

The Ephemeroptera of Central America. Part 1: Guatemala

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ABSTRACT

The Ephemeroptera fauna of Guatemala is inventoried by way of documenting 160 Toménew locale records for 48 species and reviewing historical geographic records associated with any of the 66 species represented. Mayflies are now known from 18 of the 22 departments of Guatemala. Twenty-four species are reported from Guatemala for the first time. *Baetodes inermis* Cohen and Allen, *B. longus* Mayo, *B. pictus* Cohen and Allen, *Camelobaetidium mexicanus* (Traver and Edmunds), *C. shepardi* Randolph and McCafferty, *C. variabilis* Wiersema, *Thraulodes eccentricus* Lugo-Ortiz and McCafferty, and *T. Gonzales* Traver and Edmunds also represent new Central American records. Species of the genera *Allenhyphes* Hofmann and Sartori, *Epiphrales* Wiersema and McCafferty, *Farrodes* Peters, *Guajiroilus* Flowers, *Traverella* Edmunds, and *Tricorythodes* Ulmer are reported from Guatemala for the first time. *Thraulodes pacaya*, n. sp., is described; it occurs from southern Mexico to Panama, with its type locality in Guatemala.

INTRODUCTION

Since the first mayfly species was described from Guatemala (and Central America) by Eaton (1871), there was slow progress in documenting Ephemeroptera biodiversity in that country until the considerable taxonomic and faunistic research on Mesoamerica conducted in the 1990s by C. R. Lugo-Ortiz and WPM. The latter works along with mainly records associated with a number of species descriptions by R. K. Allen and his co-workers in the 1960s and 1970s brought the total number of known Guatemalan species to 42 prior to the present study. In general, however, those 42 species were each known from only one or two locale records within the country.

Identification of recent samples taken from Guatemalan streams by William Shepard of Sacramento State University and by DEB along with the study of additional samples held in the Purdue Entomological Research Collection (PERC), West Lafayette, Indiana, and the Texas A & M University Entomological Collection (TAMU), College Station, Texas, have allowed the addition herein of 160 new locale records for 48 species. These data along with an exhaustive review of the historical records associated with Guatemala are reported as part I of a series of articles now in progress on the mayfly fauna of Central America. Mayflies are documented from 18 of the 22 geopolitical departments within Guatemala and are represented by 66 species among 32 genera. Of those species, 24 represent new country records, nine of which are also new records for Central America. In addition, the genera *Allenhyphes* Hofmann and Sartori, *Epiphrales* Wiersema

and McCafferty, *Farrodes* Peters, *Guajirolus* Flowers, *Traverella* Edmunds, and *Tricorythodes* Ulmer are documented from Guatemala for the first time by way of newly reported species. Our study also indicated one new species of *Thraulodes* Ulmer that is described herein.

In the faunistic account given below, taxa are arranged alphabetically, and all new data are based on larval specimens unless other stages are indicated. Locale data for Guatemala include departments cited in upper case and depicted in Figure 1. All material deposited at PERC were collected by William Shepard, unless other collectors are specifically indicated, and all material deposited at TAMU were collected by DEB, unless other collectors are indicated.



Fig. 1. Guatemala and its departments

FAUNISTIC ACCOUNT

BAETIDAE

Americabaetis intermedius (Lugo-Ortiz and McCafferty), 1994

Previous data.—Lugo-Ortiz and McCafferty (1996a): TONONICAPÁN (high mountain stream); SOLOLÁ (Panajachel).

New data.—BAJA VERAPAZ: unnamed stream, 2.6km S Purulhá, 15/13/34N, 90/13/80W, 1787m, VII-14-2001 [PERC, TAMU]; Río Montarico Bala Estrella, W Chilasco, 15/06/32N, 90/10/03W, 1670m, VII-13-2001; unnamed stream 0.3km S Purulhá, 2068m, VII-14-2001 [TAMU].

Remarks.—This species is also known from southern Mexico (Lugo-Ortiz and McCafferty 1996a) and Costa Rica (Lugo-Ortiz and McCafferty 1994a).

Americabaetis pleturus (Lugo-Ortiz and McCafferty), 1994

New data.—BAJA VERAPAZ: Río San Jerónimo, San Jerónimo, 15/03/52N, 90/14/03W, 1088m & Río El Estancia, Salamá, 15/05/54N, 90/18/18W, 1050m, VII-13-2001 [PERC]. IZABAL: Río Ciénega, 4.7km S San Miguelito, 55m, VII-16-2001 & unnamed stream, 2km SW Montúfar, 128m, VII-15-2001 [PERC]. EL PROGRESO: Río Hato, Magdalena, 14/55/11N, 89/57/56W, 364m, VII-14-2001 [PERC].

Remarks.—This species is also known from Belize, Costa Rica and Nicaragua (Lugo-Ortiz and McCafferty 1994a), northern and southern Mexico (Lugo-Ortiz and McCafferty 1994a, 1996a, Randolph and McCafferty 2000, 2001), and Texas (Wiersema and McCafferty 1999).

Baetis magnus McCafferty and Waltz, 1986

Previous data.—Lugo-Ortiz and McCafferty (1993): SOLOLÁ (Panajachel).

New data.—BAJA VERAPAZ: Río Montarico Bala Estrella, N Chilasco, 1670m, VII-18-2001 & unnamed stream 0.3km S Purulhá, 2068m, VII-12,14-2001 [PERC].

Remarks.—This species was described from western Nebraska (McCafferty and Waltz 1986) and is now also known from much of the intermountain USA (e.g., McCafferty et al. 1993, 1997), Costa Rica (Lugo-Ortiz and McCafferty 1993), Panama (Lugo-Ortiz and McCafferty 1996a), and throughout Mexico (Lugo-Ortiz and McCafferty 1994b, 1996a, Randolph and McCafferty 2000, 2001).

Baetodes adustus Cohen and Allen, 1972

New data.—ALTA VERAPAZ: Río Cahabón, San Julián, 15/19/09N, 90/19/06W, 1645m, VII-14-2001 [TAMU]. IZABAL: Río Juan de Pax, 10km W Los Amates, 140m, VII-15-2001 [PERC]. PETÉN: Río Chatalte, Chatalte, 15/59/22N, 89/17/44W, 210m, VII-16-2001 [PERC].

Remarks.—This species is also known from southern Mexico and Panama (Cohen and Allen 1972, 1978).

Baetodes caritus Cohen and Allen, 1972

Previous data.—Cohen and Allen (1972): ESCUINTLA? (Río Latoma).

New data.—BAJA VERAPAZ: Río San Jerónimo, San Jerónimo, 15/03/52N, 90/14/03W, 1088m, VII-13-2001 [PERC, TAMU]. IZABAL: Río Ciénega, 4.7km

S San Miguelito, 55m, VII-16-2001 [PERC]. EL PROGRESO: Río Hato, Magdalena, 14/55/11N, 89/57/56W, 364m, VII-14-2001 [PERC, TAMU]. ZACAPA: Río Los Achiotes, 5.6km E Gualán, 189m, VII-15-2001 & Río Cayo, 2.3km E Santa Cruz, 15/00/54N, 89/39/09W, 290m, VII-14-2001 & unnamed stream, Gualán, 179m, VII-15-2001 [PERC]; Río Stainkreec, 0.8km E jct Hwy 9 & 10, Río Hondo, 15/02/23N, 89/35/14W, 210m, VII-15-2001 [TAMU].

Remarks.—This species is also known from Costa Rica (McCafferty 1985), El Salvador, Honduras, and southern Mexico (Cohen and Allen 1972).

Baetodes deludens Lugo-Ortiz and McCafferty, 1995

Previous data.—McCafferty and Baumgardner (2003): BAJA VERAPAZ (unnamed stream S La Cumbre).

New data.—BAJA VERAPAZ: Río Montarico Bala Estrella, W Chilasco, 15/06/32N, 90/10/03W, 1670m & Río San Jerónimo, San Jerónimo, 1088m, 15/03/52N, long 90/14/03W, & Río La Estancia, Salamá, 1050m, VII-13-2001 [PERC].

Remarks.—This species is also known only from Costa Rica (Lugo-Ortiz and McCafferty 1995a).

Baetodes fuscipes Cohen and Allen, 1972

Previous data.—Lugo-Ortiz and McCafferty (1995): SOLOLÁ (Panajachel).

Remarks.—This species is also known from Belize (Lugo-Ortiz and McCafferty 1996a), Honduras, and northern and southern Mexico (Cohen and Allen 1972, Mayo 1973a).

Baetodes inermis Cohen and Allen, 1972

New data.—ALTA VERAPAZ: Río Cahabón, San Julián, 15/19/09 N, 90/19/06 W, 1645 m, VII-14-2001 [PERC].

Remarks.—This species is also known from throughout Mexico (Cohen and Allen 1972, 1978, Lugo-Ortiz and McCafferty 1996a, Randolph and McCafferty 2000, 2001) and from Texas (McCafferty and Davis 1992, Lugo-Ortiz and McCafferty 1995c).

Baetodes longus Mayo, 1973a

New data.—BAJA VERAPAZ: unnamed stream, 2.6km S Purulhá, 15/13/34N, 90/13/80W, 1787m, VII-14-2001 [PERC].

Remarks.—This species is also known only from central and northern Mexico (Mayo 1973a, Lugo-Ortiz and McCafferty 1995a, Randolph and McCafferty 2001).

Baetodes noventus Cohen and Allen, 1972

Previous data.—Cohen and Allen (1972): ESCUINTLA? (Río Latoma).

New data.—BAJA VERAPAZ: unnamed stream, 0.3km S La Cumbre, 15/00/34N, 90/13/51W, 1274m, VII-12-2001 [TAMU]. EL PROGRESO: Río Las Pericas, 11km W El Rancho Jct, 14/54/54N, 90/05/52W, 364m, VII-12-2001 [TAMU].

Remarks.—This species is also known from Costa Rica (Lugo-Ortiz and McCafferty 1995a), Honduras (Cohen and Allen 1972, 1978), and El Salvador (Cohen and Allen 1972).

Baetodes pallidus Cohen and Allen, 1972

New data.—ALTA VERAPAZ: Río Cahabón, San Julián, 15/19/09N, 90/19/06W, 1645m, VII-14-2001 [TAMU].

Remarks.—This species is also known from Honduras and southern Mexico (Cohen and Allen 1972).

Baetodes pictus Cohen and Allen, 1972

New data.—BAJA VERAPAZ: unnamed stream, 0.3km S La Cumbre, 15/00/34N, 90/13/51W, 1274m, VII-12-2001 [PERC].

Remarks.—This species is also known from southern and northern Mexico (Cohen and Allen 1972, 1978, Lugo-Ortiz and McCafferty 1995a).

Baetodes tritus Cohen and Allen, 1972

Previous data.—Cohen and Allen (1972): ESCUINTLA? (Río Latoma).

New data.—BAJA VERAPAZ: Río Montarico Bala Estrella, W Chilasco, 15/06/32N, 90/10/03W, 1670m, VII-13-2001 [TAMU]. CHIQUIMULA: Río Grande, 1km N Oeste de Puente Apantes por camino, VII-14-1995, B Yates [TAMU]. ESCUINTLA: Finca Cecilia, III-29-1991, ME González [TAMU]. EL PROGRESO: Río Las Pericas, 11km W El Rancho Jct, 14/54/54N, 90/05/52W, 364m, VII-12-2001 [PERC]. ZACAPA: Río Los Achiotés, 5.6km E Gualán, 189m, VII-15-2001 & unnamed stream, Gualán, 179m, VII-15-2001 [PERC].

Remarks.—This species is also known from northern and southern Mexico (Cohen and Allen 1972, 1978, Randolph and McCafferty 2000, 2001), Belize (McCafferty 1985), Costa Rica (Lugo-Ortiz and McCafferty 1995a), Honduras (Cohen and Allen 1972), and Panama (Cohen and Allen 1978, Flowers 1987).

Callibaetis floridanus Banks, 1900

Previous data.—Lugo-Ortiz and McCafferty (1996a): CHIMALTENANGO (Chimaltenango); EL PROGRESO (Estancia de la Virgen); QUICHÉ (Chichicastenango).

Remarks.—This species is known generally from Mexico, Texas and southeastern USA states and certain Caribbean Islands (see Lugo-Ortiz and McCafferty 1994b, 1996a, 1996b), and also from Belize (Wiersema and Baumgardner 2000), Honduras, El Salvador (Lugo-Ortiz and McCafferty 1994b, 1996a), and Costa Rica (Lugo-Ortiz and McCafferty 1996b).

Callibaetis montanus Eaton, 1885

Previous data.—Eaton (1885): ESCUINTLA (Aceituno).

Remarks.—This species is also known from Nicaragua (McCafferty and Lugo-Ortiz 1992), Mexico (Randolph and McCafferty 2000, 2002), and the extreme southwestern USA states (see Lugo-Ortiz and McCafferty 1996b).

Callibaetis pictus (Eaton), 1871

Previous data.—Eaton (1885): ESCUINTLA (Aceituno).

New data.—ALTA VERAPAZ: Río Cahabón, Chibite, I-3-1989, BC Kondratieff (adults) [PERC]. CHIMALTENANGO: 32km NW Chimaltenango, VIII-20-1965, PJ Spangler [PERC]. GUATEMALA: 16km W Guatemala City, VIII-8-1965, PJ Spangler [PERC]. SOLOLÁ: Panajachel, 1550m, VIII-21-1962. GG Musser [PERC].

Remarks.—This species is also known from Honduras (Lugo-Ortiz and McCafferty 1996a) and Costa Rica (Lugo-Ortiz and McCafferty 1996b), and it is widespread in the western USA and Mexico (McCafferty and Waltz 1990, McCafferty and Davis 1992, McCafferty et al. 1993, 1997, Lugo-Ortiz and McCafferty 1994b, Randolph and McCafferty 2000, 2001).

Camelobaetidius kondratieffi Lugo-Ortiz and McCafferty, 1995b

Previous data.—Lugo-Ortiz and McCafferty (1995b): IZABAL (tributary of Río Cahabón).

New data.—ALTA VERAPAZ: Río Cahabón, San Julián, 15/19/09N, 90/19/06W, 1645 m, VII-14-2001 [TAMU]. IZABAL, Río Ciénega at Hwy 13, 4km S Shaila, 15/43/53N, 89/84/44W, 55m, VII-16-2001 [TAMU]. EL PROGRESO: Río Las Pericas, 11km W El Rancho Jct, 14/54/54N, 90/05/52W, 364m, VII-12-2001 [TAMU].

Remarks.—This species is also known from Belize (Lugo-Ortiz and McCafferty 1996a) and Costa Rica (Wiersema and Baumgardner 2000).

Camelobaetidius mexicanus (Traver and Edmunds), 1968

New data.—ALTA VERAPAZ: Río Cahabón, San Julián, 15/19/09N, 90/19/06W, 1645m, VII-14-2001 [PERC, TAMU]. BAJA VERAPAZ: Río La Estancia, Salamá, 15/05/54N, 90/18/18W, 1050m & Río San Jerónimo, San Jerónimo, 15/03/52N, 90/14/03W, 1088m & Río Montarico Bala Estrella, W Chilasco, 15/06/32N, 90/10/03W, 1670m, VII-13-2001 [PERC, TAMU]; unnamed stream, 2.6km S Purulhá, 15/13/34N, 90/13/80W, 1787m, VII-14-2001 [PERC]. IZABAL: unnamed stream, 2km SW Montúfar, 128m, VII-15-2001 [PERC]. EL PROGRESO: Río Hato, Magdalena, 14/55/11N, 89/57/56W, 364m, VII-14-2001 [TAMU]. ZACAPA: Río Los Achiotés, 5.6km E Gualán, 189m, VII-15-2001 [PERC]; Río Cayo, 2.3 km E Santa Cruz, 290m, VII-14-2001 [TAMU].

Remarks.—This species is known from throughout Mexico (Traver and Edmunds 1968, Allen and Cohen 1977, Randolph and McCafferty 2000, 2001), Texas (e.g., McCafferty and Davis 1992, McCafferty and Provonsha 1993, Lugo-Ortiz and McCafferty 1995c), and Idaho (Lester et al. 2002).

Camelobaetidius musseri (Traver and Edmunds), 1968

Previous data.—Traver and Edmunds (1968): SOLOLÁ (Pena Fachel). Allen and Cohen (1977): SAN MARCOS (Río Cabuz); ESCUINTLA? (Río Latoma, Río Negro).

New data.—ALTA VERAPAZ: Río Cahabón, San Julián, 15/19/09N, 90/19/06W, 1645m, VII-14-2001 [PERC]. BAJA VERAPAZ: Río San Jerónimo, San Jerónimo, 15/03/52N, 90/14/03W, 1088m & Río Montarico Bala Estrella, W Chilasco, 15/06/32N, 90/10/03W, 1670m, VII-13-2001 [PERC]. IZABAL: Río Ciénega, 4.7km S San Miguelito, 55m, VII-16-2001 & Río Juan de Pax, 10km W Los Amates, 140m & unnamed stream, 2km SW Montúfar, 128m, VII-15-2001 [PERC]. PETÉN: Río Chatalte, Chatalte, 15/59/22N, 89/17/44W, 210m, VII-16-2001 [PERC, TAMU]. EL PROGRESO: Río Hato, Magdalena, 14/55/11N, 89/57/56W, 364m, VII-14-2001 [PERC]. ZACAPA: Río Los Achiotés, 5.6km E Gualán, 189m & unnamed stream, Gualán, 179m & Río Stainkreec, 0.8km E jct Hwy 9 & 10, Río Hondo, 15/02/23N, 89/35/14W, 210m, VII-15-2001 [PERC].

Remarks.—This common Guatemalan species is also known from Mexico

(Traver and Edmunds 1968, Randolph and McCafferty 2000), Costa Rica (Lugo-Ortiz and McCafferty 1995b), Honduras and El Salvador (Allen and Cohen 1977), and New Mexico and Nevada (Lugo-Ortiz and McCafferty 1995b).

Camelobaetidium shepardi Randolph and McCafferty, 2001

New data.—ZACAPA: Río Cayo, 2.3km E Santa Cruz, 15/00/54N, 89/39/09W, 290m, VII-14-2001 [PERC].

Remarks.—This species is also known only from south-central Mexico (Randolph and McCafferty 2001).

Camelobaetidium variabilis Wiersema, 1998

New data.—IZABAL: unnamed stream, 2km SW Montúfar, 128m, VII-15-2001 [PERC]. EL PROGRESO: Río Las Pericas, 11km W El Rancho Jct, 14/54/54N, 90/05/52W, 364m, VII-12-2001 [TAMU]. ZACAPA: Río Cayo, 2.3km E Santa Cruz, 15/00/54N, 89/39/09W, 290m, VII-14-2001 [PERC].

Remarks.—This species is also known from northern Mexico, Texas and Oklahoma (Wiersema 1998), and Nebraska (McCafferty et al. 2001).

Camelobaetidium warreni (Traver and Edmunds), 1968

New data.—ALTA VERAPAZ: Río Cahabón, San Julián, 15/19/09N, 90/19/06W, 1645m, VII-14-2001 [PERC]. IZABAL: Río Ciénega, 4.7km S San Miguelito, 55m, VII-16-2001 & Río Juan de Pax, 10km W Los Amates, 140m, VII-15-2001 [PERC]. EL PROGRESO: Río Las Pericas, 11km W El Rancho Jct, 14/54/54N, 90/05/52W, 364m, VII-12-2001 [TAMU].

Remarks.—This species is also known from Costa Rica and Honduras (Lugo-Ortiz and McCafferty 1995b), throughout Mexico (see Randolph and McCafferty 2000, 2001), most western and some plains states in the USA (e.g., Lugo-Ortiz and McCafferty 1995b; McCafferty et al. 2001), and Saskatchewan (McCafferty and Randolph 1998).

Cloeodes excogitatus Waltz and McCafferty, 1987

Previous data.—McCafferty and Lugo-Ortiz (1996): HUEHUETENANGO (Pequeña Quebrada).

Remarks.—This species is also known from Arizona (Waltz and McCafferty 1987), and California, southern and northern Mexico, Oregon and Texas (Waltz et al. 1998, Baumgardner and Wiersema 1999, Randolph and McCafferty 2000, 2001, Wiersema and Baumgardner 2000; McCafferty et al. 2002).

Fallceon fortipalpus Lugo-Ortiz and McCafferty, 1994

New data.—BAJA VERAPAZ: unnamed stream, 0.3km S La Cumbre, 15/00/34N, 90/13/51W, 1274m, VII-12-2001 [PERC].

Remarks.—This species is also known from Costa Rica (Lugo-Ortiz et al. 1994) and northern Mexico (Wiersema and Baumgardner 2000).

Fallceon quilleri (Dodds), 1923

Previous data.—Lugo-Ortiz and McCafferty (1996a): SOLOLÁ (Río Panajachel; Panajachel).

New data.—BAJA VERAPAZ: Río San Jerónimo, San Jerónimo, 15/03/52N, 90/14/03W, 1088m & Río El Estancia, Salamá, 15/05/54N, 90/18/18W, 1050m,

VII-13-2001 [PERC]. IZABAL: Río Juan de Pax, 10km W Los Amates, 140m & unnamed stream, 2km SW Montúfar, 128 m, VII-15-2001 [PERC]. PETÉN: Río Chatalte, Chatalte, 15/59/22N, 89/17/44W, 210m, VII-16-2001 [TAMU]. EL PROGRESO: Río Hato, Magdalena, 14/55/11N, 89/57/56 W, 364m, VII-14-2001 [PERC, TAMU]; Río Las Pericas, 11km W El Rancho Jct, 14/54/54N, 90/05/52W, 364m, VII-12-2001 [PERC]. ZACAPA: Río Cayo, 2.3km E Santa Cruz, 15/00/54N, 89/39/09W, 290m, VII-14-2001 & Río Stainkreec, 0.8km E jct Hwy 9 & 10, Río Hondo, 15/02/23N, 89/35/14W, 210m, VII-15-2001 [PERC].

Remarks.—This ubiquitous species is also known from Belize (McCafferty 1985), Costa Rica and Honduras (Lugo-Ortiz et al. 1994), throughout Mexico (e.g., Randolph and McCafferty 2000, 2001), many western and central states in the USA (e.g., McCafferty et al. 1993, 1997, 2001, 2003), and western and central Canada (e.g., McCafferty and Randolph 1998).

Guajirolus nanus Lugo-Ortiz and McCafferty, 1995d

New data.—IZABAL: unnamed stream, 2km SW Montúfar, 128m, VII-15-2001 [PERC].

Remarks.—This species is also known from Costa Rica (Lugo-Ortiz and McCafferty 1995d).

Lugoiops maya McCafferty and Baumgardner, 2003

Previous data.—McCafferty and Baumgardner (2003): BAJA VERAPAZ (unnamed stream south of La Cumbre).

Remarks.—This extraordinary, and possibly rare, mayfly was only recently discovered in Guatemala (McCafferty and Baumgardner 2003).

Mayobaetis ellenae (Mayo), 1973b

Previous data.—McCafferty and Baumgardner (2003): BAJA VERAPAZ (unnamed stream south of Le Cumbre).

New data.—EL PROGRESO: unnamed stream at Hwy 17, 6.5km S La Cumbre, 14/59/26N, 90/15/37W, 1383m, VII-12-2001 [TAMU].

Remarks.—This species is also known from Costa Rica (Waltz and McCafferty 1985, Flowers and Pringle 1995), and is one of the few Central American species also known from South America (McCafferty 1998) [Ecuador (Mayo 1973b) and Peru as *Baetis* sp. 1 (Berner 1980)].

Moribaetis macaferti Waltz, 1985

Previous data.—Waltz and McCafferty (1985): ESCUINTLA.

New data.—ALTA VERAPAZ: Río Cahabón, San Julián, 15/19/09N, 90/19/06W, 1645m, VII-14-2001 [PERC, TAMU]. BAJA VERAPAZ: unnamed stream, 2.6km S Purulhá, 15/13/34N, 90/13/80W, 1787m, VII-14-2001 [PERC]. EL PROGRESO: Estancia Virgen, VIII-12-1965, JP Spangler (adult) [PERC]. SAN MARCOS: Río Cabuz, 6mi E Mexico-Guatemalan border at Hwy 2, X-24-1968, RK Allen [PERC]. ZACAPA: Río Los Achiotés, 5.6km E Gualán, 189m, VII-15-2001 [PERC].

Remarks.—This species is also known from Costa Rica (Waltz and McCafferty 1985), Honduras (Lugo-Ortiz and McCafferty 1996a), Panama (McCafferty and Lugo-Ortiz 1998), and southern Mexico (Lugo-Ortiz and McCafferty 1994b, 1996a, Randolph and McCafferty 2000, 2001).

Moribaetis salvini (Eaton), 1885

Previous data.—Eaton (1892): ALTA VERAPAZ (Río Panima, Zapote); QUETZALTENANGO (Cerro Zunil).

Remarks.—This species is also known from Costa Rica (Eaton 1885, Waltz and McCafferty 1985) and southern Mexico (Waltz and McCafferty 1985). Recent description of the adult of *M. macaferti* (McCafferty and Lugo-Ortiz 1998) shows the two species to be distinct and substantiates previous records.

EPHEMERIDAE

Hexagenia albivitta (Walker), 1853

Previous data.—Lugo-Ortiz and McCafferty (1996a): ALTA VERAPAZ (Río Polochi).

New data.—PETÉN: Sayaxché, in building, VIII-22-1962, RJ Dysart (adult) [Illinois Natural History Survey].

Remarks.—This species ranges from South America to Mexico (McCafferty 1998) being known also from Costa Rica (McCafferty 1970), Veracruz, Mexico (Lugo-Ortiz and McCafferty 1996a), and throughout much of South America (e.g., Spieth 1941).

Hexagenia mexicana Eaton, 1883

Previous data.—Lugo-Ortiz and McCafferty (1996a): IZABAL (Lago Izabal).

Remarks.—This species is also known from Costa Rica (McCafferty 1970) and southern Mexico (Eaton 1892, Lugo-Ortiz and McCafferty 1996a).

EUTHYPLOCIIDAE

Euthyplocia hecuba (Hagen), 1861

Previous data.—Eaton (1892): GUATEMALA (Aceituno); UNKNOWN DEPARTMENT (San Isidro).

New data.—SANTA ROSA: 29km ENE Jutiapa, III-15-1946, RR Miller (PERC).

Remarks.—This is a Panamerican species, being also known from Belize (Lugo-Ortiz and McCafferty 1996a), Costa Rica (Ulmer 1942), Panama (Lugo-Ortiz and McCafferty 1996a), Mexico (Hagen 1861, Ulmer 1942), and Argentina, Brazil, Colombia, Ecuador, Peru and Venezuela (e.g., see Ulmer 1920b).

HEPTAGENIIDAE

Ecdyonurus bellus (Allen and Cohen), 1977

Previous data.—McCafferty (2004): SOLOLÁ (Panajachel).

New data.—BAJA VERAPAZ: unnamed stream, 2.6km S Purulhá, 15/13/34N, 90/13/80W, 1787m, VII-14-2001 [TAMU].

Remarks.—This species is also known from southern Mexico (Cohen and Allen 1977, McCafferty 2004).

Epeorus metlacensis Traver, 1964

Previous data.—McCafferty (1985): IZABAL (Puerto Barrios).

New data.—BAJA VERAPAZ: unnamed stream, 2.6km S Purulhá, 15/13/34N, 90/13/80W, 1787m, VII-14-2001 [PERC].

Remarks.—This species is also known from Costa Rica (Traver 1964), Honduras (Lugo-Ortiz and McCafferty 1996a), and southern and northern Mexico (Traver 1964, Lugo-Ortiz and McCafferty 1996a, Randolph and McCafferty 2001).

Maccaffertium mexicanum (Ulmer), 1920a

Previous data.—Cohen and Allen (1977): ESCUINTLA? (Río Latoma, Río Negro).

New data.—IZABAL: unnamed stream, 2km SW Montúfar, 128m, VII-15-2001 [PERC].

Remarks.—The pertinent subspecies, *M. m. mexicanum*, is also known from Belize (McCafferty 1984), Costa Rica (McCafferty 1984, Flowers and Pringle 1995), Panama (Flowers and Peters 1981), and Tabasco, Mexico (Ulmer 1920a). *Maccaffertium m. integrum* (McDunnough), however, is well known from eastern and central USA (see Bednarik and McCafferty 1979).

Rhithrogena notialis Allen and Cohen, 1977

Previous data.—Allen and Cohen (1977): SOLOLÁ (Panajachel).

Remarks.—This species is also known from southern Mexico (Allen and Cohen 1977).

ISONYCHIIDAE

Isonychia sicca (Walsh), 1862

Previous data.—Eaton (1892): BAJA VERAPAZ (San Jerónimo).

Remarks.—This species is well known north of Mexico (e.g., Kondratieff and Voshell 1984). It is also known from Belize (Lugo-Ortiz and McCafferty 1996a), Costa Rica (Kondratieff and Voshell 1984), Honduras (Allen and Cohen 1977), and throughout Mexico (Eaton 1892, Allen and Cohen 1977, Kondratieff and Voshell 1984, Lugo-Ortiz and McCafferty 1996a).

LEPTOHYPHIDAE

Ableptemetes dicinctus (Allen and Brusca), 1973

New data.—ZACAPA: Río Stainkreec, 0.8km E jct Hwy 9 & 10, Río Hondo, 15/02/23N, 89/35/14W, 210m, VII-15-2001 [PERC].

Remarks.—This species is also known from Guerrero, Mexico (Allen and Brusca 1973) and Belize (Wiersema and Baumgardner 2000).

Ableptemetes melanobranchus (Allen and Brusca), 1973

Previous data.—Allen and Brusca (1973): ESCUINTLA? (Río Cartago).

New data.—EL PROGRESO: Río Hato, Magdalena, 14/55/11N, 89/57/56W, 364m, VII-14-2001 [TAMU]. ZACAPA: Río Cayo, 2.3km E Santa Cruz, 15/00/54N, 89/39/09W, 290m, VII-14-2001 [PERC].

Remarks.—We doubt this species will prove to be endemic to Guatemala.

Allenhyphes nanus (Allen), 1967

New data.—EL PROGRESO: Río Las Pericas, 11km W El Rancho Jct, 14/54/54N, 90/05/52W, 364m, VII-12-2001 [PERC, TAMU]; Río Hato, Magdalena, 14/55/11N, 89/57/56W, 364m, VII-14-2001 [TAMU]. ZACAPA: Río Cayo, 2.3km E Santa Cruz, 15/00/54N, 89/39/09W, 290m, VII-14-2001 [PERC, TAMU].

Remarks.—This species is also known from Honduras (Allen 1978) and Panama (Allen 1967).

Epiphraodes undatus (Lugo-Ortiz and McCafferty), 1995e

New data.—ZACAPA: Río Cayo, 2.3km E Santa Cruz, 15/00/54N, 89/39/09W, 290m, VII-14-2001 [PERC].

Remarks.—This species is also known from Costa Rica (Lugo-Ortiz and McCafferty 1995e).

Leptohyphes brevisissimus Eaton, 1892

Previous data.—Eaton (1892): ESCUINTLA? (Zapote).

Remarks.—This species is known only from the female adults from Guatemala (Kimmins 1934) and is of dubious status.

Leptohyphes brunneus Allen and Brusca, 1973

Previous data.—Allen (1978): ESCUINTLA? (Río Latoma).

New data.—ALTA VERAPAZ: Río Cahabón, San Julián, 15/19/09N, 90/19/06W, 1645m, VII-14-2001 [TAMU]. BAJA VERAPAZ: Río San Jerónimo, San Jerónimo, 15/03/52N, 90/14/03W, 1088m, VII-13-2001 [TAMU]. EL PROGRESO: Río Las Pericas, 11km W El Rancho Jct, 14/54/54N, 90/05/52W, 364m, VII-12-2001 [PERC].

Remarks.—This species is also known from throughout Mexico (Allen and Brusca 1973, Lugo-Ortiz and McCafferty 1996a, Randolph and McCafferty 2000).

Leptohyphes castaneus Allen, 1967

Previous data.—Allen (1967): SOLOLÁ (Panajachel).

Remarks.—This species is also known from southern Mexico (Lugo-Ortiz and McCafferty 1994b) and Costa Rica (Lugo-Ortiz and McCafferty 1995e).

Leptohyphes musseri Allen, 1967

Previous data.—Allen (1967): SOLOLÁ (Panajachel).

New data.—ALTA VERAPAZ: Río Cahabón, San Julián, 15/19/09N, 90/19/06W, 1645m, VII-14-2001 [TAMU]. BAJA VERAPAZ: Río Montarico Bala Estrella, W Chilasco, 15/06/32N, 90/10/03W, 1670m & Río San Jerónimo, San Jerónimo, 15/03/52N, 90/14/03W, 1088m, VII-13-2001 [PERC]. EL PROGRESO: unnamed stream, 39km W El Rancho Jct, VII-12-2001 [PERC].

Remarks.—This species is also known from Honduras (Allen 1978); it and *L. brunneus* are either very closely related or conspecific.

Leptohyphes peterseni Ulmer, 1920a

Previous data.—McCafferty (1985): IZABAL (Puerto Barrios).

Remarks.—This species is known from Argentina, Bolivia and Brazil (see Ulmer 1920a), and McCafferty (1985) reported numerous adults from seaports in both Guatemala and El Salvador.

Leptohyphes zalope Traver, 1958

Previous data.—Allen (1978): ESCUINTLA? (Río Látoma).

New data.—ALTA VERAPAZ: Río Cahabón, San Julián, 15/19/09N, 90/19/06W, 1645m, VII-14-2001 [PERC]. BAJA VERAPAZ: Río El Estancia, Salamá, 15/05/54N, 90/18/18W, 1050m, VII-13-2001 & unnamed stream, 0.3km S La Cumbre, 15/00/34N, 90/13/51W, 1274m, VII-12-2001 [PERC]. IZABAL: Río Ciénaga, 4.7km S San Miguelito, 55m, VII-16-2001 & Río Juan de Pax, 10km W Los Amates, 140m & unnamed stream, 2km SW Montúfar, 128m, VII-15-2001 [PERC]. GUATEMALA: Río Negro, between Esquintla and Taxisco, X-25-1968 RK Allen [PERC]. EL PROGRESO: Río Hato, Magdalena, 14/55/11N, 89/57/56W, 364m, VII-14-2001 & Río Las Pericas, 11km W El Rancho Jct, 14/54/54N, 90/05/52W, 364m, VII-12-2001 [PERC]. ESCUINTLA: VI-15-1962, GG Musser [PERC]. SAN MARCOS: Río Cabuz, 10km E Guatemala/Mexico border on Hwy 2, 200m, X-24-1968, RK Allen [PERC]; Río Petacalapa, 2km E Guatemala/Mexico border, on Hwy 2, 200m, X-24-1968, RK Allen [PERC]. ZACAPA: Río Los Achiotés, 5.6km E Gualán, 189m, VII-15-2001 & Río Cayo, 2.3km E Santa Cruz, 15/00/54N, 89/39/09W, 290m, VII-14-2001 & Río Stainkreec, 0.8km E jct Hwy 9 & 10, Río Hondo, 15/02/23N, 89/35/14W, 210m & unnamed stream, Gualán, 179m, VII-15-2001 [PERC].

Remarks.—Allen (1978) reported this species under two of its synonyms from the same locale at the Río Látoma in Guatemala. Baumgardner & McCafferty (2000) reviewed the distribution of this polytypic species in Belize, Costa Rica, Guatemala, Honduras, El Salvador, southern and northern Mexico, and the western states of the USA. Randolph and McCafferty (2001) gave additional Mexican records.

Tricorythodes sordidus Allen, 1967

New data.—BAJA VERAPAZ: Río El Estancia, Salamá, 15/05/54N, 90/18/18W, 1050m, VII-13-2001 & Río San Jerónimo, San Jerónimo, 15/03/52N, 90/14/03W, 1088m, VII-13-2001 & unnamed stream, 0.3km S La Cumbre, 15/00/34N, 9/13/51W, 1274m, VII-12-2001 [PERC]. IZABAL: Río Ciénaga at Hwy 13, 4km S Shaila, 15/43/53N, 89/84/44W, 55m, VII-16-2001 [TAMU] & unnamed stream, 2km SW Montúfar, 128m, VII-15-2001 [PERC]. EL PROGRESO: Río Hato, Magdalena, 14/55/11N, 89/57/56W, 364m, VII-14-2001 [PERC, TAMU] & Río Las Pericas, 11km W El Rancho Jct, 14/54/54N, 99/05/52W, 364m, VII-12-2001 [TAMU]. SOLOLÁ: Panajachel, 1550m, VII-21-1962, GG Musser [PERC]; Río Panajachel, ca 1333m, V-15-1972, J Vandermeer [PERC]. ZACAPA: Río Cayo, 2.3km E Santa Cruz, 15/00/54N, 89/39/09W, 290m, VII-14-2001 [TAMU].

Remarks.—This species is also known from Costa Rica (Allen 1967).

Vacupernius packeri (Allen), 1967

Previous data.—Allen (1978): SAN MARCOS (Río Petacalpa).

New data.—BAJA VERAPAZ: Río El Estancia, Salamá, 15/05/54N, 90/18/18W, 1050m, VII-13-2001 [TAMU]. IZABAL: Río Juan de Pax, 10km W Los Amates, 140m, VII-15-2001 [PERC]. EL PROGRESO: Río Hato, Magdalena, 14/55/11N, 89/57/56W, 364m, VII-14-2001 & Río Las Pericas, 11km W El Rancho Jct, 14/54/54N, 90/05/52W, 364m, VII-12-2001 [PERC, TAMU]. ZACAPA: Río Cayo, 2.3km E Santa Cruz, 15/00/54N, 89/39/09W, 290m, VII-14-2001 [PERC,

TAMU]; Río Stainkreec, 0.8km E jct Hwy 9 & 10, Río Hondo, 15/02/23N, 89/35/14W, 210m & unnamed stream, Gualán, 179m, VII-15-2001 [PERC].

Remarks.—This species is also known from Belize (Lugo-Ortiz and McCafferty 1995e), Costa Rica (Flowers and Pringle 1995), Honduras (Allen 1967, 1978), throughout Mexico (Allen 1978, Allen and Murvosh 1987a, Lugo-Ortiz and McCafferty 1996a, Baumgardner 2003), Arizona (Kilgore and Allen 1973, Allen 1978, Gray 1981, Baumgardner 2003), and Texas (Allen 1978, Henry 1986, Baumgardner 2003).

LEPTOPHLEBIIDAE

Choroterpes nervosa (Eaton), 1892

Previous data.—Eaton (1892): ESCUINTLA (Zapote).

Remarks.—This species, which we consider of dubious status, is known only from Guatemalan female adults.

Farrodes texanus Davis, 1987

New data.—IZABAL: unnamed stream, 2km SW Montúfar, 128m, VII-15-2001 [PERC].

Remarks.—This species is also known from Belize (McCafferty and Lugo-Ortiz 1996), northern Mexico (Lugo-Ortiz and McCafferty 1996a), and Texas (Davis 1987).

Thraulodes brunneus Koss, 1966

New data.—BAJA VERAPAZ: Río San Jerónimo, 15/03/52N, 90/14/03W, 1088m, VII-13-2001 [TAMU]. EL PROGRESO: Río Las Pericas, 11 km W El Rancho Jct, 14/54/54N, 90/05/52W, 364m, VII-12-2001 [TAMU].

Remarks.—This species is also known from Honduras (Allen and Brusca 1978, throughout Mexico (see Randolph and McCafferty 2000), and from Arizona and New Mexico (see Lugo-Ortiz and McCafferty 1995f, McCafferty et al. 1997).

Thraulodes eccentricus Lugo-Ortiz and McCafferty, 1996c

New data.—BAJA VERAPAZ: Río El Estancia, Salamá, 15/05/54N, 90/18/18W, 1050m, VII-13-2001 [PERC]. IZABAL: Río Ciénaga, 4.7km S San Miguelito, 55m, VII-16-2001 [PERC]. ZACAPA: Río Los Achiotés, 5.6km E Gualán, 189m, VII-15-2001 [PERC].

Remarks.—This species was previously known only from throughout Mexico (Allen and Brusca 1978, Lugo-Ortiz and McCafferty 1996c, Randolph and McCafferty 2000, 2001).

Thraulodes gonzalesi Traver and Edmunds, 1967

New data.—BAJA VERAPAZ: Río San Jerónimo, San Jerónimo, 15/03/52N, 90/14/03W, 1088m, VII-13-2001 [PERC].

Remarks.—This species is also known from Mexico (Allen and Brusca 1978, Allen and Murvosh 1987b), Texas (Traver and Edmunds 1967), Arizona (Kilgore and Allen 1973, Lugo-Ortiz and McCafferty 1995f), and New Mexico (McCafferty et al. 1997).

Thraulodes grandis Lugo-Ortiz and McCafferty, 1996c

Previous data.—Lugo-Ortiz and McCafferty (1996c): IZABAL (tributary of Río Cahabón).

New data.—IZABAL: Río Ciénaga, 4.7km S San Miguelito, 55m, VII-16-2001 & unnamed stream, 2km SW Montúfar, 128m, VII-15-2001 [PERC].

Remarks.—We doubt this distinctive species will prove to be endemic to Guatemala.

Thraulodes hilaris (Eaton), 1892

Previous data.—Eaton (1892): ALTA VERAPAZ (San Juan Chamelco).

Remarks.—This species is also known from Costa Rica (Ulmer 1920a) and Tabasco, Mexico (Eaton 1892).

Thraulodes humeralis Navás, 1935

Previous data.—Navás (1935): Site unspecified.

Remarks.—This species is also known from Mexico (Navás 1935), but we consider the Guatemalan record tenuous because it is based on a subimago.

Thraulodes pacaya McCafferty, Baumgardner and Guenther, new species

New data.—IZABAL: Río Ciénaga, 4.7km S San Miguelito, 55m, VII-16-2001 & unnamed stream, 2km SW Montúfar, 128m, VII-15-2001 [PERC]. EL PROGRESO: Río Las Pericas, 11km W El Rancho Jct. 14/54/54N, 90/05/52W, 364m, VII-12-2001 [PERC], including the larval HOLOTYPE, and five larval PARATYPES.

Remarks.—This species was previously informally known as *T. sp. C* (Allen and Brusca 1978). Our comparisons of large larval series of many species of Mexican and Central American *Thraulodes* indicate that this is a distinctive and separate species worthy of formal naming. The description given by Allen and Brusca (1978), and in particular figure 24 therein will serve as original descriptors for this species at this time and are here applied as such. The relative narrow elongate gills with indistinct lateral tracheation, along with the narrow, dark, transverse band on the posterior border of middle abdominal terga and the pair of antero-sublateral, approximately right-triangle shaped dark marks on middle abdominal terga are distinctive for *T. pacaya* larvae. The shape and degree of maculation of the antero-sublateral tergal markings referred to above vary slightly among individuals.

The species remains unknown in the adult stage, and larval types are designated in the new Guatemalan data given above. The specific epithet is a noun in apposition after the major active volcano in Guatemala.

Thraulodes pacaya is also known from southern Mexico, Honduras, and Panama (see Allen and Brusca 1978).

Thraulodes packeri Traver and Edmunds, 1967

New data.—EL PROGRESO: Río Hato, Magdalena, 14/55/11N, 89/57/56W, 364m, VII-14-2001 [PERC].

Remarks.—This species is also been known from Belize (McCafferty 1985), Costa Rica (Lugo-Ortiz and McCafferty 1996a), Honduras (Traver and Edmunds 1967, Allen and Brusca 1978), and southern Mexico (Allen and Brusca 1978).

Thraulodes speciosus Traver, 1934

Previous data.—Lugo-Ortiz and McCafferty (1996a): IZABAL (tributary of Río Cahabón).

New data.—IZABAL: Río Juan de Pax, 10km W Los Amates, 140m, VII-15-2001 [PERC].

Remarks.—This species is also known from Mexico (Randolph and McCafferty 2000, 2001), Arizona (Lugo-Ortiz and McCafferty 1995f), and New Mexico (McCafferty et al. 1997).

Traverella promifrons Lugo-Ortiz and McCafferty, 1996c

New data.—ALTA VERAPAZ: Arroyo Santa Rita, 3km N Cahabón, V-10-1995, B Yates [TAMU]. IZABAL: Río Ciénaga, 4.7km S San Miguelito, 55m, VII-16-2001 [PERC, TAMU]; unnamed stream, 2km SW Montúfar, 128m, VII-15-2001 [PERC].

Remarks.—This species is also known from Belize and Costa Rica (Lugo-Ortiz and McCafferty 1996c), and Honduras and northern and southern Mexico (Allen 1973).

OLIGONEURIIDAE

Homoeoneuria salviniae Eaton, 1881

Previous data.—Eaton (1881): Guatemala (no site data). Eaton (1883): GUATEMALA (Aceituno); SACATEPEQUEZ (Dueñas).

Remarks.—This species is also known from southern Mexico (Allen and Cohen 1977).

Lachlania lucida Eaton, 1883

Previous data.—Eaton (1883): Guatemala (no site data).

Remarks.—This species has not been rediscovered since its description.

POLYMITARCYIDAE

Campsurus cuspidatus Eaton, 1871

Previous data.—Eaton (1871): Guatemala (no site data).

Remarks.—This was the first mayfly known from Central America. It is also known from Belize (Lugo-Ortiz and McCafferty 1996a), Nicaragua (McCafferty and Lugo-Ortiz 1992), and Mexico (Traver 1960, McCafferty 1985).

Tortopus unguiculatus (Ulmer), 1920a

Previous data.—Lugo-Ortiz and McCafferty (1996d): ALTA VERAPAZ (Panzós); IZABAL (Río Polochic).

Remarks.—This species is also known from Colombia (Ulmer 1920a), Costa Rica (Ulmer 1942), Honduras (Lugo-Ortiz and McCafferty 1996d), and Nicaragua (Maes 1988).

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LITERATURE CITED

- Allen, R. K. 1967. New species of New World Leptohiphinae (Ephemeroptera: Tricorythidae). *Canadian Entomologist* 99: 350-375.
- Allen, R. K. 1973. Generic revisions of mayfly nymphs. I. *Traverella* in North and Central America (Leptophlebiidae). *Annals of the Entomological Society of America* 66: 1287-1295.
- Allen, R. K. 1978. The nymphs of North and Central American *Leptohyphes* (Ephemeroptera: Tricorythidae). *Annals of the Entomological Society of America* 71: 537-558.
- Allen, R. K. and R. C. Brusca. 1973. New species of Leptohiphinae from Mexico and Central America (Ephemeroptera: Tricorythidae). *Canadian Entomologist* 105: 83-95.
- Allen, R. K. and R. C. Brusca. 1978. Generic revisions of mayfly nymphs. II. *Thraulodes* in North and Central America (Leptophlebiidae). *Canadian Entomologist* 110: 413-433.
- Allen, R. K. and S. D. Cohen. 1977. Mayflies (Ephemeroptera) of Mexico and Central America: new species, descriptions, and records. *Canadian Entomologist* 109: 399-414.
- Allen, R. K. and C. M. Murvosh. 1987a. Mayflies (Ephemeroptera: Tricorythidae) of the southwestern United States and northern Mexico. *Annals of the Entomological Society of America* 80: 35-40.
- Allen, R. K. and C. M. Murvosh. 1987b. Leptophlebiidae of the southwestern United States and northern Mexico (Insecta: Ephemeroptera). *Great Basin Naturalist* 47: 283-286.
- Baumgardner, D. E. 2003. New synonyms and stage descriptions for three species of Leptohiphidae (Ephemeroptera). *Proceedings of the Entomological Society of Washington* 105: 203-208.
- Baumgardner, D. E. and W. P. McCafferty. 2000. *Leptohyphes zalope* (Ephemeroptera: Leptohiphidae): a polytypic North and Central American species. *Entomological News* 111: 49-59.
- Baumgardner, D. E. and N. A. Wiersema. 1999. Additions to the inventory of Texas mayflies (Ephemeroptera). *Entomological News* 110: 70-71.
- Bednarik, A. F. and W. P. McCafferty. 1979. Biosystematic revision of the genus *Stenonema* (Ephemeroptera: Heptageniidae). *Canadian Bulletin of Fisheries and Aquatic Sciences* 210: 1-73.
- Berner, L. 1980. Results of the Catherwood Bolivian-Peruvian altiplano expedition Part I: aquatic insects except Diptera. *Proceedings of the Academy of Natural Sciences of Philadelphia* 132: 187-217.
- Cohen, S. D. and R. K. Allen. 1972. New species of *Baetodes* from Mexico and Central America. *Pan-Pacific Entomologist* 48: 123-135.
- Cohen, S. D. and R. K. Allen. 1978. Generic revisions of mayfly nymphs. III. *Baetodes* in North and Central America (Baetidae). *Journal of the Kansas Entomological Society* 51: 253-269.

- Davis, J. R. 1987. A new species of *Farodes* (Ephemeroptera: Leptophlebiidae) from southern Texas. *Proceedings of the Entomological Society of Washington* 89: 407-416.
- Eaton, A. E. 1881. An announcement of new genera of the Ephemeridae. *Entomologist's Monthly Magazine* 17: 191-197.
- Eaton, A. E. 1883-88. A revisional monograph of recent Ephemeridae or mayflies. *Transactions of the Linnaean Society of London, Zoology* 3: 1-352.
- Eaton, A. E. 1892. *Insecta, Neuroptera, Ephemeridae*. Pages 1-16. *In: Biologia Centrali-Americana*. Bernard Quaritch, London.
- Flowers, R. W. 1987. The adult stage of three Central American *Baetodes* (Ephemeroptera: Baetidae) with notes on the genus. *Aquatic Insects* 9: 1-10.
- Flowers, R. W. and W. L. Peters. 1981. *Stenonema mexicana* (Heptageniidae: Ephemeroptera) in southern Central America. *Entomological News* 92: 52-154.
- Flowers, R. W. and C. M. Pringle. 1995. Yearly fluctuations in the mayfly community of a tropical stream draining lowland pasture in Costa Rica. Pages 131-150. *In: Corkum L. and J. Ciborowski, eds., Current directions in research on Ephemeroptera*. Canadian Scholars' Press, Toronto.
- Gray, L. J. 1981. Species composition and life histories of aquatic insects in a lowland Sonoran Desert stream. *American Midland Naturalist* 106: 229-242.
- Hagen, H. A. 1861. Synopsis of the Neuroptera of North America, with a list of South American species: Ephemeridae. *Smithsonian Institution Miscellaneous Collections* 1861: 33-55.
- Henry, B. C. 1986. Mayflies (Ephemeroptera) of the Concho River, Texas. *Southwestern Naturalist* 31: 15-21.
- Kilgore, J. I. and R. K. Allen. 1973. Mayflies of the Southwest: new species, descriptions, and records (Ephemeroptera). *Annals of the Entomological Society of America* 66: 321-332.
- Kimmins, D. E. 1934. Notes on the Ephemeroptera of the Godman and Salvin collection, with descriptions of two new species. *Annals and Magazine of Natural History* 14: 338-353.
- Kondratieff, B. C. and J. R. Voshell. 1984. The North and Central American species of *Isonychia* (Ephemeroptera: Oligoneuriidae). *Transactions of the American Entomological Society* 110: 129-244.
- Lester, G. T., W. P. McCafferty, and M. R. Edmondson. 2002. New mayfly (Ephemeroptera) records from Idaho. *Entomological News* 113: 131-136.
- Lugo-Ortiz, C. R. and W. P. McCafferty. 1993. Genera of Baetidae (Ephemeroptera) from Central America. *Entomological News* 104: 193-197.
- Lugo-Ortiz, C. R. and W. P. McCafferty. 1994a. The mayfly genus *Acerpenna* (Insecta, Ephemeroptera, Baetidae) in Latin America. *Studies on Neotropical Fauna and Environment* 29: 65-74.
- Lugo-Ortiz, C. R. and W. P. McCafferty. 1994b. New records of Ephemeroptera from Mexico. *Entomological News* 105: 17-26.
- Lugo-Ortiz, C. R. and W. P. McCafferty. 1995a. New species, stage descriptions, and records of *Baetodes* (Ephemeroptera: Baetidae) from Mexico and Central America. *Entomological News* 106: 81-86.
- Lugo-Ortiz, C. R. and W. P. McCafferty. 1995b. Taxonomy of North and Central American species of *Camelobaetidius* (Ephemeroptera: Baetidae). *Entomological News* 106: 178-192.
- Lugo-Ortiz, C. R. and W. P. McCafferty. 1995c. The mayflies (Ephemeroptera) of Texas and their biogeographic affinities. Pages 151-169. *In: Corkum L. and J. Ciborowski, eds., Current directions in research on Ephemeroptera*. Canadian Scholars' Press, Toronto.
- Lugo-Ortiz, C. R. and W. P. McCafferty. 1995d. *Guajirolus nanus* (Ephemeroptera: Baetidae), a new species from Costa Rica. *Entomological News* 106: 68-70.
- Lugo-Ortiz, C. R. and W. P. McCafferty. 1995e. Contribution to the taxonomy of the

- Leptohiphidae (Insecta: Ephemeroptera) of Central America. *Studies on Neotropical Fauna and Environment* 30: 165-176.
- Lugo-Ortiz, C. R. and W. P. McCafferty. 1995f. Annotated inventory of the mayflies (Ephemeroptera) of Arizona. *Entomological News* 106: 131-140.
- Lugo-Ortiz, C. R. and W. P. McCafferty. 1996a. New Central American and Mexican records of Ephemeroptera species. *Entomological News* 107: 303-310.
- Lugo-Ortiz, C. R. and W. P. McCafferty. 1996b. Contribution to the taxonomy of *Callibaetis* (Ephemeroptera: Baetidae) in southwestern North America and Middle America. *Aquatic Insects* 18: 1-9.
- Lugo-Ortiz, C. R. and W. P. McCafferty. 1996c. New species of Leptophlebiidae (Ephemeroptera) from Mexico and Central America. *Annales de Limnologie* 32: 3-18.
- Lugo-Ortiz, C. R. and W. P. McCafferty. 1996d. Central American *Tortopus* (Ephemeroptera: Polymitarcyidae): a unique new species and new country records. *Entomological News* 107: 23-27.
- Lugo-Ortiz, C. R., W. P. McCafferty, and R. D. Waltz. 1994. Contribution to the taxonomy of the Panamerican genus *Fallceon* (Ephemeroptera: Baetidae). *Journal of the New York Entomological Society* 102: 460-475.
- Maes, J. M. 1988. Catálogo de los Ephemeroptera y Plecoptera de Nicaragua. *Revista Nicaragüense de Entomología* 2: 49-50.
- Mayo, V. K. 1973a. Four new species of the genus *Baetodes*. *Pan-Pacific Entomologist* 49: 308-314.
- Mayo, V. K. 1973b. A new species of *Baetis* from Ecuador (Ephemeroptera: Baetidae). *Pan-Pacific Entomologist* 49: 285-288.
- McCafferty, W. P. 1970. Neotropical nymphs of the genus *Hexagenia* (Ephemeroptera: Ephemeridae). *Journal of the Georgia Entomological Society* 5: 224-228.
- McCafferty, W. P. 1984. The relationship between North and Middle American *Stenonema* (Ephemeroptera: Heptageniidae). *Great Lakes Entomologist* 17: 125-128.
- McCafferty, W. P. 1985. New records of Ephemeroptera from Middle America. *International Quarterly of Entomology* 1: 9-11.
- McCafferty, W. P. 1998. Ephemeroptera and the great American interchange. *Journal of the North American Benthological Society* 17: 1-20.
- McCafferty, W. P. 2004. Contribution to the systematics of *Leucrocuta*, *Nixe*, and related genera (Ephemeroptera: Heptageniidae). *Transactions of the American Entomological Society* 130: 1-9.
- McCafferty, W. P. and D. E. Baumgardner. 2003. *Lugoiops maya*, a new genus and species of Ephemeroptera (Baetidae) from Central America. *Proceedings of the Entomological Society of Washington* 105: 397-406.
- McCafferty, W. P. and J. R. Davis. 1992. New and additional records of small minnow mayflies (Ephemeroptera: Baetidae) from Texas. *Entomological News* 103: 199-209.
- McCafferty, W. P. and C. R. Lugo-Ortiz. 1992. Registros nuevos y notas sobre los Ephemeroptera de Nicaragua. *Revista Nicaragüense de Entomología* 19: 1-7.
- McCafferty, W. P. and C. R. Lugo-Ortiz. 1996. Los Ephemeropteros (Ephemeroptera) de América Central. *Revista Nicaragüense de Entomología* 35: 19-28.
- McCafferty, W. P. and C. R. Lugo-Ortiz. 1998. The adult of *Moribaetis macaferti* (Ephemeroptera: Baetidae). *Entomological News* 109: 117-121.
- McCafferty, W. P. and A. V. Provonsha. 1993. New species, subspecies, and stage descriptions of Texas Baetidae (Ephemeroptera). *Proceedings of the Entomological Society of Washington* 95: 59-69.
- McCafferty, W. P. and R. P. Randolph. 1998. Canada mayflies: a faunistic compendium. *Proceedings of the Entomological Society of Ontario* 129: 47-97.
- McCafferty, W. P. and R. D. Waltz. 1986. *Baetis magnus*, new species, formal new name for *Baetis* sp. B of Moriuhara and McCafferty (Ephemeroptera: Baetidae). *Proceedings of the Entomological Society of Washington* 88: 604.

- McCafferty, W. P. and R. D. Waltz. 1990. Revisionary synopsis of the Baetidae (Ephemeroptera) of North and Middle America. *Transactions of the American Entomological Society* 116: 769-799.
- McCafferty, W. P., R. S. Durfee, and B. C. Kondratieff. 1993. Colorado mayflies (Ephemeroptera): an annotated inventory. *Southwestern Naturalist* 38: 252-274.
- McCafferty, W. P., C. R. Lugo-Ortiz, G. Z. Jacobi. 1997. Mayfly fauna of New Mexico. *Great Basin Naturalist* 57: 283-314.
- McCafferty, W. P., T. H. Klubertanz, R. P. Randolph, A. V. Provonsha, H. R. Lawson, and B. C. Kondratieff. 2001. Mayflies (Ephemeroptera) of the Great Plains. I: Nebraska. *Transactions of the American Entomological Society* 127: 5-29.
- McCafferty, W. P., T. Hubbard, T. H. Klubertanz, R. P. Randolph, and M. Birmingham. 2003. Mayflies (Ephemeroptera) of the Great Plains. II: Iowa. *Transactions of the American Entomological Society* 129: 77-105.
- Randolph, R. P. and W. P. McCafferty. 2000. Mexican mayflies: inventory and additions (Ephemeroptera). *Annales de Limnologie* 36: 113-121.
- Randolph, R. P. and W. P. McCafferty. 2001. New species and records of Ephemeroptera (Insecta) from central Mexico. *Dugesiana* 8: 15-21.
- Randolph, R. P. and W. P. McCafferty. 2002. First report of the genus *Tortopus* from Mexico, with additional new records of Mexican Ephemeroptera. *Entomological News* 113: 34-36.
- Spieth, H. T. 1941 Taxonomic studies of the Ephemeroptera. II. The genus *Hexagenia*. *American Midland Naturalist* 26: 233-280.
- Traver, J. R. 1960. Some Mexican and Costa Rican mayflies. *Bulletin of the Brooklyn Entomological Society* 61: 121-131.
- Traver, J. R. 1964. A new species of the subgenus *Iron* from Mexico (Ephemeroptera: Heptageniidae). *Bulletin of the Brooklyn Entomological Society* 59-60: 23-29.
- Traver, J. R. and G. F. Edmunds. 1968. A revision of the Baetidae with spatulate-clawed nymphs (Ephemeroptera). *Pacific Insects* 10: 629-677.
- Ulmer, G. 1920a Neue Ephemeropteren. *Archiv für Naturgeschichte* 85: 1-80.
- Ulmer, G. 1920b. Über die nymphen einiger exotischen Ephemeropteren. *Festschrift für Zschokke* 25: 3-25.
- Ulmer, G. 1942. Alte und neue Eintagsfliegen (Ephemeropteren) aus Süd und Mittleamerika. *Stettiner Entomologische Zeitung* 102: 98-128.
- Waltz, R. D. and W. P. McCafferty. 1985. *Moribaetis*: a new genus of Neotropical Baetidae (Ephemeroptera). *Proceedings of the Entomological Society of Washington* 87: 239-251.
- Waltz, R. D. and W. P. McCafferty. 1987. Revision of the genus *Cloeodes* Traver (Ephemeroptera: Baetidae). *Annals of the Entomological Society of America* 80: 191-207.
- Waltz, R. D., P. Ode, and J. Lee. 1998. *Cloeodes excogitatus* (Ephemeroptera: Baetidae) in northern California. *Entomological News* 109: 215-216.
- Wiersema, N. A. 1998 *Camelobaetidius variabilis* (Ephemeroptera: Baetidae), a new species from Texas, Oklahoma and Mexico. *Entomological News* 109: 21-26.
- Wiersema, N. A. and D. E. Baumgardner. 2000. Distribution and taxonomic contributions to the Ephemeroptera fauna of Mexico and Central America. *Entomological News* 111: 60-66.
- Wiersema, N. A. and W. P. McCafferty. 1999. *Americabaetis* (Ephemeroptera: Baetidae) from Texas: first USA record and adult description of *A. pleturus*. *Entomological News* 110: 36-38.