

## New species of *Bryophaenocladus* Thienemann from the Nearctic Region (Diptera: Chironomidae: Orthoclaadiinae)

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### Abstract

The male imagines of three new species of *Bryophaenocladus* from the USA, *B. paranudisquama* sp. n., *B. polychaetus* sp. n. and *B. sclerus* sp. n., are described and figured. A key to the male imagines of Nearctic *Bryophaenocladus* is presented.

**Key words:** Diptera, Chironomidae, *Bryophaenocladus*, new species, Nearctic

### Introduction

The orthoclad genus *Bryophaenocladus* was established by Thienemann in 1934. To date more than 70 species have been described world wide, with 12 species recorded from the Nearctic region (Malloch 1915, Oliver et al. 1990; Roback 1957; Sæther 1973, 1976, 1982; Sæther et al. 2000). Recently, we obtained material from the southeastern United States which contained several taxa new to science. Three new species are described below. A key to adult males of the genus in the Nearctic region is provided.

### Material and methods

The morphological nomenclature follows Sæther (1980). Measurements are given as ranges followed by a mean when there are four or more measurements, followed by the number measured (n) in parentheses. Unless otherwise indicated, all measurements are in µm. The material examined was mounted on slides following the procedure outlined by Sæther (1969). In the figures of the male genitalia, the dorsal view is shown to the left, the

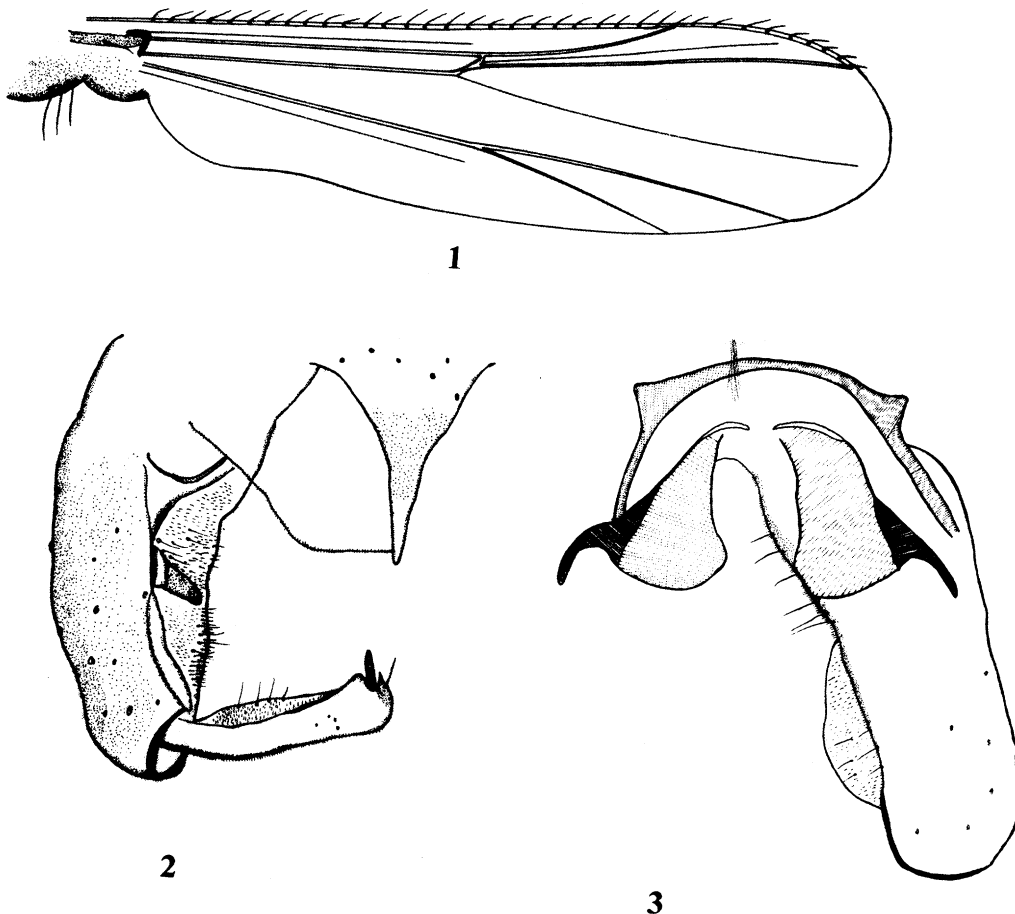
ventral aspect and the abdomen to the right. GRSM refers to Great Smoky Mountains National Park.

The holotype specimens of new taxa described in this paper are deposited in the National Museum of Natural History (USNM), Washington, D.C., U.S.A.; paratypes in the USNM and Department of Biology, Nankai University, China (BDN).

***Bryophaenocladus paranudisquama* sp. n.**

(Figs. 1–3)

**Type material.** Holotype male, USA: South Carolina: Barnwell Co., Savannah River Site, Pen Branch SRS Road B (PBI) 33°12'30''N, 81°38'05''W; light trap, 12. vi. 1995, leg. M. Womble, 98-233.



**FIGURES 1–3.** *Bryophaenocladus paranudisquama* sp. n. Holotype, male imago: **1.** Wing; **2.** Hypopygium, dorsal aspect; **3.** Hypopygium, ventral aspect.

**Etymology.** This new species is close to *B. nudisquama* Caspers et Reiss in the structure of the hypopygium, but can be separated by having three squamal setae and a wing without costal extension.

**Male** imago (n = 1).

Total length 2.46 mm. Wing length 1.24 mm. Total length/wing length 1.98. Wing length/length of profemur 2.07. Coloration dark brown.

**Head.** Terminal flagellomere 464 long, without strong subapical seta. AR 1.46. Temporal setae 10; including 4 inner verticals, 2 outer verticals and 4 postorbitals. Clypeus with 6 setae. Tentorium 146 long, stipes 114 long. Palpomere lengths: 28, 52, 100, 74, 128. Sensilla clavata in the 3<sup>rd</sup> palpomere not visible.

**Thorax.** Anteprenotum with 2 setae. Dorsocentrals 10, acrostichals 8, prealars 2. Scutellum with 4 setae.

**Wing** (Fig. 1). Anal lobe normal developed. Moderately coarse punctation easily visible at 100x magnification. VR 1.16.  $R_{2+3}$  ends 1/2 distance between  $R_1$  and  $R_{4+5}$ . Costa without extension. Brachiolum with 1 seta; R with 3 setae, remaining veins bare.  $Cu_1$  slightly curved. Squama with 3 setae.

**Legs.** Spur of front tibia 42 long, without denticles. Spurs of middle tibia 34 and 28 long, of hind tibia 48 and 28. Hind tibial comb with 7 setae. Middle and hind tibial spurs with weak denticles. Pseudospurs absent.

Lengths and proportions of leg segments:

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>	LR
P <sub>1</sub>	600	660	480	240	200	120	60	0.73
p <sub>2</sub>	580	520	300	160	120	80	60	0.58
p <sub>3</sub>	620	700	400	200	160	100	60	0.57

**Hypopygium** (Figs. 2, 3). Anal point long, parallel-sided with blunt apex, 42 long, 10 wide, anal point length/width 4.20. Tergite IX with 6 long setae; laterosternite IX with 8 setae. Phallapodeme 90 long; transverse sternapodeme 90 long, weakly arcuate with oral projection. Virga 42 long, composed of cluster of 4 spines. Gonocoxite 172 long. Gonostylus straight, 76 long. Inferior volsella naked, well sclerotized and somewhat conical with 4–5 basal setae. Crista dorsalis low. Megaseta 10 long. HR 2.26, HV 3.24.

**Distribution.** The species is only known from the type locality and was collected by light trap.

**Remarks.** This new species is very similar to *B. nudisquama* from Austria in the structure of the hypopygium, but can be separated by having three setae on the squama and a wing without costal extension. Female and immature stages unknown.

***Bryophaenocladus polychaetus* sp. n.**

(Figs. 4–6)

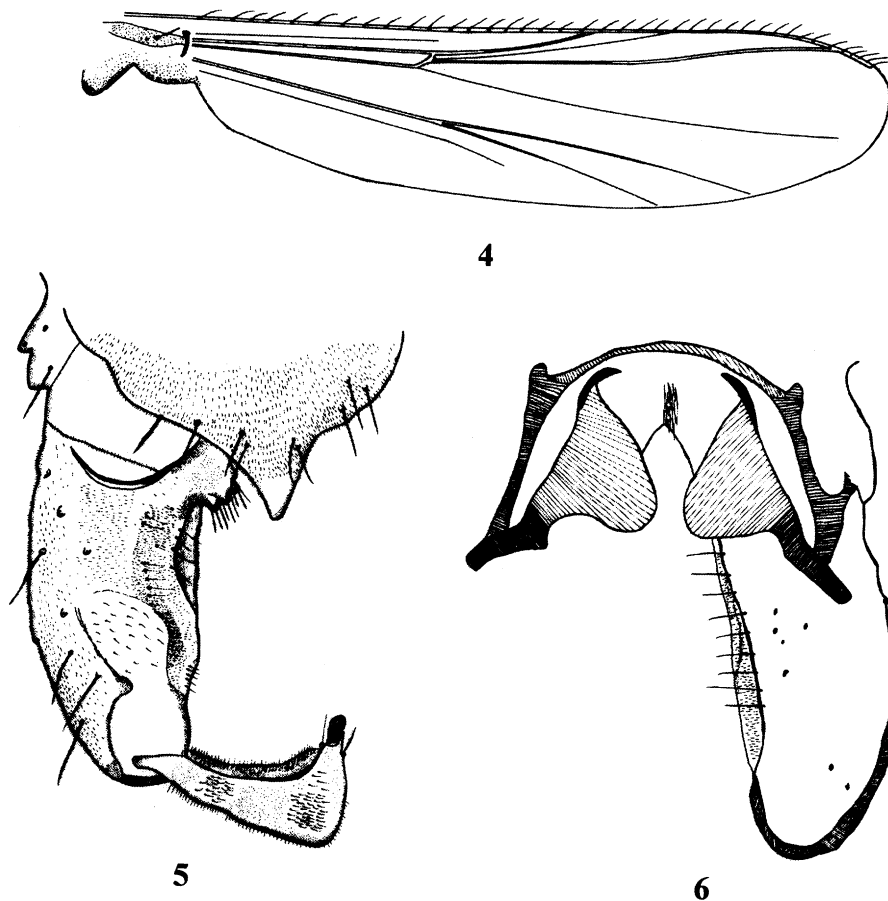
**Type material.** Holotype male, USA: North Carolina: Swain Co., Poplar Hollow Branch; Malaise trap, 16 Aug–10 Oct 2001; leg. RC Harrington, DR Jones.

**Etymology.** From the Greek *polys*, many, and *chaite*, hair, referring to the setose inferior volsella.

**Male imago** (n=1) Total length 2.33 mm. Wing length 1.27 mm. Total length/wing length 1.84. Wing length / length of profemur 2.16. Coloration yellowish brown.

**Head.** Antenna lost. Temporal setae 9, including 3 inner verticals, 6 outer verticals. Clypeus with 7 setae. Tentorium 133 long; palpomere lengths: 27, 42, 95, 90, 101, the 3<sup>rd</sup> palpomere with a cluster of 4 sensilla clavata.

**Thorax.** Anteprenotum with 3 setae. Dorsocentrals 11, acrostichals 6, bi-serial and very decumbent, prealars 6. Scutellum with 3 setae.



**FIGURES 4–6.** *Bryophaenocladus polychaetus* sp. n. Holotype, male imago: 4. Wing; 5. Hypopygium, dorsal aspect; 6. Hypopygium, ventral aspect.

**Wing** (Fig. 4). Anal lobe with slight projection. Moderately coarse punctation easily visible at 100x magnification. VR 1.18.  $R_{2+3}$  ends 1/2 distance between  $R_1$  and  $R_{4+5}$ . Costal extension 85 long. Brachiolum with 2 setae, R with 6 setae, remaining veins bare. Squama bare.

**Legs.** Spur of front tibia 48 long, spurs of middle tibia 37 and 16 long, of hind tibia 42 and 21 long, with weak denticles. Hind tibial comb with 8–9 setae. Length and proportions of leg segments:

fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>	LR
P1 588	777	515	242	lost	lost	lost	0.66
P2 588	599	292	143	111	69	69	0.49
P3 620	683	389	200	147	74	74	0.57

**Hypopygium** (Figs. 5, 6). Anal point hyaline, roughly triangular with blunt apex, 16 long, 10 wide at base. Anal point length/width 1.60. Tergite IX with 9 setae, laterosternite IX with 2 setae. Phallapodeme 75 long, transverse sternapodeme 86 wide, weakly arcuate with developed oral projection. Virga 26 long, composed of cluster of 6-7 spines. Gonocoxite 164 long. Gonostylus 70 long, with angulate subapical heel. Inferior volsella setose and present at the base of gonocoxite. Megaseta 13 long. HR 2.33, HV 1.42.

**Distribution.** The species is known only from the type locality in the Great Smoky Mountains National Park.

**Remarks.** This new species is similar in hypopygial structure to three Palaearctic species, *B. cuneiformis* (Armitage), *B. propinquus* (Brundin) and *B. scanicus* (Brundin). It differs in the following combined characters: tergite IX without cornuted projection; squama bare; setose inferior volsella present at the base of gonocoxite and different shaped crista dorsalis. Female and immature stages unknown.

### *Bryophaenocladus sclerus* sp. n

(Figs. 7–9)

**Type material.** Holotype male, USA: North Carolina: Swain Co., GRSM, Left Fork, Deep Creek, 3500 ft, 8. IV. 1993, G. Salansky, P93-43. Paratypes: 11 males, USA. Tennessee: Sevier Co., GRSM, Silers Creek, Site #1 3500 ft, 7. iv. 1993, leg. C. R. Parker, P93-44.

**Etymology.** From the Greek *skleros*, hard, referring to the strongly sclerotized inferior volsella.

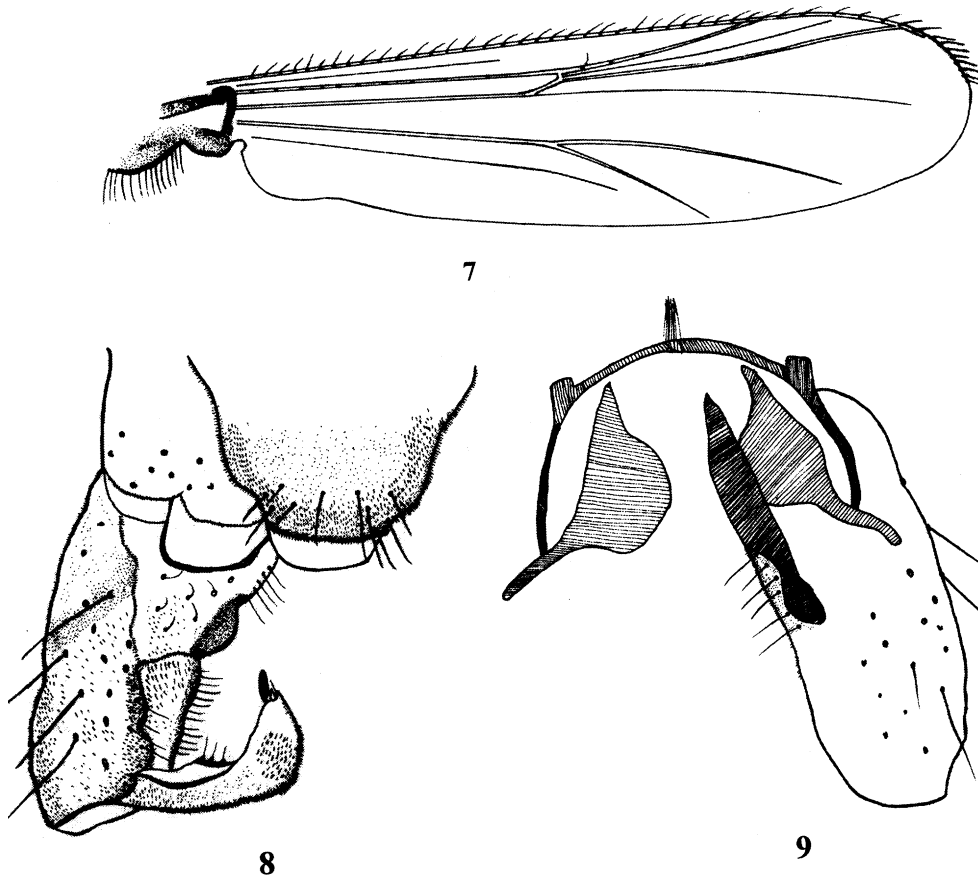
**Male** imago (n = 11, except when otherwise stated).

Total length 2.92–3.54, 3.28 mm. Wing length 1.74–1.76, 1.75 mm. Total length / wing length 1.66–2.01, 1.87. Wing length / length of profemur 2.35–2.44, 2.40. Coloration dark brown.

**Head.** Terminal flagellomere 592 long, without strong subapical seta. AR 1.95 (n=1). Temporal setae 8–9, 8; including 3–4, 4 inner verticals, 2 outer verticals and 2–4, 3 postorbitals. Clypeus with 6–8, 7 setae. Tentorium 170–180, 176 long; stipes 108–128, 118 long. Palpomere lengths: 32–40, 35; 56–70, 64; 132–144, 139; 114–120, 117; 146–148, 147. 3<sup>rd</sup> palpomere without sensilla clavata.

**Thorax.** Anteprenotum with 4–6, 5 setae. Dorsocentrals 15–18, 16, acrostichals 8–13, 11, very decumbent, prealars 6–9, 8. Scutellum with 12–14, 13 setae. Humeral pits small, rounded.

**Wing** (Fig. 7). Anal lobe protruding. Moderately coarse punctation easily visible at 100x magnification. VR 1.17–1.19, 1.18.  $R_{2+3}$  ends 1/2 distance between  $R_1$  and  $R_{4+5}$ . Costal extension 20–26, 23 long. Brachiolum with 3–4, 4 setae; R with 10–14, 13 setae;  $R_{4+5}$  with 3–4, 4 setae, remaining veins bare.  $Cu_1$  slightly curved. Squama with 16–17, 17 setae.



**FIGURES 7–9.** *Bryophaenocladus sclerus* sp. n. Holotype, male imago: 7. Wing; 8. Hypopygium, dorsal aspect; 9. Hypopygium, ventral aspect.

**Legs.** Spur of front tibia 92–100, 95 long, spurs of middle 62–68, 65 and 34–40, 37 long, of hind tibia 94–106, 99 and 36–42, 38. Hind tibial comb with 7–9, 8 setae. Pseudospurs present on  $ta_1$  of middle and hind legs. All tibial spurs with weak developed denticles. Lengths and proportions of leg segments:

fe	ti	$ta_1$	$ta_2$	$ta_3$	
p <sub>1</sub>	720–740, 730	800–880, 845	500–520, 512	480–520, 500	300–320, 310
p <sub>2</sub>	800–860, 820	820–860, 850	360–400, 380	200–220, 213	160
p <sub>3</sub>	820–860, 840	960–1020, 995	540–560, 553	300	220
	$ta_4$	$ta_5$	LR		
p <sub>1</sub>	200–220, 210	100–120, 115	0.58–0.60, 0.59		
p <sub>2</sub>	100	100	0.42–0.47, 0.45		
p <sub>3</sub>	120	100–120, 107	0.55–0.56, 0.56		

**Hypopygium** (Figs. 8, 9). Anal point hyaline with semicircular apex; 12–24, 18 long, 60–82, 69 wide at base. Anal point length/width 0.20–0.34, 0.26. Tergite IX broad, with 16–24, 19 long setae; laterosternite IX with 9–12, 11 setae. Phallapodeme 122–142, 133 long; transverse sternapodeme 128–156, 137 wide, weakly arcuate with developed oral projection. Virga 36–56, 44 long, composed of cluster of 5–7, 6 spines. Gonocoxite 256–280, 268 long. Gonostylus strongly curved, 134–136, 135 long, with 3 stout setae situated on inner side. Inferior volsella naked, well sclerotized and low dome-shaped. Crista dorsalis low and present at apex of gonostylus. Megaseta 20–22, 21 long. HR 1.91–2.06, 2.01, HV 2.15–2.64, 2.41.

**Distribution.** The species is known from Great Smoky Mountains National Park in North Carolina and Tennessee.

**Remarks.** The prominent sclerotized, bare inferior volsella, combined with the short costal extension, short and broad anal point, and strongly curved gonostylus easily separate *B. sclerus* sp. n. from other known species of the genus. Female and immature stages unknown.

#### Key to males of *Bryophaenocladius* of the Nearctic Region

- 1 Third palpomere with digitiform projection ..... 2  
Third palpomere without projection ..... 4
- 2 Costal extension absent, tergite IX and anal point triangular .....  
..... *B. flavoscutellatus* (Malloch)
- Costal extension present, tergite IX and anal point not as above ..... 3

- 3 Anal point short, length of anal point/width  $< 1$ , pseudospurs present ..... *B. subparallelus* (Malloch)  
 Anal point long, length of anal point/width  $> 1$ ; pseudospurs absent ..... *B. psilacrus* Sæther
- 4 Squama bare ..... 5  
 Squama with setae ..... 6
- 5 Anal point long and slender; inferior volsella rounded; entirely yellow or predominantly yellow with darkened scutal stripes and postnotum ..... *B. ictericus* (Meigen)  
 Anal point broadly triangular; inferior volsella tuberculate and setose; yellowish-brown in color ..... *B. polychaetus* sp. n.
- 6 Without costal extension or  $< 5\mu\text{m}$  long ..... 7  
 Costal extension present and  $> 10\mu\text{m}$  long ..... 8
- 7 Anal point long triangular, inferior volsella very large, with seta; anal lobe well developed ..... *B. impectinus* Sæther  
 Anal point very long and slender, length/width 4.2; inferior volsella conical, bare and sclerotized ..... *B. paranudisquama* sp. n.
- 8 Pseudospurs absent ..... 9  
 Pseudospurs present ..... 11
- 9 Inferior volsella fingerlike ..... *B. digitatus* Sæther  
 Inferior volsella not as above ..... 10
- 10 Tergite IX rectangular; anal point parallel-sided and with round apex, slender, length/width 2.0; rectangular near the apex of gonostylus, not convex in the middle of gonostylus ..... *B. aestivus* (Brundin)  
 Tergite IX with round projection near the anal point; anal point short, length/width 0.47; narrow near the apex of gonostylus, convex in the middle of gonostylus ..... *B. pleuralis* (Malloch)
- 11 With one pseudospur, present on  $ta_1$  of middle and hind legs ..... 12  
 With two pseudospurs, present on  $ta_1$ ,  $ta_2$  of middle and hind legs; anal point triangular, length/width 0.89; gonocoxite bearing two lobes; inferior volsella large, nose-like ..... *B. astis* (Roback)
- 12 Body yellow; anal point broad and rectangular, length/width 0.5; inferior volsella small, triangular; squama with 7 seta; 3rd palpomere with sensilla clavata ..... *B. laticaudus* Sæther  
 Body brown; anal point very short, length/width 0.26; inferior volsella round; squama with 17 seta; 3rd palpomere without sensilla clavata ..... *B. sclerus* sp. n.

**Notes:** To date, *B. furcatus* (Kieffer) was described only as adult females, larvae and pupae (Edwards, 1929; Cranston, 1987). *B. fumosinus* (Curran) was recorded from New York, but the original description by Curran (1930) was not in detail; Sublette (1966: 14) redescribed and illustrated the holotype. According to his description the species is very



close to *B. aestivus* (Brundin) from Alaska and the Palaearctic. But some necessary characters used in the above key and descriptions are unobtainable from the original description and redescription, and type material has not been examined. Therefore, these 2 species recorded from the Nearctic region are not included in the present key.

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