

## A new species of *Bryophaenocladius* (Diptera: Chironomidae) from Argentina

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### Una nueva especie de *Bryophaenocladius* (Diptera: Chironomidae) de Argentina

■ **RESUMEN.** Se describe y se dibuja el macho de *Bryophaenocladius carolinae* sp. nov. La especie puede separarse del resto de las especies Neotropicales porque posee una punta anal hialina y triangular, con su punta redondeada; la volsella inferior sub-rectangular y comparativamente más pequeña; gonostilo ensanchado en su parte media y con una quilla externa;  $R_{4+5}$  finalizando opuesta a la terminación de  $M_{3+4}$ ; escama setosa, pseudospinas y peine en la tibia de la pata dos, ausentes. Se brinda una clave de identificación de adultos machos neotropicales del género *Bryophaenocladius* Thienemann.

**PALABRAS CLAVE.** Orthoclaadiinae. Sistemática. Neotrópico. Clave.

■ **ABSTRACT.** The male of *Bryophaenocladius carolinae* sp. nov. is described and figured. The species can be separated from all other Neotropical species by having a hyaline, blunt triangular anal point, a comparatively small, sub-rectangular inferior volsella, gonostylus widened medially with an outer heel,  $R_{4+5}$  ending opposite to end of  $M_{3+4}$ , setose squama and absence of comb on middle tibia and pseudospurs. A key to the adult males of the Neotropical *Bryophaenocladius* Thienemann is provided.

**KEY WORDS.** Orthoclaadiinae. Systematics. Neotropics. Key.

### INTRODUCTION

The genus *Bryophaenocladius* Thienemann is distributed worldwide, with the possible exception of Australasia. The genus is very rich with more than 100 species recorded (Du *et al.* 2011). Most species of *Bryophaenocladius* appear to be terrestrial or semi-terrestrial (Cranston *et al.*, 1989) but Strenzke (1942) recorded immatures of *B. subvernalis* (Edwards) from two alpine lakes.

The delimitation of this genus is difficult since there are exceptions for nearly all diagnostic characters, but in the last ten years several revisions clarify its systematics

and the topic is still in progress (Wang *et al.*, 2001; 2004; 2006; Du *et al.*, 2011).

In this contribution, a new species of the genus *Bryophaenocladius* is described based on male specimens and the key to adult males of the genus for the Neotropical region by Wang *et al.* (2006) is updated.

### MATERIAL AND METHODS

The specimens were collected with a sweep net. Microscope slides were made by clearing with 10% KOH; neutralization with glacial acetic acid; dehydration in 80%, 96%

and 100% ethanol and mounting in Canada Balsam. Morphological measurements follow Sæther (1980) in  $\mu\text{m}$  rounded to the nearest 5 unless otherwise stated. Measurements are given as ranges followed by measurements of the holotype in square brackets.

Comparisons with other members of the genus *Bryophaenocladius* were made from the original descriptions and revisions. In addition, the new species was compared with the holotype of *Bryophaenocladius nidorum* (Edwards) housed in the Natural History Museum (London, UK) and collection material of *B. aestivus* (Brundin), *B. cf. astis* (Roback), *B. flavoscutellatus* (Malloch) and *B. pleuralis* (Malloch) deposited in the Department of Natural History, Bergen Museum, University of Bergen, Norway. The holotypes of the species described by Dr. Manabu Sasa were studied from the National Museum of Nature and Science Tokyo (Japan), Type Specimen Database (<http://www.type.kahaku.go.jp/TypeDB/diptera>), except *B. ikiheius* Sasa et Suzuki which was not found in this database.

The holotype and paratypes of *Bryophaenocladius carolinae* sp. nov. are housed in La Plata Museum, Argentina (MLP).

## RESULTS

### *Bryophaenocladius carolinae* sp. nov.

**Diagnosis:** The species can be separated from all other Neotropical species by the following combination of characters: anal point hyaline, triangular with blunt apex; inferior volsella comparatively small, sub-rectangular; gonostylus widened medially, with outer heel indicated;  $R_{4+5}$  ending opposite to end of  $M_{3+4}$ , squama setose and comb on middle tibia and pseudospurs absent.

#### Male ( $n = 2-3$ )

Total length 2.45–2.65 [2.45] mm (2). Wing length 1.34–1.58 [1.34] mm. Total length/wing length 1.72–1.83 [1.83] (2).

Wing length/length of profemur 2.68–2.85 [2.68] (2). Coloration blackish brown.

Head. Antennae with 13 flagellomeres, AR 1.36–1.41 [1.41], ultimate flagellomere length 410–450 [410]  $\mu\text{m}$ . Temporal setae 10–11 [11], divided in 4 inner verticals, 3 outer verticals and 3–4 [4] postoculars. Clypeus with 8–14 [11] setae. Cibarial pump, tentorium, and stipes as in Figure 1. Tentorium 135–157 [135]  $\mu\text{m}$  long, 22–34 [29]  $\mu\text{m}$  wide. Stipes 127–135 [127] (2) long, 42–47 [42]  $\mu\text{m}$  wide (2). Palp segment lengths (in  $\mu\text{m}$ ): 29–34 [29]; 39–49 [39]; 125–140 [125]; 108–115 [108]; 127–142 [127]. Third palpomere without finger-like apical extension, without sensilla clavata.

Thorax (Fig. 2). Antepronotum with 6–8 [6] lateral setae. Dorsocentrals 25–29 [25]; acrostichals 16–17 [16] (2); prealars 8–10 [8]. Scutellum with 11–14 [11] setae.

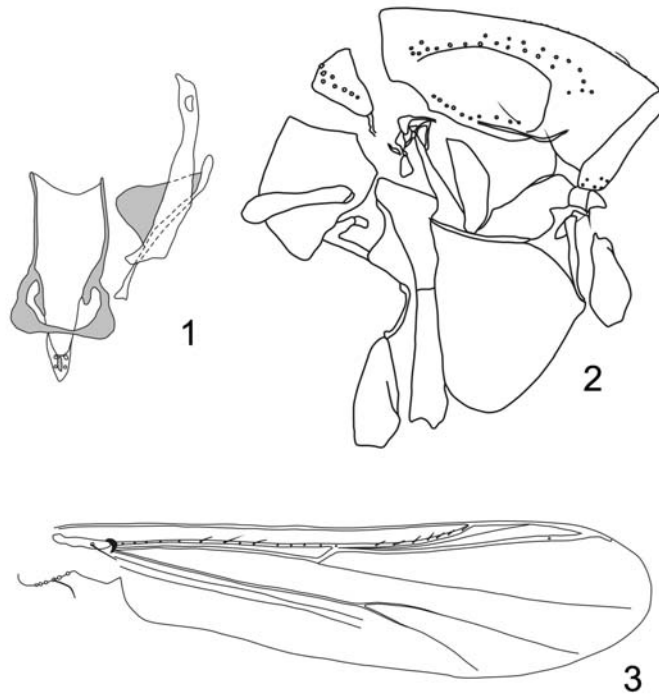
Wing (Fig. 3). Microtrichia visible at 100x magnification.  $R_{4+5}$  ending opposite to end of  $M_{3+4}$ . VR 1.26–1.29 [1.28]. C extension 32–66 [32]  $\mu\text{m}$ . Brachiolum with 1–2 [2] setae; R with 11–13 [11];  $R_1$  with 6–11 [6];  $R_{4+5}$  with 0–3 [3]. Squama with 6–9 [6] setae.

Legs. Spur of front tibia 64–76 [64]  $\mu\text{m}$  long; spurs of middle tibia: 22–27 [22]  $\mu\text{m}$  and 47–54 [47]  $\mu\text{m}$ ; of hind tibia: 22–32 [22]  $\mu\text{m}$  and 51–69 [51]  $\mu\text{m}$  long. Width at apex of front tibia 32–39 [32]  $\mu\text{m}$ ; of middle tibia 27–42 [34]  $\mu\text{m}$ ; of hind tibia 44  $\mu\text{m}$ . Middle tibia without comb. Comb of hind tibia with 11–12 [11] setae, longest 37–44 [37]  $\mu\text{m}$  long, shortest 20–27 [20]  $\mu\text{m}$  long. Lengths (in  $\mu\text{m}$ ) and proportions of legs in Table I.

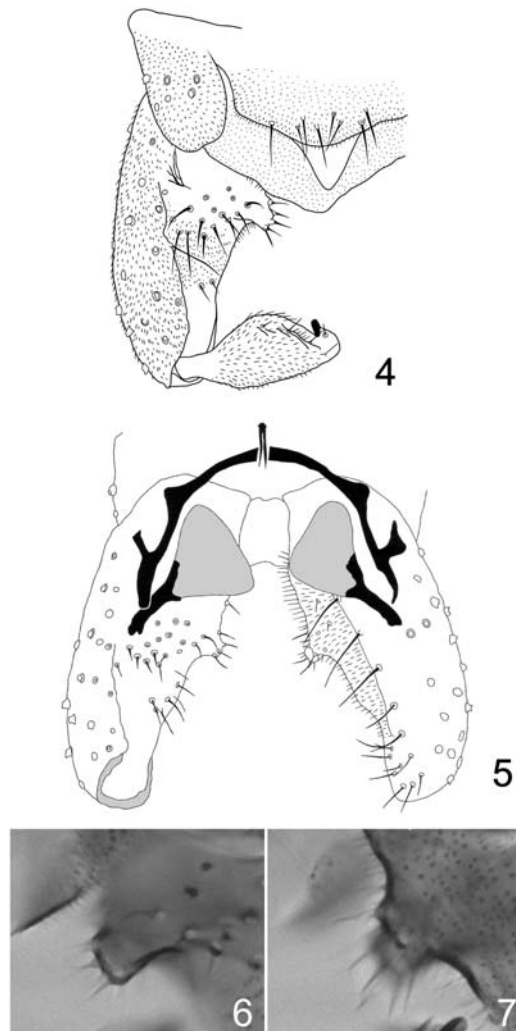
Hypopygium (Figs. 4–7). Anal point hyaline, bluntly triangular, 27–31 [31]  $\mu\text{m}$  long, 39–42 [39]  $\mu\text{m}$  wide at base; anal point length/width 1.26–1.52 [1.26]. Tergum IX with 8–12 [8] setae, laterosternite IX with 6 setae. Phallapodeme 49–61 [51]  $\mu\text{m}$  long; transverse sternapodeme 110–130 [110]  $\mu\text{m}$  long. Virga 22–27 [25]  $\mu\text{m}$  long, with two spines. Gonocoxite 194–206 [194]  $\mu\text{m}$  long, inferior volsella sub-rectangular with a dorsal lobe with 5–6 [5] apical setae and a ventral lobe with 2–3 [2] apical setae (Figs. 6–7); ending 95–115 [100] from apex of

**Table I.** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Bryophaenocladius carolinae* n. sp. (male) ( $n = 2-3$ ). Abbreviations: Femur (Fe); Tibia (Ti); Tarsomeres 1-5 ( $\text{Ta}_{1-5}$ ); Leg Ratio (LR), ratio of metatarsus to tibia; Beinverhältnisse» (BV), combined length of femur, tibia, and basitarsus divided by combined length of tarsomeres 2-5; «Schenkel-Scheine-verhältnis» (SV), ratio of femur plus tibia to metatarsus.

	Fe	Ti	$\text{Ta}_1$
$P_1$	500–540 [500] (2)	610–730 [610]	360–460 [360]
$P_2$	560–670 [560]	580–700 [580]	270–330 [270]
$P_3$	590–700 [590]	690–850 [690]	380–460 [380]
	$\text{Ta}_2$	$\text{Ta}_3$	$\text{Ta}_4$
$P_1$	210–270 [210]	160–200 [160]	120–140 [120]
$P_2$	150–180 [150]	110–140 [110]	90–100 [90]
$P_3$	210–260 [210]	160–210 [160]	100–120 [100]
	$\text{Ta}_5$	LR	BV
$P_1$	80–100 [80]	0.47–0.64 [0.47]	2.42–3.14 [3.14] (2)
$P_2$	80–90 [80]	0.46–0.55 [0.55]	2.87–3.33 [2.91]
$P_3$	90–100 [90]	0.54–0.56 [0.55]	2.91–2.98 [2.96]
	SV		
$P_1$	2.86–4 [4] (2)		
$P_2$	3.29–4.26 [3.29]		
$P_3$	3.31–3.37 [3.37]		



**Figs. 1-3.** *Bryophaenocladius carolinae* sp. nov. Male adult. 1, Tentorium, stipes and cibarial pump; 2, thorax; 3, wing.



**Figs. 4-7.** *Bryophaenocladus carolinae* sp. nov. Male adult. 4, Hypopygium dorsal view; 5, hypopygium with tergite IX removed, right ventral view, left dorsal view; 6, inferior volsella dorsal view; 7, inferior volsella ventral view.

gonocoxite; distance from apex of gonocoxite to apex of inferior volsella 110–122 [110]; ratio of “inferior volsella ending from apex of gonocoxite/length of gonocoxite” 0.47–0.56 [0.52]. Gonostylus 96–105 [96] long, widest medially and with a slight angulate subapical heel; crista dorsalis absent; megaseta 10–12 [10] long (9). HR 1.93–2.1 [2.02]; HV 2.55–2.7 [2.55] (2).

**Etymology.** Dedicated to my wife Carolina, for her patience and support.

**Type material. ARGENTINA. Buenos Aires:** Holotype male, MLP number 5312/1: Los Hornos, 34° 57' 32''S- 58° 00' 57''W, 16-IV-2005, sweep net, M. Donato leg. (MLP). Paratypes, MLP numbers 5312/3–4: 2 males, same data as the holotype.

#### DISCUSSION

The genus *Bryophaenocladus* is one of the largest genera in the subfamily Orthoclaadiinae. The systematics and

taxonomy of this genus is based mainly on males with a few exceptions that are based on females and the knowledge of its immature stages is scarce. The variation in the taxonomic characters is large, mainly in the shape of the hypopygium. Wang *et al* (2006) pointed out that the species defined as belonging to *Bryophaenocladius* are based on a combination of characters and they also considered that probably this character variation could give rise to split the genus into several genera or subgenera in the future when the revision of the genus is completed.

The new species here described was established after a comparison with the rest of the species of the genus from their original descriptions or from a revision, as well as after the study of their holotypes or collection material. In this way, 92 species of the genus *Bryophaenocladius* were compared with *B. carolinae* and studied in order to account for the variation in the taxonomic characters pointed out by Wang *et al.* (2006). The taxonomic characters were divided into two groups based on their importance in delimiting species. As a result, the most important characters used to define the *Bryophaenocladius* species are the shape of the anal point, the shape of inferior volsella, presence or absence of virga, shape of gonostylus, the presence and different degree of development of the crista dorsalis, presence or absence of the finger-like projection on palpomere 3 and wing punctuation. Other characters used in the species diagnosis, although less important, are the presence or absence of wing anal lobe, number of setae on R<sub>1</sub> vein, different degree of development of acrostichal setae, length of Costal extension, length of megaseta, presence or absence of pseudospurs, presence or absence of a comb at apex of middle tibia, presence or absence of oral projections in sternapodeme, number of palpomeres and AR. Among the characters mentioned above as the most important, the character shape of anal point was found as a very good character since it has six well defined character states and only two particular character states. The character

states found for this character are anal point long with rounded apex [e.g. *B. aestivus* (Brundin)]; anal point pointed triangular [e.g. *B. flexidens* (Brundin)]; anal point wide, trapezoidal [e.g. *B. inconstans* (Brundin)]; anal point bluntly triangular [e.g. *B. scanicus* (Brundin)]; anal point sharply triangular (e.g. *B. parinberbus* Wang et Du) and anal point subtriangular (e.g. *B. usambarensis* Andersen et Schnell). The other character states found were anal point small triangular (present in *B. togatenuis* Sasa et Okazawa) and anal point absent (present in *B. ikiheius* Sasa et Suzuki).

The combination of characters anal point bluntly triangular and hyaline, gonostylus widened medially, virga present and finger-like apical extension on palpomere 3 present in *Bryophaenocladius carolinae* are shared with three species of the 92 species studied of the genus. The species *B. digitatus* Sæther is clearly distinguished from *B. carolinae* by the presence of a weak comb at apex of middle tibia, wing punctuation coarse and inferior volsella digitate with few curved setae dorsally. The species *B. kobayashii* Makarchenko et Makarchenko differs from *B. carolinae* by the presence of a rounded inferior volsella. The species *B. xinglongensis* Du et Wang is clearly distinguished from the new species here described by the presence of a not obvious and setose inferior volsella and R<sub>4+5</sub> ending distal to end of M<sub>3+4</sub>.

**Key to males of the genus  
*Bryophaenocladius* from the Neotropical  
region (modified from Wang *et al.* 2006)**

1. Palp with 4 short palpomeres.....  
.....*Bryophaenocladius carus* (Roback). Panama, Brazil  
- Palp with 5 well-developed palpomeres ...  
..... 2
2. Third palpomere with digitiform projection .....  
..... *Bryophaenocladius simplex* Wang, Andersen et Sæther. Mexico  
- Third palpomere without projection .....  
..... 3

3. Inferior volsella digitiform; mid leg with weak comb .....  
*Bryophaenocladus digitatus* Sæther. Mexico  
 - Inferior volsella rounded or sub-rectangular ..... 4
4. Pseudospurs absent ..... *Bryophaenocladus carolinae* sp. nov. Argentina  
 - Pseudospurs present ..... 5
5. Megaseta simple; transverse sternapodeme lacking oral projections .....  
*Bryophaenocladus humerosus* Wang, Andersen et Sæther. Mexico  
 - Megaseta with several teeth; transverse sternapodeme with pronounced oral projections .....  
 ..... *Bryophaenocladus pichinensis* Wang, Andersen et Sæther. Mexico

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