

## DISTRIBUTION AND TAXONOMIC CONTRIBUTIONS TO THE EPHEMEROPTERA FAUNA OF MEXICO AND CENTRAL AMERICA<sup>1</sup>

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**ABSTRACT:** New records for 16 species of mayflies are reported for Belize, Costa Rica and the Mexican states of Chihuahua, Nuevo Leon and Tamaulipas. The presence of *Apobaetis indepressus* in Tamaulipas represents a new genus record for Mexico. *Fallceon fortipalpus* is reported from Tamaulipas, representing the first report in Mexico and first record other than its type locality in Costa Rica. *Cloeodes excogitatus* is reported in Nuevo Leon and Tamaulipas representing the first known locations in Mexico. A new species, *Cloeodes waltzi*, is described from a distinctive larva collected from the Rio Corona in Tamaulipas, Mexico.

At present there are records of 184 mayfly species within 43 genera and 11 families reported for Mexico and Central America (Domiquez et al. 1996; Lugo-Ortiz and McCafferty 1996a; McCafferty and Lugo-Ortiz 1996b; Wiersema 1998; Waltz and McCafferty 1999), 121 in Mexico and 106 in Central America. Examination of recent collections from Chihuahua, Nuevo Leon and Tamaulipas, Mexico and Costa Rica and Belize revealed many significant new records within the mayfly families Beatidae, Caenidae, and Leptohyphidae as well as a highly distinctive new species described below as *Cloeodes waltzi* new species. Specimens upon which these reports are based are deposited in the following institutional collections: Brackenridge Field Laboratory of the University of Texas at Austin (BFL); Texas A&M University at College Station (TAMU); Purdue Entomological Research Collection (PERC); Wilber Enns Museum at the University of Missouri (UM).

### BAETIDAE

*Apobaetis indepressus* Day—MEXICO: Tamaulipas, spring at head of Rio Mante, ca., 10 mi., W of Mante, V-17-1995, D.E. Baumgardner and B.C. Henry (male adult, TAMU). This represents the first report of this species outside the USA. Prior to this report *A. indepressus* had its known southern limit in Texas (McCafferty and Davis 1992; Wiersema 1998).

*Baetodes velmae* Cohen & Allen—COSTA RICA: San Jose Prov., Cerro de la Muerte, Rio Savegre at San Gerardo de Dota, 09°33'N, 083°48'W, VIII-7-8-1995, C.R. Nelson (larvae, BFL). *Baetodes velmae* was previously known from Panama (Cohen and Allen 1978; Flowers 1987), thus its presence in

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southern Costa Rica was to be expected.

*Callibaetis floridanus* Banks—BELIZE: Cayo District, Belmopan at Belmopan Airstrip, I-11-1996 J.C. Abbott (adult female, TAMU). *Callibaetis floridanus* ranges from Pennsylvania (Wiersma, unpublished) in the north-eastern United States to Costa Rica in Central America, but has not previously been reported from Belize.

*Callibaetis puntilus* McCafferty & Provonsha—BELIZE: Cayo District, Belmopan at Belmopan Airstrip, I-11-1996 J.C. Abbott (adult female, TAMU). This species was previously known from Texas in the United States to Chiapas, Mexico, thus its presence in northern Central America was expected.

*Camelobaetidius arriaga* (Traver & Edmunds)—BELIZE: Cayo District, Caves Branch River on Hummingbird Belmopan, 13 mi SE, I-4-1996, J.C. Abbott (male adult NAW). The adult male reported above is typical of the form originally characterized under the name of *C. arriaga* (distinctly elongate basal forcep segments and dark blue-black coloration covering the posterior half or margin of most abdominal segments) by Traver and Edmunds (1968). However, an additional adult male from the Belmopan Airstrip was collected by John Abbott a week later which is typical of the form characterized under the name *C. chiapas* (Traver and Edmunds). McCafferty (1996) placed *C. chiapas* and *C. jenseni* (Traver & Edmunds) as junior synonyms of *C. arriaga*. Unfortunately, of the eight species of *Camelobaetidius* known from southern Mexico and Central America only *C. warreni* (Traver and Edmunds) is known from both adults and larvae. *Camelobaetidius arriaga*, *C. chiapas*, and *C. jenseni* are only known as adults, where as *C. kondratieffi* Lugo-Ortiz & McCafferty, *C. musseri* (Traver & Edmunds), *C. similis* Lugo-Ortiz & McCafferty, and *C. sinaloa* (Allen & Murvosh) are only known as larvae. Thus the status of the various aforementioned species will remain unclear until the larval and adult stages are correctly associated.

*Camelobaetidius kondratieffi* Lugo-Ortiz & McCafferty—COSTA RICA: Puntarenas Prov., Rio Bellavista, Las Alturas Biological Station, VIII-15-1995, C.R. Nelson (larva, BFL). This species was previously known from Guatemala and Belize (Lugo-Ortiz and McCafferty 1996a).

*Camelobaetidius similis* Lugo-Ortiz & McCafferty—MEXICO: Tamaulipas, Branch of Rio Chihue at Hwy. 101, ca. 12 mi. S of Jaumave, between kilometer 91 & 92, V-17-1995, D.E. Baumgardner & R.C. Henry., (larva, TAMU). This species was previously known from only its type locality in Guerrero, Mexico (Lugo-Ortiz and McCafferty 1995a). The presence of *C. similis* in Tamaulipas, Mexico represents a significant northern extension of its known range. Additionally, this is only the third larva of this species reported to have been collected.

*Cloeodes excogitatus* Waltz & McCafferty—MEXICO: Nuevo Leon, Rio Pabillo at St. Hwy 115, near Linares, V-15-1995, D.E. Baumgardner & B.C. Henry (larvae, TAMU). Tamaulipas, Rio Pilon at bridge off Hwy 85, near Villa

Mainero, V-16-1995, D.E. Baumgardner & B.C. Henry (larvae, TAMU). The location records reported here represents the first known locations of *C. excogitatus* in Mexico. Previous to this report *C. excogitatus* was known from Arizona (Waltz and McCafferty 1987; Lugo-Ortiz and McCafferty 1995b), an unknown locality in Mexico (Lugo-Ortiz and McCafferty 1994), and recently in Texas (Baumgardner and Wiersema 1999) and northern California (Waltz et al. 1998).

### *Cloeodes waltzi*, NEW SPECIES

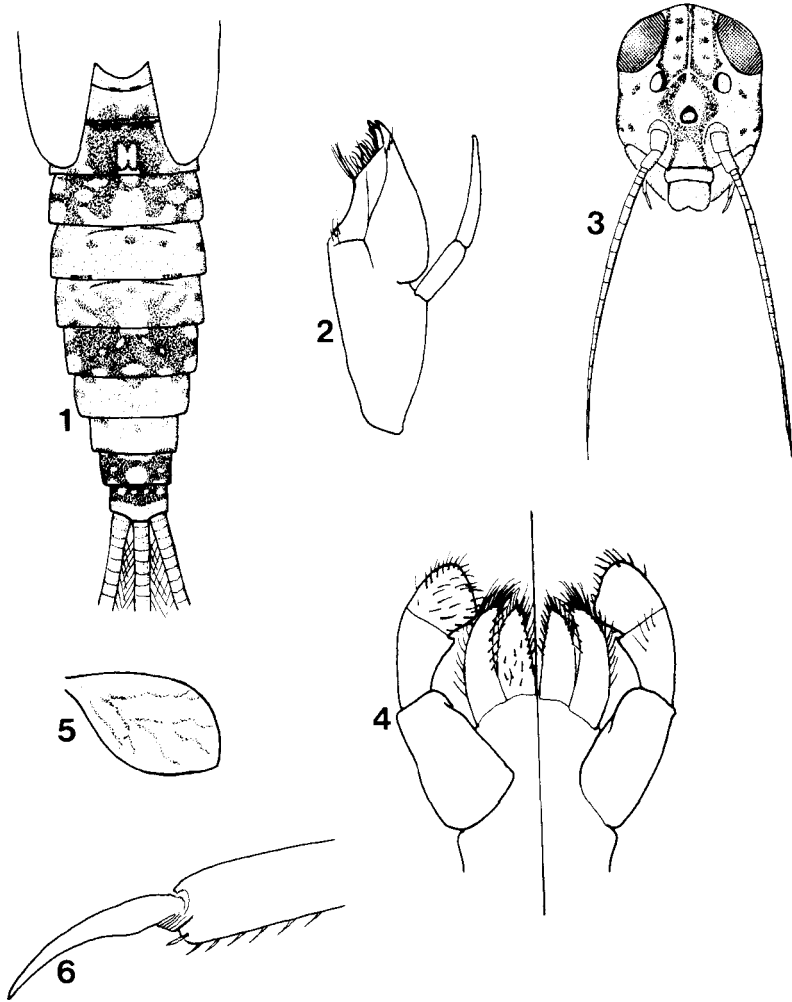
(Figs. 1-6)

**Larva.** Lengths: body 5.2 mm (female); median caudal filament 2.0 mm; cerci 2.2 mm. Head: (Fig. 3) Coloration pale yellowish, with distinct dorsal patterning of 3-4 brown spots on each side of the epicranial suture, as well as distinct frontal patterning. Frons not developed into intra-antennal process. Antennae about half as long as larval body. Labrum with deep medial emargination along nearly parallel anterior margin; paired submedial and 2-3 lateral elongate, simple setae. Right mandibular denticulation 3(1)+1+3 with well developed tuft of setae near the molar region. Left mandibular incisors damaged, but apparently with 3(1)+1+3 denticulation. Segment 2 of labial palpi (Fig. 4) with 4-5 dorsal setae, segment 3 narrowly truncate apically. Paraglossae with 4-5 dorsal, inner marginal setae medioapically and 5-6 ventral inner marginal setae; glossae robust, with 14-16 inner marginal setae. Maxillae with 3 galealacinae crest setae; palpi (Fig. 2) elongate and two segmented. Thorax: Pronotum with brown patterning on each side of wide medial pale area. Meso- and metathoracic nota with pattering of light and dark areas. Thoracic sterna entirely pale yellowish except for dark brown coloration adjacent to intersegmental areas of metathoracic coxae. Mesonotal crest [convex medial longitudinal suture of mesonotum] well developed in anterior half. Hindwingpads absent. Femora with large brown area medially and two lanceolate setae distally, tibia with an arc of fine, hairlike setae basally and darkened distally with one lanceolate subtended setae, tarsi with short row of fine, hair-like setae and darkened basally; tarsal claws elongate and narrow (Fig. 6). Abdomen: Terga (Fig. 1) with distinct pattering of light and dark areas. Anterior margin of abdominal sterna 2-8 with darkened, transverse bands and paired lateral brown spots; transverse bands increasing in size and connecting to the lateral spots posteriorly; sternite 9 entirely brown in the anterior three-fourths. Gills elongate and rounded medially with broken tracheation (Fig. 5), gill seven extending to middle of segment 9. Posterior lateral spines elongate and widely spaced. Caudal filaments with narrow, subdistal band of darkened segments.

**Adult.** Unknown.

**Material.** HOLOTYPE: female larva (body and headcapsule in alcohol, mouthparts and mesothoracic leg mounted on slide in euparal) MEXICO: Tamaulipas, Rio Corona at Hwy 85, ca. 15 mi north of Victoria, V-16-1995, D.E. Baumgardner & B.C. Henry (PERC).

**Etymology.** We are honored in naming this species after Robert D. Waltz in recognition of his extensive contributions to our understanding of the diverse and complex family Baetidae.



Figs. 1-6. *Cloeodes waltzi*, n. sp., 1-6 Larva. 1. Tergal patterning. 2. Maxillae. 3. Head capsule. 4. Labium (right dorsal, left ventral). 5. Gill five. 6. Tarsal claw.

**Diagnosis.** The larvae of *C. waltzi* are at once distinguished from all other *Cloeodes* Traver species found in North and Middle America by the possession of apically truncate labial palpi; elongate two segmented maxillary palpi; elongate antennae; elongate and narrowed tarsal claws; distinctly patterned head capsule; and tergal patterning. The tergal patterning and labial palps are reminiscent of the Brazilian species *C. hydration* Lugo-Ortiz & McCafferty (1996b). However, no relationship can be ascertained at this time. *Cloeodes* species have additionally been found in Africa (Waltz and McCafferty 1994), Australia (Lugo-Ortiz and McCafferty 1998), Cuba (Kluge 1991), and Madagascar (Lugo-Ortiz et al. 1999) since the world revision presented by Waltz and McCafferty (1987).

***Fallceon fortipalpus*** Lugo-Ortiz & McCafferty—MEXICO: Tamaulipas, Rio Pilon at bridge off Hwy 85, at Villa Mainero, V-16-1995, D.E. Baumgardner & B.C. Henry (2 larvae TAMU, some parts on slide in euparal). Previous to this report, *F. fotipalpus* was only known from its type locality in Costa Rica (Lugo-Ortiz et al. 1994).

***Fallceon longifolius*** (Kluge)—BELIZE: Cayo District, Caves Branch River on Hummingbird Belmopan, 13 mi SE, I-4-1996, J.C. Abbott (17 adult males, TAMU and NAW); Cayo District, Macal River on road to Coracal Augustine, 10 mi S, I-6-1996, J.C. Abbott (2 adult males, TAMU). This species was previously only known from southeastern Cuba and Hidalgo, Mexico (Lugo-Ortiz et al. 1994).

***Fallceon quilleri*** Dodds—MEXICO: Tamaulipas, spring (at local park) at Hidlago Ave.? , 1 kilometer W of Juamave off Hwy 101, V-16-1995, D.E. Baumgardner & B.C. Henry (6 adult males, TAMU); Branch of Rio Chihue at Hwy 101, ca. 12 mi S of Juamave V-17-1995 D.E. Baumgardner & B.C. Henry (larva, TAMU). BELIZE: Cayo District, Caves Branch River on Hummingbird Belmopan, 13 mi SE, I-4-1996, J.C. Abbott (3 adult males, TAMU). This widespread species is known from as far south as Costa Rica in Central America (McCafferty and Lugo-Ortiz 1996b) and as far north as the Black Hills of South Dakota in North America (McCafferty 1990), but previous to now was not reported from Tamaulipas, Mexico.

***Paracloeodes minutus*** (Daggy)—BELIZE: Cayo District, Caves Branch River on Hummingbird Belmopan, 13 mi SE, I-4-1996, J.C. Abbott (15 adult males, TAMU). This common trans-continental species ranges from California to North Carolina (Wiersema, unpublished) in the United States, as far north as Ontario, Canada and as far south as Costa Rica, but has not previously been reported from Belize.

## CAENIDAE

*Caenis latipennis* Banks—MEXICO: Chihuahua, Rio Chuviscar, off rd. to Namiquipa, Hwy 160, X-22-1995, D.E. Bowles (3 males, TAMU). Nuevo Leon, Rio Pobillo at Hwy 115, nr Linares, V-15-1995, D.E. Baumgardner & B.C. Henry (male, TAMU). Tamaulipas, Rio Chorretas at Las Norias, XII-23-1971 (9 males and 36 females, TAMU). This widespread and common small square-gill mayfly was previously reported only from the states of Chiapas and Nuevo Leon in Mexico (McCafferty and Lugo-Ortiz 1996b).

*Caenis punctata* McDunnough—MEXICO: Nuevo Leon, Rio Pilon at unnamed rd., across from General Teran off Hwy 35, V-15-1995, D.E. Baumgardner & B.C. Henry (larva, TAMU). This represents the first report of this principally eastern North American species in Mexico.

## LEPTOHYPHIDAE

*Leptohyphes dicinctus* Allen & Brusca—BELIZE: Stann Creek District, North Stann Creek, 2.7 mi SE Middlesex on Hummingbird Hwy, I-11-1996, R.W. Sites (6 larvae, UM). This species was previously known only from Guerrero, Mexico. With respect to diagnosis these larvae lack the row of long posterior marginal "spines" on tergum 6, as described in Allen (1978).

*Leptohyphes vescus* Allen—MEXICO: Tamaulipas, Rio Guayalejo off Hwy 247, nr San Ignacio, V-26-1993, B.C. Henry (larvae, TAMU); spring (at local park) at Hidalgo Ave?, near Juamave on Hwy 101, V-16-1995, D.E. Baumgardner & B.C. Henry (2 males, TAMU). *Leptohyphes vescus* was described and has been known only from Texas.

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## LITERATURE CITED

- Allen, R.K. 1978. The nymphs of North and Central American *Leptohyphes* (Ephemeroptera: Tricorythidae). *Ann. Entomol. Soc. Am.* 71: 537-558.
- Baumgardner, D.B. and N.A. Wiersema. 1999. Additions to the inventory of Texas mayflies (Ephemeroptera). *Entomol. News* 110: 70-71.
- Cohen, S.D. and R.K. Allen. 1978. Generic revisions of mayfly nymphs. III. *Baetodes* in North and Central America (Baetidae). *J. Kansas Entomol. Soc.* 51: 253-269.

- Domiquez, E., C. Molineri and W.L. Peters.** 1996. Ephemeroptera from Central and South America: New species of the *Farrodes bimaculatus* group with key for the males. *Stud. Neotrop. Fauna & Environm* 31: 87-101.
- Flowers, R.W.** 1987. The adult stage of three Central American *Baetodes* (Ephemeroptera: Baetidae) with notes on the genus. *Aq. Insects* 9: 1-10.
- Kluge, N.Y.** 1991. Cuban mayflies of family Baetidae (Ephemeroptera) 1. *Callibaetis*, *Cloedes*, and *Paracloedes*. *Zool. Zh.* 12: 128-136 [in Russian]
- Lugo-Ortiz, C.R. and W.P. McCafferty.** 1994. New records of Ephemeroptera from Mexico. *Entomol. News* 105: 17-26.
- Lugo-Ortiz, C.R. and W.P. McCafferty.** 1995a. 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.** 1995b. Annotated inventory of the mayflies (Ephemeroptera) of Arizona. *Entomol. News* 106: 131-140.
- Lugo-Ortiz, C.R. and W.P. McCafferty.** 1996a. New Central American and Mexican records of Ephemeroptera species. *Entomol. News* 107: 303-310.
- Lugo-Ortiz, C.R. and W.P. McCafferty.** 1996b. *Cloedes hydatation*, n. sp. (Ephemeroptera: Baetidae): an extraordinary, drought tolerant mayfly from Brazil. *Entomol. News* 106: 29-35.
- Lugo-Ortiz, C.R. and W.P. McCafferty.** 1998. First report and new species of the genus *Cloedes* (Ephemeroptera: Baetidae) from Australia. *Entomol. News* 109: 122-128.
- Lugo-Ortiz, C.R., W.P. McCafferty, and J.-L. Gattolliat.** 1999. The small minnow mayfly genus *Cloedes* Traver (Ephemeroptera: Baetidae) in Madagascar. *Proc. Entomol. Soc. Wash.* 101: 208-211.
- Lugo-Ortiz, C.R., W.P. McCafferty and R.D. Waltz.** 1994. Contribution to the taxonomy of the Panamerican genus *Fallceon* (Ephemeroptera: Baetidae). *J. New York Entomol. Soc.* 102: 46-475.
- McCafferty, W.P.** 1990. Biogeographic affinities of the Ephemeroptera of the Black Hills, South Dakota. *Entomol. News* 101: 193-199.
- McCafferty, W.P.** 1996. The Ephemeroptera species of North America and index to their complete nomenclature. *Trans. Am. Entomol. Soc.* 122: 1-54.
- McCafferty, W.P. and J.R. Davis.** 1992. New and additional records of small minnow mayflies (Ephemeroptera: Baetidae) from Texas. *Entomol. News* 103: 199-209.
- McCafferty, W.P. and C.R. Lugo-Ortiz.** 1996a. Los efemerópteros (Ephemeroptera) de America Central. *Rev. Nica. Entomol.* 35: 19-28.
- McCafferty, W.P. and C.R. Lugo-Ortiz.** 1996b. Ephemeroptera. pp. 133-145. In J.E. Llorente-Bousquets, A.N. García-Aldrete and E. González-Soriano (eds.). *Biodiversidad, taxonomía y biogeografía de artrópodos de México: hacea una síntesis de su conocimiento.* Universidad Nacional Autónoma de México, México DF.
- Traver, J.R. and G.F. Edmunds.** 1968. A revision of the Baetidae with spatulate-clawed nymphs (Ephemeroptera). *Pac. Insects* 10: 629-677.
- Waltz, R.D. and W.P. McCafferty.** 1987. Revision of the genus *Cloedes* Traver (Ephemeroptera: Baetidae). *Ann. Entomol. Soc. Am.* 80: 191-207.
- Waltz, R.D. and W.P. McCafferty.** 1994. *Cloedes* (Ephemeroptera: Baetidae) in Africa. *Aq. Insects* 16: 165-169.
- Waltz, R.D., P. Ode, and J. Lee.** 1998. *Cloedes excogitatus* (Ephemeroptera: Baetidae) in northern California. *Entomol. News* 109: 215-216.
- Waltz, R.D. and W.P. McCafferty.** 1999. Additions to the taxonomy of *Americabaetis* (Ephemeroptera: Baetidae): *A. lugoi* n. sp., adult of *A. robacki*, and key to larvae. *Entomol. News* 109: 39-44.
- Wiersema, N.A.** 1998. *Camelobaetidius variabilis* (Ephemeroptera: Baetidae), a new species from Texas, Oklahoma and Mexico. *Entomol. News* 110: 21-26.