

Two new dobsonfly species in the genus *Protohermes* van der Weele (Megaloptera: Corydalidae) from China

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Abstract: We describe two new species of the dobsonfly genus *Protohermes* van der Weele (Megaloptera: Corydalidae: Corydalinae) from China: *Protohermes trapezius* **sp. nov.** and *Protohermes wuyishanicus* **sp. nov.** These two new species belong to the *Protohermes davidi* species-group based on the immaculate wings and the flatly valvate male ectoprocts. A key to species of the *P. davidi* group is presented.

Key words: Corydalinae; taxonomy; key

中国星齿蛉属 *Protohermes* van der Weele 二新种记述 (广翅目: 齿蛉科)

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摘要: 本文报道中国星齿蛉属 *Protohermes* van der Weele (广翅目: 齿蛉科: 齿蛉亚科) 2 新种: 梯星齿蛉 *Protohermes trapezius* **sp. nov.** 和武夷山星齿蛉 *Protohermes wuyishanicus* **sp. nov.**。新种因翅无斑及扁平、瓣状雄肛上板而属于大卫星齿蛉种团。编制了大卫星齿蛉种团的分种检索表。

关键词: 齿蛉亚科; 分类; 检索表

Introduction

Protohermes van der Weele, 1907 (Corydalidae: Corydalinae) is the most species-rich genus in Megaloptera, currently with 78 species (Oswald 2021). This genus is endemic to Asia and most species are distributed in the Oriental region. The adults of *Protohermes* are characterized by forewing A2 vein with anterior branch partly fused with A1, forming a distally trifurcate A1. Many *Protohermes* species have smoky brown wings marked with some yellowish or whitish rounded spots, and some species even have blackish wings and creamy white spots (Liu *et al.* 2007; Yang & Liu 2010). Recently, the Oriental endemic genus *Neurhermes* Navás, 1915, which has similar blackish wings and creamy white markings (Liu *et al.* 2015), was treated as a junior synonym of *Protohermes* (Jiang *et al.* 2021). Nevertheless, there are some *Protohermes* species with immaculate wings, and most of them belong to the *P. davidi* species-group, the *P. latus* species-group, the *P. parvus* species-group, and the *P. xingshanensis* species-group (Liu *et al.* 2009, 2010, 2013; Yang & Liu 2010).

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Here we describe two new species of *Protohermes*: *Protohermes trapezius* **sp. nov.** from Yunnan and *Protohermes wuyishanicus* **sp. nov.** from Fujian. These new species have immaculate wings and belong to the *P. davidi* group. A key to the species in the *P. davidi* species-group is provided.

Material and methods

The type specimens of the new species herein described are deposited in the Entomological Museum of China Agricultural University (CAU), Beijing. Preparations of the genital segments were made by macerating the apex of the abdomen in a hot, saturated KOH solution for about 20 min. After rinsing the KOH with acetic acid and water, the apex of the abdomen was transferred to glycerine for further dissection and examination. The terminology of the genitalia generally follows Liu *et al.* (2016).

Taxonomy

Genus *Protohermes* van der Weele, 1907

Protohermes van der Weele, 1907: 243. Type species: *Hermes anticus* Walker, 1853, original designation.

Allohermes Lestage, 1927: 100. Type species: *Protohermes davidi* van der Weele, 1909, original designation.

The *Protohermes davidi* species-group

Diagnosis. Body medium to large-sized (male forewing length 42–57 mm). Coloration yellow to yellowish brown, vertexal markings narrowly hook-like if present, pronotal markings longitudinally band-like or indistinct. Postocular spines well-developed. Wings mostly immaculate; proximal anal veins distinctly darkened on forewings; venation usually dense. Lateral ocelli close to median ocellus. Male tergum 9 subtrapezoidal; sternum 9 broad, medially depressed to some degree, with V-shaped or subtrapezoidal posterior incision; gonostylus 9 simply unguiform, sometimes with longitudinal incision along inner margin; ectoproct flattened, valvate, obliquely directed posterolaterally, gradually narrowed toward apex; fused gonocoxites 10 extremely small, proximally more or less extended posteriorly, forming a transverse ridge dorsad; gonostyli 10 usually digitiform, but sometimes modified as subuliform or clavate processes. Female fused gonocoxite 8 subtrapezoidal in lateral view and slightly incised on posterior margin in ventral view.

Distribution. China; Vietnam.

Key to species of the *Protohermes davidi* species-group based on male characters

1. Sternum 9 nearly as long as length of tergum 9 plus ectoproct (Liu *et al.* 2010: figs 9, 14); gonostylus 9 with an incision along inner margin (Liu *et al.* 2010: figs 10, 15) 2
- . Sternum 9 much shorter than length of tergum 9 plus ectoproct (Liu *et al.* 2010: figs 21, 28, 34, 41); gonostylus 9 without any incision 3

- 2. Head immaculate (Liu *et al.* 2010: fig. 7); pronotal markings distinct; sternum 9 strongly depressed medially (Liu *et al.* 2010: fig. 9)..... *P. axillatus* Navás
- Head with a pair of black markings on vertex (Liu *et al.* 2010: fig. 12); pronotal markings indistinct; sternum 9 feebly depressed medially (Liu *et al.* 2010: fig. 14)..... *P. concolorus* Yang & Yang
- 3. Wings with three or four pale round markings between RP+MA and MP (Liu *et al.* 2010: fig. 5)
..... *P. dimaculatus* Yang & Yang
- Wings immaculate..... 4
- 4. Head with a pair of black markings on vertex (Liu *et al.* 2010: fig. 19); ectoproct rather elongate, approximately 2.5 times as long as tergum 9 (Liu *et al.* 2010: fig. 20)..... *P. davidi* van der Weele
- Head immaculate; ectoproct short, slightly longer or shorter than tergum 9 (Liu *et al.* 2010: figs 27, 33, 40)..... 5
- 5. Tergum 9 posteromedially produced, sternum 9 with very shallow posterior incision (Fig. 4).....
..... *P. wuyishanicus* **sp. nov.**
- Tergum 9 posteromedially truncate, sternum 9 with deep posterior incision (Fig. 2)..... 6
- 6. Pronotal markings indistinct (Liu *et al.* 2010: fig. 39); gonostylus 10 short and conical (Liu *et al.* 2010: fig. 42)..... *P. hubeiensis* Yang & Yang
- Pronotal markings distinct (Liu *et al.* 2010: fig. 32); gonostylus 10 digitiform (Liu *et al.* 2010: fig. 36)..... 7
- 7. Sternum 9 with a subtrapezoidal posterior incision (Liu *et al.* 2010: fig. 34)
..... *P. dulongjiangensis* Liu, Hayashi & Yang
- Sternum 9 with a broad V-shaped posterior incision (Fig. 2) *P. trapezius* **sp. nov.**

1. *Protohermes trapezius* **sp. nov.** (Figs 1, 2)



Figure 1. *Protohermes trapezius* **sp. nov.**, ♂, holotype, habitus photo. Scale bar = 5.0 mm.

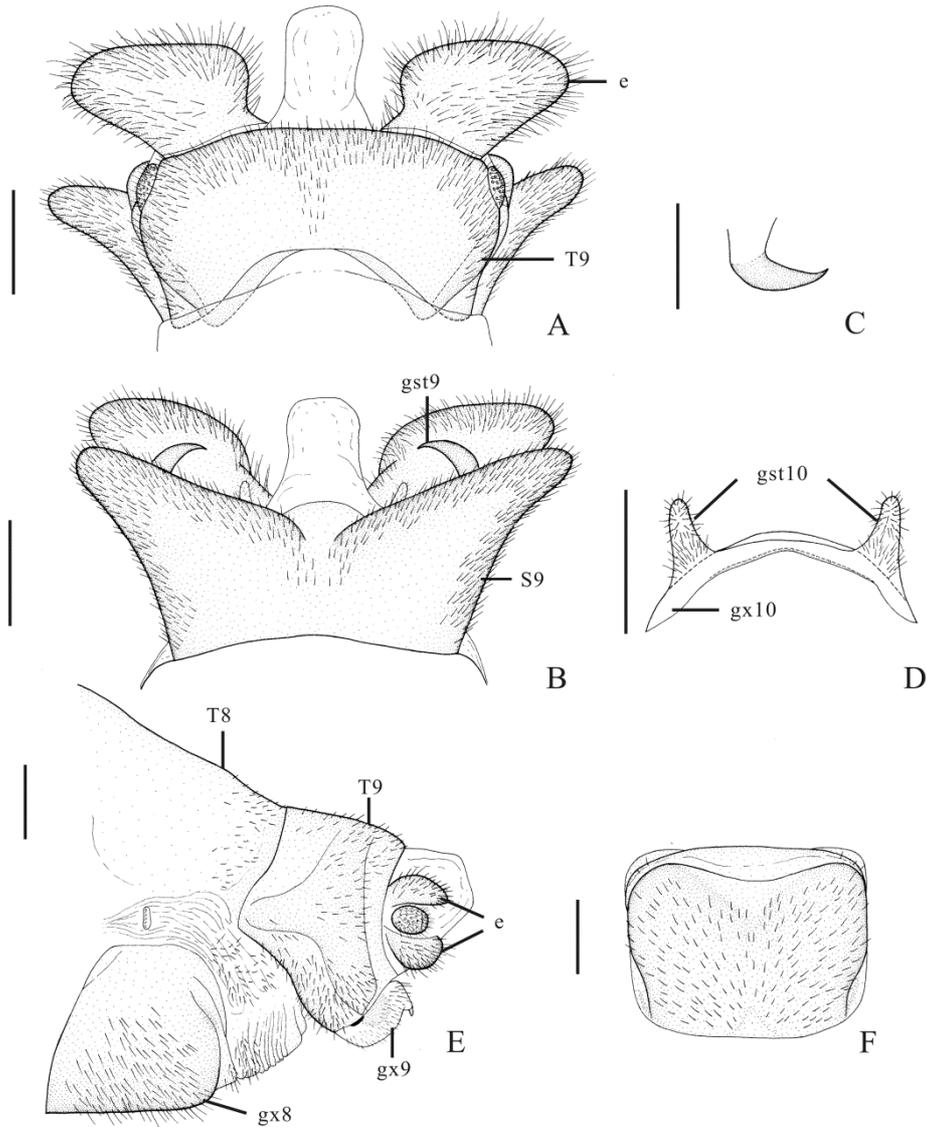


Figure 2. *Protohermes trapezius* sp. nov. A. Male genitalia, dorsal view; B. Male genitalia, ventral view; C. Male gonostylus 9, ventral view; D. Male gonocoxites + gonostyli 10, ventral view; E. Female genitalia, lateral view; F. Female fused gonocoxites 8, ventral view. e – ectoproct; gx – gonocoxite; gst – gonostylus; S – sternum; T – tergum. Scale bar = 1.0 mm.

Description. Male. Body length 39.1–41.9 mm; forewing length 42.2–46.5 mm, hindwing length 37.9–43.6 mm.

Head (Fig. 1) pale reddish brown with clypeus yellow, immaculate; postocular spines short and acutely tapering. Compound eyes blackish brown; ocelli yellow, medially margined brown. Antenna black, with scape and pedicel pale reddish brown. Mouthparts yellow; mandibles with distal half black.

Thorax (Fig. 1) yellow; pronotum pale reddish brown, median part of anterior margin and lateral margins yellow, with a pair of blackish vittae near lateral margins; meso- and metanota each with a pair of blackish brown markings anterolaterally, but anterior pair much broader than posterior pair. Legs yellow with yellowish setae; profemur blackish brown on dorsomedian portion; tibiae and tarsi blackish brown. Wings greyish, immaculate, except for costal regions with dark stripes on costal cellules, sometimes with whitish round spots on nygmata in very mature individuals. Veins yellow, much darker on distal half, with proximal anal veins black; veins sometimes mostly black on forewings in very mature individuals, but stems of CuA always yellow on both wings. RP 8 to 9-branched; MA bifurcate; 11 to 12 ra-rp crossveins; anterior branch of MP 4-branched, posterior branch of MP 2-branched.

Abdomen yellow, dorsally greyish. Tergum 9 (Fig. 2A) subtrapezoidal, anterior margin arcuately incised, posterior margin nearly truncate. Sternum 9 (Fig. 2B) subtrapezoidal, feebly depressed medially, posteriorly with a broad V-shaped incision, leaving a pair of broad subtriangular lobes. Gonostylus 9 (Fig. 2C) short, unguiform. Ectoproct (Fig. 2A) flattened, slightly shorter than tergum 9, proximally narrowed, and strongly broadened distad into a subtrapezoidal lobe. Fused gonocoxites 10 (Fig. 2D) small, slightly arched, with transverse ridge feebly developed but visible; gonostyli 10 short, digitiform, directed straight.

Female. Body length 40.1 mm; forewing length 47.4 mm, hindwing length 43.5 mm.

Wings much paler than those in males. Legs yellow with only tarsi slightly darker.

Fused gonocoxite 8 (Figs 2E, 2F) subtrapezoidal in lateral view, slightly concave posteriorly in ventral view. Gonocoxite 9 (Fig. 2E) narrow, posterior margin straight and feebly incised on ventral margin, with a small digitiform gonostylus 9 at posteroventral corner. Ectoproct (Fig. 2E) short, with posterior margin medially incised, leaving short digitiform dorsal and semicircular ventral lobes.

Holotype. ♂, **China**, Yunnan, Tengchong, Xiaodifang, 2000 m, 05-VIII-2010, Liang LIANG (CAU). **Paratypes.** 4♂1♀, same data as holotype (CAU).

Etymology. The specific epithet “*trapezius*” refers to the subtrapezoidal male ectoproct in this new species.

Diagnosis. Head pale reddish brown, immaculate; pronotum laterally with a pair of black vittae; wings slightly greyish; male sternum 9 with broad, V-shaped posterior incision, ectoproct shorter than tergum 9, subtrapezoidal in dorsal view.

Remarks. This new species in appearance resembles *P. dulongjianensis* Liu, Hayashi & Liu by having similar body and wing coloration, but can be distinguished from the latter species by the male sternum 9 with broad, V-shaped posterior incision and the subtrapezoidal male ectoproct. The subtrapezoidal male ectoproct is also a distinctive diagnostic character for distinguishing this new species from all the other species in the *P. davidi* group.

2. *Protohermes wuyishanicus* sp. nov. (Figs 3, 4)

Description. Male. Body length 36.0 mm; forewing length 44.7 mm, hindwing length 40.6 mm.

Head (Fig. 3) yellowish brown, generally immaculate; clypeus slightly darker on anteromedian margin and posterolateral corners; postocular spines short and blunt. Compound eyes brown; ocelli yellow, medially margined black. Antenna black, with scape and pedicel brown. Mouthparts yellow; mandibles with distal half blackish brown.



Figure 3. *Protohermes wuyishanicus* sp. nov., ♂, holotype, habitus photo. Scale bar = 5.0 mm.

Prothorax (Fig. 3) pale brown; pronotum slightly paler on lateral margins, laterally with a pair of narrow, hook-like, blackish brown vittae. Meso- and metathorax yellow, each notum brownish anterolaterally. Legs yellow, with yellowish setae; tibiae slightly darker. Wings pale greyish, immaculate. Veins pale yellowish brown, but with costal crossveins and proximal A1 and A2 of forewings slightly darker. RP 7- or 8-branched; MA bifurcate; 10 ra-rp crossveins; anterior branch of MP 4- to 5-branched, posterior branch of MP 2- to 3-branched.

Abdomen blackish brown. Tergum 9 (Fig. 4A) nearly pentagonal due to posterior margin distinctly tapering medially, anterior margin arcuately incised. Sternum 9 (Fig. 4B) subtrapezoidal, nearly as long as tergum 9, slightly depressed medially, posteriorly shallowly incised with a broad trapezoidal notch, leaving a pair of broad and subtriangular lobes. Gonostylus 9 (Fig. 4B) unguiform, much shorter than tergum 9, medially directed and only slightly curved at tip. Ectoproct (Fig. 4A) much shorter than tergum 9, flattened, subtriangular, distinctly tapering laterally, with obtuse tip. Fused gonocoxites 10 (Fig. 4C) small, arched, with transverse ridge feebly developed; gonostyli 10 digitiform, directed straight.

Female. Unknown.

Holotype. ♂, **China**, Fujian, Wuyishan, Masu, 1250 m, 17-VIII-2006, Hui DONG (CAU).

Etymology. The specific epithet “*wuyishanicus*” refers to the type locality of the new species, the Mt. Wuyishan, Fujian Province, China.

Diagnosis. Head without any dark markings laterally; pronotum laterally with a pair of narrow, hook-like, blackish brown vittae; male tergum 9 distinctly tapering posteromedially, sternum 9 shallowly incised posteriad, forming a broad trapezoid incision.

Remarks. The new species in appearance resembles *P. axillatus* by having a similar body and wing coloration, but it can be distinguished from the latter species as well as other species

of the *P. davidi* group by the male tergum 9 distinctly tapering posteromedially and the male sternum 9 with a rather shallow, trapezoidal posterior incision.

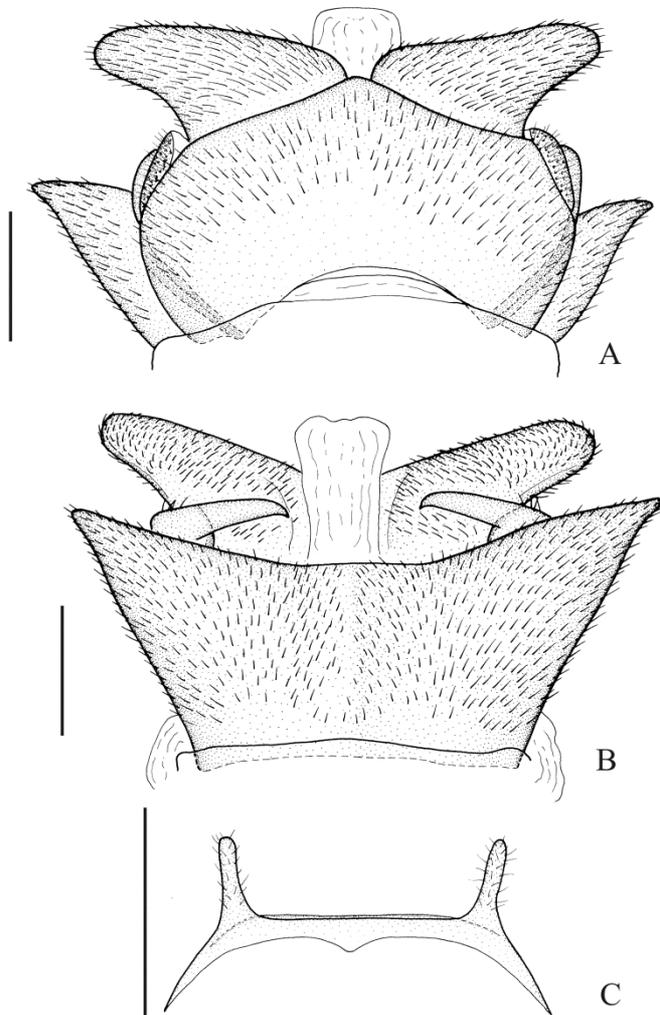


Figure 4. *Protohermes wuyishanicus* **sp. nov.** A. Male genitalia, dorsal view; B. Male genitalia, ventral view; C. Male gonocoxites + gonostyli 10, ventral view. Scale bar = 1.0 mm.

Discussion

The species of the *P. davidi* group mostly occur in southwestern China. Actually, the *Protohermes* species with immaculate wings are primarily distributed in southwestern China and adjacent regions, such as northern Myanmar, Nepal, and northeastern India. The easternmost record of the *P. davidi* group and other *Protohermes* species with immaculate wings previously known refers to Xingshan County in Hubei Province. *Protohermes wuyishanicus* **sp. nov.** is a surprising finding that updates the easternmost record of the *P. davidi* group. The fauna of Corydalidae from Fujian Province is rich but has few endemic

species (Yang & Liu 2010). Here *P. wuyishanicus* **sp. nov.** is the only species of Corydalinae endemic to Fujian. This new species may be very rare because only one specimen (i.e., the holotype male) has been collected and no other specimen of this species has been found during the past 15 years, although many field surveys on insects were carried out in the Wuyishan National Nature Reserve. The phylogenetic status of this new species in the *P. davidi* group needs to be investigated to figure out its biogeographic history and the divergence of this peculiar eastern member of this species-group.

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