

TAXONOMY OF THE NORTH AND CENTRAL AMERICAN SPECIES OF *CAMELOBAETIDIUS* (EPHEMEROPTERA: BAETIDAE)¹

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ABSTRACT: Ten nominal species of *Camelobaetidius* (Ephemeroptera: Baetidae) are recognized from North and Central America. Two new species are described from larvae: *Camelobaetidius kondratieffi*, NEW SPECIES, from Guatemala, and *C. similis*, NEW SPECIES, from Guerrero, Mexico. *Camelobaetidius salinus* is synonymized with *C. musseri*. *Camelobaetidius cepheus*, *C. navis*, *C. trivialis*, and *C. zenobia* are synonymized with *C. warreni*. *Camelobaetidius musseri* is newly reported from Costa Rica and New Mexico. *Camelobaetidius warreni* is newly reported from Costa Rica and Honduras. A key to the known larvae of North and Central American species is provided.

Demoulin (1966) erected the genus *Camelobaetidius* (Ephemeroptera: Baetidae) to include *C. leentvaari* Demoulin, a species described from larvae from Suriname. He indicated that the only character that distinguished the genus was the spatulate shape of the tarsal claws. Other characters, according to this author, were doubtfully of generic significance because only *C. leentvaari* was known to him at that time.

Traver and Edmunds (1968) erected the genus *Dactylobaetis* and designated *D. warreni* Traver and Edmunds, a species described from larvae and male and female adults from California, as the type species. According to these authors, the larvae of *Dactylobaetis* could be readily distinguished from other baetid genera, except *Camelobaetidius*, by the presence of spatulate tarsal claws. *Dactylobaetis* was differentiated from *Camelobaetidius* by the length of the terminal filament (less than the length of abdominal segment 10 in *Camelobaetidius*; at least 3/4 the length of the cerci in *Dactylobaetis*) and the presence of a blunt projection on the anterior margin of the forefemora of *Camelobaetidius*. The adults of *Dactylobaetis* were separated from other baetids by the broadly based costal projection and the wide separation of the male genital forceps. Traver and Edmunds (1968) further indicated that the venational characters discussed by Demoulin (1966) and based on the developing fore- and hindwings of the larvae of *C. leentvaari* were unreliable because they could be highly modified during larval growth.

McCafferty and Waltz (1990) studied the types of *Camelobaetidius* and *Dactylobaetis* and concluded that they were of the same genus because there were no autapomorphies that could separate them. Consequently, *Dactylo-*

baetis was placed as a junior synonym of *Camelobaetidius*. These authors also discussed the circumstances surrounding the priority of the name *Camelobaetidius*.

Camelobaetidius has a widespread distribution in the Western Hemisphere, being reported from large rivers with silt/clay substrate from Saskatchewan (Lehmkuhl 1976) and Indiana (McCafferty and Klubertanz 1994) to northern Argentina (Traver and Edmunds 1968). McCafferty *et al.* (1992) hypothesized that the genus had a Mesoamerican center of dispersal (but not necessarily center of origin). Two pieces of evidence led to this hypothesis. First, *Camelobaetidius* tends to be arid-favored and warm-water sublimited in southwestern North America, a pattern seen in other genera which clearly have a recent Neotropical center of dispersal (e. g., *Fallceon* Waltz and McCafferty, *Thraulodes* Ulmer, and *Traverella* Edmunds). Second, preliminary phylogenetic data indicated that the most derived species are South American. In addition, demographic data indicated that *Camelobaetidius* has more species in the Mexican and Mesoamerican region than in North and South America. These data also suggest to us the possibility that the genus evolved in the Mexican and Mesoamerican landmass between the Eocene (54-38 mya) and Pliocene (5-2 mya), when South America was isolated, and that it spread to that continent after the emergence of the Panamanian land bridge during the Pliocene.

Although a comprehensive revision of the genus is not yet possible, we here review in alphabetical order those species known to occur in North and Central America, and we include the description of two new species from Mexico and Central America, new synonyms, and new locale data. We also provide a key to differentiate North and Central American species known from the larval stage. Institutions housing the materials used in this study and their acronyms are as follows: Colorado State University (CSU), Fort Collins; Florida A & M University (FAMU), Tallahassee; New Mexico Highlands University (NMHU), Las Vegas; Purdue Entomological Research Collection (PERC), West Lafayette, Indiana; the Universidad Nacional Autónoma de México (UNAM), México, D. F.; and the private collection of J. R. Davis (JRD), Texas Water Commission, Austin.

Camelobaetidius Demoulin

Camelobaetidius Demoulin 1966: 9.

Dactylobaetis Traver and Edmunds 1968: 629.

Larva. Head hypognathus. Forelegs usually longer than mid- and hindlegs. Tarsi bowed (Fig. 7). Tarsal claws spatulate, with 5-45 denticles (Figs. 8, 9). Abdominal gills 1-7 ovate, simple; gills 1 and 7 smaller than gills 2-6.

Adult. Forewings with paired marginal intercalaries. Hindwings with two longitudinal veins,

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broadly-based costal process, and small undulation beyond costal process (Fig. 2). Male genital forceps 3-segmented, widely separated basally.

Diagnosis. Larvae of *Camelobaetidius* can be distinguished by the bowed tarsi (Fig. 7) and the spatulate tarsal claws (Figs. 8, 9). Adults can be provisionally distinguished by the combination of two longitudinal veins, a broadly-based costal process, and a small undulation beyond the costal process in the hindwings (Fig. 2). Male adults of *Camelobaetidius* are similar to those of *Acerpenna* Waltz and McCafferty. However, male adults of *Acerpenna* possess a distinct conical process at the base of the genital forceps and a broad undulation beyond the costal process of the hindwings (see McCafferty and Morihara 1979: Figs. 1 and 2). These differences are based on North American species of *Acerpenna*; adults of Mesoamerican species of this genus remain unknown (Lugo-Ortiz and McCafferty 1994). As is the case with many baetid genera, adult characteristics associated with *Camelobaetidius* are probably not as stable as those of the larvae (Waltz *et al.* 1994).

Type species. *Camelobaetidius leentvaari* Demoulin, 1966: 9 (original designation).

Included North and Central American species. *Camelobaetidius arriaga* (Traver and Edmunds); *C. chiapas* (Traver and Edmunds); *C. jenseni* (Traver and Edmunds); *C. kondratieffi* Lugo-Ortiz and McCafferty, NEW SPECIES; *C. mexicanus* (Traver and Edmunds); *C. musseri* (Traver and Edmunds); *C. similis* Lugo-Ortiz and McCafferty, NEW SPECIES; *C. sinaloa* (Allen and Murvosh); *C. waltzi* McCafferty; *C. warreni* (Traver and Edmunds).

Camelobaetidius arriaga (Traver and Edmunds)

Dactylobaetis arriaga Traver and Edmunds 1968: 658.
Camelobaetidius arriaga: McCafferty and Waltz 1990: 777.

Diagnosis. Male adults can be separated from those of other species of *Camelobaetidius* by the elongate basal segment of the genital forceps (Traver and Edmunds 1968: Fig. 60). According to Traver and Edmunds (1968), *C. arriaga* is further differentiated by the purplish posterior margins of terga 1-3, 6, and 10, and the contiguous, large, orange turbinate eyes.

Remarks. The type material of *C. arriaga* is in rather poor condition. Only one male of the type series retains complete genitalia. This character agrees with Traver and Edmunds' (1968) description. However, the purplish poste-

rior margins of terga 1-3, 6, and 10 are difficult to discern, and the coloration of the male turbinate eyes is yellowish in all specimens. Moreover, the turbinate eyes are not contiguous; they are separated and diverge anteriorly. This condition is similar to that of *C. jenseni*. Despite these discrepancies, we recognize *C. arriaga* as a valid species on the basis of its particularly elongate basal forceps segment. This species remains unknown in the larval stage.

Known distribution. Mexico: Chiapas.

Material examined. Paratypes: Four male and one female adults, MEXICO, Chiapas State, VIII-22-1965, P. J. Spangler (PERC).

Camelobaetidius chiapas (Traver and Edmunds)

Dactylobaetis chiapas Traver and Edmunds 1968: 659.
Camelobaetidius chiapas: McCafferty and Waltz 1990: 777.

Diagnosis. Male adults of *C. chiapas* can be separated from those of *C. arriaga* and *C. jenseni* by the relatively small and yellowish turbinate eyes and the uniformly cream abdominal coloration. We found the shape of the male genital forceps not to be of use in separating this species from *C. jenseni*. Male adults of *C. chiapas* are similar to those of *C. mexicanus*. However, in *C. chiapas* the apical segment of the genital forceps (Traver and Edmunds 1968: Fig. 68) is more elongate than in *C. mexicanus* (McCafferty and Provonsha 1993: Fig. 12). The genitalia of *C. chiapas* is also very similar to that of *C. warreni*, but in the latter species the forceps are more widely separated and bowed (Traver and Edmunds 1968: Fig. 4) than in *C. chiapas*.

Remarks. The larva of this species is unknown. Turbinate eye color of male adults apparently is useful to distinguish species only in fresh specimens.

Known distribution. Mexico: Chiapas.

Material examined. Paratypes: 10 male and 12 female adults, MEXICO, Chiapas State, Arriaga, VIII-22-1965, P. J. Spangler (PERC).

Camelobaetidius jenseni (Traver and Edmunds)

Dactylobaetis jenseni Traver and Edmunds 1968: 660.
Camelobaetidius jenseni: McCafferty and Waltz 1990: 777.

Diagnosis. Male adults of this species can be separated from those of *C. arriaga* only by the short basal segment of the genital forceps (Traver and Edmunds 1968: Fig. 62). The coloration, shape, and size of the male turbinate eyes and the abdominal coloration are indistinguishable in these two species (see remarks under *C. arriaga*, above). However, these same characters can be used to separate *C. jenseni* from *C. chiapas*.

Remarks. We consider one of Traver and Edmunds' specimens now in the PERC and labeled only as "Holotype" and "*Dactylobaetis* sp." to be the holotype of *C. jenseni*. The locale data of the specimen agrees with that cited by Traver and Edmunds (1968) (see below), and, although in poor condition and taken in the same time and place as *C. arriaga*, its genitalia and purplish markings of the abdomen fit the original description of *C. jenseni*. The larva of this species is not known.

Known distribution. Mexico: Chiapas.

Material examined. Holotype: Male adult, MEXICO, Chiapas State, Arriaga, VIII-22-1965, P. J. Spangler (PERC). Paratypes: One male and one female adults, same data as holotype (PERC).

Camelobaetidius kondratieffi Lugo-Ortiz and McCafferty, NEW SPECIES

(Figs. 1, 3)

Larva (Fig. 1). Body length: 5.5-6.5 mm; caudal filaments: 2.2-3.0 mm. Head: Coloration pale, with areas along coronal and frontal sutures pale brown. Vertex pale brown. Ocelli black. Turbinate eyes of male orange-brown. Antennae pale, with very fine, simple setae on scapes, pedicel, and distally on each segment; ventral porelike sensilla distally on each antennal segment. Labrum (Fig. 3) sclerotized along margin; submedial and five to six submarginal branched setae present; simple intermediate setae minute. Right mandible 3 + 1 + 2 (?) denticles; tuft of simple setae between prostheca and molar (outer denticles appear to be worn in all specimens). Left mandible similar to right mandible, except with long, slender process at base of molar, similar to Fig. 43 in Traver and Edmunds (1968). Maxillae robust; maxillary palps extending almost as far as galealacinae; palp segment 2 broad distally, similar to Fig. 55 in Traver and Edmunds (1968). Labium robust; palp segment 1 short and robust; segment 2 subequal to 1, with three to four minute setae dorsally, but otherwise similar to Fig. 81 in Traver and Edmunds (1968); segment 3 rounded, with numerous fine, simple setae; glossae with seven to eight simple setae medially, two to three simple setae dorsally, and seven to eight simple setae laterally; paraglossae with three to four simple setae dorsally and 15-17 laterally. Thorax: Notula with complex and distinct color pattern. Sterna cream. Legs cream; femora with pale brown submedian area and numerous fine, long, simple setae dorsally, distal ends rounded and sclerotized; distal end of tibiae with short, simple setae ventrally; tarsi with four short, simple and three long, simple setae ventrally; tarsal claws with 40-45 sclerotized denticles. Abdomen: Color pale brown; terga 1-10 with pale submedian line; tergum 1 variable, almost always with dark brown posterior margin and dashlike anteromedian marks, in some individuals with broad light to dark brown anterior margin, or completely pale except for posterior dark brown margin; terga 2-7 with dark brown posterior margins and two pairs of anteromedian marks; first pair oblique, sometimes fusing with second pair; oblique diffuse brown marks arising almost submedially on anterior margin and reaching base of gills; terga 8-9 usually with same pattern as terga 2-7, but without submedian oblique marks reaching gills; tergum 8, especially in male, somewhat pale; tergum 10 with brown submedian marks running along pale submedian line and bifurcating anteriorly, giving appearance of small Y. Sterna cream, usually with brown sublateral marks on middle and posterior segments; sterna 7-9 with pair of brown submedian dots; dots on sternum 7 usually present, although somewhat faded in some individuals; dots on sterna 8-9 present or absent. Gills on segments 1 and 7 small, with very little or no tracheation; those on segments 2-6 similar to Fig. 6 in Traver and Edmunds (1968). Paraprocts with four to five relatively long spines. Caudal filaments pale to pale brown.

Adult. Unknown.

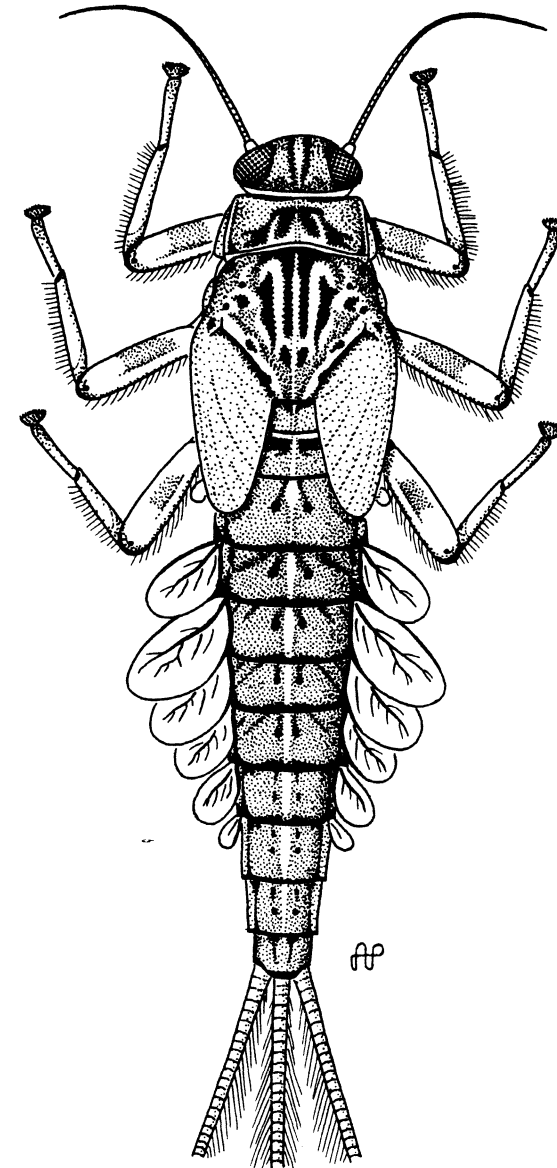


Fig. 1. *Camelobaetidius kondratieffi*, NEW SPECIES, larva, dorsal view.

Diagnosis. *Camelobaetidius kondratieffi* differs from *C. musseri* in the number of denticles on the tarsal claws (30-35 in *C. musseri* vs. 40-45 in *C. kondratieffi*), general body coloration (Fig. 1), the presence of weakly pectinate setae on the anterior margin of the dorsal surface of the labrum (Fig. 3), and the extreme reduction of abdominal gills 1 and 7 (Fig. 1).

Known distribution. Guatemala.

Material examined. Holotype: Female larva, GUATEMALA, Izabal Province, small stream [tributary of?] in Río Cahabón, nr Cahaboncito, I-4-1989, B. C. Kondratieff (PERC). Paratypes: Two female and two male larvae, same data as holotype (PERC).

Etymology. The species is named after Boris C. Kondratieff, for his many collections and much appreciated donations of Mexican and Central American mayflies, among which was *C. kondratieffi*.

Camelobaetidius mexicanus (Traver and Edmunds)

(Figs. 2, 4)

Dactylobaetis mexicanus Traver and Edmunds 1968: 662.

Camelobaetidius mexicanus: McCafferty and Waltz 1990: 777; McCafferty and Provonsha 1993: 66 (male adult).

Diagnosis. Larvae of *C. mexicanus* are very similar to those of *C. warreni*. We found, however, two characters which can help to separate them. First, the setation of the labrum is different in the two species. *Camelobaetidius warreni* has one intermediary and two to three lateral setae, whereas *C. mexicanus* has no intermediary and two lateral setae (Fig. 4). Secondly, the tarsal claws of *C. warreni* have seven to nine denticles, but *C. mexicanus* has five to six. Traver and Edmunds (1968) pointed out that the larvae of *C. mexicanus* also tend to be smaller than those of *C. warreni*. We have not found consistent differences to confidently separate male adults of *C. mexicanus* and *C. warreni*. The male adults of *C. mexicanus*, however, appear to differ from *C. chiapas* by their shorter apical segment of the genital forceps, and they can be separated from *C. arriaga* and *C. jenseni* by the absence of purplish markings on the abdominal terga.

Remarks. Although *C. mexicanus* and *C. chiapas* are very similar (see remarks under *C. chiapas*, above), we do not know if the larvae of the two species are similar because the larva of *C. chiapas* is not known. We therefore provisionally continue to recognize both species, based on the fact that *C. mexicanus* is also similar as adults to *C. warreni* but distinct from that species in the larval stage.

Known distribution. Mexico: Chiapas, Guerrero, Jalisco, Morelos, Nuevo León, Oaxaca, Sinaloa, Sonora, Tamaulipas, Veracruz, Zacatecas; USA: Kansas, Texas.

Material examined. MEXICO, Nuevo León State, Santiago, XII-23-1939, L. Berner, larvae (PERC); Río Santa Lucía, Linares, XII-28-1947, L. Berner, larvae (PERC); Tamaulipas State, Arroyo del Meco, XII-26-1939, L. Berner, larvae (PERC); Río Frío, III-14-16-1939, L. Berner, larvae (PERC).

Camelobaetidius musseri (Traver and Edmunds)

(Fig. 8)

Dactylobaetis musseri Traver and Edmunds 1968: 663.

Dactylobaetis salinus Allen and Chao 1978: 302. NEW SYNONYM.

Camelobaetidius musseri: McCafferty and Waltz 1990: 777.

Camelobaetidius salinus: McCafferty and Waltz 1990: 777. NEW SYNONYM.

Diagnosis. Larvae of *C. musseri* closely resemble those of *C. kondratieffi*, but are different in having fewer denticles on the tarsal claws (30-35) (Fig. 8) and lacking the weakly pectinate setae on the dorsal surface of the labrum. The larvae also resemble those of *C. sinaloa*, but can be separated by the absence of dark posterior margins on terga 1-9 in *C. musseri*.

Remarks. We consider *C. salinus* to be equivalent to *C. musseri* because the larval differences indicated by Allen and Chao (1978) reflect intraspecific variability. Traver and Edmunds (1968) discussed the presence of larval "allies of *D. musseri*" in Costa Rica and Honduras. Our examination of part of those specimens indicated that they are variants of *C. musseri*. Adults of *C. musseri* are unknown.

Known distribution. Costa Rica; El Salvador; Guatemala; Honduras; Mexico: Chiapas, Guerrero, Jalisco, Morelos, Nuevo León, Oaxaca, San Luis Potosí, Veracruz; USA: Arizona, Nevada, New Mexico. The records from Nevada, Costa Rica, and New Mexico are new (see below).

Material examined. COSTA RICA, Cartago Province, Río Platanillo, 2.2 km E of Tayutic, 730 m, 9.82°N/83.55°W, I-30-1986, Holzenthal, Morse, and Fasth, larvae (FAMU); Guanacaste Province, Río Tenorio at Finca La Pacífica, E of Panamerican Hwy, II-2-1969, W. P. McCafferty, larvae (PERC); same data, II-8-11-1969; same data, II-8-1969; Heredia Province, Río Sarapiquí, Puerto Viejo, 90 m, VII-10-1962, G. G. Musser, larvae (PERC); Puntarenas Province, Quebrada Pita, nr 3 km (air) W of Golfito, 15 m, 8.642°N/83.193°W, II-15-1986, Holzenthal, Morse, and Fasth, larva (FAMU); San José Province, San José, 1160 m, VIII-9-1962, G. G. Musser, larvae (PERC). USA, Nevada, Clark County, Warm Springs, Moapa Valley, IV-21-1989, G. F. Edmunds, Jr., larvae (PERC); New Mexico, Catron County, San Francisco R, at Reserve, VIII-4-1993, R. Durfee, larva (CSU); Catron County, N of Silver City, W fork Gila R. Gila National Monument, 1.5 mi above jct with Middle Fork, 5600 ft. VII-29-1969, R. and D. Koss, larva (PERC); North of Silver City, Gila R at jct with Little Cr, VII-9-1969, R. W. Koss, W. P. McCafferty, and A. V. Provonsha, larvae (PERC); Grant County, Grant Canyon, 6700 ft. above Gila, X-12-1993, P. Stewart, larva (NMHU); E Fork of Gila R, nr Graperine, 6400 ft. X-12-1993, P. Stewart, larva (NMHU).

Camelobaetidius similis Lugo-Ortiz and McCafferty, NEW SPECIES

(Fig. 5)

Larva. Body length: 4.7-5.0mm; caudal filaments: unknown. Head: Coloration pale, with area along coronal and frontal sutures pale brown. Vertex pale brown. Ocelli black. Turbinate eyes yellowish. Antennae pale, with very fine, simple setae on scapes, pedicel, and distally on each segment; sensilla absent. Labrum (Fig. 5) sclerotized posteriorly along margin, with submedial and four to five submarginal simple setae arranged almost linearly; intermediate simple setae present. Right mandible 3 + 1 + 3 denticles; distal two denticles appearing fused; tuft of simple setae between protheca and molar. Left mandible 3 + 3 denticles, with short, robust process at base of molar. Maxillae robust; maxillary palps extending as far as galealaciniae; palp segment 2 broad distally similar to Fig. 55 in Traver and Edmunds (1968). Labium somewhat elongate and robust; palp segment 1 long, segment 2 shorter than 1, with five simple setae dorsally and round distal projection; segment 3 almost conical, with numerous fine, simple setae; glossae with 11-12 simple setae medially, five to six dorsally, and four to five laterally; paraglossae with five to six simple setae dorsally and 17-20 simple setae laterally. Thorax: Color pale to dark brown, with no distinct pattern. Sterna pale. Forecoxal osmobranchia present. Legs pale; femora rounded distally, with numerous fine, long, simple setae dorsally; distal end of tibiae with five to seven robust, simple setae ventrally; tarsi with 12 robust, simple setae ventrally, last three longer than preceding nine; tarsal claws with five to six denticles. Abdomen: Color pale brown. Tergal color pattern as in Figs. 11-12 in Traver and Edmunds (1968). Sterna pale brown. Gills on segments 1 and 7 small and with very little or no tracheation; those on segments 2-6 similar to Fig. 6 of Traver and Edmunds (1968). Paraprocts with five to six spines. Caudal filaments pale to pale brown.

Adult. Unknown.

Diagnosis. Differences separating the larvae of *C. similis* and *C. warreni* are the setation on the labrum (shown respectively in Figs. 5 and 6) and the presence of forecoxal gills in *C. similis*.

Known distribution. Mexico: Guerrero.

Material Examined. Holotype: Male larva, MEXICO, Guerrero State, km 15 carretera Bejucos, nr Ciudad Altamirano, XI-22-1984, Brailovsky *et al.* (UNAM). Paratype: Female larva, same data as holotype (PERC).

Etymology. The specific epithet is a Latin word meaning alike. It is in reference to the general similarity of this species and *C. warreni*.

Camelobaetidius sinaloa (Allen and Murvosh)

Dactylobaetis sinaloa Allen and Murvosh 1987: 1099.

Camelobaetidius sinaloa: McCafferty and Waltz 1990: 778.

Diagnosis. According to Allen and Murvosh (1987), larvae of *C. sinaloa* have 30-35 denticles in the tarsal claws. This matches the number of denticles found in *C. musseri*; however, larvae of *C. sinaloa* apparently differ from the larvae of *C. musseri* in having a pale abdomen as depicted in Figure 1 of Allen and Murvosh (1987).

Remarks. The adults of this species have not been described.

Known distribution. Mexico: Sinaloa.

Material examined. Our study of this species is based entirely on the literature since we have been unable to locate the type material (the only material known of the species).

Camelobaetidius waltzi McCafferty

(Figs. 7, 9, 10)

Camelobaetidius waltzi McCafferty, in McCafferty and Klubertanz 1994: 38.

Diagnosis. This species can be readily separated from other species of *Camelobaetidius* in North and Central America by the unique combination of a pointed second segment of the labial palps (Fig. 10) and the small number of denticles (6-7) in the tarsal claws (Fig. 1).

Remarks. The pointed second segment of the labial palps of *C. waltzi* is similar to that found in the South American species *C. anubis* (Traver and Edmunds) and *C. penai* (Traver and Edmunds). However, as pointed out by McCafferty and Klubertanz (1994), *C. waltzi* is similar to *C. mexicanus* with respect to mandibular morphology, labral setation, small number of denticles on the tarsal claws, and gill pigmentation, and thus the labial palps of *C. waltzi* probably represent an anomaly. The adults of *C. waltzi* remain to be discovered.

Known distribution. USA: Indiana, Iowa.

Material examined. Holotype: Female larva, USA, Indiana, Posey County, Wabash R. at Old Dam nr Harmony, VII-20-1977, W. P. McCafferty and A. V. Provonsa (PERC). Paratypes: Eight larvae, USA, Iowa, Van Buren County, Des Moines R, at Lacy Keosauqua State Park, VIII-29-1992, T. H. Klubertanz (PERC).

Camelobaetidius warreni (Traver and Edmunds)

(Fig. 6)

Dactylobaetis warreni Traver and Edmunds 1968: 642.

Dactylobaetis cepheus Traver and Edmunds 1968: 648. NEW SYNONYM.

Dactylobaetis zenobia Traver and Edmunds 1968: 651. NEW SYNONYM.

Dactylobaetis navis Allen and Chao 1978: 300. NEW SYNONYM.

Dactylobaetis trivialis Allen and Chao 1978: 302. NEW SYNONYM.

Camelobaetidius cepheus: McCafferty and Waltz 1990: 777. NEW SYNONYM.

Camelobaetidius navis: McCafferty and Waltz 1990: 777. NEW SYNONYM.

Camelobaetidius trivialis: McCafferty and Waltz 1990: 778. NEW SYNONYM.

Camelobaetidius warreni: McCafferty and Waltz 1990: 778.

Camelobaetidius zenobia: McCafferty and Waltz 1990: 778. NEW SYNONYM.

Diagnosis. Larvae of *C. warreni* could be confused with those of *C. mexicanus*. However, the tarsal claws of *C. warreni* have more denticles (7-9) and

the labrum (Fig. 6) has intermediary setae. In addition, the larvae of *C. warreni* tend to be larger than those of *C. mexicanus*.

Remarks. Larvae named *C. cepheus*, *C. navis*, *C. trivialis*, *C. warreni*, and *C. zenobia* show only intraspecific variability in morphology and coloration. Mouthpart morphology cannot be used to distinguish them because the labra, mandibles, maxillae, and labia of all of them are of similar type (see Traver and Edmunds 1968). According to Traver and Edmunds (1968), only *C. zenobia* has a different left mandible, categorized as Grade II denticulation (i.e., outer incisor almost or wholly fused, inner incisor with distinct denticles; see Traver and Edmunds 1968: Fig. 87). Our examination of the paratype material of *C. zenobia*, however, revealed that the mandibular denticles were worn at the time of being slide mounted, thus artificially giving the appearance of a Grade II denticulation. Tarsal claw denticulation varies between seven to nine denticles in all of the above larvae. In addition, adults assigned to *C. cepheus*, *C. warreni*, and *C. zenobia* are impossible to separate using the characterization provided by Traver and Edmunds (1968). The genitalia, for example, are nearly identical, and we regard them as variations of the *C. warreni* type. Differences in coloration can also be attributed to variation among populations.

Distribution. Costa Rica; Honduras; Mexico: Baja California Sur, Chiapas, Chihuahua, Guerrero, Oaxaca, Sonora; USA: Arizona, California, Colorado, Idaho, New Mexico, Utah. The records from Costa Rica and Honduras are new (see below).

Material examined. COSTA RICA, Cartago Province, Río Platanillo, 2.2 km E of Tayutic, 9.82°N/83.55°W, 730 m, I-30-1986, Holzenthal, Morse, and Fash, larvae (FAMU); Guanacaste Province, Río Tenorio at Finca La Pacifica, E of Panamerican Hwy., II-2-1969, W. P. McCafferty, larvae (PERC); same data, II-8-11-1969; Puntarenas Province, Río Sinigri, nr 2 km (air) S of Finca Helechales, 9.057°N/83.082°W, 720 m, II-21-1986, Holzenthal, Morse, and Fash, larva (FAMU); Río Guineal, nr 1 km (air) E of Finca Helechales, 9.076°N/83.092°W, 840 m, II-22-1986, Holzenthal, Morse, and Fash, larva (FAMU); San José Province, San José, 1160 m, VIII-9-1962, G. G. Musser, larvae (PERC). HONDURAS, Comayagua Province, Río Selguapa, at bridge nr Comayagua, on Hwy 1, X-17-1964, J. S. Packer, larvae (PERC); El Rosario, Río Humuya, X-20-1964, J. S. Packer, larvae (PERC); Choluteca Province, Marcovia, X-10-1964, J. S. Packer, larva (PERC); El Paraíso Province, tributary of Río Guayamabre, at jct Hwy 4, 50 km 1R of Danlí, IX-3-1964, J. S. Packer, larvae (PERC); Santa María, small stream, IX-3-1964, J. S. Packer, larvae (PERC); Escuela Agrícola Panamericana, X-26-1964, J. S. Packer, larvae (PERC); 3 km E of Danlí, small stream, VIII-29-1964, J. S. Packer, larvae (PERC); Olancho Province, 1.6 mi W of Campamento Galera turn-off (at bridge), on Hwy 3, XI-7-1964, J. S. Packer, larvae (PERC). MEXICO, Chiapas State, Ocosingo Valley, tributary of Río Santa Cruz, VII-1-7-1950, Goodnight and Stannard, larva (PERC); Chihuahua State, Río Gavalón, Gavalón Ranch, VIII-26-1986, B. C. Kondratieff, male adult (PERC); Guerrero State, Km 15 carretera Bejucos, nr Ciudad Altamirano, XI-22-1984, Brailovsky *et al.*, larvae (UNAM); Oaxaca State, Dominguillo, III-8-1978, H. Zapién, larvae (UNAM); Sonora State, Hwy 11, SW of Tezopuco, I-18-1988, B. C. Kondratieff and R. W. Baumann, larva (PERC); Río Yaqui, nr Tonichi, IV-25-1982, D.A. and J. T. Polhemus, larvae (PERC). USA, Utah, Washington Co., Virgin R at St. George, V-20-1971, W. P. McCafferty, larva (PERC); Uintah Co., White R. 2 mi S Curay, X²-12-1974, B. Stark and T. Wolff, larvae (PERC).

Camelobaetidius sp. 1 McCafferty and Davis

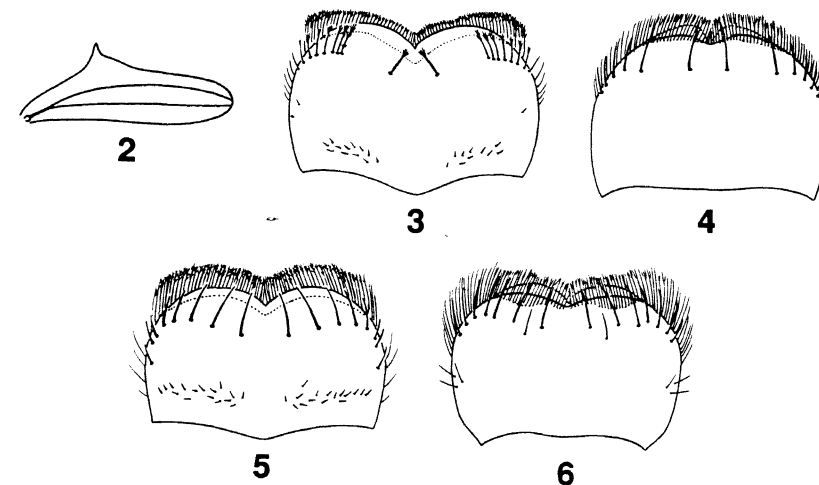
Camelobaetidius sp. 1 McCafferty and Davis 1992: 207.

Diagnosis. This species can be separated from other representatives of the genus in North and Central America by the presence of 16-18 denticles in the tarsal claws.

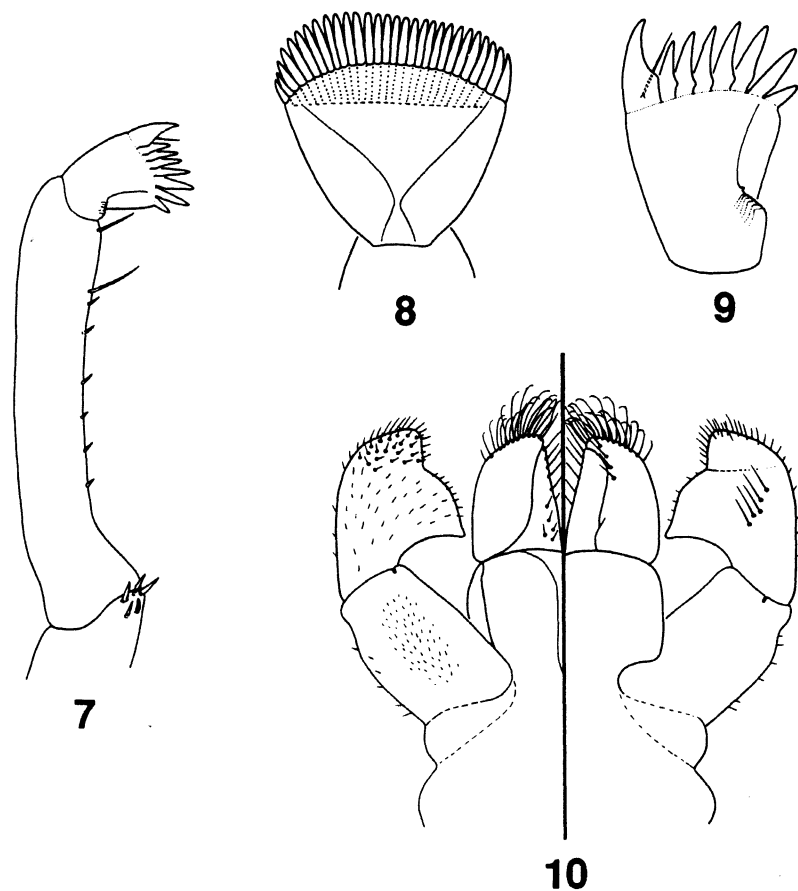
Remarks. As indicated by McCafferty and Davis (1992) and McCafferty *et al.* (1993), this species appears to be a distinct representative of *Camelobaetidius* in North America because of the unique number of denticles in the tarsal claws (16-18). We do not give a formal name to this species because the material examined consists of early instar larvae and we do not know yet if mouthpart characters and the number of denticles in the tarsal claws will be affected with growth. However, we have not observed significant changes in mouthpart morphology and tarsal claw denticulation in species series including different aged larvae of *Camelobaetidius* that we have studied thus far, and there remains a strong possibility that *C. sp. 1* is a distinct species.

Distribution. USA: Colorado, Texas.

Material examined. USA, Texas, Brewster County, Río Grande at Santa Elena Canyon, IX-28-1977, J. R. Davis, larvae (JRD); Presidio County, Río Grande 13 mi downstream from Presidio, VI-28-1977, J. R. Davis, larvae (JRD); Val Verde County, Río Grande at Foster Ranch nr Langtry, V-2-1977, larvae (JRD); Colorado, Moffat County, Yampa R. Echo Park, Dinosaur National Monument, VII-16-1981, larvae (CSU).



Figs. 2-6. *Camelobaetidius* spp.: Hind wing: 2. *C. mexicanus*. Labra: 3. *C. kondratieffi*. 4. *C. mexicanus*. 5. *C. similis*. 6. *C. warreni*.



Figs. 7-10. *Camelobaetidiusspp.*: Tarsus: 7. *C. waltzi*. Tarsal claws: 8. *C. musseri*. 9. *C. waltzi*. Labium: 10. *C. waltzi*.

Key to the known North and Central American larvae of *Camelobaetidiusspp.*

1. Tarsal claws with 5-10 denticles (Fig. 9) 2
- Tarsal claws with 16-45 denticles (Fig. 8) 5
2. Forecoxal gills present *similis*
- Forecoxal gills absent 3
3. Second segment of labial palps pointed (Fig. 10) *waltzi*
- Second segment of labial palps round 4
4. Tarsal claws with 5-6 denticles; labrum without intermediary setae (Fig. 4) *mexicanus*
- Tarsal claws with 7-9 denticles; labrum with intermediary setae (Fig. 6) *warreni*
5. Tarsal claws with 16-18 denticles sp. 1
- Tarsal claws with 30-45 denticles 6
6. Tarsal claws with 40-45 denticles; labrum with branched setae (Fig. 3) *kondratieffi*
- Tarsal claws with 30-35 denticles (Fig. 8); labrum with simple setae 7
7. Posterior margins of terga 1-9 pale *musseri*
- Posterior margins of terga 1-9 blackish *sinaloa*

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SCIENTIFIC NOTE

REPORT OF *CHRYSOMYA MEGACEPHALA*
(DIPTERA: CALLIPHORIDAE)
IN NORTHERN NEW MEXICO¹

Grant D. De Jong^{2, 3}

The blowfly *Chrysomya megacephala* (Fabricius) has spread dramatically through South and Central America from its introduction to southern Brazil around 1975, probably from southern Africa (Baumgartner and Greenberg 1984), and is a recent invader of the continental United States. It has been reported from the southern regions of California (Greenberg 1988) and Texas (Wells 1991) and southern and central areas of Florida (Baumgartner 1993.)

On 19 October 1994, a single female specimen of *C. megacephala* was collected in association with a dead raccoon (*Procyon lotor* Linnaeus) in northern New Mexico (Mora Co., 12 mi SE of Wagon Mound). The collection of a single specimen does not confirm establishment of this species in New Mexico; however it can indicate the possibility of such an establishment. This record is new to the state and is substantially further north than previous records in North America.

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SPECIFIC ASSIGNMENTS IN
EPHEMERELLINA AND *VIETNAMELLA*
(EPHEMEROPTERA: EPHEMERELLIDAE)¹

T.-Q. Wang, W. P. McCafferty²

ABSTRACT: The presence in alate stages of vestiges of distinguishing larval cephalic horns indicates that Oriental species previously assigned to *Ephemerellina* and known only from alate stages belong to the genus *Vietnamella*. The species thus transferred include *V. ornata*, n. comb. and *V. sinensis*, n. comb. *Ephemerellina* presently is known only from temperate southern Africa.

In revising the higher classification of the pannota mayflies, certain problems with respect to correct generic assignment of species have come to our attention. Such problems often result from the fact that taxa are based on either only alate stages or only larvae, or from the fact that life stages have been incorrectly associated. This note deals with the resolution of a problem exemplifying the former situation. It is prerequisite to conducting accurate cladistics and biogeographic analyses at the species group level.

Ephemerellina was erected by Lestage (1924) and was the first recorded genus of Ephemerellidae from southern Africa. The genus was for many years known only from temperate South Africa, where McCafferty and deMoor (1995) have recognized three species. Allen and Edmunds (1963) transferred *Ephemerella sinensis* Hsu, a species known from adults only from Kiangsi Province, China, to *Ephemerellina*. Later, Tshernova (1972) described two subimagos from Yunnan Province, China as *Ephemerellina ornata* Tshernova, based on its similarity to *E. sinensis*. We have new evidence, however, that neither of these Oriental species belong to *Ephemerellina*.

Tshernova (1972) described the genus *Vietnamella* from Vietnam based on a single species, *V. thani* Tshernova. Although adults were unknown to her, the larvae of this genus were shown to be most unusual by their possession of many unique characteristics, including a pair of long cephalic frontal horns [illustrated by Tshernova (1972): Fig. 4]. *Vietnamella dabiieshanensis* You and Su (1987) from China has been the only other species that has been described in this genus. You and Su (1987) provided the first adult description of the genus (the species was based on both larvae and adults).

Recent research on the pannota mayflies has indicated that many larval characters, especially prominent and well-sclerotized armature, are often

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