Animal Cells and Systems
Vol. 14, No. 3, September 2010, 221–224

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Togoperla thinhi, a new stonefly from central Vietnam (Plecoptera: Perlidae)

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(*Received 5 May 2010; received in revised form 6 June 2010; accepted 8 June 2010*)

A new and rare perlid stonefly, *Togoperla thinhi* n. sp., is described from male and female adults and egg specimens from tropical central Vietnam. The male adult of *T. thinhi* n. sp. can be distinguished from other congeners by the distinct head markings, bilobed processes on the posterior margin of the abdominal tergum V, and S-shaped aedeagus. The female adult has a long and tongue-shaped subgenital plate on the abdominal sternum VIII, which extends to the posterior margin of the abdominal sternum IX. A male key to the Vietnamese species of *Togoperla* is provided. The finding of this new species provides evidence of an extension of the geographical distribution of *Togoperla* to tropical mainland Southeast Asia.

Keywords: *Togoperla thinhi*; Perlidae; Plecoptera; description; Vietnam

Introduction

The perlid stonefly genus *Togoperla* was erected by Klapálek (1907) but the generic concept has been interwined with the sister genus *Paragnetina* Klapálek throughout the last century (Stark and Sivec 2008). Kawai (1967) cataloged four *Togoperla* species in Japan. Sivec et al. (1988) revised the genus and recognized only four species from previously described species under the genus of *Togoperla*. Du and Chou (1999) included six *Togoperla* species in the male key to the species of Chinese *Togoperla*. Stark and Sivec (1991) described one *Togoperla* species, *T. shan*, from Thailand. Stark and Sivec (2008) recently reviewed the genus and additionally described a species, *T. clavata* Stark and Sivec, which resulted in a total number of 11 valid species. The genus is known distributed in the eastern Palearctic and Oriental regions including Japan, southern mainland China, Hong Kong, northern Thailand, and northern Vietnam (Stark and Sivec 2008). In Vietnam, five species of *Togoperla*, *T. canilimbata* (Enderlein), *T. chekianensis* (Chu), *T. clavata* Stark and Sivec, *T. perpicta* Klapálek, and *T. poilanina* (Navás), have been recorded by Wu (1935), Zwick (1973), Hua (2000), and Stark and Sivec (2008).

In this study, one new species of *Togoperla* is described from tropical central Vietnam based on adult male and female specimens.

Adult specimens were collected by a sweeping net or a light trap and housed in the Entomological Museum of Korea University (KU). They are preserved in 80% EtOH. Morphological terminology follows Sivec et al. (1988).

Taxonomic accounts

Family Perlidae Latreille
Genus *Togoperla* Klapálek

Perla (*Togoperla*) Klapálek, 1907: 19. Type species. *Perla limbata* Pictet, designated by Klapálek (1923).

Togoperla thinhi, n. sp.
(Figure 1A–K)

Material examined. Holotype: ♂ (SWU-PLE-210), Central Vietnam, Thua Thien-Hue Province, Bach Ma National Park, 7.V.2005, Ta Huy Thinh (KU). Paratypes: 2♂ (SWU-PLE-211), same data as holotype (KU). Other materials: 1♂ & 1♀ (SWU-PLE-212), Central Vietnam, Thua Thien-Hue Province, A Luoi, A Roang, 20.VII.2004, Hoang Vu Tru; 2♀ (SWU-PLE-213), Central Vietnam, Quang Nam Province, Phuoc Son, Lo Xo Pass, alt. 1000 m, 1.V.2005, Hoang Vu Tru.

Male adult (holotype). Body length 20.1 mm; antennae 13.0 mm; forewings 21.8 mm; hindwings 19.1 mm. General body color brown with dark brown markings. Head (Figure 1A) brown, slightly wider than pronotum, with dark brown triangular marking on anterior frons to M-line, with large dark brown area on vertex covering three ocelli; three membranous ocelli widely located on middle of head. Antennae generally brown, apically darker in color.

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ISSN 1976-8354 print/ISSN 2151-2485 online

DOI: 10.1080/19768354.2010.504349
http://www.informaworld.com

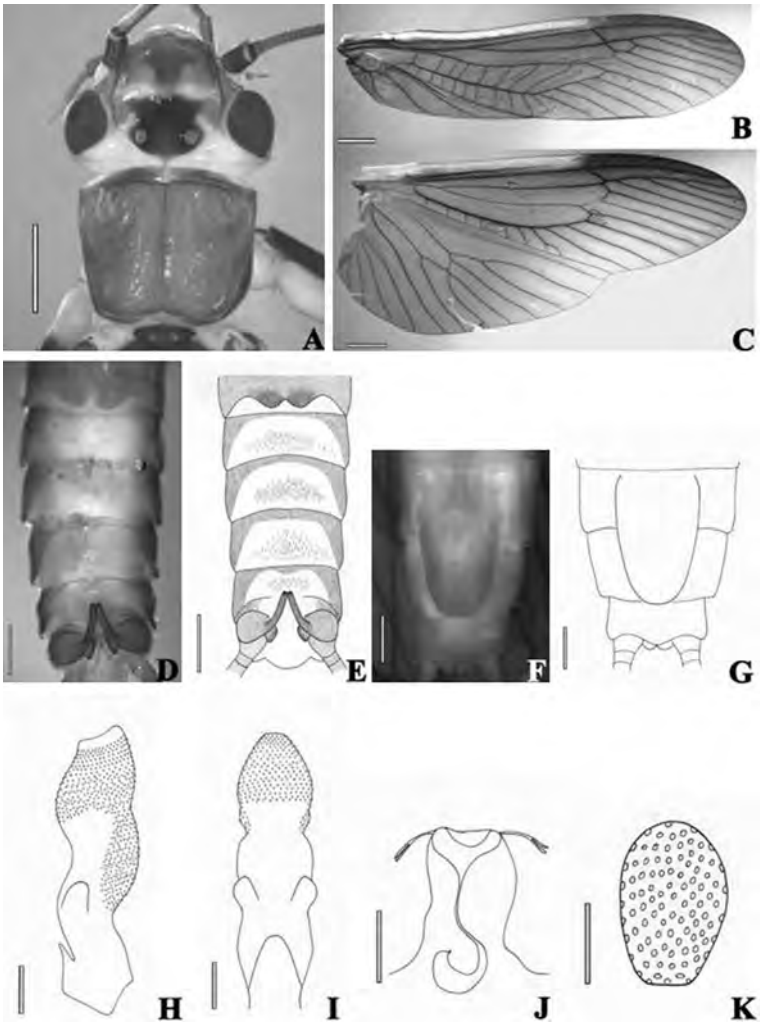

Figure 1. *Togoperla thinhi*, n. sp., adult: A, male head and pronotum; B, male forewing; C, male hindwing; D, E, male dorsal terminalia; F, G, female ventral terminalia; H, everted aedeagus, lateral; I. everted aedeagus, dorsal; J, female vagina; K, egg, lateral. Scale bars = 2 mm (A–C), 1 mm (D–G), 0.5 mm (H–J), 0.2 mm (K).

Pronotum (Figure 1A) brown, narrowing only slightly to posterior margin; anterolateral margin somewhat round; surface with faint rugosities. Mesonotum and metanotum dark brown. Wings (Figure 1B,C) infuscated; costal margins yellowish-brown, veins brown. Forewing Rs with six branches; C-Sc with 19 crossveins; hindwing 3A three-forked. Legs relatively long; coxae and proximal femora yellow; distal femora, tibiae, and tarsi dark brown. Anterior metasternum and abdominal sterna V–VII with brush of brown hairs medially.

Abdominal tergum V (Figure 1D,E) produced into bilobed processes, with emargination on posterior margin; lobes strongly sclerotized and without sensilla basiconica. Abdominal terga VI–IX (Figure 1D,E) unmodified, strongly sclerotized anterolaterally, membranous posteriorly, with patch of slender hair-like setae on membranous area. Hemitergal finger processes (Figure 1D,E) sclerotized, terminally round, and with a few sensilla basiconica; anterior area of basal callus ca. 3.0 × length of basal callus; process deeply grooved between lateral margin and basal callus in dorsal view; basal callus well-developed, with several sensilla basiconia marginally.

Aedeagus (Figure 1H,I) relatively short, ca. 1.6 mm long, strongly S-shaped in lateral view; tube with a pair of unarmed basolateral lobes and a well-developed median lobe. Everted sac as long as tube length; apex without additional lobe; armature consisting short thick triangular spinules covering most of sac in ventral and dorso-apical half. Cerci brown, hairy (tip broken).

Female adult. Body length 25.6–26.5 mm; antennae 16.9 mm; forewings 26.5–27.6 mm; hindwings 24.5–26.3 mm. Body size somewhat larger than male; general body color as in male. Abdominal sterna I–VII with

membranous fold. Subgenital plate (Figure 1F,G) relatively long, tongue-shaped, extending posterior margin of abdominal sternum IX. Vagina (Figure 1J) somewhat longer than wide, membranous, with short anterior accessory glands. Spermatheca sausage-like; spermathecal stalk slender, shorter than vagina. Cerci brown, hairy (tip broken).

Nymph. Unknown.

Egg. Egg (Figure 1K) outline oval, 0.38 mm long and 0.27 mm wide. Chorion coarsely punctate entirely, with round pits. Collar absent. Micropyles not observed.

Etymology. The specific epithet, *thinhi*, follows Mr Ta Huy Thinh, who collected the holotype of this species.

Diagnosis. The male adult of *T. thinhi* n. sp. can be distinguished from other congeners by the distinct dark brown markings on head (Figure 1A), bilobed processes on the posterior margin of the abdominal tergum V, which lack sensilla basiconica (Figure 1D,E), and strongly S-shaped aedeagus in lateral view (Figure 1H,I).

The female adult of *T. thinhi* n. sp. can be distinguished by the long and tongue-shaped subgenital plate on the abdominal sternum VIII, which extends to the posterior margin of the abdominal sternum IX (Figure 1F,G).

Distribution. Central Vietnam.

Key to the species of Vietnamese *Togoperla* males

1. Hemitergal finger processes relatively long and slender (Figure 1D,E). 2
- Hemitergal finger processes relatively short and broad (in Stark and Sivec 2008: 210, figure 2) . . .5
2. Bilobed processes on posterior margin of abdominal tergum V without sensilla basiconica; aedeagus as in Figure 1H,I . . . . . .*T. thinhi* n. sp.
- Bilobed processes on posterior margin of abdominal tergum V with sensilla basiconica or hairy; aedeagus not as in Figure 1H,I 3
3. Lateral lobes of aedeagus tube without small triangular spinules (in Stark and Sivec 2008: 218, figures 42–43) . . . . . .*T. poilanina*
- Lateral lobes of aedeagus tube covered with small triangular spinules 4
4. Length from basal callus to hemitergal tip ca. 2.3–2.8 × as long as basal callus; aedeagus sac terminating with long cylindrical lobe, armed with fine long setae in apical half (in Sivec et al. 1988: 18, figure 6d–h) . . . . . *T. perpicta*
- Length from basal callus to hemitergal tip ca 1.8 × as long as basal callus; aedeagus sac terminating with long polyp-shaped lobe, armed with fine long setae (in Stark and Sivec 2008: 211, figures 8–12) . . . . . *T. clavata*
5. Tip of membranous aedeagus sac with a pair of slender bare lateral lobes and a slender median lobe, armed with fine brown setae (in Stark and Sivec 2008: 210, figure 5) . . . . . *T. canilimbata*
- Tip of membranous aedeagus sac round, without additional lobes, without basal sclerites (in Du and Chou 1999: 5, figures 1–3) . . . . . *T. noncoloris*

Discussion

General morphology of the adults of *T. thinhi* n. sp. is similar to that of *T. perpicta* Klapálek but they can be separated from each other by the characters of head markings, abdominal tergum V, and everted aedeagus in male, and subgenital plate in female.

Du and Chou (1999) originally described *T. noncoloris* based on only male adult specimens from Guangxi Province in southern mainland China. We successfully reared both of the male and female adults of *T. noncoloris* from the last instar nymphs and confirmed the nymphal and adult association based on external morphology. The female adult and nymph of *T. noncoloris* Du and Chou is described elsewhere (Cao and Bae, unpublished). We therefore include *T. noncoloris* in the key to the Vietnamese *Togoperla* males.

T. chekianensis (Chu 1928) was originally described from Zhejiang Province in China, but later synonymized with *T. tricolor* Klapálek (1921) by Sivec et al. (1988). Stark and Sivec (2008) confirmed this synonymy. Although *T. chekianensis* (Chu) was listed as Vietnamese Plecoptera fauna (Hua 2000), we exclude this species in the key to the Vietnamese *Togoperla*.

The genus *Togoperla* is known distributed in the eastern Palearctic and Oriental regions with a high degree of species richness in the area of southern mainland China and northern Vietnam that lies on the subtropical climatic region (Stark and Sivec 2008). The finding of this new species from central Vietnam provides evidence of an extension of the geographical distribution of *Togoperla* to tropical mainland Southeast Asia.

Acknowledgements

We thank Mr Hoang Vu Tru and Dr Ta Huy Thinh (Institute of Ecology and Biological Resources, Hanoi) for their materials donation. Vietnamese field research was supported by a research grant from National Foundation for Science and Technology Development (NAFOSTED-106.12.29.09) in Vietnam. This work was supported by a Korea University Research Grant.

References

Chu YT. 1928. Description of four new species and one new genus of stoneflies in the family Perlidae from Hangchou. China J. 10:89–92.

Du Y, Chou I. 1999. Note on Chinese species of genus *Togoperla* Klapálek (Plecoptera: Perlidae: Perlinae) from China. Entomotaxonomia. 21:1–7.

Hua LZ. 2000. List of Chinese insects Vol. 1. Guangzhou: Zhongshan (Sun Yat-sen) University Press.

Kawai T. 1967. Fauna Japonica Plecoptera (Insecta). Japan: Biogeographical Society of Japan Press.

Klapálek F. 1907. Evropske druhy roda Perla Geoffr. Rozpravy Ceske Akademy. Praha. 16(31):1–28.

Klapálek F. 1921. Plécoptères nouveaux. Ann Soc Entomol Belg. 61:57–67.

Klapálek F. 1923. Plécoptères II. Famille Perlidae. Collections Zoologie du Baron Edm. de Selys Longchamps. Bruxelles. 4(2):1–193.

Sivec I, Stark BP, Uchida S. 1988. Synopsis of the world genera of Perlinae (Plecoptera: Perlidae). Scopolia. 16:1–66.

Stark BP, Sivec I. 1991. Description of Oriental Perlini (Plecoptera: Perlidae). Aquat Ins. 13:151–160.

Stark BP, Sivec I. 2008. The genus *Togoperla* Klapálek (Plecoptera: Perlidae). Illiesia. 4:208–225.

Wu CF. 1935. Order IX. Plecoptera. Catalogus Insectorum Sinensium. 1:299–315.

Zwick P. 1973. Die Plecopteren-Arten Enderleins (Insecta); Revision der Typen. Ann Zool Warsz. 30:471–507.