

AN UNUSUAL NEW SPECIES OF *CAMELOBAETIDIUS* (EPHEMEROPTERA: BAETIDAE) FROM PARAGUAY^{1, 2}

C. R. Lugo-Ortiz³, W. P. McCafferty⁴

ABSTRACT: *Camelobaetidius tuberosus*, new species (Ephemeroptera: Baetidae), is described from Paraguay. The species, known only in the larval stage, is distinguished by the presence of erect, apically blunt tubercles on the pronotum and metanotum; minute, fine, simple setae between the mandibular prothecae and molae; apicomediaally produced maxillary palp segment 1; number of tarsal claw denticles; and abdominal coloration. The tuberculate condition is not known in other species of *Camelobaetidius*.

The small minnow mayfly genus *Camelobaetidius* Demoulin (Ephemeroptera: Baetidae) is found in the Western Hemisphere, from Argentina to Saskatchewan and Indiana (Traver and Edmunds 1968, Lehmkuhl 1976, McCafferty and Klubertanz 1994). Larvae are mostly found in large, warm-water streams (Traver and Edmunds 1968, McCafferty et al. 1992, McCafferty and Klubertanz 1994). Based on habitat ecology, predominantly southwestern distribution in the Nearctic, and demographics, McCafferty et al. (1992) and McCafferty (1998) hypothesized a Neotropical center of origin for *Camelobaetidius*. There are currently 11 valid species of *Camelobaetidius* described from South America, eight from North America (including Mexico), and three from Central America (Traver and Edmunds 1968; Lugo-Ortiz and McCafferty 1995, 1999; Wiersema 1998).

In South America, nominal species of *Camelobaetidius* have been reported from Argentina, Brazil, Peru, Suriname, Venezuela, and Uruguay (Traver and Edmunds 1968, Lugo-Ortiz and McCafferty 1999). Six species are known from larvae only, four from adults only, and only one from both larvae and adults (Traver and Edmunds 1968, Lugo-Ortiz and McCafferty 1999). Additional unnamed species of *Camelobaetidius* have been reported from Colombia (Rojas de Hernández et al. 1995), and we have examined considerable *Camelobaetidius* material from Ecuador. Herein, we describe a highly unusual new species of *Camelobaetidius* from Paraguay. Although the material is limited, we consider it imperative to describe this species at this time because it demonstrates new characteristics within *Camelobaetidius*. The material is housed in the Purdue Entomological Research Collection, West Lafayette, Indiana.

¹ Received March 26, 1999. Accepted May 3, 1999.

² Purdue Agricultural Research Program Journal No. 15971.

³ Albany Museum, Department of Freshwater Invertebrates, Somerset Street, Grahamstown, 6140 Republic of South Africa.

⁴ Department of Entomology, Purdue University, West Lafayette, IN 47907.

***Camelobaetidius tuberosus* Lugo-Ortiz and McCafferty, NEW SPECIES**

Larva. Body length: 4.4 mm; caudal filaments length: 3.0 mm. Head: Medium yellow-brown in vertex, cream in frons, clypeus, and genae. Antennae pale yellow-brown, approximately 2.5x length of head capsule. Labrum (Fig. 1) with anterodorsal row of eight long, fine, simple setae. Left mandible (Fig. 2) with six denticles; prostheca robust, apically denticulate; minute, fine, simple setae between prostheca and subtriangular process. Right mandible (Fig. 3) with six denticles; prostheca slender, with minute, fine, simple setae apically and medially. Maxillae (Fig. 4) with palp segment 1 medially produced subdistally; segment 2 subequal in length to segment 1. Labium (Fig. 5) with glossae subequal in length to paraglossae, somewhat narrow-elongate; paraglossae narrow-elongate; palp segment 1 subequal in length to segments 2 and 3 combined; segment 2 approximately 5.0x longer than segment 3, moderately produced distomedially; segment 3 basally broad, apically narrow. Thorax (Fig. 6): Pronotum with medial pair of erect, apically blunt tubercles; (Fig. 7) cream to medium brown; femora cream, with medium brown proximal, dorsal, and distal margins and thin anterodorsal line, and with row of 40-45 long, robust, simple setae dorsally; tibiae cream, with numerous short, fine, simple setae dorsally and scattered short, acute, simple setae ventrally; tarsi medium brown, bare dorsally and with scattered short, acute, simple setae and subdistal long, robust, simple seta ventrally; spatulate tarsal claws (Fig. 8) with 15-17 denticles. Abdomen: Terga 1-9 with faint thin medial line; tergum 1 cream, suffused with black; terga 2 and 5 cream, anteriorly light brown; terga 3 and 4 cream, suffused with black submedially and sublaterally; terga 6-10 pale yellow-brown, slightly darker marginally. Sterna cream to pale yellow-brown. Gills untracheated or poorly tracheated. Median caudal filament approximately 0.6x length of cerci.

Adult. Unknown.

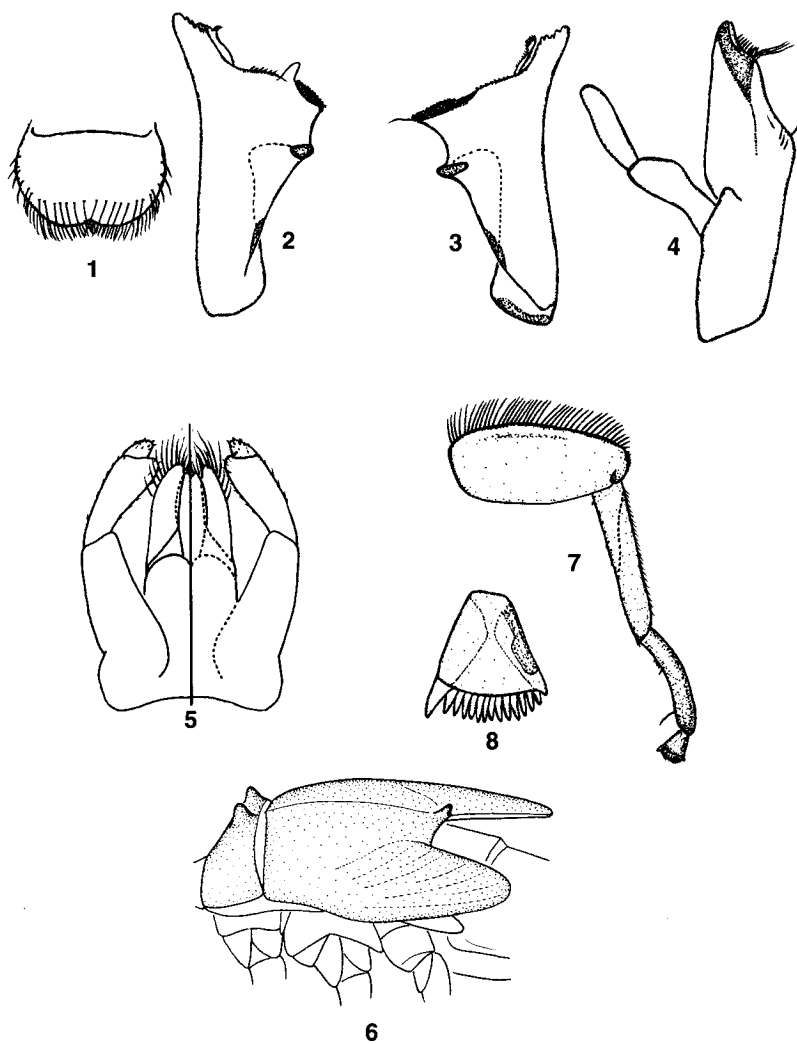
Material examined. Holotype: Larva, Paraguay, Departamento Cordillera, Pirebibuy, Rio Pirebibuy, 3-V-1985, R. T. Bonace [mouthparts and left foreleg mounted on slide (medium: Euparal)].

Etymology. The specific epithet is a Latin word meaning "full of tubercles."

Discussion. The presence of a medial pair of erect, blunt tubercles on the pronotum and a single medial slightly erect, blunt tubercle on the metanotum readily distinguishes *C. tuberosus* from all other known larvae of *Camelobaetidius* (Fig. 6). Other distinguishing features of *C. tuberosus* include the presence of minute, fine, simple setae between the prosthecae and molae of the mandibles (Figs. 2, 3), apicomediaally produced maxillary palp segment 1 (Fig. 4), number of tarsal claw denticles (Fig. 8), and abdominal coloration.

Camelobaetidius tuberosus appears closely related to the Brazilian species *C. phaedrux* (Traver and Edmunds). Both species have similar labral setation (Fig. 1; Traver and Edmunds 1968: Fig. 36), a long labial palp segment 2 that is moderately produced apicomediaally (Fig. 5; Traver and Edmunds 1968: Fig. 54), and long and slender procoxal osmobranchia. The morphology of maxillary palp segment 1, however, is most similar to that of the Brazilian species *C. anubis* (Traver and Edmunds) (Fig. 4; Traver and Edmunds 1968: Fig. 35).

In Western Hemisphere baetids, only the genus *Baetodes* Needham and Murphy possesses dorsal tubercles (Lugo-Ortiz and McCafferty 1996). However, with the exception of some species that have a single metanotal tubercle,



Figs. 1-8. *Camelobaetidius tuberosus*, new species. 1. Labrum (dorsal). 2. Left mandible. 3. Right mandible. 4. Right maxilla. 5. Labium (left-ventral; right-dorsal). 6. Thorax (lateral). 7. Left fore-leg. 8. Tarsal claw.

those tubercles are located on the abdomen in *Baetodes*, and they vary considerably in degree of development. No known species of *Baetodes* has pronotal tubercles.

ACKNOWLEDGMENTS

We thank R. T. Bonace (formerly of Asunción, Paraguay, and the United States Peace Corps; current address unknown) for the donation of the material used in this study. We also thank A. V. Provonsha (Purdue University, West Lafayette, IN) for drawing Figure 6.

LITERATURE CITED

- Lehmkuhl, D. M.** 1976. Mayflies. *Blue Jay* 34: 70-81.
- Lugo-Ortiz, C. R. and W. P. McCafferty.** 1995. Taxonomy of the North and Central American species of *Camelobaetidius* (Ephemeroptera: Baetidae). *Entomol. News* 106: 178-192.
- Lugo-Ortiz, C. R. and W. P. McCafferty.** 1996. Phylogeny and classification of the *Baetodes* complex (Ephemeroptera: Baetidae), with description of a new genus. *J. N. Am. Benthol. Soc.* 15: 367-380.
- Lugo-Ortiz, C. R. and W. P. McCafferty.** 1999. Revision of South American species of Baetidae (Insecta: Ephemeroptera) previously placed in *Baetis* Leach and *Pseudocloeon* Klapálek. *Ann. Limnol.*, in press.
- McCafferty, W. P.** 1998. Ephemeroptera and the great American interchange. *J. N. Am. Benthol. Soc.* 17: 1-20.
- McCafferty, W. P. and T. H. Klubertanz.** 1994. *Camelobaetidius* (Ephemeroptera: Baetidae) in Indiana and Iowa: new species and range extensions. *Proc. Entomol. Soc. Wash.* 96: 37-43.
- McCafferty, W. P., R. W. Flowers, and R. D. Waltz.** 1992. The biogeography of Mesoamerican mayflies. Pp. 173-193. In: S. P. Darwin and A. L. Welden (eds.), *Biogeography of Mesoamerica: proceedings of a symposium*. Tulane Univ. Stud. Zool. Bot., Suppl. Publ. 1.
- Rojas de Hernández, A. M., M. del C. Zúniga de Cardoso, M. H. Burbano T., and C. Serrato H.** 1995. Altitudinal distribution of Ephemeroptera in the Farallones de Cali National Park, Colombia. Pp. 121-129. In: L. D. Corkum and J. J. H. Ciborowski (eds.), *Current directions in research on Ephemeroptera*. Canadian Scholars' Press, Toronto.
- Traver, J. R. and G. F. Edmunds, Jr.** 1968. A revision of the Baetidae with spatulate-clawed nymphs (Ephemeroptera). *Pac. Insects* 10: 629-677.
- Wiersema, N. A.** 1998. *Camelobaetidius variabilis* (Ephemeroptera: Baetidae), a new species from Texas, Oklahoma and Mexico. *Entomol. News* 109: 21-26.