



The Nymph and Additional Imaginal Description of *Epeorus melli* new combination from China (Ephemeroptera: Heptageniidae)

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Abstract

The nymph plus additional imaginal characters of *Epeorus melli* (Ulmer) **new combination** are described and figured in detail. The nymphs have 2 cerci, gills 1–7 which do not form a closed disk ventrally, and abdominal terga with a median row of setae dorsally but without median tubercle. Originally described in the genus *Thalerosphyrus*, it is actually a member of the genus *Epeorus*.

Key words: Ephemeroptera, Heptageniidae, *Thalerosphyrus*, *Epeorus*, nymph, China

Introduction

Thalerosphyrus melli was originally described by Ulmer (1925) from males and females found in southern China. Knowledge of the genera of Heptageniidae has expanded since Ulmer's publication (for example: Braasch and Soldán 1984; Kluge 1988, 2004; Wang and McCafferty 2004), and a reevaluation of older species is needed. In recent years, imaginal materials of "*T. melli*" have been collected frequently in this country. Based on the Ulmer's description and materials in our collection, imagoes are identified easily by the subequal length of the femur, tibia and tarsus of the hind leg (Fig. 28), reddish stripes and spots on body and wings (Fig. 27) and the shape of the genitalia (divided, divergent penes, each penis lobe with a small apical projection, Fig. 29).

In 2005, several adults of the *T. melli* were collected in Lei-Gong-Shan Natural Reserve, Guizhou province, southwestern China. Nymphs associated with the adults based on color patterns and developing male genitalia, belong to the genus *Epeorus*. A description of the nymphal and additional imaginal characters of *Epeorus melli* **new combination** are described and figured below

Epeorus melli (Ulmer, 1925) n. comb.

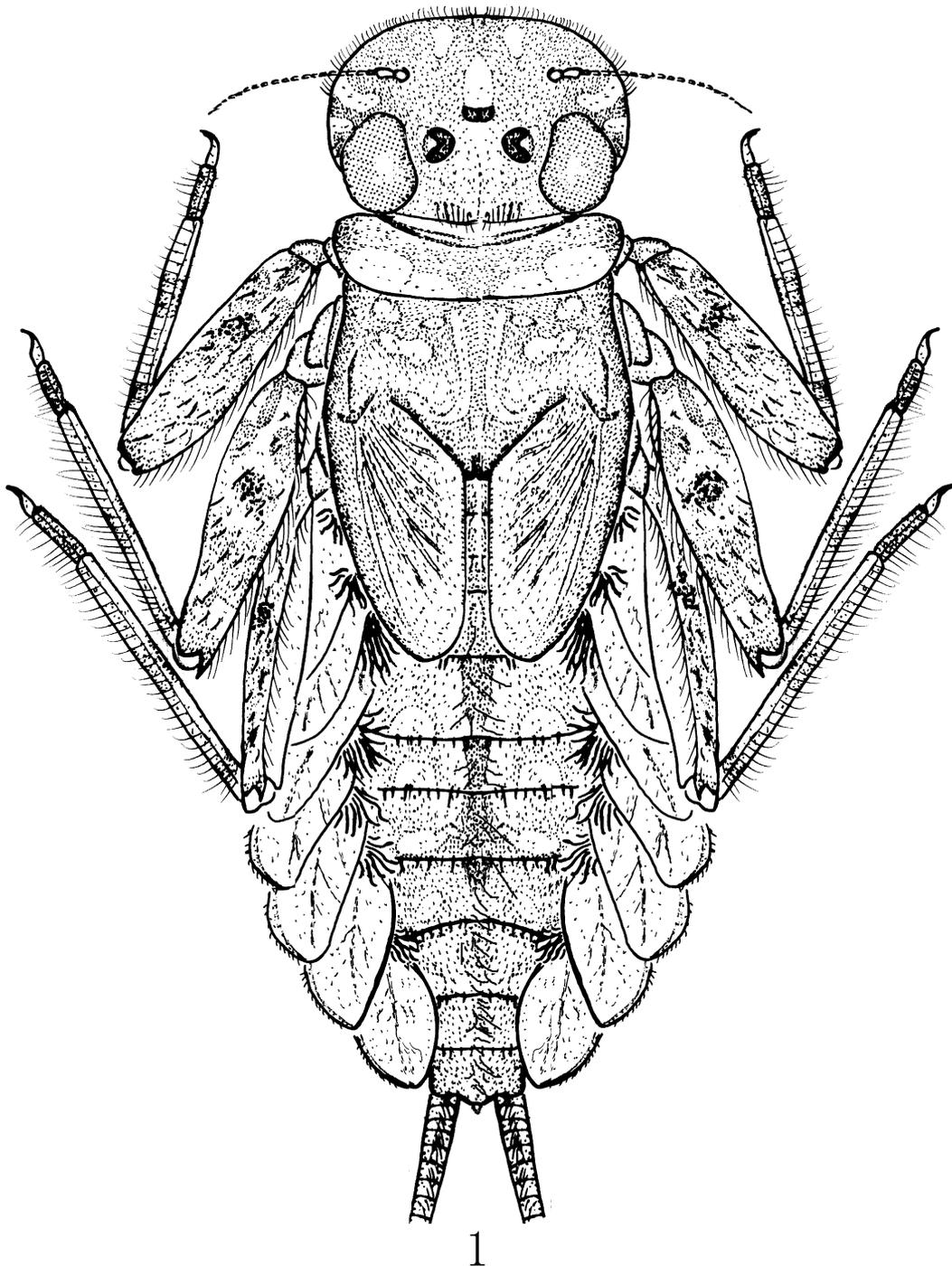
(Figs. 1–29)

Thalerosphyrus melli Ulmer, 1925: 101, figs. 89–93. Types: male, female, collected in Luofushan Mt. (Lofaushan), Maizi Mt. (Mahn tsi shan), Guangdong (Kuangtung) province, southern China.

Thalerosphyrus melli—Wu, 1935:252; Ulmer, 1935–1936:215; Gui, 1985:86; You et Gui, 1995:45, fig. 41 (male).

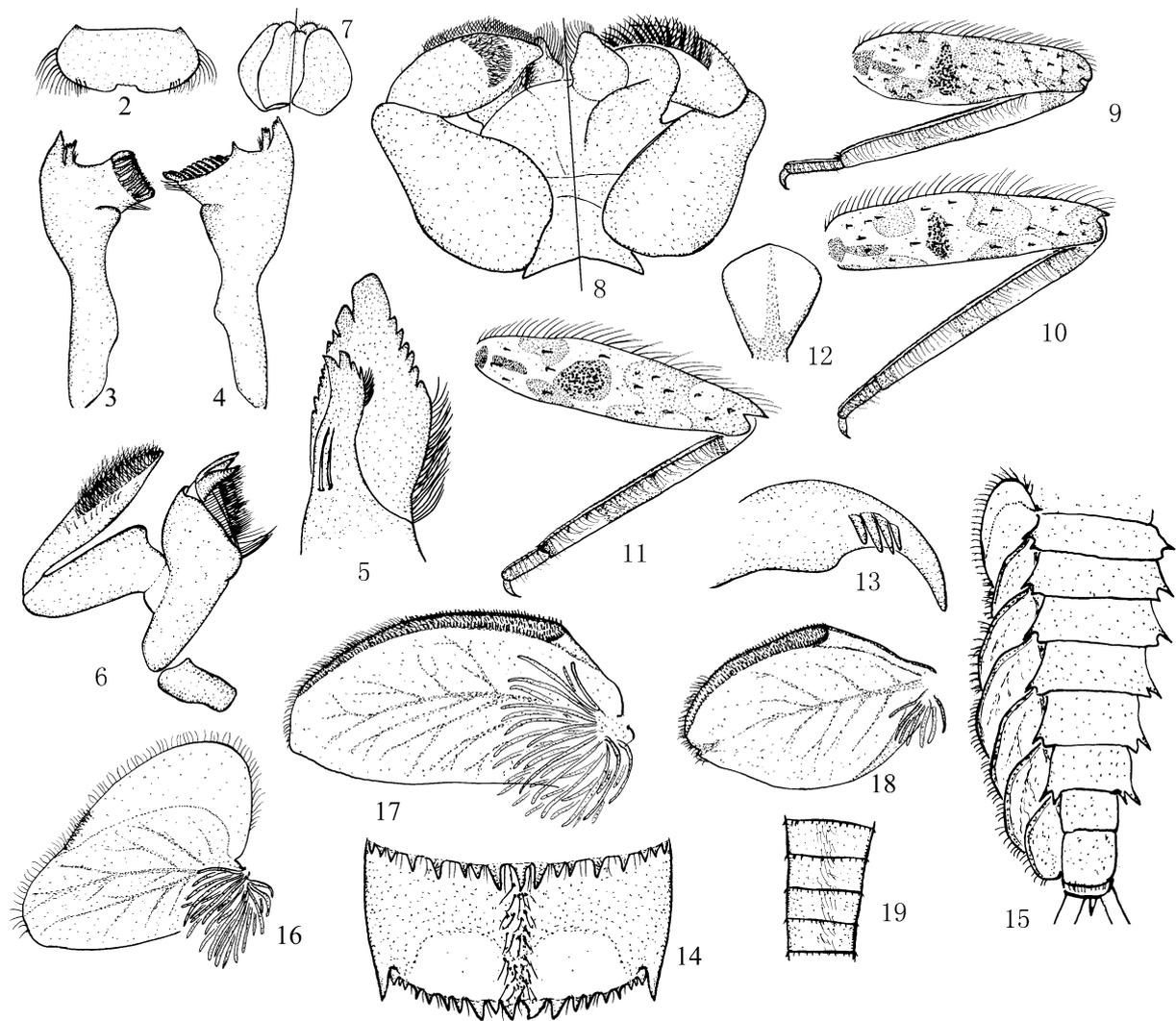
Material examined. CHINA: Guizhou province: Rong-Jiang Ct., Dan-Jiang village (10820'394"E, 2620'550"N, alt. 685 m), Lei-Gong-Shan reserve, 1 10 35 Larvae (L), 2005-IX-15-18; Leishan Ct., Fang-Xiang village (10816' 551"E, 2626'599"N, alt. 880 m), Lei-Gong-Shan reserve, 11 L, 2005-IX-13-15, col-

lected by Peng LI & Zhijie WANG; Fujian province, Sang-Gang village, Wuyi Mt., 6, 1995-VII-15, Ling YIN & Changfa ZHOU; Jiu-qu stream, Wuyi Mt., 31, 1980-VII-23, collected by Dashou YOU; Zhejiang province, Qingyuan Ct., Zhouqi village, 130, 1994-VIII-9, Chaodong ZHU & Changfa ZHOU; Anhui province, Huoshan Ct., Qiling village, 1, 1983-VII-31, Xinyong WU; Hubei province, Dabie Mt., 203, 2000-VIII-20, Xiulan RONG.



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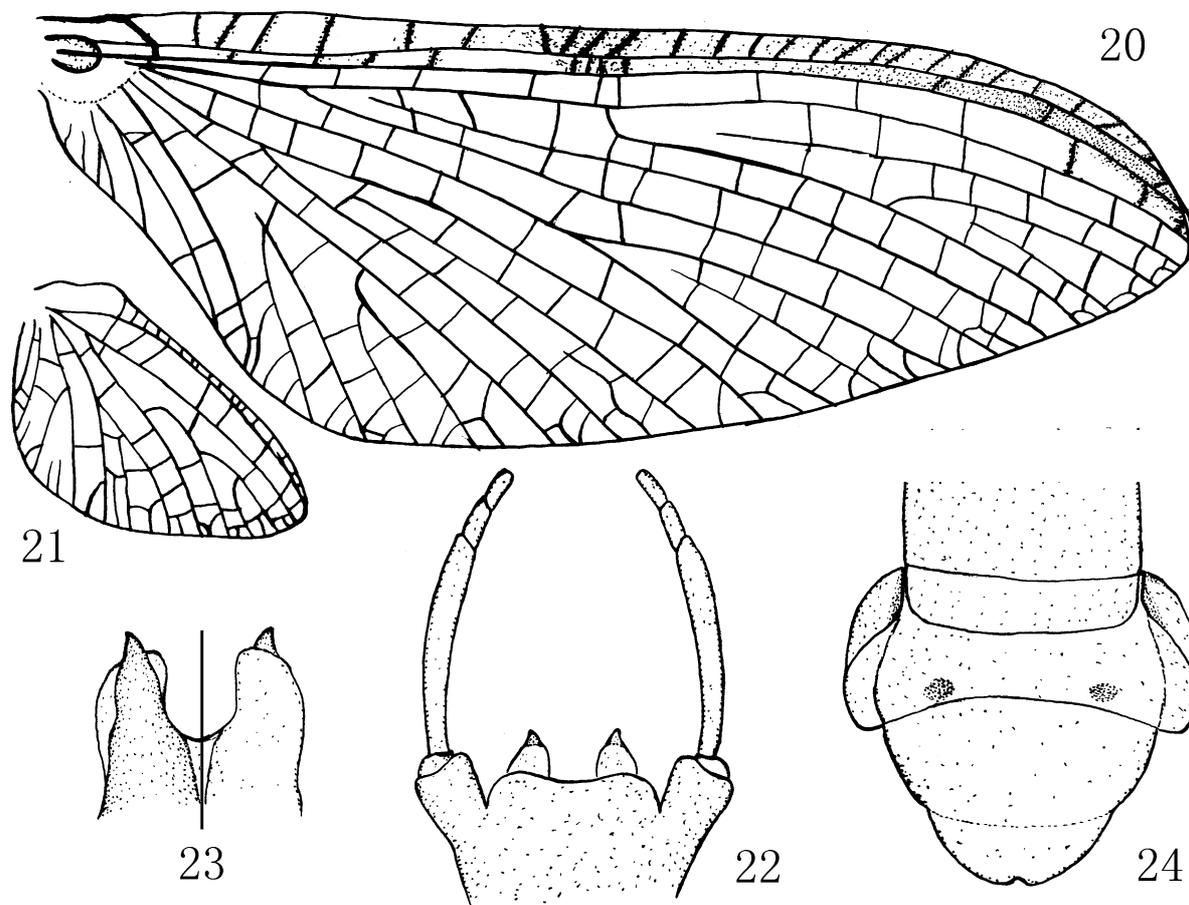
FIGURE 1. *Epeorus melli* (Ulmer, 1925), habitus of female.



FIGURES 2–19. *Epeorus melli* (Ulmer, 1925), mature nymph: 2, labrum; 3, left mandible; 4, right mandible; 5, ventral detail of incisors of right mandible; 6, maxilla; 7, hypopharynx (dorsum on left and venter on right); 8, labium (dorsum on left and venter on right); 9, foreleg; 10, midleg; 11, hindleg; 12, pectinate spines on femora; 13, foreclaw; 14, tergum 3; 15, ventral view of abdomen; 16, gill 1; 17, gill 2; 18, gill 7; 19, base of cerci.

Nymph:body length 15.0–16.0 mm, caudal filaments 19.0–21.0 mm. Head capsule gray dorsally, with 4 pale dots near anterior margin; anterior margin evenly convex, with row of dense setae; posterior margin straight or slightly concave, with submedian tufts of setae (Figs. 1, 25, 26); ocelli pale, basal portion dark. Labrum 0.25 as wide as head capsule, with shallow U-shaped median emargination, a cluster of thick submarginal setae lateral to median emargination on dorsal surface; long hair on anterolateral margin (Fig. 2). Mandibles with tuft of bristles on inner margin (Figs. 3, 4); outer incisor much longer and heavier than inner incisor, margins serrated; ventral margin of inner incisor serrated; each incisor with a row of bristles on ventral margins; prostheca represented by 2 fine setae (Fig. 5). Maxillae with armature on crown of galea-lacinia absent, apex terminating in triad of stout spines; ventral surface with submedian row of setae and mesal margin with a row of dense setae, basal setae longer than others; maxillary palpi 2-segmented, basal segment expanded basally; apical segment about 1.2 X length of basal segment, apex acute, with brush composed of small dense pectinate spines; a row of sparse setae along brush basally (Fig. 6). Hypopharynx with lingua rounded at apex, superlinguae slightly expanded laterally, with dense row of setae at apex (Fig. 7). Labium with small V-shaped

separation between glossae, paraglossae moderately expanded laterally, glossae and paraglossae with dense setae dorsally; apical segment of palpi subequal in length to basal segment, with dorsal transverse row of spines near apex and a row of pectinate spines ventrally (Fig. 8).



FIGURES 20–24. *Epeorus melli* (Ulmer, 1925). Male imago: 20, forewing; 21, hindwing; 22, genitalia (ventral view); 23, penes (dorsum on left and venter on right); Female imago: 24, sterna 7–9.

Pro- and mesonota gray to brown, with pale dots and stripes dorsally. Femora of all legs gray, with irregular 9 brown to dark dots on dorsal surface, 3 basal dots smaller, one of them and a median one obviously darker than others, the median darker dot larger than basal one, very clear; femora with row of long setae on outer margin, those setae further have fine setae, form a pectinate structure; femora surface with scattered irregularly, mostly spatulate spines (Fig. 12). Foretibiae slightly longer than forefemora, mid tibiae subequal to mid femora, while hind tibiae slightly shorter than hind femora; tibiae with basal and median brown to dark brown rings. Tarsi dark brown, all tibiae and tarsi with row of setae on dorsal margins (Figs. 9, 10, 11, 25, 26). Claws with 4 subapical denticles (Fig. 13).

Abdomen with median row of setae dorsally on terga, each tergum with 2 pale dots and a row of obvious spines along posterior margin, 1–2 setae located between two neighbor spines; posterolateral spines of terga elongated into 2 projections (Figs. 14, 15, 25, 26). Gills on abdominal segments 1–7, with lamellae and fibrilliform portions but fibrilliform threads of gills 7 reduced, lamellae with distinct tracheae; lamellae of gills 1 expanded anteriorly but not meeting ventrally, anterior margin with setae, additional small tuft of setae located medially (Fig. 16, 26); gills 2–6 similar in shape but progressively smaller posteriorly; anterior margin sclerotized and with dense short setae (Fig. 17). Gills 7 similar to gills 2–6 but smaller with indistinct fold line (Fig. 18). The hind margin of all gills thickened progressively from anterior to posterior, those of gills 7 clear, like a

sclerotized rib (Fig. 18). Cerci: dorsal setae on several basal segments, articulations with very tiny spines; terminal filament rudimentary (Figs. 1, 15, 19, 25, 26).

Male: forewings with well red to brown pigmented cross veins of C and Sc section, stigmatic region semi-hyaline, several apical cross veins in R1 section pigmented (Fig. 20). Hind wings hyaline (Fig. 21). Genitalia: long basal segment of forceps broader at apex than at base. Dorsal surface of penes sclerotized but ventral surface membranous (Figs. 22, 23, 29).

Female: sternum 7 expanded posteriorly into obvious projection, sterna 8–9 enlarged, with a pair of distinct lateral lobes and a pair of dark dots on ventral surface, sternum 9 expanded posteriorly and posterior margin with a small median notch (Fig. 24).

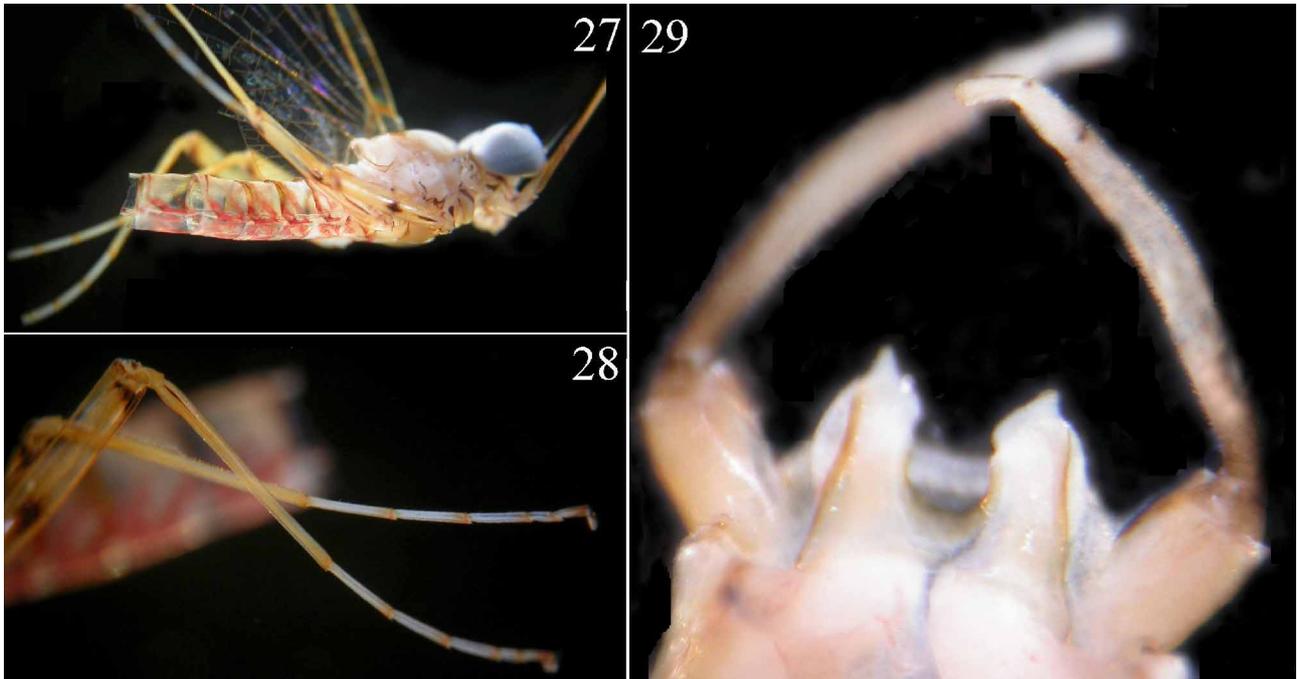
Distribution: Central and southern China (Guangdong, Guizhou, Fujian, Zhejiang, Anhui, Hubei provinces).



FIGURES 25–26. *Epeorus melli* (Ulmer, 1925). Male nymph (photo): 25, dorsal view; 26, ventral view (showing gill disc pattern).

Discussion

Historically, the genus *Epeorus* was divided into 6 subgenera or genera: *Ironodes*, *Belovius*, *Epeorus*, *Iron*, *Ironopsis*, *Caucasiron* (Kluge, 1988, 1997; Edmunds et al., 1976; Tshernova 1981; Wang and McCafferty 2004); more recently Kluge (2004) added the subgenera *Proepeorus* and *Albertiron*. Here this genus is treated as the definition on the subgenus *Epeorus* (*Epeorus*) of Kluge (1997). Gills 1–7 of nymphs of present species do not form a closed disk ventrally; the abdominal terga have a median row of setae without spines; and the penes of the males have no titillators, these characters place it into this genus.



FIGURES 27–29. *Epeorus melli* (Ulmer, 1925). Male imago (photo): 27, body (abdominal terminal part excluded, showing body color pattern); 28, mid- and hind legs (showing the tarsal length); 29, genitalia (dorsal view).

According to Webb & McCafferty (2006), in Oriental region, only 6 species in the genus have been known from both imagos and nymphs by now. In China, several *Epeorus* species have been reported (You and Gui, 1995), and more recorded by others (Imanishi, 1940). As far as known, 5 species were placed in the genus originally, they are *E. erratus* (Braasch, 1981) (nymph and imago) (Kang & Yang, 1994), *E. curvatulus* Matsumura (1931) (nymph and imago), *E. latifolium* Uéno (1928) (nymph) (see Imanishi, 1940), *E. pingguoyuanensis* You (1987) (subimago) and *E. sagittatus* Tong and Dudgeon (2003) (nymph). The exact status of *E. erratus* and *E. pingguoyuanensis* is not clear (Kluge, 2004), *E. latifolium* has been placed into *Epeorus* (*Belovius*) by Tshernova (1981), *E. curvatulus* distributes in northern Asia. Among Chinese described species, nymphs of *E. melli* are similar to *E. sagittatus* Tong and Dudgeon (2003) based upon gill structure, but the latter species is smaller and has 5 denticles on claw but does not have acute distal point on mid and hind femora. The nymphs of *E. melli* can be differentiated from those of Taiwan *E. erratus* by color pattern on body and femora and 4 claw denticles, only 3 denticles of the latter. Nguyen and Bae (2004) described 6 *Epeorus* species from Vietnam. Compared to them, *E. melli* has no prominent submedian spines on posterior tergal margin but relatively larger marginal denticles and a row of longer median longitudinal setae. The imagos of this species are unique because of reddish color pattern, male genitalia, longer hind tarsi and female sternum 8.

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