segments; size of spines is larger on tergites III-VII than on VIII. Pedes spurii B weak but distinct. Sternites bare; Pedes spurii A present on sternites IV-VI, distinct on IV-VI, indistinct on VII. Apophyses markedly distinct on segments I-VI. Anal segment 270-280 μm long 250-260 μm wide, slightly narrowed towards apices, bearing 16-19 taeniate setae (16-18 in male, 17-19 in female). Male genital sac 225-235 μm long, swollen proximally and narrowed distally, overreaching apical margin of anal lobe by 105-110 μm . Macrosetae (315-325 μm long and regularly sinuous in Corsican specimens, Figs 31, 36; 265-275 μm long and regularly S-shaped in Pyrenean specimens, Fig. 37), stout and inserted on well developed tubercles, curved and pointed apically. No indication of sexual dimorphism on sternite VIII in male or female.

Larva: unknown.

4. Taxonomic position

Using the relevant taxonomic literature (SÆTHER 1976, 1980a; CRANSTON et al. 1989) the male and female imagines of the new species keys to the genus *Trissocladius* on the basis of various characters including in both male and female imagines: - the absence of acrostichals, hind tibial comb and pulvilli; (in the male) anal point short and sharply pointed; (in the female) seminal sac partly sclerotized. In SÆTHER (1980a) and Coffman et al. (1986) the pupal exuviae key to the genus *Trissocladius*.

Trissocladius orsinii sp. n. can be easily distinguished from the two other known European species (*T. brevivalpis* and *T. heterocerus*) by a combination of differentiating characters. In the male adult: - the presence of setae on cell r_{4+5} (Figs 4-5); - wing with a weakly developed and non protruding anal lobe (Fig. 3); - squama bearing only 5-6 setae (Fig. 3) much less than in *T. heterocerus* (21-26, Fig. 7) and *T. brevivalpis* (10-24, Fig. 8); - distribution pattern of setae on tergites III-IV (Fig. 9); - shape of the anal point, inferior volsella and gonostylus (Figs 10a-10b, 12-14). In the female adult: - shape and form of gonapophysis VIII (ventrolateral and dorsomesal lobes), - the sclerotized area on seminal capsules (Fig. 17), tergite IX divided posteriorly (Fig. 19). In the pupal exuviae: - the frontal apotome distinctly domed and granulated (Figs 22-23); - thoracic horn more spiny (Figs 28-29) than in *T. brevivalpis* (Fig. 29); - presence of characteristic reticulation on anteromedian area of thorax (Fig. 24a-24b); placement of dorsocentrals on thorax (Fig. 24a) is different in *T. brevivalpis* (Fig. 25); - wing sheath bearing characteristic long pearl rows along the outer margin (Figs 26-27) and undulations on proximal inner margin (Figs 24a, 26); armament pattern of segments III-VIII (Fig. 31); shape of macrosetae (sinuous, Fig. 36, S-shaped, Fig. 37). A male pupal exuviae of *T. brevivalpis*, in the National Museum of Ireland, examined by the junior author, showed the presence of the following characters: - reticulation and semicircular wart on the cephalothorax; - absence of pearl row on wing sheaths. However, the shape and length of macrosetae (sinuous and longer in specimens from Corsica, S-shaped in

specimens from the Eastern Pyrenees) are considered as geographical intra-specific variation between the two populations.

Key to adult males and known pupal exuviae of *Trissocladius* Kieffer

Adult males (modified in part from SÆTHER 1976)

1. Wing membrane with setae in cell r_{4+5} (Figs 4-5); Squama with 5-6 setae (Fig. 3); Gonostylus without an outer projection on posterior margin, crista dorsalis present distally (Figs 10a-10b, 14); Virga consists of 3 small fused spines (Fig. 11)*T. orsinii* sp. n. Moubayed-Breil & Ashe
- Wing membrane without setae in cell r_{4+5} (SÆTHER 1976, Figs 48E, 50B); Squama with 10 or more setae (Figs 7-8); Gonostylus with an outer projection on posterior margin, crista dorsalis absent (SÆTHER 1976, Figs 49B, 50E); Virga consists of a cluster of 6 moderately long spines (SÆTHER 1976, Fig. 49B)2
2. Tergite IX including anal point with 46-61 setae, anal point stronger and less sharply pointed (SÆTHER 1976, Figs 50C-D); Squama with 21-26 setae (Fig. 7; SÆTHER 1976, Fig. 50B) *T. heterocerus* Kieffer, 1908
- Tergite IX including anal point with 26-38 setae, anal point proper short and sharply pointed (SÆTHER 1976, Fig. 49B); Squama with 10-24 setae (Fig. 8; SÆTHER 1976, Fig. 48E) *T. brevialpis* Kieffer, 1908

Pupal exuviae (*T. heterocerus* unknown)

1. Wing sheath without long pearl rows close to outer margin; Dorsocentrals, Dc_1 to Dc_4 all subequal in length, bristle-like, placed close together (Fig. 25; SÆTHER 1980a, Fig. 3C)*T. brevialpis* Kieffer, 1908
- Wing sheath with very long pearl rows along outer margin (Figs 26-27); Dorsocentrals placed otherwise along the thoracic suture, not all subequal in length; Dc_1 thin and very long; Dc_2 , Dc_3 and Dc_4 spine-like (Fig. 24)*T. orsinii* sp. n. Moubayed-Breil & Ashe

5. Ecology and geographical distribution

Male and female pharates (adults and associated pupal exuviae) belonging to *Trissocladius orsinii* sp. n. were collected in high mountain springs and streams located in Corsica and the Eastern Pyrenees, (altitude 1400-2000 m). Localities where material was collected consist of moderate to weakly shaded pristine stretches with cold mountain helocrenes and streams, including waterfalls, on rocky or sandy to gravelly substrata. Bryocolous, hygropetric and madicolous habitats including waterfalls probably represent the most common and favoured aquatic areas for larval populations. Such lotic habitats, which are endangered by ecotourism and both natural and accidental flooding, deserve much greater consideration, protection and preservation. The new species is typically rheophilic and representative of helocrenes and cold stenothermic streams. It belongs to the crenobiontic and crenophilous community of species as documented by Lindegaard (1995).

T. orsinii sp. n., the third European species in the genus, is only known from the eastern part of French Pyrenees and Corsica. Within the Tyrrhenian Province, it is also the third recently documented pyreneocorsican chironomid taxon (the other two being *Rheotanytarsus dactylopho-*

reus Moubayed-Breil, Ashe & Langton 2012 (Moubayed-Breil et al. 2012) and Orthoclaadiinae, genus nov., sp. nov., reported by Moubayed-Breil & Ashe 2012), which reinforces affinities between western Corsica and the eastern part of the Eastern Pyrenees. Occurrence of this rare and sparsely distributed new rheophilic species in both Corsica and the Eastern Pyrenees indicates that it is apparently more widespread in similar cold high mountain streams of the Tyrrhenian subregion, and therefore can be expected to occur in other similar geographic areas of the western Mediterranean, including for example similar high altitude pristine streams located in Spain and Italy.



Photo 1. Corsica, upper basin of the Restonica River, Cavacciole tributary (altitude 1500-1800 m), down to Lake Cavacciole (2015 m), up to the "Bergeries de Grotelle" (holotype locality). Photo A. Orsini.

Photo 1. Corsica, bassin supérieur de la Restonica, affluent Cavacciole (altitude 1500-1800 m), en dessous du lac Cavacciole (2015 m), au-dessus de la Bergerie de Grotelle (localité de l'holotype). Photo A. Orsini.



Photo 2. “Voile de la Mariée” (paratype locality), altitude 1400-1500 m, upstream area of the Gravona River, a fascinating waterfall located in Central Corsica. Photo J. M-B.

Photo 2. Voile de la Mariée (localité du paratype), altitude 1400-1500 m, bassin supérieur de la Gravona, une fascinante cascade de la partie centrale de la Corse. Photo J. M-B.

Aquatic insects encountered in the same localities include cold stenothermic species belonging mainly to the following genera: *Baetis*, *Ecdyonurus*, *Electrogena*, *Rhithrogena* (Ephemeroptera); *Leuctra*, *Capnioneura*, *Protonemura*, *Arcynopteryx*, *Isoperla* (Plecoptera); *Rhyacophila*, *Silo*, *Silonella*, *Allogamus* (Trichoptera); *Liponeura*, *Prosimulium*, *Simulium*, *Thaumalea*, *Dia-mesa*, *Syndiamesa*, *Pseudodiamesa* and *Wiedemannia* (Diptera).

Chironomid species encountered in the same streams, and listed by MOUBAYED-BREIL (2007) for continental France and MOUBAYED-BREIL & ASHE (2012) for Corsica, include: *Boreoheptagyia cinctipes* (Edwards, 1928); *Diamesa latitarsis* (Goetghebuer, 1921); *D. insignipes* Kieffer, 1908; *D. cinerella* Meigen, 1835; *D. macronyx* (Kieffer, 1918); *D. zernyi* Edwards, 1933; *Pseudodiamesa branickii* (Nowicki, 1873); *P. nivosa* (Goetghebuer, 1928); *Syndiamesa*

nigra Rossaro, 1980; *Bryophaenocladus aestivus* (Brundin, 1947); *B. nidorum* (Edwards, 1929); *Chaetocladus suecicus* (Kieffer, 1916); *Eukiefferiella fittkai* Lehmann, 1972; *E. minor* (Edwards, 1929); *Krenosmittia boreoalpina* (Goetghebuer, 1944); *Parametriocnemus boreoalpinus* Gowin & Thienemann, 1942; *Thienemannia corsicana* Moubayed-Breil, 2013 and *T. gracilis* Kieffer, 1909.

Two species of *Trissocladus*, *T. brevivalpis* and *T. heterocerus*, are associated with small standing water bodies (including temporary and permanent pools, marshes and ponds) and even slow-flowing ditches and brooks (*T. brevivalpis*), with emergence primarily in Spring (March to May) (SÆTHER 1976, MOLLER PILOT 2013). Both species appear to be more common in lowland areas, with *T. brevivalpis* more frequently reported in central and northern Europe than in southern Europe while *T. heterocerus* is only known from Denmark and Germany. In contrast, *T. orsinii* is associated with cold high mountain springs and streams, at altitude ranging from 1400 to 2000 m, located in Corsica and the Eastern Pyrenees, with recorded emergence in Summer and early Autumn (June, July and September).

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