



New and variable caddisfly species (Insecta: Trichoptera) from Bạch Mã National Park in Vietnam

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Abstract

Two new species and descriptions of variation in two previously-described species of Vietnamese Trichoptera are presented. Adult males were collected in Bạch Mã National Park, Thừa Thiên Huế Province, Vietnam. Two species in the genus *Anisocentropus* (Calamoceratidae) are examined here, with one new species and variations in the second species described. Two species in the family Hydroptilidae are examined, with descriptions of a new species in the genus *Chrysotrichia* and variation in a species of *Ugandatrichia*. We provide illustrations of male genitalia for each species.

Keywords: Southeast Asia, Calamoceratidae, Hydroptilidae, species description

Introduction

Over 800 species of Trichoptera are known from Vietnam (Morse 2019). Ten species in the genus *Anisocentropus* McLachlan 1863 (Trichoptera: Calamoceratidae) are known from Vietnam, including five species described originally from Vietnam in subgenera *Anisocentropus* (hereafter *Anisoc.*), *Anisokantropus* Malicky 1994 (*Anisok.*), and *Anisomontropus* Malicky 1994 (*Anisom.*). These include: *A. (Anisoc.) cameloides* Malicky 1995, *A. (Anisoc.) orion* Mey 1997, *A. (Anisom.) bungus* Oláh & Johanson 2010, *A. (Anisom.) thonmihn* Oláh & Johanson 2010, and *A. (Anisom.) csorbai* Oláh & Johanson 2010. Five others [*A. (Anisoc.) brevipennis* (Ulmer 1906), *A. (Anisoc.) erichthonios* Malicky & Cheunbarn 2001 (in Malicky *et al.* 2001), *A. (Anisoc.) kawamurai* (Iwata 1927), *A. (Anisom.) janus* Malicky & Chantaramongkol 1994 (in Malicky 1994), and *A. (Anisom.) maculatus* Ulmer 1926], were originally described from other countries, but have been documented from Vietnam as well (Arefina-Armitage & Armitage 2015; Oláh & Johanson 2010; Armitage *et al.* 2005). Here we describe a new species near *A. (Anisoc.) diana* Malicky & Chantaramogkol 1994 (in Malicky 1994), and we describe variation in the male genitalia for *A. (Anisoc.) brevipennis*, which is widespread in Southeast Asia.

The family Hydroptilidae is one of the most diverse families in the Oriental Biogeographic Region, with more than 600 species reported from the Region so far (Morse 2019). We present here a study of species from two genera: *Ugandatrichia* Mosely 1939 (tribe Hydroptilini Stephens 1836) and *Chrysotrichia* Schmid 1958 (tribe Stactobiini Botosaneanu 1956). Four of the 31 species in the genus *Ugandatrichia* are known to occur in Vietnam: *U. frigorsii* Mey 1998, *U. hairanga* Oláh 1989, *U. hongae* Oláh 1989, and *U. sanana* Oláh 1989. Here,

we show variation in specimens of *U. hongia*. Seven of 70 species of *Chrysotrichia* are known from Vietnam: *C. choliona* Oláh 1989, *C. monga* Oláh 1989, *C. echna* Oláh & Johanson 2010, *C. hacha* Oláh & Johanson 2010, *C. hailana* Oláh & Johanson 2010, *C. serrula* Oláh & Johanson 2010, and *C. thira* Oláh & Johanson 2010. We describe a new species near *C. laoana* Oláh & Johanson 2010, which is known from Laos.

Materials & Methods

Specimens examined here were collected from four locations in Bạch Mã National Park in central Vietnam, Thừa Thiên Huế Province, during 30 June–03 July 2017 at a range of elevations (31–1275 m a.s.l.). Sites in the park were accessed by roads or hiking trails. We collected adult caddisflies using a BioQuip (Rancho Dominguez, CA, USA) 15-watt ultraviolet light placed over a white pan filled with 95% ethanol adjacent to streams from dusk to one hour after sunset.

Abdomens of adult male specimens were cleared with 85% lactic acid over heat, following the methods of Blahnik & Holzenthal (2004) and Blahnik *et al.* (2007). Pencil templates of diagnostic structures were prepared using a gridded eyepiece on a Wild® M5 dissecting microscope. Illustrations were finalized with Adobe Illustrator® CC. Specimens were preserved in 95% ethanol and deposited in either the Vietnam National Museum of Nature (VNMN) or the Clemson University Arthropod Collection (CUAC).

Family CALAMOCERATIDAE

Anisocentropus (Anisoc.) brevipennis (Ulmer 1906)

Ganonema brevipenne Ulmer 1906: 46–47, 50, 106, fig. 56 forewing; 2 male syntypes; “Borneo”; syntypes deposited in Stettiner Museum (now Museum of the Institute of Zoology, Polish Academy of Science, Warsaw; probably lost according to Oláh & Johanson 2010) and Paris Museum (genitalia illustrated by W. Mey 2001, personal communication to J. Oláh). Ulmer 1915: 74 (Sri Lanka). Banks 1931: 394 (Malaysian Peninsula, India).

Anisocentropus brevipennis (Ulmer 1906); Ulmer 1951: 344, 347–350, 360–363, plate 18 figs. 542–546 (male genitalia and wings).

Anisocentropus (Anisocentropus) brevipennis (Ulmer 1906); Malicky 1994: 67, plates 2 and 4 (male genitalia and wings, Thailand, Indonesia-Sumatra, Malaysia-Perak, reportedly Borneo and Sri Lanka? and India?). Malicky 2010: 330 (male genitalia and wings, Borneo, Cambodia, Peninsular Malaysia, Indonesia-Sumatra, Thailand). Oláh & Johanson 2010: 45 (*A. (A.) latifascia* Diagnostic Species Group, *A. (A.) brevipennis* Diagnostic Species Cluster). Arefina-Armitage & Armitage 2015: 1–19 (Vietnam).

Description

Length of each forewing 7.5–8.0 mm; in alcohol light brown with small, scattered, pale spots. Fringe of hair present on posterior margin of each hind wing.

Variation: Compared to illustrations prepared by Malicky (1994), preanal appendages shorter and more bluntly rounded apically in lateral view and more slender in dorsal view. Segment X excavated on dorsal posterior margin of our specimens (Fig 1); additionally, segment X vertically shorter in lateral view, much longer than tall. Phallus more nearly truncate distally; with more structure observed than in retracted phallus illustrated by Malicky (1994).

Material examined

Bạch Mã National Park, Thừa Thiên Huế Province, Thuy diên Waterfall, 16.2653°N, 107.8703°E, elev. 31 m., 03 July 2017, coll. Murray-Stoker K.M., Genco M.S., Morse J.C., Nguyễn T.M., Hugh D.H., Nguyễn V.H., 2 males preserved in 95% ethanol. Deposited in VNMN.

Distribution

Anisocentropus brevipennis was described originally from Borneo and subsequently found in Cambodia, India, Indonesia (Sumatra), Malaysia, Thailand, and Vietnam (Bunlue *et al.* 2012; Laudee & Prommi 2011; Malicky 2007; Malicky *et al.* 2014; Nuntakwang *et al.* 2007; Prommi & Chantaramongkol 2005; Seetapan & Prommi 2012). It was previously reported from Kon Tum Province in Vietnam by Arefina-Armitage & Armitage (2015), which is south of Thừa Thiên Huế Province, though both locations are in central Vietnam.

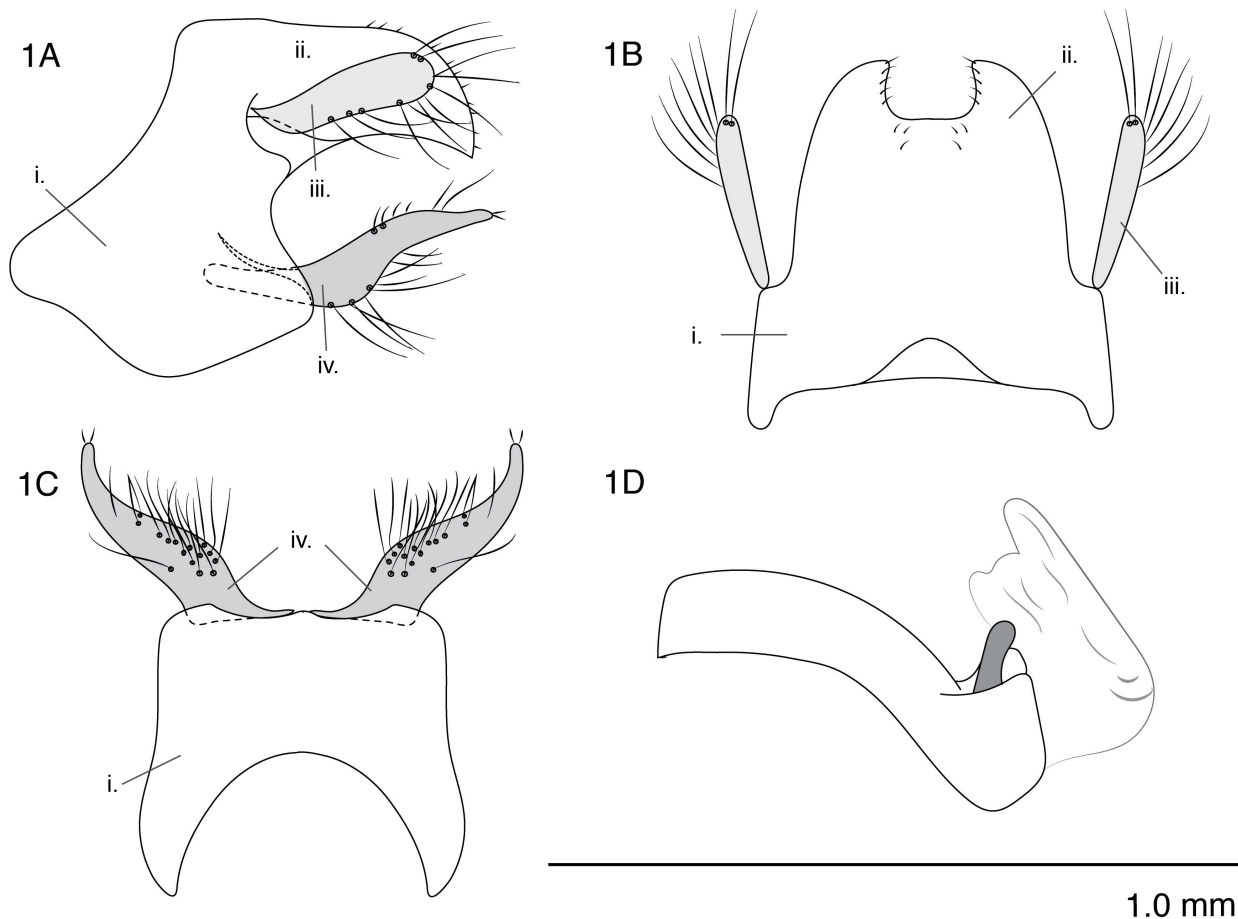


FIGURE 1. *Anisocentropus brevipennis* (Ulmer 1906), variation in male genitalia of specimens from Bạch Mã National Park, Vietnam. 1A, left lateral; 1B, dorsal; 1C, ventral; 1D, phallus, left lateral. Labels: i. segment IX; ii. segment X; iii. preanal appendage; iv. inferior appendage.

***Anisocentropus (Anisok.) minerva* Murray-Stoker & Morse, new species**

Description

Length of each forewing 8.0 mm; in alcohol brown, with small, scattered, pale spots. Fringe of hair present on posterior margin of each hind wing, with hair on basal portion being longest. Body yellow-brown and mesoscutal setal area darker brown.

Male Genitalia (Fig. 2): Dorsum IX with acute anteromesal notch and with pair of raised setose lobes near posterior margin; pair of posterior dorsolateral lobes not extending past lateral margins of segment. Preanal appendages in lateral view oval with median constriction; subtriangular in dorsal view with broadly rounded mesal angles, scalloped posterior margins, and blunt apices. Segment X divided mesally to base; in lateral view with paired and acutely pointed dorsal and ventral angles and no subdorsal angles, each dorsal angle setose, each ventral angle forming smooth downward curve; in dorsal view each half of tergum X triangular and apically tapered, with outer margin ridged and bearing short setae, inner margin with short mesal point. Inferior appendages in lateral view each with setose basoventral lobe and setose subbasodorsal lobe, slender distal portion as long as basal portion; in ventral view gradually curved mesad, distal portion apically straight and obliquely truncate. Phallus in lateral view downcurved in basal half, conspicuously curved upward in distal half; single ventromesal ridge at midlength; larger pair of subapicodorsal ridges forming mesal depression.

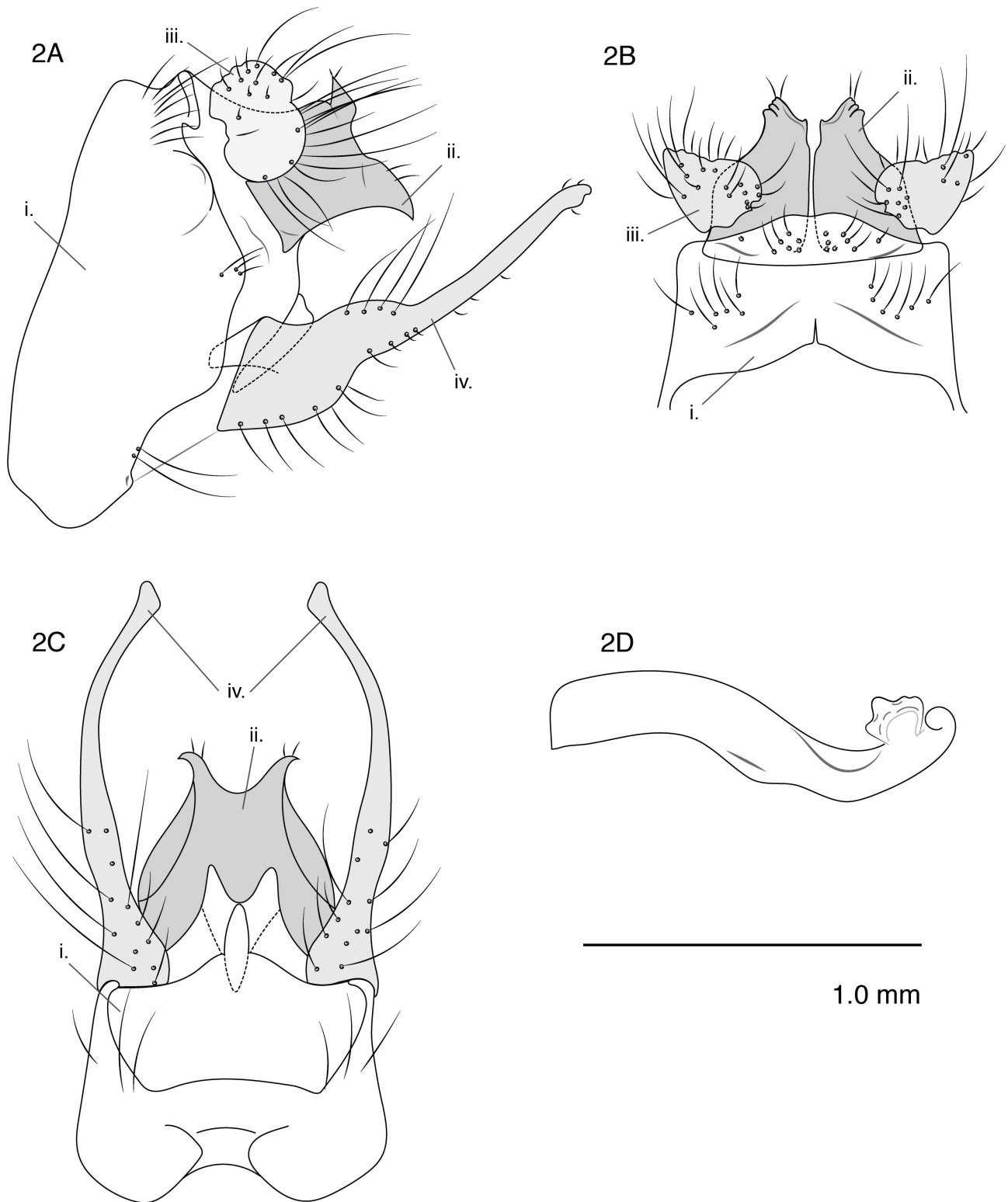


FIGURE 2. *Anisocentropus minerva* Murray-Stoker & Morse, new species, male genitalia. 2A, left lateral; 2B, dorsal; 2C, ventral; 2D, phallus, left lateral. Labels: i. segment IX; ii. segment X; iii. preanal appendage; iv. inferior appendage.

Diagnosis

This species is most similar to *A. (Anisok.) diana* Malicky & Chantaramongkol 1994 (in Malicky 1994), known from Thailand, Malaysia, and Indonesia (Sumatra) (Bunlue *et al.* 2012; Malicky 1994, 2007, 2010; Nuntakwang *et al.* 2007; Oláh & Johanson 2010). The new species differs in the following ways: The poste-

rior dorsolateral lobe on each side of segment IX is not as pronounced as in *A. diana*. The preanal appendages have distal margins convex mesally scalloped distally and blunt apically in dorsal view, rather than angled and straight and acute as in *A. diana*. Segment X is divided mesally to its base and the distal portion of each division is more tapered and differently shaped than the examples of variation noted by Malicky & Chantaramongkol (in Malicky 1994; Malicky 2010). The distal portion of each inferior appendage is relatively longer (as long as basal portion) and in ventral view straight and obliquely truncate apically in *A. minerva* n. sp.; the distal portion is much shorter than the basal portion and the apices are curved mesad and blunt apically in *A. diana*. The phallus is more sinuous in lateral view and distinctly upcurved distally and has ventromesal and subapicodorsal ridges in *A. minerva* n. sp. but is nearly straight and without ridges in *A. diana*.

Etymology

Named for the maiden goddess of wisdom in Roman mythology, because it is similar to *A. diana*, named for the Roman goddess Diana, maiden goddess of the hunt, the moon, and nature.

Material examined

Holotype male: Bạch Mã National Park, Thừa Thiên Huế Province, where two tributaries meet 5-Lakes Stream, upstream of 7-m-deep pool, 16.1922°N, 107.8559°E, elev. 1275 m., 03 July 2017, coll. Murray-Stoker K.M., Genco M.S., Morse J.C., Nguyễn T.M., Hugnh D.H., Nguyễn V.H., preserved in 95% ethanol; deposited in VNMN.

Family HYDROPTILIDAE

Ugandatrichia hongia Oláh 1989

Ugandatrichia hongia Oláh 1989: 275–276, figs. 20A–20C; male; Vietnam; deposited in the Hungarian Natural History Museum, Budapest. Yang *et al.* 2005: 441–460 (China). Laudee 2008: 29–39 (larva, Thailand). Malicky 2010: 35 (male genitalia, Thailand and Vietnam). Oláh & Johanson 2010: 100 (Laos).

Ugandatrichia navicularis Xue & Yang 1990: 125–126, 130–131, figs. 2A–2C; male; China (Hainan); deposited in the Insect Collection of Nanjing Agricultural University, Nanjing, PR China. Synonymized by Malicky 2013: 43.

Description

Length of each forewing 2.5 mm; short, thick hair present and concentrated on anterior forewing margin. Wings and body in alcohol uniformly medium brown.

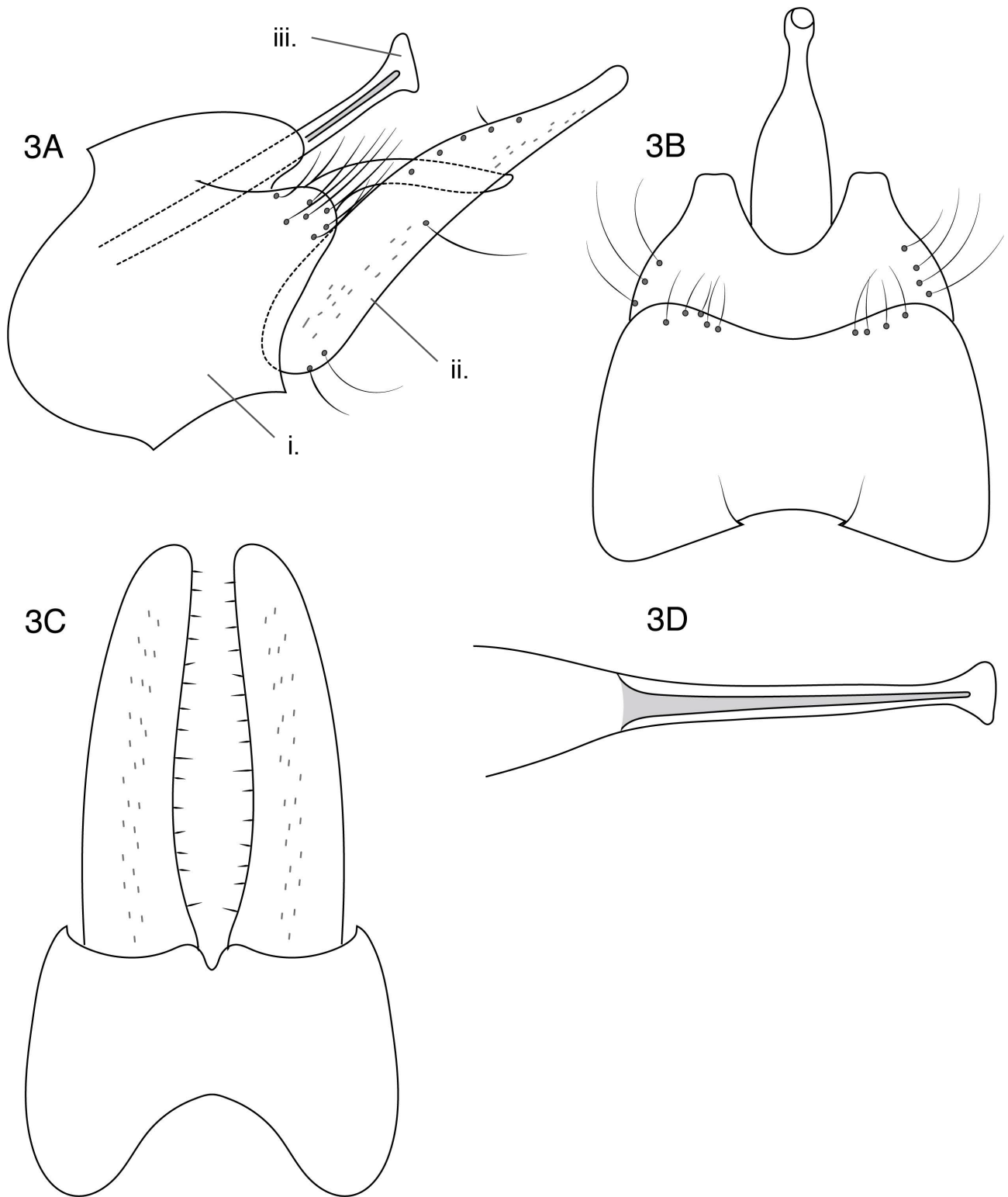
Variation (Fig. 3): Segment IX posterior dorsolateral and lateral margins more strongly projecting than in any of the previously described specimens of this species. Inferior appendages of types and our specimen longer and more slender in lateral view than those of specimen illustrated by Malicky (2010), those of our specimens each without acute subapicodorsal point of types. Phallus apically truncate, unlike that of any of the previously described specimens.

Material examined

Bạch Mã National Park, Thừa Thiên Huế Province, tributary to Pheasant Falls (tributary to Truoi River), 16.2287°N, 107.8486°E, elev. 159 m., 30 June 2017, coll. Murray-Stoker K.M., Genco M.S., Morse J.C., Nguyễn T.M., Hugnh D.H., Nguyễn V.H., 1 male preserved in 95% ethanol. Deposited in VNMN.

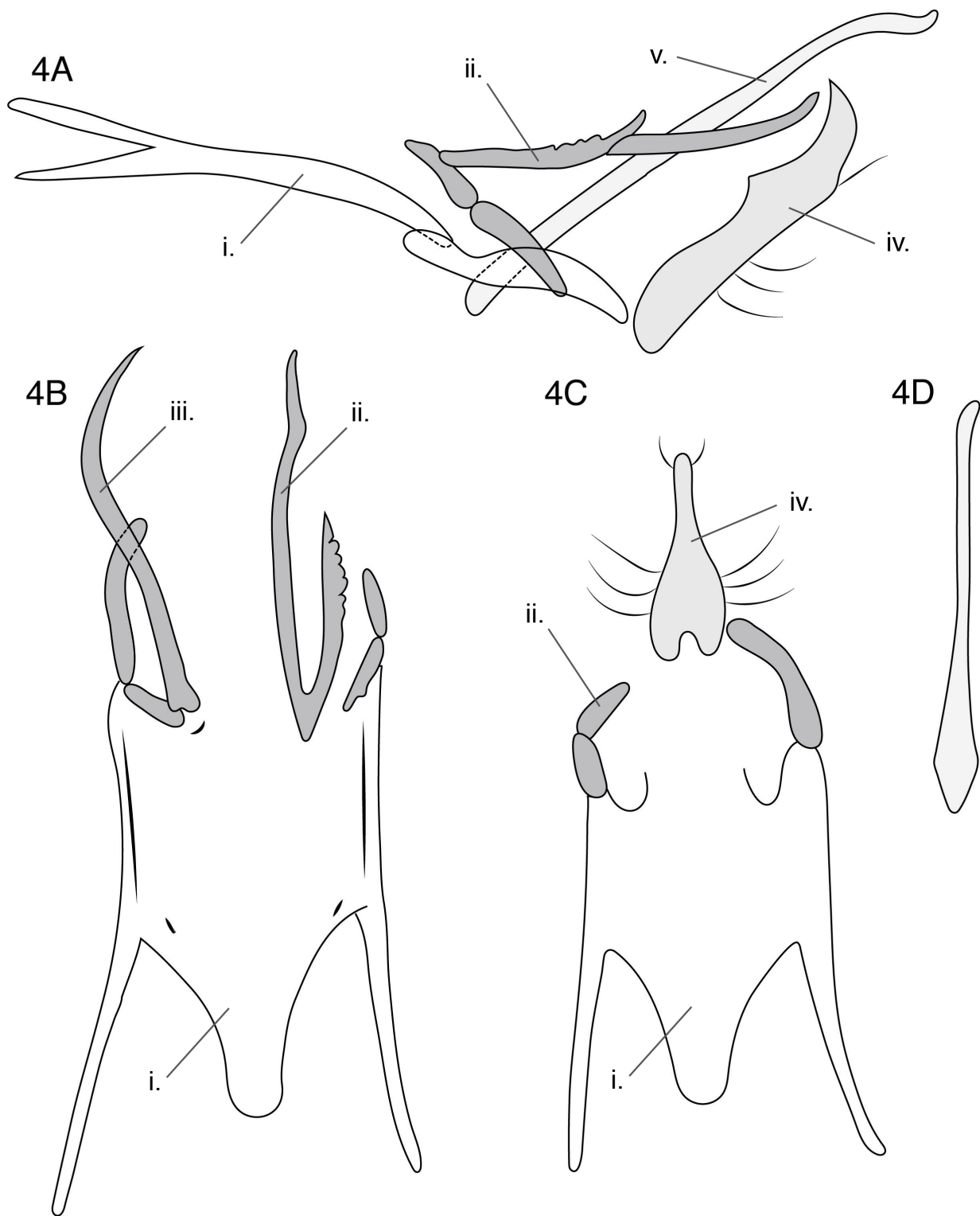
Distribution

This species was described originally from northwestern Vietnam by Oláh (1989) and is also known from Thailand, China, and Laos (Bunlue *et al.* 2012; Laudee 2008; Laudee & Prommi 2011; Oláh & Johanson 2010; Yang *et al.* 2016). Our record from central Vietnam extends the range southward in this country.



0.5 mm

FIGURE 3. *Ugandatrachia hongae* Oláh 1989, variation in male genitalia of specimens from Bạch Mã National Park, Vietnam. 3A, left lateral; 3B, dorsal; 3C, ventral; 3D, phallus, left lateral. Labels: i. segment IX; ii. inferior appendage; iii. phallus.



0.5 mm

FIGURE 4. *Chrysotrichia bachma* Murray-Stoker & Morse, new species, male genitalia. 4A, left lateral; 4B, dorsal; 4C, ventral; 4D phallus, dorsal. Labels: i. segment IX; ii. left paraproct; iii. right paraproct; iv. inferior appendage; v. phallus.

Chrysostrichia bachma Murray-Stoker & Morse, new species

Description

Length of each forewing 1.0 mm; with hair on distal half of anterior and posterior margins. In alcohol body and wings uniformly gray-brown.

Male genitalia (Fig. 4): Segment IX with three anterior apodemes; median apodeme with rounded anterior margin and not as long as lateral apodemes. Paraprocts each 3-segmented; long arm of right paraproct curved outward and then mesad from midline; long arm of left paraproct with only slight subapical curve and left paraproct with basal process having a serrated outer margin. Fused inferior appendages in ventral view rounded in basal 2/3 and with anterior incision and nearly parallel-sided in distal 1/3; in lateral view, inferior appendages each with dorsal tooth beyond midlength and curved upward to apical point, with setae on ventral margin. Phallus parallel-sided tube for most of its length, expanded basally and slightly curved to left distally.

Diagnosis

This species appears most similar to *C. laoana* Oláh & Johanson 2010, which was described close to *C. thira* Oláh & Johanson 2010. These species also resemble *C. barisan* Oláh & Johanson 2010, *C. ganjil* Wells & Huisman 1993, *C. quirinus* Malicky & Chantaramongkol 2007, *C. serrula* Oláh & Johanson 2010, *C. skamandros* Malicky & Chantaramongkol 2007, *C. thira* Oláh & Johanson 2010, and *C. zoroastres* Malicky & Chantaramongkol 2007 by having a depressed (dorsoventrally flattened) segment IX with a long anteromesal lobe, spine-like paraprocts (“dorsal rods” auctt.), and fused and tapering inferior appendages. Among all of these species, only *C. laoana* and this new species have a separate serrate basal process on the left paraproct.

Compared to *C. laoana*, segment IX of the new species is much more depressed. The median apodeme of segment IX is rounded in *C. bachma* n. sp. rather than truncate. The paraprocts each appear 3-segmented in *C. bachma* n. sp., rather than 2-segmented as in *C. laoana*, and strongly asymmetrical (nearly symmetrical in *C. laoana*). The fused inferior appendages in *C. bachma* n. sp. have a dorsal tooth beyond midlength; this projection arises before midlength in *C. laoana*.

Etymology

Named for Bạch Mã National Park in Vietnam, where the specimens were collected.

Material examined

Holotype male: Bạch Mã National Park, Thừa Thiên Huế Province, tributary to Pheasant Falls (tributary to Truoi River), 16.2287°N, 107.8486°E, elev. 159 m., 30 June 2017, coll. Murray-Stoker K.M., Genco M.S., Morse J.C., Nguyễn T.M., Hugh D.H., Nguyễn V.H.; deposited in VNMN. Paratypes: 5 males preserved in 95% ethanol (2 males in VNMN, 3 males in CUAC).

Discussion

Scientific understanding of Southeast Asia’s diverse caddisfly fauna is growing (Malicky 2010), and there is likely still more diversity to be discovered (Morse 2016). Descriptions of new and previously described species are presented here in order to contribute to knowledge of Vietnamese Trichoptera species diversity and distribution in this country and region.

The current effort to establish a library of DNA barcodes will help to determine further whether variation, such as that described here, actually corresponds to separate species, and possibly make progress toward deeper understanding of Trichoptera phylogeny (e.g., Zhou *et al.* 2016).

Establishing a library for of DNA sequences Trichoptera of the Oriental Biogeographic Region will also aid in the association of larvae with described adults; currently, less than 1% of species in this region have larval associations and descriptions (Morse 2016). The ability to identify larvae to species may help illuminate ecological correspondences of the species, including those described here.

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