

**A NEW SOUTHEAST ASIAN MAYFLY SPECIES
(EPHEMEROPTERA: EPHEMERELLIDAE: EPHEMERELLINAE)**

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Abstract.—*Ephemerella quadrata*, Kluge and Zhou, new species (Ephemeroptera: Ephemerellidae: Ephemerellinae) is described based on larval material from Thailand and Yunnan Province, China. The new species may be differentiated from other Ephemerellinae by its well-developed genae, smooth frons, anterior projections on the pronotum, paired anterolateral mesonotal projections, and dorsal abdominal tubercles.

Ephemerelline mayflies (Ephemeroptera: Ephemerellidae: Ephemerellinae) occur throughout the Nearctic, Oriental, and Palearctic regions (McCafferty and Wang, 2000). The Oriental Ephemerellinae in particular are poorly known, and the proper identification of described species remains difficult (Dudgeon, 1999; Soldán, 2001). The Oriental ephemerellid fauna has been treated by Ulmer (1939), Allen and Edmunds (1976), Hubbard and Peters (1978), Allen (1980, 1986), Edmunds and Polhemus (1990), Kang and Yang (1995), You and Gui (1995), Zhou et al. (1997), Tong and Dudgeon (2000), Sites et al. (2001), Soldán (2001), Jacobus and McCafferty (2003), Sartori et al. (2003), Soldán and Yang (2003), and Kluge (2004).

As part of our studies of Oriental Ephemerellinae, we discovered a new species from Thailand and Yunnan Province, China, which we describe below.

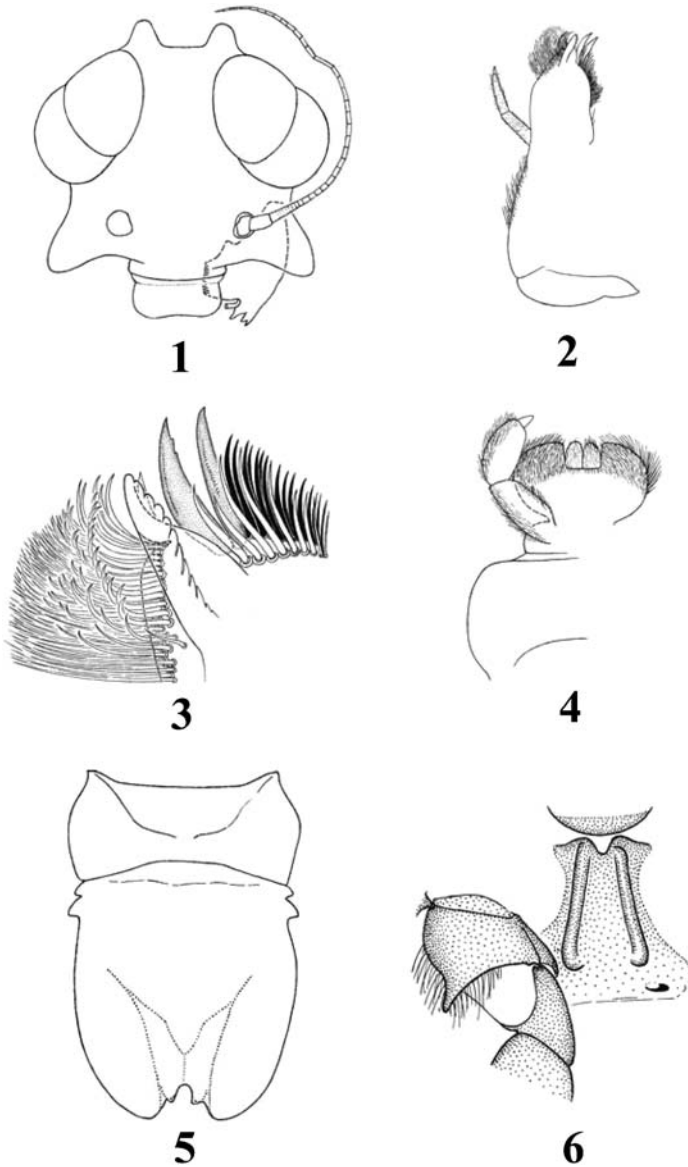
***Ephemerella quadrata* Kluge and Zhou, new species**

Figs. 1–9

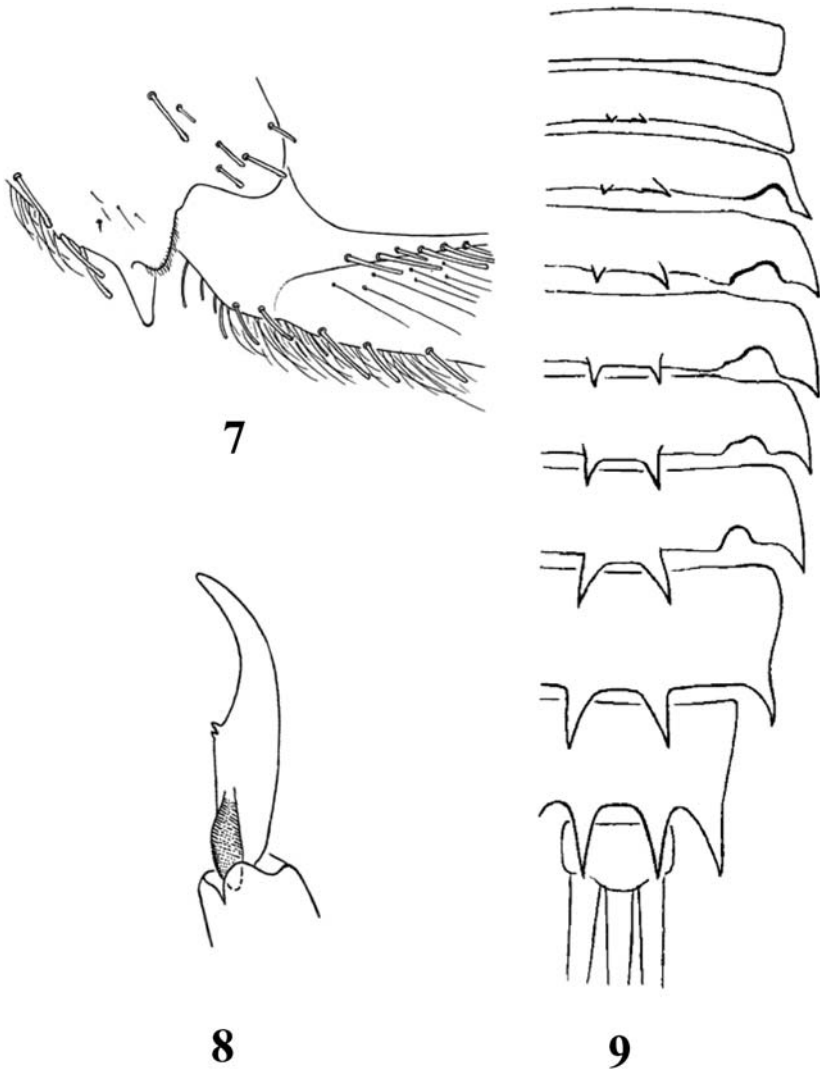
Description. Mature larvae (in alcohol). Length (in mm): Body 13–18; caudal filaments 5–11. Leg length ratios (femur : tibia : tarsi): foreleg—1.0 : 1.0 : 0.50, midleg—1.2 : 1.2 : 0.50, hindleg—1.6 : 1.8 : 0.50. Body yellow with irregular brown markings dorsally.

Head. (Fig. 1). Occiput with pair of prominent, dorsally projecting, blunt spines; frons surface smooth; anterior margin with shallow median emargination. Genae flattened and enlarged, projecting anteriorly. Dorsal surface of clypeus, labrum, and dorsolateral surface of mandibles densely covered with irregularly ordered, hairlike setae. Maxilla (Figs. 2, 3) apex moderately truncate; dense patch of relatively long, hairlike setae distally, bordered medially by sharp groove separating bases of canines; canines projected medially, ventralmost canine stout and well sclerotized, with denticles on ventral margin. Stipes with soft, hairlike setae irregularly situated on outer margin. Maxilla palp three-segmented, covered sparsely with

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Figs. 1–6. *Ephemerella quadrata*, Kluge and Zhou, n.sp., larva (drawn from holotype). Fig. 1. Head. Fig. 2. Right maxilla, ventral view. Fig. 3. Apex of right maxilla, ventral view. Fig. 4. Labium. Fig. 5. Pronotum and mesonotum. Fig. 6. Prosternum and right forecoxa.



Figs. 7-9. *Ephemerella quadrata*, Kluge and Zhou, n.sp., larva. Fig. 7. Articulation of femur and tibia on right hind leg, anterior view. Fig. 8. Claw of left hind leg, posterior view. Fig. 9. Abdominal terga.

hairlike setae; first and second palp segments subequal in length; second segment relatively thick; third segment greatly reduced. Labium as in Fig. 4.

Thorax. Pronotum (Fig. 5) anterolateral projections produced anteriorly; lateral margins convex. Prosternum (Fig. 6) lateral margins produced into prominent, longitudinal ridges. Mesonotum (Fig. 5) with two pairs of laterally projected, flattened, anterolateral projections, not extending beyond lateral margin of pronotum; posteriormost projection largest. Paired,

upturned projections on hind margin of mesal plate. Legs long and slender. Fore- and midcoxae with prominent, sharp, lateral projection (Fig. 6). Femora with brown bands proximally, medially and distally, with median band broadest and sometimes converging with proximal band; inner margin with bristlelike setae; outer margin with long, blunt, serrate, stout setae and long, blunt, hairlike setae; mid- and hindfemora with prominent distal projection posterolateral of tibial articulation (Fig. 7). Vestige of patella-tibial suture present on mid- and hindlegs. Tibiae with inner margin with bristlelike setae; outer margin with long, blunt, serrate, stout setae and long, blunt, hairlike setae; distal half darker than proximal half. Tarsi with inner and outer margins with short, bristlelike setae; distal half darker than proximal half. Claws (Fig. 8) with one or two proximal denticles.

Abdomen. (Fig. 9). Terga 2 or 3 through 9 each with submedian pair of sharp tubercles; posteriormost tubercles largest. Posterolateral projections on segments 3–9, sharp and elongate; posteriormost projections longest and subequal in length to dorsal tubercles. Dorsal lamellae on terga 3–6 with well-defined, brown, trilobed patterns and somewhat truncate, with anal margin (directed medially) longer than costal margin (directed laterally); anal margin proportionately longer in more posterior lamellae; dorsal lamella on tergum 7 pointed posteriorly, subcordate. Ventral lamellae on terga 3–5 bifurcate and multifoliate; ventral lamella on tergum 6 integral and multifoliate; ventral lamella on tergum 7 multifoliate. Caudal filaments with reddish brown pigmentation distally on some segments; setae absent from proximal half of caudal filaments, present in distal half, long and hairlike on lateral and inner margins of cerci and lateral margins of paracercus, whorls of fine setae at distal margins of segments.

Adults. Unknown.

Types. Holotype: THAILAND, **Chiang Mai Prov.**, Doi Ithanon National Park, SW Chiang Mai, tributary of River Klang, 18th km of road, 17-I-1998, S. Grigorenko, larva (Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia [ZIN]). Paratypes: same data as holotype, three larvae (ZIN). CHINA, **Yunnan Prov.**, Jingdong county, Juhe river, 24.26°N, 100.50°E, 2001-IV-15, C.-F. Zhou, one larva (Nanjing Normal University Mayfly Research Collection, Nanjing, P. R. China).

Etymology. The specific epithet, *quadrata* (feminine), is from the Latin adjective *quadratus*, meaning quadrate, and refers to the distinctive shape of the larval head capsule.

Diagnosis. *Ephemerella quadrata* may be differentiated from other Oriental *Ephemerella* Walsh *sensu lato*, based on its having: well-developed genae; a smooth frons; anterior projections on the pronotum; two pairs of anterolateral mesonotal projections, none of which extends beyond lateral margin of pronotum; paired, dorsal tubercles on abdominal terga 2 or 3 through 9; and posterolateral projections of abdominal segment 9 subequal in length to the paired, dorsal, tubercles.

Larval variability. Individuals vary in size, and paired tubercles may be present or absent on abdominal tergum 2. The shape of the anterior margin of the prosternum may vary between populations. The prosternum on specimens from Thailand, including the holotype, is anteriorly emarginate (Fig. 6); whereas, the prosternum of the specimen from China is slightly produced anteriorly.

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Received 22 October 2003; accepted 14 September 2004.