

One new species in the genus *Bryophaenocladius* Thienemann (Chironomidae: Diptera) from China

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Abstract: One new species *Bryophaenocladius alpinus* Deng & Zhang **sp. nov.** is described and illustrated based on adult males collected from China. The adult males can be distinguished by the third palpomere with a digitiform projection but without sensilla clavata, anal point broad triangular, inferior volsella sub-rectangular-shaped and covered with setae, gonostylus broad triangular, and crista dorsalis well-developed.

Key words: Chironominae; DNA barcode; taxonomy

苔摇蚊属中国一新种记述（双翅目：摇蚊科）

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摘要: 记述采自陕西太白山的苔摇蚊属 *Bryophaenocladius* 1 新种: 高山苔摇蚊 *Bryophaenocladius alpinus* Deng & Zhang **sp. nov.**, 并提供了该新种的条形码。此新种雄虫的下唇须第 3 节具指状突, 但缺少毛形感器; 肛尖宽阔三角形; 下附器近方形, 被有刚毛; 抱器端节宽三角形, 亚端背脊发达。

关键词: 直突摇蚊亚科; DNA 条形码; 分类

Introduction

The genus *Bryophaenocladius* was established by Thienemann in 1934 with *Orthocladius muscicola* Kieffer, 1906 as the type species. The male adults of most *Bryophaenocladius* species can be recognized by the shape of tergite IX, anal point, virga, apodemes and gonostylus (Moubayed & Lods-Crozet 2022). The species of *Bryophaenocladius* which possess a hind tibial comb can be recognized by bare, strongly punctuate wings, strong decumbent acrostichals commencing close to the anterior scutum and the broad-based, hyaline anal point (Cranston *et al.* 1989). To date, more than 100 species have been recorded worldwide (Ashe & O'Connor 2012; Lin *et al.* 2012; Kong *et al.* 2021;

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Moubayed & Lods-Crozet 2022; Moubayed & Lencioni 2023; Som *et al.* 2023), of which 12 species are in China (Yang *et al.* 2020; Kong *et al.* 2021).

In this paper, we describe a new species, *Bryophaenocladius alpinus* **sp. nov.**, based on seven adult males collected from Taibaishan National Forest Park, Meixian County, Shaanxi Province, China.

Material and methods

Specimens were collected with sweep net and mounted on slides, following the procedure in Sæther (1969). Digital photographs of slide-mounted specimens were taken using a Nikon Digital Sight DS-Fil camera mounted on a Nikon Eclipse 80i compound microscope. Morphological abbreviations and terminology follow Sæther (1980). In the text, ranges followed by means are given. The holotype and six paratypes are deposited at the College of Fisheries and Life Sciences, Shanghai Ocean University (SHOU).

The thorax of the collected specimens were processed and outsourced for DNA extraction, amplification using cytochrome oxidase subunit I (COI) universal primers LCO 1490 and HCO 2198 (Folmer *et al.* 1994) following Lin *et al.* (2018). The amplified products were sequenced by bidirectional Sanger's sequencing. The obtained sequence, trace files and other details were uploaded to the NCBI GenBank. The COI DNA sequences (Accession numbers: PP379554, PP379555, PP379556) for *Bryophaenocladius alpinus* **sp. nov.** were deposited in GenBank.

Taxonomy

Bryophaenocladius alpinus Deng & Zhang **sp. nov.** (Figs 1, 2)

Description. Male imago ($n = 7$).

Total length 2.74–3.15, 2.84 mm. Wing length 1.53–1.62, 1.61 mm. Total length/wing length 1.66–1.93, 1.77. Wing length/length of profemur 2.53–2.70, 2.61.

Colouration (alcohol preserved). Head dark brown, antennae and palpal segments brown. Thorax– scutum, scutellum and postnotum shiny dark brown to black. Legs brown. Wings greyish-brown.

Head (Fig. 1A). Antennal ratio (AR) 1.31–1.56, 1.44. Ultimate flagellomere 428–499, 468 μm long. Temporal setae 7–12, 9 including 6–9, 7 verticals and 1–3, 2 post-orbitals. Clypeus with 9–14, 10 setae. Tentorium 115–157, 140 μm long, width at sieve pore 33–45, 39 μm , width at posterior tentorial pit 13–18, 14 μm . Stipes 118–125, 122 μm long. Palpomere lengths (in μm): 18–29, 22; 25–32, 28; 110–130, 119; 106–120, 113; 71–135, 103. The third palpomere (Fig. 1C) with a finger-like terminal projection but without sensilla clavata.

Thorax. Anteprepronotum with 4–8, 6 lateral setae. Dorsocentrals 20–23, 22; acrostichals 10–14, 12; prealars 7–9, 8. Scutellum with 9–12, 10 setae.

Wing (Fig. 1B). Anal lobe not developed. Wing without costa extension. Venarum ratio (VR) 1.01–1.16, 1.10. Brachiolum with 1 seta. R with 7–14, 10 setae, R_1 with 1–5, 2 setae, remaining veins bare. Squama with 6–11, 8 setae.

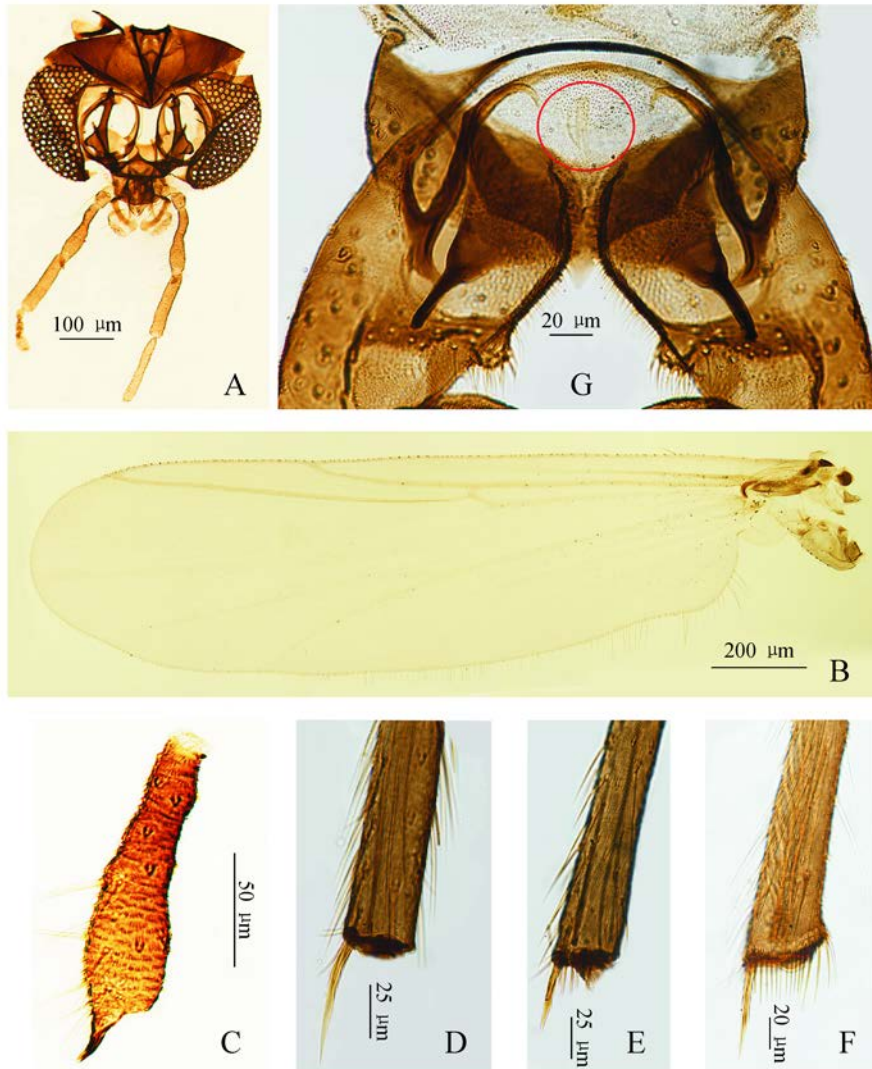


Figure 1. *Bryophaenocladus alpinus* Deng & Zhang **sp. nov.** A. Head; B. Wing; C. The third palpomere; D. Fore tibia; E. Mid tibia; F. Hind tibia; G. Part of hypopygium (indicating the virga in red circle).

Legs. Spur of fore tibia (Fig. 1D) 48–73, 60 μm long; spurs of mid tibia 48–58, 53 and 23–25, 24 μm long; spurs of hind tibia 50–75, 62 and 28–30, 29 μm long. Mid tibial comb with 4–6, 5 spines (Fig. 1E), hind tibial comb with 10–15, 13 spines (Fig. 1F). Width at apex of fore tibia 30–38, 33 μm , of mid tibia 38–43, 40 μm , of hind tibia 50–58, 53 μm . Lengths (in μm) and proportions of legs as in Table 1.

Hypopygium (Figs 1G, 2). Anal point broad triangular, widest at base and posterior margin rounded, hyaline and bare, 29–50, 40 μm long and 88–95, 92 μm wide. Tergite IX with 6–12, 9 setae situated in base of anal point, laterosternite with 7–12, 9 setae. Phallapodeme 86–103, 90 μm long, basal expansion thin with pointed apex, aedeagal lobe broadly swollen. Transverse sternapodeme arcuated with weak oral projection, 92–109, 97 μm

long. Virga visible only in one specimen composed of 3 spines (Fig. 1G). Gonocoxite 185–209, 193 μm long, dorsal side with median part of setiferous inner area covered with setae. Inferior volsella sub-rectangular shaped, being 9–12, 10 strong setae, arising from ridge, about 13–20, 16 μm long and 10–25, 17 μm wide, Gonostylus 81–105, 95 μm long, broad triangular-shaped, widest at about base 2/5, crista dorsalis well-developed, lobe-like. Megaseta 11–15, 13 μm long. HR 1.86–2.35, 2.03, HV 1.34–1.67, 1.47.

Table 1. Lengths (in μm) and proportions of legs of *Bryophaenocladus alpinus* sp. nov.

	P1	P2	P3
fe	572–637,613	630–712,668	669–711,696
ti	666–764,719	641–809,701	754–863,799
ta ₁	373–454,420	292–376,340	453–513,478
ta ₂	252–284,265	165–261,191	219–264,244
ta ₃	178–214,197	125–168,148	204–224,211
ta ₄	112–137,126	89–115,100	111–120,114
ta ₅	84–105,96	72–98,83	77–96,89
LR	0.57–0.65,0.60	0.45–0.49,0.47	0.57–0.61,0.60
BV	4.69–5.08,4.85	5.95–6.61,6.38	5.61–6.42,5.91
SV	3.06–3.38,3.17	4.01–4.36,4.23	3.03–3.21,3.12

Holotype. ♂ (specimen number ZRL01501; DNA Accession numbers: PP379555), China, Shaanxi Province, Meixian County, Taibaishan National Forest Park, 33°59′49.04″N, 107°48′22.74″E, 3,516 ma.s.l., 25-VII-2023, sweeping net, leg. R. L. ZHANG. Paratypes. 6♂, same data as holotype.

Etymology. From the Latin word, *alpinus*, meaning high mountains and referring to the new species collected from Taibai Mountain at an altitude of 3,516 m.

Diagnosis. The adult male of this new species can be distinguished from known species of *Bryophaenocladus* by the following combination of characters: AR 1.31–1.56; third palpomere with a digitiform projection but without sensilla clavata; anal point broad triangular; inferior volsella sub-rectangular shaped, covered by strong setae; gonostylus broad triangular, crista dorsalis well-developed.

Remarks. This new species resembles *B. cuneiformis* Armitage, 1987 recorded in Spain but differs from the latter in the following combination of characters in Table 2 (the data of the latter according to Armitage, 1987). *Bryophaenocladus alpinus* sp. nov. can be separated from other species by more than 9.86% divergence in partial COI sequences. The new species was collected at an altitude of 3,516 meters above sea level near the scenic spot of TianYuanDiFang in Taibai Mountain National Forest Park. The climate here belongs to the alpine cold zone, and the vegetation is mainly alpine meadow. There is no large water source here, and the larvae of this new species are probably terrestrial.

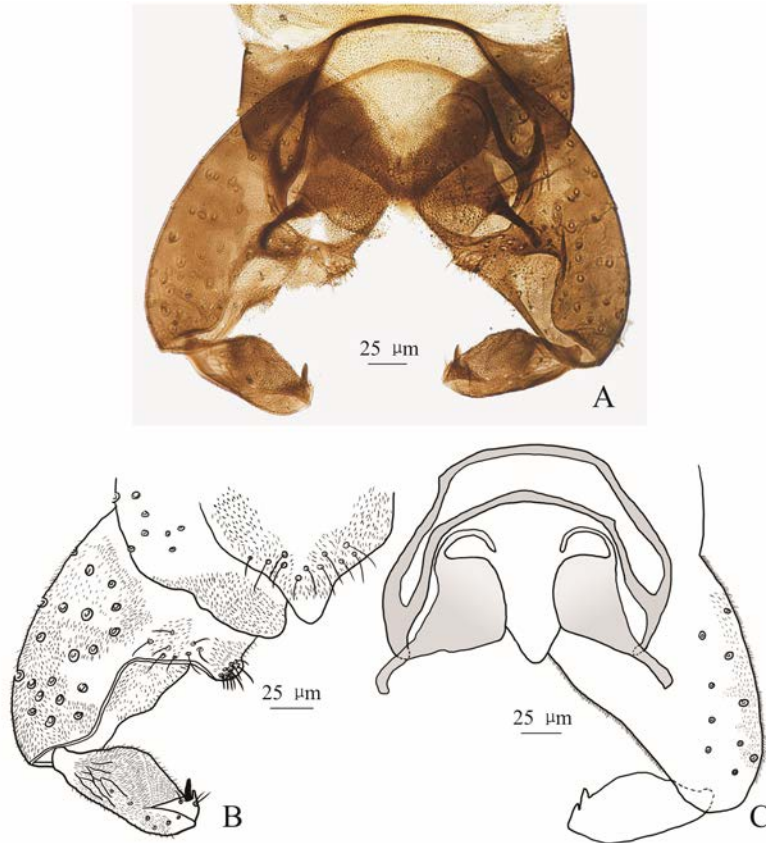


Figure 2. *Bryophaenocladius alpinus* Deng & Zhang **sp. nov.** A. Hypopygium; B. C. Hypopygium, dorsal and ventral views.

Table 2. Differences between *Bryophaenocladius alpinus* sp. nov. and *B. cuneiformis* Armitage

	<i>B. alpinus</i> sp. nov.	<i>B. cuneiformis</i> Armitage
Wing length	1.53–1.62, 1.61	1.90–2.13, 2.02
AR	1.31–1.56, 1.44	1.64–1.70, 1.67
Sensilla clavata on 3rd palpomere	absent	present
Costa extension	75–110, 88 µm	without
Shape of anal point	more wider	more slender
Setae on dorsal inner margin of distal part of gonocoxite	absent	present
Shape of inferior volsella	sub-rectangular	rounded
Shape of gonostylus	widest at base 2/5, more broad at distal 1/2	widest at base 1/3, more slender at distal 1/2

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