

FIRST ADULT DESCRIPTION OF THE UNUSUAL BAETID MAYFLY GENUS *ECHINOBAETIS* (EPHEMEROPTERA: BAETIDAE)^{1, 2}

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ABSTRACT: The female adult of the Indonesian species *Echinobaetis phagas* (Ephemeroptera: Baetidae) is described. The adult of *Echinobaetis* has not been known previously. It is distinct from other baetid adults in that the forewings have an R₃ sector, which is formed by the basal union of R_{3a} and R_{3b}, multiple marginal intercalaries between MP and A, and a CuA that is attached to CuP. In addition, the pronotum has a deep, V-shaped anteromedian emargination, and the meso- and metasternal sclerites are ventrally extended.

Mol (1989) erected the genus *Echinobaetis* (Ephemeroptera: Baetidae) for *E. phagas* Mol, a species from Sulawesi (formerly Celebes) known from the larvae only. The genus has been notable because the larvae have depressed, peripherally expanded heads with prognathous mouthpart orientation [Mol (1989): Figs. 1, 2], triads of elongate, posteriorly oriented spines on terga 1-8 [Mol (1989): Figs. 22, 23], and mouthparts modified for predation [Mol (1989): Figs. 3-17]. Although highly atypical of baetid mayflies in general, this "flat-headed" small minnow highly does possess the unique baetid epicranial suture with lateral branches anterior to the lateral ocelli [Wang and McCafferty (1996): Fig. 6] and ventral orientation of the dorsal apical lobe of the femora. These latter characteristics distinguish all baetid larvae.

In our recent examination of baetid material from Sulawesi, we discovered the adult of *E. phagas*. Although female, it, like the larvae, is highly unusual for the family and therefore deserving of this special report. The material examined is housed in the Purdue Entomological Research Collection, West Lafayette, IN.

Echinobaetis phagas Mol, 1989

Female adult. Body length: 10.6 mm; wing length: 9.7 mm; caudal filaments length: 25.3 mm. Head (Figs. 1, 2): Face pale brown to medium brown. Vertex with medium brown fleur-de-lis marking. Flagella, scapes, and pedicels whitish dorsally, pale brown ventrally. Compound eyes black. Thorax: Pronotum (Fig. 1) pale brown to medium brown, with deep, V-shaped anteromedian emargination. Meso- and metanota dark brown. Sterna cream. Meso- and metasternal sclerites (Fig. 3) enlarged, extending ventrally. Legs cream. Midfemora (Fig. 4) with two triangular processes distally. Tarsi each with ovoid claw and acute claw. Fore-

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wings (Fig. 5) dark brown between C and R₁ and in most crossveins; 2.71x longer than wide; single marginal intercalary between R₁ and R₂; area between R₂ and MP with elongate double marginal intercalaries, except between IMA and MA₂ with three; area between MP and A with two, three, four, and five marginal intercalaries of various lengths, mostly elongate; R_{3a} and R_{3b} basally attached, forming a fork; CuA basally attached to CuP. Hindwings absent. Abdomen: Terga dark brown. Larval spine remnants on terga 1-8, barely visible. Gill socket remnants on abdominal segments 1-7. Sterna medium brown to yellow-brown. Caudal filaments dark brown, turning cream distally.

Material examined. SULAWESI, Uтура Prov., Toraut R, Dumoga-Bone Nat. Park, 211 m, 0°44' N, 123°54' E, IX-3-1985, J. T. and D. A. Polhemus, female adult (forewing mounted on slide).

DISCUSSION

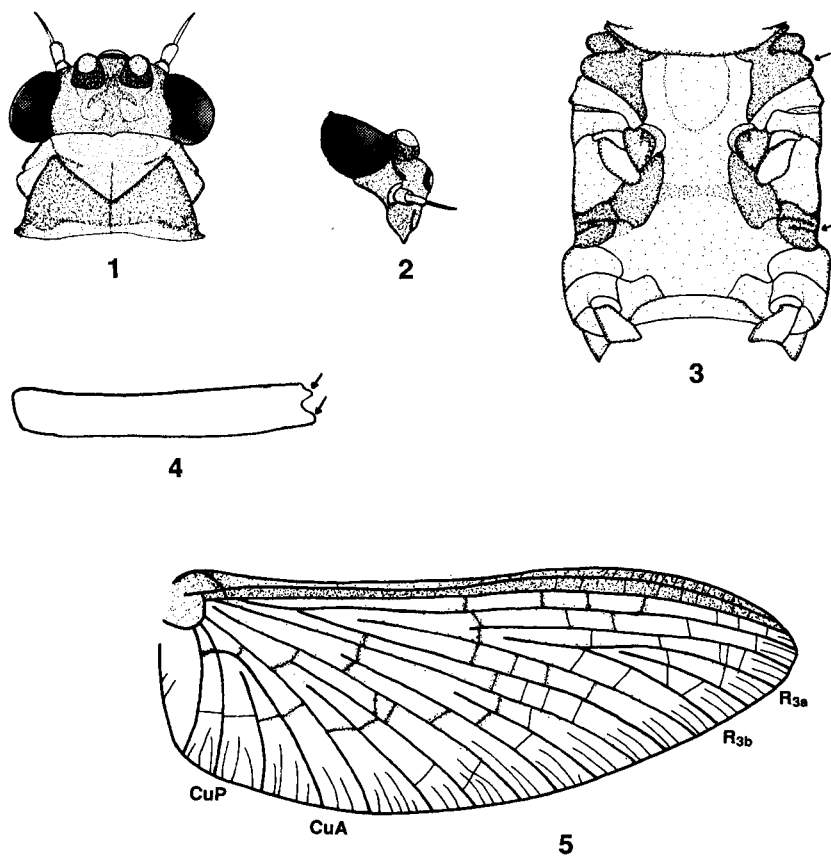
The specimen upon which the above description is based was not reared. However, we are confident that it belongs to *E. phagas* because it possesses vestiges of the three spines that are present on terga 1-8 of the larvae as well as possessing spiny gill socket remnants on abdominal segments 1-7. Both characteristics are diagnostic of the species. Also, the head shape (Figs. 1, 2) is indicative of the nature of the larval head. The adult was collected from the same general area and season as the original material described by Mol (1989).

The adult of *E. phagas* possesses characteristics that are unique or highly unusual among the Baetidae. Wings are narrow-elongate, with atypical venation. A striking venational characteristic is the presence of an R₃ sector in the forewings (Fig. 5). This sector, formed by the basal union of R_{3a} and R_{3b}, is not present in other baetid adults, and may possibly represent an ancestral condition within Baetidae because it is present in Siphlaenigmatidae [see Penniket (1962): Fig. 1], some members of the Heptagenioidea [see McCafferty (1991): Figs. 26, 28], and some Siphonuroidea [see McCafferty (1991): Fig. 24].

The union of CuA to CuP (Fig. 5) is another unusual characteristic for Baetidae. Only one other baetid genus, *Centroptiloides* Lestage, has CuA attached to CuP [see Crass (1947): Fig. 29a]. This condition is variously widespread throughout the Ephemeroptera and is highly subject to homoplasy. Thus, even within Baetidae, *Centroptiloides* and *Echinobaetis* clearly belong to disparate phyletic clades.

The presence of multiple, elongate marginal intercalary veins in the forewing (Fig. 5) is of considerable additional interest. All other baetid genera have relatively short marginal intercalaries. The relatively large number of intercalaries in each space (up to five), particularly between MP and A, and their retention appears related to the lengthening of the cubito-anal area, which is the major contributor to elongation of the forewing.

Despite the unusual and distinctive venation of the forewings of *Echinobaetis*,



Figs. 1-5. *Echinobaetis phagas*, female adult. 1. Head and pronotum. 2. Head (lateral). 3. Meso- and metasterna (pointers towards meso- and metasternal sclerites). 4. Left midfemur (pointers towards distal processes). 5. Right forewing.

adults are still readily identifiable as Baetidae due to the basally detached IMA, MA₂, IMP, and MP₂, and three-segmented mid- and hindtarsi. Also, based on larvae, the male adults should have turbinate eyes, although it has been recently shown that this is not a universal characteristic of Baetidae (Lugo-Ortiz and McCafferty 1996).

The deep anteromedian emargination of the pronotum (Fig. 1) and enlarged, ventrally extended meso- and metasternal sclerites (Fig. 3) of *E. phagas* are not present in other baetid adults. We consider them additional apomorphies defining *Echinobaetis*.

The only other flatheaded baetid mayfly genus known at present is *Jubabaetis* Müller-Liebenau (1980). It is known from larvae only of one species from the Philippines. It is apparently related to *Echinobaetis*, and therefore its adults may demonstrate some of the adult characteristics that we have established for *Echinobaetis*. In any case, adults of *J. pescadori* Müller-Liebenau should be readily distinguished from *E. phagas* because *J. pescadori* will possess small hindwings and should have a single tergal spine vestige on abdominal segments 1-9, while *E. phagas* lacks hindwings and has three tergal spine vestiges on abdominal segments 1-8.

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