ORIGINAL ARTICLE

Neotropical Bryophaenocladius Thienemann, 1934 (Diptera: Chironomidae)

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Abstract
Three new species of Bryophaenocladius Thienemann are described and figured as male imagines: B. humerosus sp. n. from Mexico, B. pichinensis sp. n. from Ecuador and Mexico, and B. simplex sp. n. from Mexico. Male and female imagines of B. carus (Roback, 1962) are redescribed and the immatures described. B. marginatus (Edwards, 1931) from Argentina and Chile, tentatively placed in the genus, is redescribed. B. digitatus Sæther, 1973, described from the Nearctic region, is recorded from Mexico. Two species placed in Bryophaenocladius both belong in Pseudosmittia Goetghebuer: P. joaquimvenancioi (Messias & Oliveira, 2000) comb. n. and P. fortispinatus (Edwards, 1931) comb. n. Bryophaenocladius now comprises six species from Mexico and the Neotropical region. A key to male imagines is provided.

Keywords: Chironomidae, Orthocladiinae, Bryophaenocladius, new species, Neotropical region

Introduction
The genus Bryophaenocladius Thienemann, 1934, is one of the more enigmatic orthocladiinae genera. Although most species are easily identifiable to genus there are no unique features in the imagines, and a combination of characters is needed to place the different species in the genus. The variation is large, particularly in the shape of the hypopygium. The immatures, however, show much less variation and although quite similar to Gymnometriocnemus Goetghebuer the differences hold up also in material originating from outside of the Holarctic region.

The present paper forms part of a worldwide revision of the genus. It is premature to present a complete diagnosis of the genus or to speculate in splitting the genus into several genera or subgenera. Typical members of Bryophaenocladius have comparatively long and strong, decumbent acrostichals starting in front combined with coarse punctuation, but no macrotrichia on the wing, few setae on squama, no or vestigial pulvilli, and a broad anal point with hyaline margin. Squama may be bare and/or the punctuation of the wings may be fine, but then the known species have the typical acrostichals, the typical hypopygium or the third palpmere have a digitiform projection.

The last feature occurs also in Parakiefferiella Thienemann (Ferrington & Sæther, 1995a) and Pseudosmittia Goetghebuer (Sæther, 1981) and led to the placement of B. joaquimvenancioi Messias & Oliveira (2000) in Bryophaenocladius. Examination of the types, however, show that the species belongs in Pseudosmittia Goetghebuer and is identical to P. digitata Sæther described from the Caribbean (Sæther, 1981). However, the situation is more complex. The types of P. digitata were in bad shape. The illustrated male had lost the palp and other specimens were without legs, etc. A revision of the genus Pseudosmittia in progress has shown that the type material from St. Vincent and St. Lucia consists of two species, one with a digitiform projection on the third palpmere and one without. The holotype belongs to the species without a projection, which receives the unfortunate name of P. digitata, while the one with a digitiform projection will be Pseudosmittia joaquimvenancioi (Messias & Oliveira) comb. n. P. joaquimvenancioi appears to be widespread in South and Central America, while P. digitata is common in North America and so far has in the
Neotropical region been found only in St. Vincent, St. Lucia, Mexico, Surinam and Venezuela.

Although one species has been recorded from a subalpine lake, larvae of *Bryophaenocladius* appear to be terrestrial or semi-terrestrial. Up to now more than 70 species of the genus *Bryophaenocladius* have been described from most biogeographical regions. Spies and Reiss (1996) listed three species from the Neotropical region: *B. carus* (Roback, 1962) from Panama, and *B. emarginatus* (Edwards, 1931) and *B. fortispinatus* (Edwards, 1931) from Argentina and Chile.

Ferrington and Sæther (1995b) tentatively placed *Spaniotoma (Smittia) fortispinata* Edwards in the genus *Bryophaenocladius* since it apparently had several acrostichals. Re-examination of the type shows that there are no more than two clear acrostichals like in most *Pseudosmittia*; what was interpreted as acrostichals are actually dust particles. Also in other details the species fits well within *Pseudosmittia* and is here given the new combination *Pseudosmittia fortispinata* (Edwards).

Three new species from Ecuador and Mexico and all stages of a reared female from Brazil apparently belonging to *B. carus* are described below. We also redescribe type material of *B. emarginatus* and *B. carus*, and give a new record of *B. digitatus* Sæther, 1973 from Mexico. Thus the genus now comprises six species from the Neotropical region.

**Materials and methods**

The material examined was mounted on slides following the procedure outlined by Sæther (1969). The general terminology follows Sæther (1980). Measurements are given as ranges, followed by the mean when four or more specimens are measured.

The examined material is from the Academy of Natural Sciences of Philadelphia (ANSP); The Natural History Museum, London (BMNH), the Museu de Zoologia da Universidade de Sao Paulo, Brazil (MZUSP); and the Museum of Zoology, Bergen, Norway (ZMBN). The holotype and most paratypes of the new species are deposited in the Museum of Zoology, Bergen, Norway; the remaining paratypes are in the Department of Biology, Nankai University, Tianjin, China (BDN).

**Results**

**Key to male imagines of the genus *Bryophaenocladius* from the Neotropical region**

1. Four short palpomeres ............ *B. carus* (Roback)
2. Third palpomere with digitiform projection ............ 2
– Five well-developed palpomeres ......................... 2
– Third palpomere without projection .................... 3
3. Inferior volsella digitiform; mid leg with weak comb; pseudospurs present .................................. *B. digitatus* Sæther
– Inferior volsella rounded; mid leg lacking weak comb, pseudospurs present .............................. 4
4. Megaseta simple; transverse sternapodeme lacking oral projections ........................ *B. humerosus* sp. n.
– Megaseta with several teeth; transverse sternapodeme with pronounced oral projections .................. *B. pichinensis* sp. n.

**Bryophaenocladius carus** (Roback) (Figures 1–14)

*Cantomyia cara* Roback, 1962, p. 5.

*Bryophaenocladius carus* (Roback); Sæther, 1976, pp. 275–276; Spies & Reiss, 1996, p. 75.


**Material examined**


**Redescription**

**Male imago** (*n* = 1). Total length 2.38 mm. Wing length 1.32 mm. Total length/wing length 1.80.

**Head**. AR 1.56, ultimate flagellomere 128µm long. Tentorium 114µm long, stipes 100µm long. Palpomere lengths (in µm): 26, 32, 44, 36. Other details not measurable. **Thorax**. Antepronotum with two setae. Dorsocentrals 6, acrostichals 5, prealars 3. Scutellum with five setae. **Wing** (Figure 1). Microtrichia visible at 100× magnification. Other details not clear. **Legs**. Spur of front tibia 62µm long, spurs of middle tibia 46µm and 22µm long, of hind tibia 54µm and 24µm long. Legs not measurable. **Hypopygium** (Figure 2). Anal point 30µm long. Tergite IX with 11 setae, laterosternite IX with four setae. Phallapodeme 88µm long; transverse sternapodeme 102µm long, weakly arcuate, without oral projections. Virga not apparent. Gonocoxite 178µm long, inferior volsella rounded. Gonostylus 74µm long. **Female imago** (*n* = 2–3). Total length 1.90–2.13 mm. Wing length 1.02–1.12 mm. Total length/wing length 1.70–2.09.
of profemur 3.19 – 3.21. Coloration dark brown. **Head.** Antenna with 5 – 6 flagellomeres. Length of flagellomeres (in µm) of specimen with five flagellomeres: 66, 36, 39, 36, 118; AR 0.66; length of flagellomeres (in µm) of specimen with six flagellomeres: 76, 33, 35, 35, 49, 80; AR 0.35. Temporal setae apparently 5 – 6, consisting of 1 – 2 outer verticals and four postorbitals. Clypeus with four setae. Tentorium and stipes not measurable. Palp with four palpomeres only, lengths (in µm): 11, 17, 28, 32. **Thorax.** Antepronotum with 4 – 5 setae. Dorsocentrals 8 – 9, acrostichals 12 – 14, prealars 1 – 4. Scutellum with four setae. **Wing** (Figure 3). Anal lobe rounded. Microtrichia easily visible at 100× magnification. VR 1.12. $R_{2+3}$ ends 1/2 distance between $R_1$ and $R_{4+5}$. Costa barely extended. Brachiolum with one seta; $R$ with 9 – 10, $R_1$ with 4 – 5 and $R_{4+5}$ with 5 – 8 setae. Cu₁ slightly curved. Squama bare. **Legs.** Spur of front tibia 35 – 37 µm long, spurs of middle tibia 29 – 32 µm and 16 – 18 µm long, of hind tibia 40 – 44 µm and 20 – 22 µm. Width at apex of front tibia 29 – 31 µm, of

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middle tibia 30–32 μm, of hind tibia 32–35 μm. Apex of hind tibia with 3–5 setae not arranged in a comb, about 20–22 μm long. Lengths (in μm) and proportions of legs as in Table I. Genitalia (Figures 4–7). Tergite IX divided by posterior notch, but not into setigerous protrusions, with altogether 14–16 setae. Sternite VIII forming distinct floor under vagina, with 28–34 long setae. Gonocoxite IX 40–42 μm long, with 8–12 long setae. Cercus 92–109 μm long. Seminal capsules sclerotized, 78–100 μm long. Notum 96–110 μm long. Gonapophysis VIII divided into large ventrolateral lobe (Figure 5) and small dorsomesal lobe (Figure 6). Apodeme lobe as in Figure 7.

Pupa (n = 3). Total length of exuviae 2.02–2.05 mm. Exuviae transparent with margins of antennal and wing sheaths yellowish. Cephalothorax. Frontal apotome as in Figure 8. Thoracic horn absent (Figure 9). Anterior and posterior precorneal setae each 10–12 μm long, spine-like, median precorneal seta vestigial or lost. With two median and three lateral spine-like antepronotals, median antepronotals each about 12 μm long, lateral antepronotals each about 8 μm long. Dorsoceptrals all less than 10 μm long, distance between DC1 and DC2 64–82 μm, between DC2 and DC3 96–102 μm, between DC3 and DC4 6–9 μm. Wing sheath 648–660 μm long. Basal part of wing sheath slightly wrinkled. Abdomen (Figure 10). Tergites covered with strong shagreen spines with posterior row of weaker spines, less extensive and slightly weaker on tergites I, VIII and IX. Sternites VII and VIII with weak shagreen. Abdominal setae not observed. Anal lobe 136–152 μm long. Genital sac overreaches anal lobe by about 50–76 μm. Anal lobe with three reduced macrosetae, each 6–8 μm long.

Fourth instar larva (n = 1–3). Total length 3.18 mm. Head capsule length 0.15–0.18 mm. Head. Antenna as in Figure 11. Lengths of antennal segments (in μm): 19–22, 16–18, 2–3, 4–5, 1. AR 0.88–0.96. Basal antennal segment 12–14 μm wide, blade 25–28 μm long. Lauterborn organs about 2 μm long. Premandible as in Figure 12, 56–60 μm long. Mandible as in Figure 13, 92–103 μm long, seta subdenticulate short and blunt. Mentum as in Figure 14, with two median teeth each about 10 μm wide, ventromental plates 8 μm wide. Abdomen. Posterior parapods and anal tubules not measurable.

### Diagnostic characters

The species is easily distinguished from all other members of the genus by having a reduced palp with four segments. It also differs from other Neotropical species by having a narrow, pointed anal point, bare squama and short costal extension. The pupa is exceptional in having an anal lobe with three reduced macrosetae.

### Distribution and biology

The species is known from Panama, Brazil, and tentatively from St. Vincent (Sæther, 1981). In Brazil the larvae were collected among mosses on tree trunks together with the larvae of Antillocladius biota Mendes, Andersen & Sæther.

**Bryophaenocladius digitatus** Sæther (Figures 15–17)

**Bryophaenocladius digitatus** Sæther, 1973, p. 55.

### Material examined

Mexico, Campeche, Calakmul Biosphere Reserve, Zona Arqueologica, Aguada Grande, 18°07'26.7"N, 89°48'56.7"W, 265 m a.s.l., 3 males, 2/V/1997, Malaise trap, A. Contreras-Ramos et al. (BDN, ZMBN).

### Redescription

**Male imago (n = 3).** Total length 1.85–1.98 mm. Wing length 0.98–1.02 mm. Total length/wing length 1.68–1.96. Wing length/length of profemur 2.0–2.75. Coloration dark brown. Head. AR 1.22–1.27, ultimate flagellomere 352–376 μm long. Temporal setae 7–10, including 3–5 inner verticals, 1–2 outer verticals, and 2–4 postorbitals. Clypeus with 7–9 setae. Tentorium 114–122 μm long, 17–19 μm wide; stipes 90–100 μm long, 22–25 μm wide. Palpomere lengths (in μm): 22–26, 32–38, 78–90, 74–82, 92–95; length ratio of palpomeres 5/3 1.02–1.18. Thorax (Figure 16). Antepronotum with 4–6 setae. Dorsoceptrals 16–21, acrostichals 10–19, prealars 5–7. Scutellum with six setae. Wing (Figure 15). Microtrichia visible at 100× magnification. Anal lobe rounded. Cul nearly straight. VR

### Table I. Lengths (in μm, n = 2–3) and proportions of legs of Bryophaenocladius carus (Roback) female imago.

<table>
<thead>
<tr>
<th></th>
<th>ti</th>
<th>ta1</th>
<th>ta2</th>
<th>ta3</th>
<th>ta4</th>
<th>ta5</th>
<th>LR</th>
<th>BV</th>
<th>SV</th>
<th>BR</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>320–359</td>
<td>396–433</td>
<td>236–270</td>
<td>144–155</td>
<td>106–112</td>
<td>57–64</td>
<td>33–40</td>
<td>0.59–0.62</td>
<td>2.64–3.02</td>
<td>2.99–3.03</td>
</tr>
<tr>
<td>P2</td>
<td>396–408</td>
<td>399–449</td>
<td>160–197</td>
<td>92–114</td>
<td>68–82</td>
<td>40–49</td>
<td>33–36</td>
<td>0.40–0.43</td>
<td>3.79–4.05</td>
<td>4.38–4.97</td>
</tr>
<tr>
<td>P3</td>
<td>408–449</td>
<td>432–474</td>
<td>216–221</td>
<td>124–139</td>
<td>90–100</td>
<td>44–57</td>
<td>33–40</td>
<td>0.47–0.50</td>
<td>3.43–3.59</td>
<td>3.07–3.89</td>
</tr>
</tbody>
</table>
1.17–1.19. R2 + 3 ends at 1/3 of distance between R1 and R4 + 5. Costal extension 56–70 μm long. Brachiolum with one seta, R with 4–5 setae; remaining veins bare. Squama with two setae. **Legs.** Spur of front tibia 50–52 μm long, spurs of middle tibia 30–34 μm and 18–22 μm long, of hind tibia 48–52 μm and 20–26 μm long. Lateral denticles distinct on all tibial spurs. Width at apex of front tibia 29–31 μm, of middle tibia 30–34 μm, of hind tibia 39–42 μm. Middle tibial comb with 3–4 setae,
16–20 μm long; hind tibial comb with 11–12 setae, shortest seta 23–27 μm long, longest seta 33–36 μm long. Pseudospurs absent. Lengths (in μm) and proportions of legs as in Table II.

### Hypopygium (Figure 17).

### Diagnostic characters
The absence of pseudospurs, the presence of a weak comb on the middle leg and the digitiform inferior volsella separate the species from all other American species.

### Remarks
The species was described based on a single specimen from South Dakota (Sæther, 1973). The Mexican specimens apparently differ in some aspects from the holotype, like in the shape of the anal point. However, we consider them as belonging to B. digitatus as they possess the unique finger-like inferior volsella and as the measurements do not vary much from the holotype.

### Distribution
The species is previously known from the Nearctic region (South Dakota, North Carolina, South Carolina) (Oliver et al., 1990). This is the first record from the Neotropical region, from southeastern Mexico.

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### Table II. Lengths (in μm, n = 1–3) and proportions of legs of Bryophytaemus digitatus Sæther male imago.

<table>
<thead>
<tr>
<th>P1</th>
<th>fc</th>
<th>ti</th>
<th>ta1</th>
<th>ta2</th>
<th>ta3</th>
<th>ta4</th>
<th>ta5</th>
<th>LR</th>
<th>BV</th>
<th>SV</th>
<th>BR</th>
</tr>
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<tbody>
<tr>
<td>360–416</td>
<td>472–528</td>
<td>261–278</td>
<td>147–159</td>
<td>114–122</td>
<td>65–78</td>
<td>53–61</td>
<td>0.55–0.58</td>
<td>2.73–2.97</td>
<td>3.18–3.31</td>
<td>2.15–2.27</td>
<td></td>
</tr>
</tbody>
</table>

### Table III. Lengths (in μm, n = 1) and proportions of legs of Bryophytaemus emarginatus (Edwards) female imago.

<table>
<thead>
<tr>
<th>P1</th>
<th>fc</th>
<th>ti</th>
<th>ta1</th>
<th>ta2</th>
<th>ta3</th>
<th>ta4</th>
<th>ta5</th>
<th>LR</th>
<th>BV</th>
<th>SV</th>
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</thead>
<tbody>
<tr>
<td>336</td>
<td>344</td>
<td>369</td>
<td>410</td>
<td>172</td>
<td>82</td>
<td>66</td>
<td>33</td>
<td>49</td>
<td>0.42</td>
<td>3.99</td>
</tr>
<tr>
<td>344</td>
<td>344</td>
<td>369</td>
<td>418</td>
<td>148</td>
<td>82</td>
<td>66</td>
<td>41</td>
<td>57</td>
<td>0.43</td>
<td>4.56</td>
</tr>
<tr>
<td>369</td>
<td>451</td>
<td>213</td>
<td>107</td>
<td>123</td>
<td>41</td>
<td>66</td>
<td>0.47</td>
<td>3.85</td>
<td>3.85</td>
<td>3.85</td>
</tr>
</tbody>
</table>

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Bryophytaemus emarginatus (Edwards) (Figures 18–23)

**Spaniotoma (Smittia) emarginata** Edwards, 1931, p. 297.

Bryophytaemus emarginata (Edwards); Ferrington & Sæther, 1995b, p. 57.

Bryophytaemus emarginatus (Edwards); Spies & Reiss, 1996, p. 75.

### Material examined

### Redescription
**Female imago (n = 1).** Total length 1.82 mm. Wing length 1.16 mm. Total length/wing length 1.57. Wing length/length of profemur 3.45. Coloration dark brown. **Head.** Lost. **Thorax.** Antepronotum with five setae. Dorsocentrals 13, acrostichals 14, prealars 8. Scutellum with four setae. **Wing (Figure 18).** Anal lobe weak. Microtrichia visible at 100× magnification. VR 1.57. Costal extension 148 μm long. Brachiolum with one seta, R with 11 setae, R1 with eight setae, remaining veins bare. Squama bare. **Legs.** Spur of front tibia 20 μm long, spurs of middle tibia 16 μm and 12 μm long, of hind tibia 36 μm and 20 μm long. Width at apex of front tibia 30 μm, of middle tibia 32 μm, of hind tibia 40 μm. Hind tibial comb with 14 setae; shortest 20 μm long, longest 36 μm long. **Abdomen.** Setae on tergites: I 7, II 10, III 18, IV 20, V 23, VI 22, VII 22, VIII 20. Setae on sternites: I 4, II 8, III 9, IV 10, V 13, VI 15, VII 14, VIII 11. **Genitalia (Figures 19–23).** Gonocoxite IX 60 μm long, with eight setae. Tergite IX with 18 setae. Cercus rounded, with about 20 long setae, 50 μm
long and 60 \( \mu m \) wide. Seminal capsule 64 \( \mu m \) long, 38 \( \mu m \) wide, sclerotized in anterior 44 \( \mu m \). Gonapophysis VIII divided into a large ventrolateral lobe (Figure 21) densely covered by setae, and a smaller dorsomesal lobe (Figure 22). Apodeme lobe as in Figure 23.

**Remarks**

The species is known only from the female adult. Ferrington and Sæther (1995b) tentatively placed it in *Bryophaenocladius*. Based on the generic diagnosis by Cranston et al. (1989), some characters from the type material such as the relatively well-developed pulvilli suggest a relationship with *Psectrocladius* Kieffer. However, most of the remaining features like the strongly punctuated wing and the structures of the genitalia fit *Bryophaenocladius*. Since a worldwide revision including a phylogenetic analysis has not been completed, we suggest maintaining the tentative placement suggested by Ferrington and Sæther (1995b).

**Distribution**

The species is known from Puerto Blest in Argentina and Peulla in Chile (Edwards, 1931; Spies & Reiss, 1996).

*Bryophaenocladius humerosus* sp. n.

(Figures 24 – 29)

**Type material**

Holotype male: Mexico, Morelos, Parque Nacional Lagunas de Zempoala, Laguna de Zempola, 24.IX.1998, sweep net, T. Andersen & A. Contreras-Ramos (ZMBN Type No. 286; slide mounted in Canada balsam).

**Etymology**

From the Latin *humerosus*, having shoulders, referring to the posterolateral projections of the anal tergite.

**Description**

**Male imago** (n = 1). Total length 3.40 mm. Wing length 1.90 mm. Total length/wing length 1.79.

| Table IV. Lengths (in \( \mu m \), n = 1) and proportions of legs of *Bryophaenocladius humerosus* sp. n. male imago. |
|-------|-------|-------|-------|-------|-------|-------|-------|
| fc    | ti    | ta1   | ta2   | ta3   | ta4   | ta5   | LR    | BV    | SV    | BR    |
| P1    | 735   | 956   | 572   | 318   | 237   | 147   | 90    | 0.60  | 2.86  | 2.96  | 2.81  |
| P2    | 833   | 891   | 359   | 196   | 147   | 82    | 65    | 0.40  | 4.25  | 4.80  | 3.44  |
| P3    | 858   | 1038  | 523   | 270   | 212   | 106   | 74    | 0.50  | 3.65  | 3.63  | 4.90  |

Wing length/length of profemur 2.58. Coloration dark brown. *Head.* AR 1.73, ultimate flagellomere 568 \( \mu m \) long. Temporal seta 9; including four inner verticals; two outer verticals; and three postorbitals. Clypeus with eight setae. Tentorium, stipes and cibarial pump as in Figure 24; tentorium 144 \( \mu m \) long, 31 \( \mu m \) wide; stipes 136 \( \mu m \) long, 45 \( \mu m \) wide. Palp as in Figure 25; palpomere lengths (in \( \mu m \)): 33, 60, 115, 103, 117; length ratio of palpomeres 5/3 1.02. *Thorax* (Figure 26). Antepronotum with six setae. Dorsocentrals 12, acrostichals 8, prealars 4. Scutellum with six setae. *Wing* (Figure 27). Anal lobe projecting. Moderately coarse punctation easily visible at 100\( \times \) magnification. VR 1.16. \( R_{2+3} \) ends 1/2 distance between \( R_{1} \) and \( R_{4+5} \). Costal extension 80 \( \mu m \) long. Brachiolum with one seta; \( R \) with seven setae; \( R_{4+5} \) with one seta, remaining veins bare. \( Cu_{1} \) slightly curved. Squama with six setae. *Legs.* Spur of front tibia 81 \( \mu m \) long, spurs of middle 56 \( \mu m \) and 30 \( \mu m \) long, of hind tibia 72 \( \mu m \) and 39 \( \mu m \). All tibial spurs with well-developed denticles. Width at apex of front tibia 40 \( \mu m \), of middle tibia 39 \( \mu m \), of hind tibia 49 \( \mu m \). Hind tibial comb with 14 setae, shortest seta 25 \( \mu m \) long, longest seta 44 \( \mu m \) long. Pseudospurs present on \( ta_{1} \) and \( ta_{2} \) on middle and hind legs; length of pseudospurs of \( ta_{1} \) and \( ta_{2} \) of middle leg 31 \( \mu m \) and 23 \( \mu m \); length of pseudospurs of \( ta_{1} \) and \( ta_{2} \) of hind leg 33 \( \mu m \) and 29 \( \mu m \), respectively. Lengths (in \( \mu m \)) and proportions of legs in Table IV.

*Hypopygium* (Figures 28 and 29). Anal point hyaline, tapering with blunt apex, 38 \( \mu m \) long, 22 \( \mu m \) wide at base, about 10 \( \mu m \) wide at apex. Tergite IX with pronounced posterolateral corners and seven long setae; laterosternite IX with 11 setae. Phallapodeme 110 \( \mu m \) long, transverse sternapodeme 64 \( \mu m \) long, strongly arcuate, lacking oral projections. Virga apparently consisting of six spines, each about 12 \( \mu m \) long. Gonocoxite 242 \( \mu m \) long; inferior volsella pronounced, with three curved setae along inner margin. Gonostylus 110 \( \mu m \) long; megaseta 14 \( \mu m \) long. HR 2.18, HV 3.08.

**Diagnostic characters**

In most hypopygial features *Bryophaenocladius humerosus* sp. n. resembles *B. tirolensis* (Goetghebuer) from the Palaearctic region, but differs in having lateral posterior projections on the anal tergite and in lacking oral projections of the transverse sternapodeme.
Distribution
The species is known only from the type locality in central Mexico.

Bryophaenocladius pichinensis sp. n.
(Figures 30 – 36)

Type material

Etymology
Named after Pichincha Province in Ecuador, using the Latin suffix -ensis denoting place or country of origin.

Description
Male imago \((n=4–6)\). Total length 2.70 – 3.40, 3.04 mm. Wing length 1.64 – 2.06, 1.69 mm. Total length/wing length 1.55 – 1.67, 1.62. Wing length/length of profemur 2.25 – 2.80, 2.57. Coloration dark brown.

Head.
AR 1.52 – 2.21, 1.83; ultimate flagellomere 568 – 680, 642 long. Temporal setae 9 – 11, including 4 – 6, five inner verticals; 1 – 2, two outer verticals; and 3 – 4, four postorbitals. Clypeus with 4 – 10, seven setae. Tentorium, stipes and cibarial pump as in Figure 30; tentorium 130 – 176, 155 \(\mu\)m long; 34 – 28, 36 \(\mu\)m wide; stipes 120 – 160, 144 \(\mu\)m long; 40 – 47, 43 \(\mu\)m wide. Palp as in Figure 31; palpomere lengths (in \(\mu\)m): 30 – 38, 33; 40 – 70, 59; 124 – 182, 145; 88 – 140, 120; 96 – 197, 164; length ratio of palpomeres 5/3 0.77 – 1.13, 0.96. Thorax (Figure 32). Antepronotum with 4 – 8, six setae. Dorsocentrals 12 – 22, 17; acrostichals 7 – 12, 10; prealars 6 – 9, eight. Scutellum with 7 – 14, 10 setae. Wing (Figure 33). Microtrichia visible at 100X magnification. Anal lobe protruding. Cu1 gently curved. VR 1.10 – 1.21, 1.16. \(R_2+3\) ends at 1/2 distance between \(R_1\) and \(R_4+5\). Costal extension 40-102, 71 \(\mu\)m long. Brachiolum with two setae. R with 5 – 13, 11; \(R_1\) with 1 – 5, 3; \(R_4+5\) with 0 – 2, 1 setae, remaining veins bare. Squama with 5 – 20, 13 setae.

Legs.
Spur of front tibia 77 – 98, 89 \(\mu\)m long; spurs of middle tibia 55 – 67, 63 \(\mu\)m and 27 – 40, 29 \(\mu\)m long; of hind tibia 55 – 83, 80 \(\mu\)m and 44 – 51, 47 \(\mu\)m long. All tibial spurs with well-developed denticles. Width at apex of front tibia 46 – 60, 53 \(\mu\)m; of middle tibia 43 – 47, 44 \(\mu\)m; of hind tibia 51 – 55, 53 \(\mu\)m. Hind tibial comb with 11 – 20, 15 setae; shortest seta 32 – 43, 36 \(\mu\)m long; longest seta 54 – 62, 57 \(\mu\)m long. Pseudospurs present on ta1 and ta2 on middle and hind legs; length of pseudospurs of ta1 and ta2 of middle leg 29 – 32, 30 \(\mu\)m and 27 – 30, 29 \(\mu\)m; length of pseudospurs of ta1 and ta2 of hind leg 34 – 40, 37 \(\mu\)m and 29 – 33, 31 \(\mu\)m respectively. Lengths (in \(\mu\)m) and proportions of legs in Table V.

Hypopygium (Figures 34 – 36). Anal point hyaline; 20 – 24, 21 \(\mu\)m long; 38 – 50, 45 \(\mu\)m wide at base. Tergite IX with 7 – 18, 12 setae; laterosternite IX with 6 – 8, 7 setae. Phallapodeme 94 – 120, 108 \(\mu\)m long; transverse sternapodeme 94 – 120, 106 \(\mu\)m long; with rounded oral projections. Virga 28 – 44, 35 \(\mu\)m long; with 3 – 7, 5 spines. Gonocoxite 202 – 240, 222 \(\mu\)m long; inferior volsella simple, knob-like. Gonostylus 102 – 128, 114 \(\mu\)m long; megaseta 16 – 22, 18 \(\mu\)m long; with 5 – 7 teeth. HR 1.80 – 2.26, 1.96; HV 2.45 – 2.81, 2.67.

Diagnostic characters
Bryophaenocladius pichinensis sp. n. is easily distinguished from all other Bryophaenocladius species by the toothed megaseta.

Remarks
The toothed megaseta otherwise found only in Compterosmittia Sæther and the abruptly narrowed
inner margin of the gonocoxite otherwise found only in *Eukiefferiella* Thiemenmann and an undescribed Afrotropical genus near *Cardiocladius* Kieffer would be sufficient to erect a new genus. The megaseta in *Comperosmittia*, however, is comb-like while the megaseta here is better called toothed. In other details such as the anal point, the wings and the acrostichals *B. pichinensis* is a typical *Bryophaenocladius*. However, not only the shape of the megaseta varies in *Bryophaenocladius*. Andersen and Schnell (2000) recently demonstrated variation in the number of megasetae. The two Afrotropical species *B. kalengoensis* Lehmann and *B. usambarensis* Andersen & Schnell, and the Palaearctic species *B. faegrii* Schnell all have two to five megasetae.

**Distribution**

The species is known from Ecuador and Mexico.

*Bryophaenocladius simplex* sp. n. (Figures 37–43)

**Type material**


**Etymology**

From the Latin *simplex*, simple, referring to the shape of the inferior volsella.

**Description**

**Male imago** (*n* = 1–2). Total length 2.28–2.46 mm. Wing length 1.38–1.47 mm. Total length/wing length 1.65–1.67. Wing length/length of profemur 2.22–2.29. Coloration dark brown. **Head.** AR 1.15–1.33, ultimate flagellomere 436–508 μm long. Temporal setae 7–10, including 5–6 inner vertices, 2–4 postorbitals, no outer vertices. Clypeus with 6–7 setae. Tentorium, stipes and cibarial pump as in Figure 37; tentorium 110–140 μm long, 24–26 μm wide; stipes 104–130 μm long, 39–47 μm wide. Palpomere lengths (in μm): 22–24, 36–40, 132–142, 108–118, 110–120; length ratio of palpomeres 5/3 0.77–0.91. Third palpomere with broad digitiform projection (Figure 38). **Thorax** (Figure 39). Antepronotum with five setae. Dorsocentrals 9–11, acrostichals 8–11, prealars 4–5. Scutellum with 6–8 setae. **Wing** (Figure 40). Microtrichia visible at 100× magnification. Cu1 weakly curved. VR 1.15–1.16. R2+3 ends at 1/2–2/3 distance between R1 and R4+5. Costal extension 54–66 μm long. Brachiolium with 1–2 setae. R with 3–4 setae; R1 with 0–1 seta; remaining veins bare. Squama with 0–2 setae. **Legs.** Spur of front tibia 51–55 μm long, spurs of middle tibia 44 μm and 29–33 μm long, of hind tibia 52–55 μm and 25–28 μm long. All tibial spurs with well-developed denticles. Width at apex of front tibia 37–40 μm; of middle tibia 36–44 μm; of hind tibia 46–52 μm. Hind tibial comb with 13–14 setae; shortest seta 22–24 μm long; longest seta 38–41 μm long. Pseudospurs absent. Lengths (in μm) and proportions of legs as in Table VI. **Hypopygium** (Figures 41–43). Anal point hyaline parallel-sided with bluntly rounded apex, 46–52 μm long, 22–26 μm wide at base. Tergite IX with 7–10 setae, laterosternite IX with 6–8 setae. Phallopodium 90–94 μm long, transverse sternapodeme 90–92 μm long, strongly arcuate, without oral projections. Virga 23–30 μm long, with 5–6 spines. Gonocoxite 160–190 μm long, inferior volsella low. Gonostylus 82–100 μm long, megaseta 10–14 μm long. HR 1.78–1.95, HV 2.18–2.57.

**Diagnostic characters**

*Bryophaenocladius simplex* sp. n. resembles *B. brinki* (Freeman) from the Afrotropical region in the shape of the inferior volsella and in having a digitiform projection on the third palpomere, but differs in possessing a virga and a much longer and narrower anal point.

**Distribution**

The species is known from two localities in northeastern Mexico.

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References
