

MAYFLIES (EPHEMEROPTERA) OF MEXICO AND CENTRAL AMERICA:
NEW SPECIES, DESCRIPTIONS, AND RECORDS¹

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Abstract

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Descriptions and figures of five undescribed species are presented: *Lachlania talea*, *L. iops*, *Epeorus (Iron) packeri*, *Rhithrogena notialis*, and *Heptagenia bella*. *Heptagenia mexicana* Ulmer is tentatively transferred to the genus *Stenonema*, the nymphal stage is described for *Isonychia sicca manca* Eaton and *Homoeoneuria salviniae* Eaton, and new collection records extend the known distributional range of *Dactylobaetis mexicanus* Traver & Edmunds, *D. musseri* Traver & Edmunds, *D. zenobia* Traver & Edmunds, *Isonychia sicca manca*, *Homoeoneuria salviniae*, *Epeorus (Iron) metlacensis* Traver, and *Stenonema mexicana*.

A monograph of the mayflies of Mexico and Central America is in progress, but has been delayed for several reasons: there are a large number of undescribed species involved; the nymphal and adult stages of many described species are unknown; and additional collections are necessary from several areas of this vast geographic region. Since the completion of this study is several years away it seems desirable to publish the names and descriptions of undescribed species, new distributional records of previously described species, and the nymphal stage of species formerly known only from the adult stage. These publications will make this information available to other workers, and will reduce the volume of the final publication. Collection studies were conducted by the senior author in Mexico, Honduras, El Salvador, and Guatemala, and by J. S. Packer, Entomological Society of America, from Honduras. Collections are deposited at California State University, Los Angeles, unless otherwise designated. In accounts dealing with the species, collections made by R. K. Allen are indicated by the initials RKA.

Genus **ISONYCHIA** Eaton

Isonychia was erected in 1871 for the European species *Baetis ignota* (Walker, 1853). Twenty-five species have been described from North America, north of Mexico, and one subspecies, *I. sicca manca*, is also known to occur in Mexico and Central America.

***Isonychia sicca manca* Eaton**

Isonychia manca Eaton, 1871: 34; McDunnough, 1923: 47.

Chirotonetes manca Eaton, 1885: 206.

Chirotonetes sp. Eaton, 1892: 16.

Isonychia sicca manca McDunnough, 1931: 160; Kimmins, 1934: 351.

This subspecies was described from a female imago from Texas and, in 1885, Eaton listed the type locality as West Texas (Belfrage). McDunnough (1931), when he reduced *I. manca* to subspecific rank, stated, "The name was based on a female specimen from Texas, collected by Belfrage, probably in Bosque Co. (pronounced Boskee)". Gustave W. Belfrage moved to Clifton, Bosque Co., Texas in 1870, moved to Norse (7 miles west of Clifton) in 1879, and died in 1882. Bosque County is in east-central Texas and the Bosque River runs through the town of Clifton. This is the only major river in the Clifton-Norse area, and numerous nymphs of *I. sicca manca* were collected from the river in Clifton. This does not establish the specific source of Eaton's type specimen, however it narrows the possible type locality to a single river.

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Eaton (1885) also reported specimens of this species from Montana, but the known distribution of *I. sicca* suggests that these specimens are probably *I. sicca campestris* McDunnough, described from Alberta, and known from Saskatchewan and Manitoba. In 1892, Eaton published records of *Isonychia* sp., as *Chirotenetes*, from Guatemala, and Sonora, Vera Cruz, and Tabasco, Mexico, and this material was later identified by Kimmins (1934) as *I. sicca manca*. McDunnough (1931) records specimens of *I. sicca manca* from Lawrence, Kans., and Traver (1935) lists records from Manhattan, Kans., and Austin, San Angelo, and College Station, Texas. Additional nymphal collections, associated as this subspecies, from Honduras, extend the known latitudinal range from Manhattan, Kans. (39°11' N. L.) south to near Tegucigalpa (14°05' N. L.). A description and figure of the previously undescribed nymph are included in the following treatment.

Nymph. Length: body 15–17 mm; caudal filaments 10–11 mm. General color brown with white and dark brown markings; head brown with pale coronal suture; median carina between antennae. Thoracic nota brown with pale markings; pronotum brown with pale markings; metanotum brown with pale median stripe (Fig. 1); thoracic sterna white; legs brown with pale markings; femora brown with pale basal, median, and apical transverse bands; tibiae brown with pale basal and apical transverse bands; tarsi brown with pale apical band; tarsal claws with 10–11 marginal denticles. Abdominal terga brown with white and dark brown markings; terga 1–9 brown with median white longitudinal stripe. Occasionally flanked by dark brown longitudinal streaks; tergum 10 dark brown with white anterior transverse band and thin median longitudinal stripe (Fig. 1); segments 8–9 with well-developed posterolateral projections; abdominal gills pale; lamellate portion pale with brown median chitinized streak and posterior margin fringed with small spines (Fig. 1); abdominal sterna brown with pale markings; sterna 1–9 brown with 2 pairs submedian pale dots and paired brown sublateral dots; sternum 10 brown. Caudal filaments brown.

NEW RECORDS. HONDURAS. **Comayagua:** River N. Taulabe on Highway 1, 20-X-64, J. S. Packer. **El Paraiso:** Rio Yeguaré, Escuela Agrícola Panamericana, 26-X-64, J. S. Packer; stream 38 km E. Zamorano on Highway 4, 31-X-64, J. S. Packer. **Olancho:** W. Campemento Galera turnoff on Highway 3, 7-XI-64, J. S. Packer; small stream 45 mi E. Junction Highway 3 and Salama Road, 6-XI-64, J. S. Packer; small stream 1 mi W. Campemento on Highway 2, 7-XI-64, J. S. Packer, above specimens in collection University of Utah. MEXICO. **Nuevo Leon:** Rio Sabinas at Villa Idama, 4-VIII-70, RKA. **San Luis Potosi:** Rio Axtla at Comoco, 9-VII-66, RKA. **Tamaulipas:** Rio Corona, N. Ciudad Victoria, 25-XI-68, RKA; Rio Purificacion nr. Hidalgo, 25-XI-68, RKA.

BIOLOGY. Nymphs were collected in July and August at elevations between 1200 and 1500 ft from streams with water temperatures between 80° and 84°F. Those collected in November, at the same elevations (1200–1400 ft), were in water with temperatures between 70° and 74°F.

Genus *DACTYLOBAETIS* Traver & Edmunds

The genus was described and named in 1968, based on *D. warreni* and 12 other species. *Dactylobaetis warreni* and *D. cepheus* were described from western North America; five species, *D. arriaga*, *D. chiapas*, *D. jenseni*, *D. mexicanus*, and *D. musseri* from Mexico; *D. zenobia* from Honduras; and five species from South America. Recent collections from Mexico and Central America have extended the known distributional ranges of *D. mexicanus*, *D. musseri*, and *D. zenobia*.

Dactylobaetis mexicanus Traver & Edmunds

Dactylobaetis mexicanus Traver & Edmunds, 1968: 662.

This species was named from nymphs collected from Tamaulipas, and other types were recorded from Nuevo Leon, and Vera Cruz, Mexico. Nymphs from additional Mexican localities have been examined by the authors, and the known latitudinal distribution of *D. mexicanus* is from Nuevo Leon (26°27' N. L.) to Chiapas (16°52' N. L.).

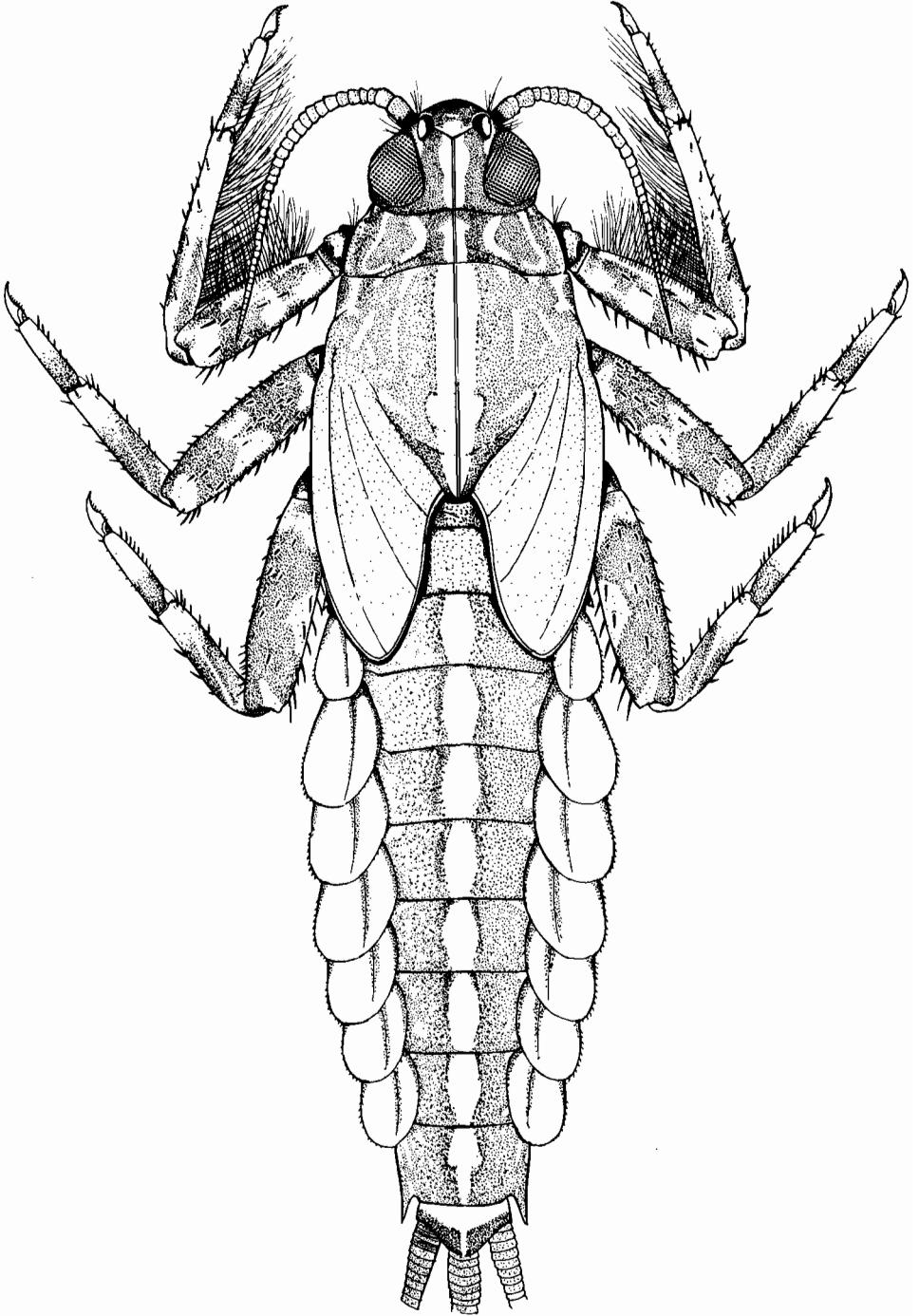


FIG. 1. *Isonychia sicca manca*, mature nymph, dorsal view.

NEW RECORDS. MEXICO. **Chiapas:** Rio Teapa nr. Ishuatan, 18-VII-66, RKA. **Guerrero:** Rio Balsas between Iguala and Chilpancingo on Highway 95, 16-XI-68, RKA. **Jalisco:** Stream at Hacienda Guadalupe, 17-X-68, RKA; Rio La Pasion at Tizapan El Alto, 16-X-68, RKA. **Morelos:** Rio Cuautla at Cuautla, 13-XI-68, RKA; stream 7 mi S. Cuemauaca, 14-XI-68, RKA; Rio Amacuzac at Huajintlan on Highway 95, 14-XI-68. **Nuevo Leon:** Rio Pilon at Montemorelos, 5-VIII-70, RKA; Rio Salinas at Cienega de Flores, 4-VII-66, RKA; Rio Sabinas at Villaldama, 4-VIII-70, RKA; Rio Sabinas at Sabinas Hidalgo, 4-VII-66, RKA. **Oaxaca:** Stream 15 mi N. Ayoquizco, 20-X-68, RKA; Rio Camacho at Linares, 5-VIII-70, RKA. **Tamaulipas:** Rio Corona N. Ciudad Victoria, 25-XI-68, RKA; Rio Purificacion nr. Hidalgo, 25-XI-68, RKA; Rio San Marcos at Ciudad Victoria, 24/25-XI-68, 6-VIII-70, RKA. **Vera Cruz:** Rio Jamapa 3 mi SE Coscomatepec, 14-VII-66, 8-XI-68, RKA; Piedras Negras at Piedras Negras nr. Poza Rica, 12-XI-68, RKA. **Zacatecas:** Rio Juchipila at Santo Rosa, 18-X-68, RKA; Rio Juchipila at Juchipila, 18-X-68, RKA.

REMARKS. The range of *D. mexicanus* closely coincides with that of *D. musseri* and nymphs of both species have been collected from the same habitat. Mature nymphs have been collected during the summer in July and August, and during the winter in October and November which suggests that adults may emerge the year around. This species occurs in streams between 650 and 6700 ft with water temperatures between 54° and 84°F.

Dactylobaetis musseri Traver & Edmunds

Dactylobaetis musseri Traver & Edmunds, 1968: 663.

The type material on which this species is based was collected in Vera Cruz, Mexico and Guatemala. Collections from additional localities in Mexico and Central America extend the known latitudinal distribution from Nuevo Leon (24°82' N. L.) to Honduras (13°40' N. L.).

NEW RECORDS. EL SALVADOR. Stream at Ciudad Arce, 31-X-68, RKA. GUATEMALA. Rio Cabuz, 6 mi E. Guatemala/Mexico border on Highway 2, 24-X-68, RKA; Rio Loma at km 182 on Highway 2, 24-X-68, RKA; Rio Negro between Esquintla and Taxisco, 25-X-68, RKA. HONDURAS. Stream 22 mi S. Tegucigalpa, 29-X-68, RKA; Rio Clarrita at San Morano on Highway to Escuela Agricola Panamericana, 29-X-68, RKA; Rio Pespire at Jicaro Galan, 30-X-68, RKA. MEXICO. **Chiapas:** Rio Laventa, 10 mi E. Cintalapa on Highway 190, 20-VII-66, RKA; Rio Sesecapa nr. Mapastepec on Highway 200, 18-VII-66, RKA; stream 7 mi N. Arriaga on Highway 190, 20-VII-66, RKA; Rio Sanaterco at Tonalá on Highway 200, 20-VII-66, RKA; stream at Santa Isabel above Arriaga on Highway 190, 23-X-68, RKA. **Guerrero:** Trib. Rio Papagayo nr. Tierra Colorado, 16-XI-68, RKA; Rio Papagayo on Highway 96, 16-XI-68, RKA. **Jalisco:** Stream at Hacienda Guadalupe, 17-X-68, RKA; Rio La Pasion at Tizapan, 16-X-68; stream 9 mi S. Rio Grande de Santiago, 17-X-68, RKA. **Morelos:** Rio Amacuzac at Huajintlan on Highway 95, 14-XI-68, RKA; Rio Cuautla at Cuautla, 13-XI-68, RKA. **Nuevo Leon:** Rio Camacho at Linares, 5-VIII-70, RKA. **Oaxaca:** Rio Grande, 3 mi S. Gualatao, 6-XI-68, RKA; Stream 6 mi N. Oaxaca, 22-X-68, RKA. **San Luis Potosi:** Rio Axtla at Conoco, 28 mi N. Tamazunchale, 9-VII-66, RKA. **Vera Cruz:** Rio Jamapa, 3 mi NE Coscomatepec, 14-VII-66, 8-XI-68, RKA; Rio Carranza, 20 mi S. Nautla, 10-XI-68, RKA; stream 5 mi S. Ciudad Mendoza, 7-XII-68, RKA.

REMARKS. The nymphs of *D. musseri* were collected from the same streams and during the same months as *D. mexicanus*. Specimens have been found between sea-level and 4600 ft elevation and in water with temperatures between 64° and 86°F.

***Dactylobaetis zenobia* Traver & Edmunds**

Dactylobaetis zenobia Traver & Edmunds, 1968: 651.

This species was described from adults and nymphs from Honduras, and collection records suggest that the population may be restricted to this country.

NEW RECORDS. HONDURAS. **Olancho:** Rio Juticalpa, 10 mi W. Juticalpa, 6-XI-64, J. S. Packer; Rio Clarrita at San Morano on Highway to Escuela Agrícola Panamericana, 29-X-68, RKA; Rio Choluteca at Tegucigalpa, 29-X-68, RKA.

Genus **HOMOEONEURIA** Eaton

The genus was erected in 1881 for *H. salviniae* and only three species have been described to date. Spieth (1938) described and named *H. ammophila*, as *Oligoneuria*, from Indiana and Edmunds, Berner, and Traver described and named *H. dolani* from Georgia in 1958.

***Homoeneuria salviniae* Eaton**

Homoeneuria salviniae Eaton, 1881: 192; 1892: 3.

This species was described from a female imago collected in Guatemala. Immature nymphal specimens collected from southern Mexico are assigned as this species, and described below, on the basis of geographic proximity of the populations and their geographic isolation from other known species.

Nymph. Length: body 12–14 mm; caudal filaments 2.5–3.5 mm. General color pale with reddish-brown markings. Head pale; vertex mottled with light brown; small blunt median carina between antennal bases; maxillary gills white. Thoracic nota pale with reddish-brown markings; pronotum pale; posterolateral area extending as broad lobe-like projection posterior to fore legs; mesonotum pale with reddish-brown marking at median posterior margin and wing bases; legs pale, often with brown longitudinal streak; legs covered with long setae; fore coxa $\frac{3}{4}$ as long as femora, inner margin fore femora and fore tibia bearing long setae; middle coxae, trochanters, femora, tibiae, and tarsi subequal in length; tarsal claw slender; hind coxae longer than femora; hind tarsal claw long and slender. Abdominal terga pale with reddish-brown markings; terga 1–2 pale; terga 3–9 pale with dark reddish-brown posterolateral corners and marginal band; tergum 10 pale; terga 8–9 with small posterolateral projections; terga covered with short pale setae; abdominal gills pale; gill 1 with large white fibrilliform portion; gills 2–7 lanceolate, long setae on inner margin, short spines on outer; abdominal sterna pale; sterna 2–9 covered with long setae. Caudal filaments pale.

NEW RECORDS. MEXICO. **Chiapas:** Rio Laventa, 10 mi E. Cintalapa on Highway 190, 20-VII-66, RKA.

Genus **LACHLANIA** Hagen

The genus was described in 1868 based on the female imago of *L. abnormis* collected in Cuba. In 1883, Eaton described *L. lucida* from male and female imagos and listed the species "habitat" as Guatemala and Central America. Navas, in 1924, described and named *L. fusca*, as *Noyopsis*, from female imagos collected in Costa Rica. Collections of nymphs and a female imago of two species of *Lachlania*, from southern Mexico and Honduras, cannot be assigned to either of the above-mentioned species and are herein described and named as new.

***Lachlania talea* n. sp.**

A nymph and female imago, collected from different localities in Honduras, are associated as the same species on the basis of the bar-like markings on the abdominal terga of the nymph and female imago.

Nymph. Length: body 14–15 mm; caudal filaments broken. General color dark brown with light markings. Head dark brown; maxillary gills dark gray. Thoracic nota dark brown; pronotum brown with darker median and sublateral markings; mesonotum brown with darker median markings; mesothorax with 2 lateral projections, anterior projection small and rounded, posterior projection slightly larger and truncate

(Fig. 3); thoracic sterna brown; meso- and metasternum with anterior sublateral spines; metasternum with small dark spines on posterior margin; legs brown; fore femora and fore tibia with long setae and spines on inner margin; middle and hind femora with 9-11 stout spines and numerous small spines on inner margin; tarsal claws red apically; claws with large subbasal and small submedian denticules. Abdominal terga dark brown with light markings; tergum 1 dark brown with paired anterior submedian half-moon maculae and brown posterior margin; terga 2-8 dark brown with pale median longitudinal line and 2 pairs submedian horizontal bar-like maculae; terga 9-10 brown with pale posterior margins (Fig 2); posterolateral projections on terga 2-8 well developed; projections on tergum 9 small; projections on tergum 1 barely discernible (Fig. 2); abdominal gills gray; abdominal sterna brown, darker laterally; sterna 1-7 with row short dark spines near posterior margin, 1-3 paired submedian spines on segment 7. Caudal filaments brown.

Female adult. Length: body 9-10 mm; caudal filaments 5-6 mm; fore wing 10 mm. Thoracic nota brown. Wings light brown; venation light brown. Abdominal terga brown with pale markings; tergum 1 brown; terga 2-7 brown with pale midline and paired submedian horizontal bars as in Fig. 2; terga 8-10 brown; abdominal sterna light brown. Caudal filaments pale.

TYPES. Holotype: mature nymph, stream 8 km E. Danli, Dept. El Paraiso, Honduras, 29-VIII-64, J. S. Packer, in collection University of Utah, Salt Lake City. Paratype: female adult, Escuela Agricola Panamericana, Dept. El Paraiso, Honduras, 26-X-64, J. S. Packer, in collection University of Utah, Salt Lake City.

REMARKS. The nymph and female imago of *L. talea* can be distinguished from other Mexican and Central American *Lachlania* by size and color characters. This species possesses distinctive bar-like markings on the abdominal terga of both the nymph and associated female imago (Fig. 2). Eaton (1883) describes the body of the male and female imagos of *L. lucida* as "fuscous, broadly annulated with white near joinings". Navas (1924) states that the body of *L. fusca* is brownish red, and the abdomen gray below. The description of the latter species is inadequate and it is uncertain that future collections can ever be placed as this species.

The female imago of *L. talea* is smaller than those of the other described species as follows:

	<i>L. lucida</i>	<i>L. fusca</i>	<i>L. talea</i>
Body	11-12 mm	12-13 mm	9-10 mm
Fore wing	11 mm	14-15 mm	10 mm
Caudal filaments	7 mm	9-10 mm	5-6 mm

The nymphs reported by Needham and Murphy (1924) from Guatemala and tentatively assigned as *L. lucida*, are extremely large with body and caudal filament lengths of 25 mm and 12 mm, respectively. Size alone would suggest that these specimens are representatives of an undescribed population.

Lachlania iops n. sp.

Nymph. Length: body 9-11 mm; caudal filaments 7-8 mm. General color light brown to brown with dark markings. Head light brown; coronal suture brown; area between ocelli dark; maxillary gills light gray. Thoracic nota light brown; pronotum light brown with dark longitudinal median and sublateral streaks; mesonotum light brown with dark median area; mesothorax with 2 lateral projections, anterior projection small and blunt, posterior projection well developed and sharp (Fig. 4); thoracic sterna light brown; meso- and metasternal sclerites tipped with small dark spines; legs light brown with brown apices; fore femora and fore tibia with long setae and spines on inner margin; middle and hind femora with 5-6 stout spines, and numerous small spines on inner margin; tarsal claws red apically; claws with large subbasal and 2-3 small median denticles. Abdominal terga light brown to brown with darker brown markings; terga 1-9 with median macula, often absent on tergum 10; maculae diamond-shaped on middle segments, and often with pale median longitudinal line on segments 3-4 (Fig. 5); abdominal gills pale; abdominal sterna pale; sterna 1-8 with row short dark spines near posterior margin; sternum 8 with 2 paired submedian spines. Caudal filaments light brown.

TYPES. Holotype: mature male nymph, Rio Chiapa at Chiapa de Corzo, Chiapas, Mexico, 19-VII-66, RKA, in collection California Academy of Sciences, San

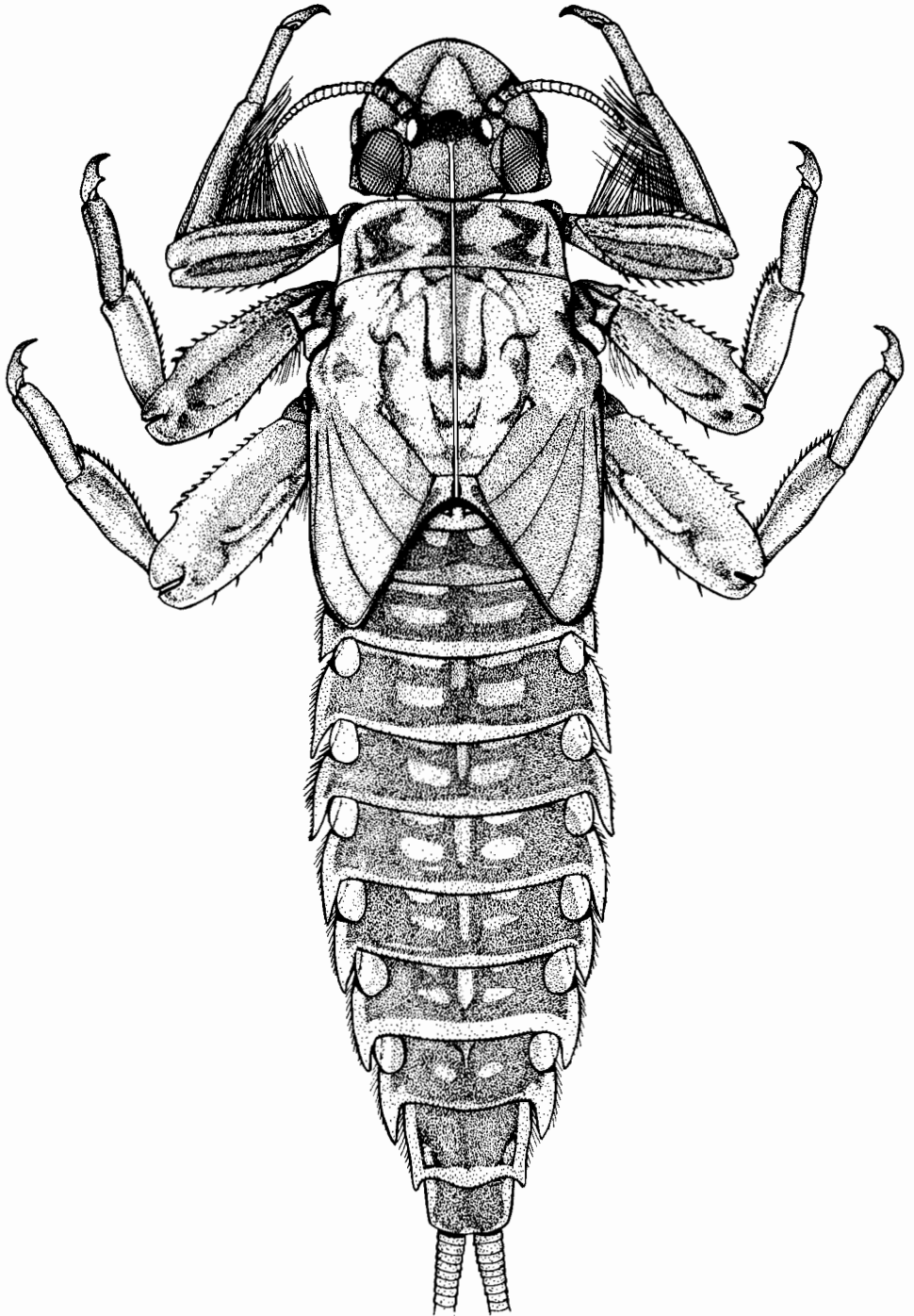


FIG. 2. *Lachlania talea*, mature nymph, dorsal view.

Francisco. Paratopotypes: 32 nymphs, same data as holotype, 2 nymphs each in following collections: Academy of Natural Sciences of Philadelphia; California Academy of Sciences, San Francisco; Canadian National Collection, Ottawa; Florida A. & M. University, Tallahassee; and Smithsonian Institution, Washington, D.C. Paratypes: 2 female nymphs, Rio Sesecapa nr. Mapastepec on Highway 200, Chiapas, Mexico, 20-VII-66, RKA; 1 male and 24 female nymphs, Rio Laventa, 10 mi E. Cintalpa on Highway 99, Chiapas, Mexico, 20-VII-66, RKA; 2 male, 70 female nymphs, Rio Mactesuma at Tamazunchale, San Luis Pototsi, Mexico, 9-VII-66, RKA.

REMARKS. This is the first species of the genus to be described from Mexico and Central America from only the nymphal stage. This species is characterized by possessing median brown markings on the middle abdominal terga. It is distinguished from the nymph of *L. talea* by these color characters, by the degree of development of the posterolateral mesothoracic projections, by size, and by possessing small spines on abdominal sternum 8. The posterolateral mesothoracic projections are well developed and sharp in *L. iops* (Fig. 4), and small and blunt in *L. talea* (Fig. 3). The body of the former species is also smaller than the latter. If nymphal color characters carry over to the imago, as in *L. talea*, then it is presumed that the specimens upon which this species is based will not be found to be the nymphal stage of either *L. lucida* or *L. fusca*.

Genus **EPEORUS** Eaton

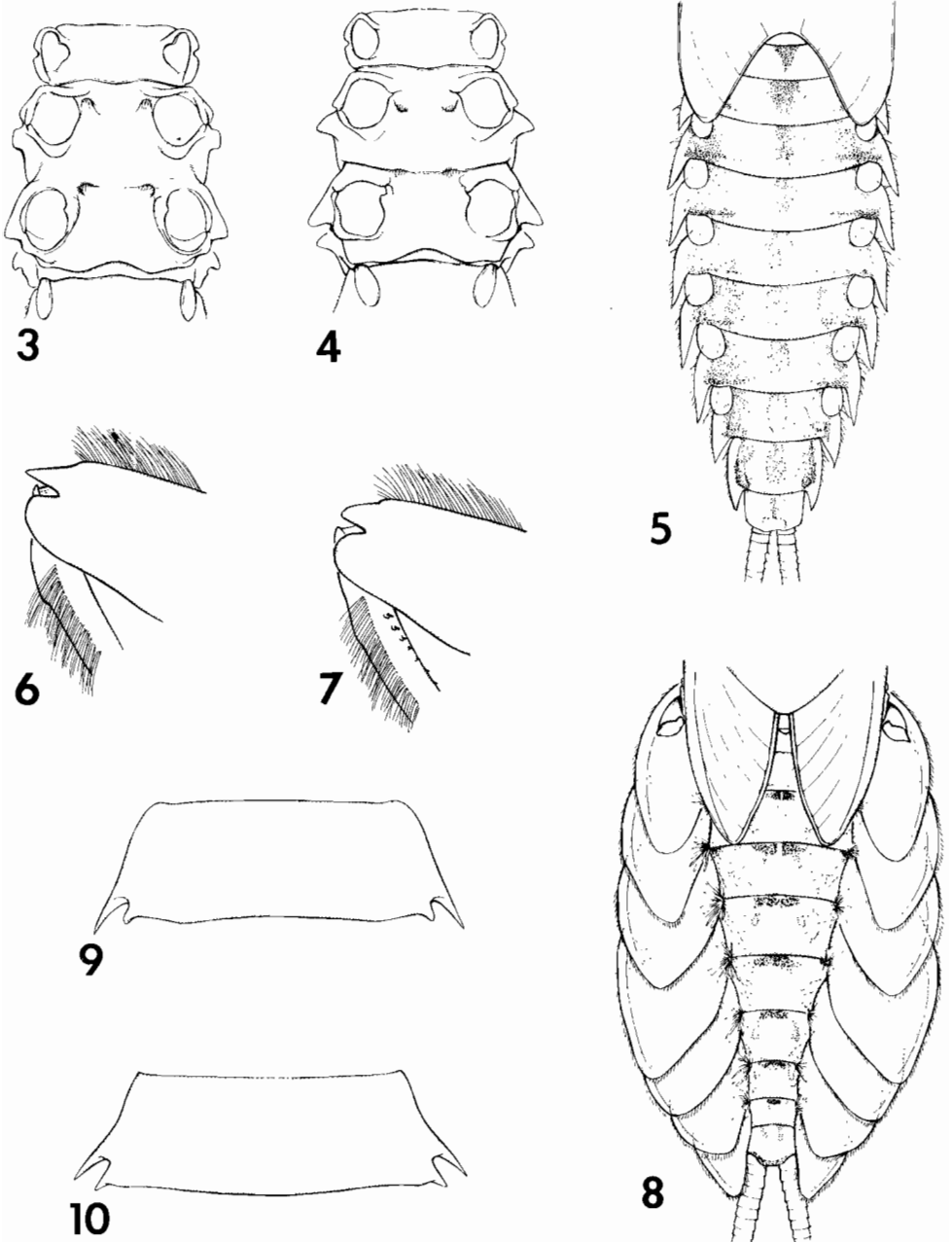
Epeorus was described in 1881 based upon nymphs and adults of *E. torrentium* from France. *Iron* was erected as a genus by Eaton (1883) for *I. longimanus* from Colorado, and Burks (1953) reduced the taxon to subgeneric rank. The subgenus *Iron* currently includes 17 species from Canada and the United States, and one species, *E. metlacensis* Traver, from southern Mexico. Collections from Mexico and Central America reveal new records of *E. metlacensis* and an undescribed species from Honduras.

Epeorus (Iron) metlacensis Traver

Iron metlacensis Traver, 1964-65: 23.

This species was described and named from adults and nymphs collected in Metlac (Vera Cruz?), Mexico, and nymphs from San Jose, 12 mi N. San Isidro del General (Pan American Highway), Costa Rica, were also identified as this species. The known distributional range is Morelia (19°40' N. L.), Michoacan, Mexico to San Isidro del General (9°28' N. L.), Costa Rica. Nymphs collected in Mexico compare favorably with Traver's nymphal description, and are identical with a nymphal collection labeled "Metlac, Mexico, XII-26-40, L. Berner", the same locality and date as the type material.

Nymph. Length: body 15-17 mm; caudal filaments 13-14 mm. General color light brown to brown with dark brown markings. Head brown with pale and dark brown markings; anterior margin head fringed with setae; vertex dark. Thoracic nota light brown to brown with dark markings; pronotum light brown with dark markings and dark anterior margin, lateral margins nearly parallel; mesonotum brown with dark midline and variable dark markings; thoracic sterna pale, legs brown with pale and dark markings; femora brown, pale mesally with dark submedian macula and brown freckling; femora fringed with long setae; femoral apex well developed and blunt, not extending beyond femorotibial joint (Fig. 7); tibia with row heavy setae and blunt spines; tarsi brown; tarsal claw with 4 marginal denticles near apex. Abdominal terga brown with dark markings; tergum 1 with anterior median dark dot and dark posterior margin; terga 2-8 with dark median triangular macula, triangle base on anterior margin (Fig. 11); tergum 9 with anterior dark dot and median longitudinal dark line; tergum 10 brown; abdominal terga with median row sparse setae; posterolateral spines on middle abdominal segments well developed, not extending beyond posterior margin (Fig. 10); gills reddish brown, pale at margins, fibrilliform portion dark; abdominal sterna pale, often with reddish-brown median stripe. Caudal filaments brown.



FIGS. 3-10. 3, *Lachlania talea* thorax, ventral view. 4-5, *L. iops*: 4, thorax, ventral view; 5, abdomen, dorsal view. 6, *Epeorus (Iron) packeri*, apex of femur. 7, *E. (Iron) metlacensis*, apex of femur. 8-9, *E. (Iron) packeri*: 8, abdomen, dorsal view; 9, fourth abdominal segment. 10, *E. (Iron) metlacensis*, fourth abdominal segment.

NEW RECORDS. MEXICO. **Michoacan:** Stream 9 mi E. Morelia on Highway 15, 5-VIII-66, RKA. **Morelos:** Rio Amacuzac at Huanjintlan on Highway 95, 14-XI-68, RKA. **Oaxaca:** Rio Grande 3 mi S. Gualatao, 6-VII-66, 8-XI-68, RKA; Rio Atoyac at Ayoquezco, 22-X-68, RKA. **Vera Cruz:** Rio Jamapa 3 mi NE Coscomatepec, 14-VII-66, 8-XI-68, RKA; stream 5 mi S. Ciudad Mendoza, 7-XI-68, RKA; Rio Tecolapan nr. Santiago Tuxtla on Highway 80, 16-VII-66, RKA; Rio San Marcos at Apapantilla, 3 mi SE Villa A. Camacho, 12-XI-66, RKA.

BIOLOGY. The species was collected in July and August at elevations between 4600 and 6400 ft from streams with a water temperature of 64°F. In November nymphs were collected at elevations between 700 and 5100 ft in streams with water temperatures between 60° and 66°F.

***Epeorus (Iron) packeri* n. sp.**

Nymph. Length: body 13–14 mm; caudal filaments broken. General color pale to light brown with dark brown markings. Head pale with light brown markings between ocelli and vertex; anterior head margin fringed with short setae. Thoracic nota light brown with brown markings; pronotum and mesonotum light brown with indistinct brown markings; thoracic sterna pale; legs light brown with brown markings; femora brown, pale mesally with dark submedian macula and brown spots; femora fringed with long setae; femoral apex well developed and sharp, extending beyond femerotibial joint (Fig. 6); tibiae with setae and double row small blunt spines on ventral margin; tarsal claws with 4 denticles near apex. Abdominal terga light brown with brown and dark brown markings; tergum 1–2 light brown; terga 3–9 light brown with dark anterior median macula, and often paired submedian brown "circles" (Fig. 8); terga 3–4 with pale median stripe separating brown macula; tergum 10 brown, usually dark brown posterior margin; posterolateral projections well developed on middle terga, extending beyond posterior margin (Fig. 9); gills pale, suffused with brown, and with short marginal setae; fibrilliform portion gray; abdominal sterna pale. Caudal filaments broken.

TYPES. Holotype: mature nymph, small stream 45 mi E. Jct. Highway 3 and Salama Rd., Dept. Olancho, Honduras, 6-XI-64, J. S. Packer, in collection University of Utah, Salt Lake City. Paratopotypes: 2 nymphs, same data as holotype, in collection University of Utah. Paratypes: 1 nymph, small stream nr. Santa Maria, Dept. El Paraiso, Honduras, 3-IX-64, J. S. Packer; 1 nymph, Cerro Punta, Panama, 13-XI-63, no other data; 1 nymph, Rio Yeguaré, Escuela Agrícola Panamericana, Dept. El Paraiso, Honduras, 26-X-64, J. S. Packer, in collection California State University, Los Angeles, other paratypes in collection University of Utah.

REMARKS. Nymphs of *E. packeri* are distinguished from *E. metlacensis* by abdominal color characters (Figs. 8, 11), by the degree of development of the apical femoral flange (Figs. 6–7), and the degree of development of the posterolateral projections on the middle abdominal segments (Figs. 9–10).

Genus **RHITHROGENA** Eaton

Rithrogena was erected in 1881 for *Baetis semicolorata* (Curtis, 1834) from Europe, and 21 species have since been described from North America north of Mexico. Nymphal collections from central and southern Mexico included specimens of an undescribed species which is the first record of the genus from Mexico.

***Rhithrogena notialis* n. sp.**

Nymph. Length: body 10–11 mm; caudal filaments 8–9 mm. General color light brown with brown markings. Head brown, pale around ocelli; frontal and coronal sutures pale; head widest at middle. Thoracic nota brown with pale markings; pronotum brown with pale midline; mesonotum brown with pale median and sublateral markings; thoracic sterna pale; legs light brown; femora brown with large pale macula extending from base to median area, smaller dark submedian maculae, and dark freckling within pale macula (Fig. 12); tibiae light brown with row short ventral spines; tarsal claws with 3 marginal denticles. Abdominal terga yellow-brown to brown; terga 1–7 brown, often darker at anterior and lateral margins; terga 8–9 brown with lighter posterior margins; tergum 10 dark brown (Fig. 12); abdominal gills white, suffused with brown near dorsal margin; lamellar portion with "ruffled" margins; abdominal sterna usually pale, darker in mature specimens. Caudal filaments pale.

TYPES. Holotype: mature female nymph, stream 7 mi S. Chalco, Mexico D. F., Mexico, 20-X-68, RKA, in collection California Academy of Sciences, San Francisco. Paratopotypes: 71 nymphs, same data as holotype, 2 nymphs in each of the following collections: Academy of Natural Sciences of Philadelphia; California Academy of Sciences, San Francisco; Canadian National Collection, Ottawa; Florida A. & M. University, Tallahassee; Smithsonian Institution, Washington, D.C.; and University of

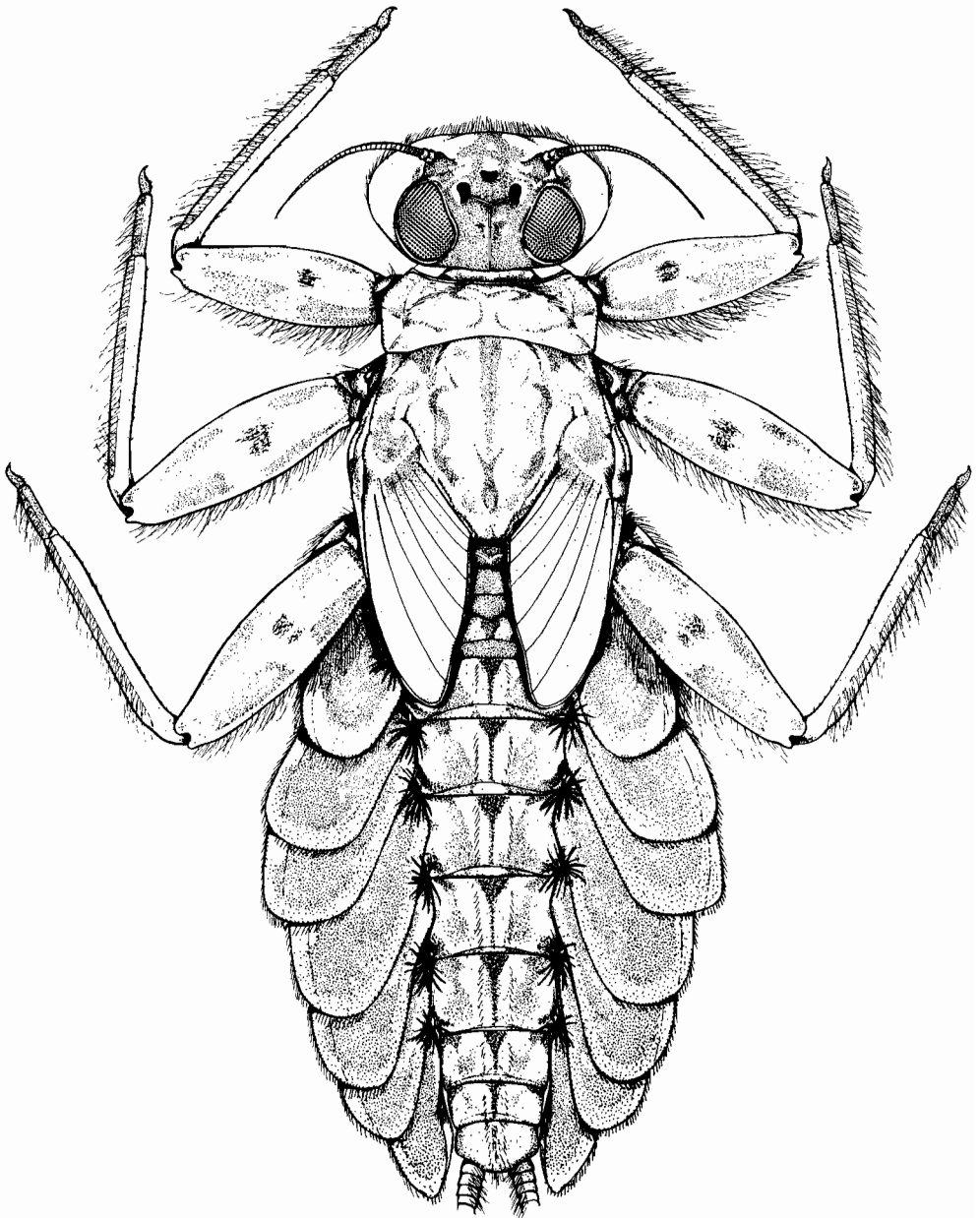


FIG. 11. *Epeorus (Iron) metlacensis*, mature nymph, dorsal view.

Utah, Salt Lake City. Paratypes: 1 nymph, Rio Turundeo at Turundeo on Highway 15 nr. Tuxpan, Michoacan, Mexico, 4-VII-66, RKA; 10 nymphs, Rio Grande 3 mi S. Gualatao, Oaxaco, Mexico, 6-XI-68, RKA; 1 nymph, Rio Jamapa 3 mi NE Coscomatepec, Vera Cruz, Mexico, 8-XI-68, RKA; 35 nymphs, stream at Oaxaca, Oaxaca, Mexico. 28-VII-66, RKA; 30 nymphs, Solola Panajachel, Guatemala, 21-VIII-62, G. G. Musser, in collection University of Utah.

BIOLOGY. This species was collected in July at elevations between 4600 and 6100 ft, and from streams with water temperatures between 61° and 65°F. In October and November nymphs were collected from streams between 5100 and 6700 ft elevation with water temperatures between 54° and 64°F.

Genus **HEPTAGENIA** Walsh

The genus was erected in 1862 for *H. flavescens* from Illinois, and 34 valid species are currently known from North America north of Mexico. Two additional species, *H. mexicana* Ulmer, 1919, and *H. salvini* Kimmins, 1934, have been described from Mexico. *Heptagenia salvini* was described from a male imago collected in northern Sonora, and *H. mexicana* from Tabasco. The latter species is herein transferred to the genus *Stenonema*. Nymphal collections from southern Mexico and Guatemala include specimens of *Heptagenia* which are geographically isolated from other populations of the genus and are described as new.

Heptagenia bella n. sp.

Nymph. Length: body 10–12 mm; caudal filaments broken. General color brown with light and dark markings. Head brown, usually paired light maculae between compound eyes; median ocellus pale at base. Thoracic nota brown with pale markings; pronotum with paired pale submedian maculae and pale lateral markings; pronotum widest near middle; mesonotum with paired pale submedian maculae and median pale posterior macula (Fig. 13); thoracic sterna pale; legs brown with pale markings; femora dark brown with pale median and distal transverse bands and dark at apex (Fig. 13); femora with dark freckling on dorsal surface and spines on inner margin; femora fringed with long setae; tibiae pale; tarsi pale, dark at apices; tarsal claws with 2 marginal denticles. Abdominal terga brown with pale markings; terga 1–2 brown with pale posterior margins; terga 3–9 brown with paired pale submedian maculae, and pale posterior sublateral maculae; tergum 10 brown; posterolateral projections on terga 6–8; gills dark purple-brown with pale margins (Fig. 13); gills on segment 1 narrower than others; fibrilliform portion absent on gill 7; abdominal sterna brown. Caudal filaments pale.

TYPES. Holotype: mature nymph, stream 5 mi S. Ciudad Mendoza, Vera Cruz, Mexico, 7-XI-68, RKA, in collection California Academy of Sciences, San Francisco. Paratopotypes: 38 nymphs, same data as holotype, 2 nymphs in each of the following collections: Academy of Natural Sciences of Philadelphia; California Academy of Sciences, San Francisco; Canadian National Collection, Ottawa; Florida A. & M. University, Tallahassee; Smithsonian Institution, Washington, D.C.; University of Utah, Salt Lake City. Paratypes: 10 nymphs, Rio Jamapa 3 mi NE Coscomatepec, Vera Cruz, Mexico, 8-XI-68, RKA.

Genus **STENONEMA** Traver

Traver (1933) erected *Stenonema* for *Heptagenia tripunctatum* (Banks, 1910) from Wisconsin. Twenty-nine species have been described from North America north of Mexico, and one species is known from southern Mexico. *Heptagenia mexicana* was described by Ulmer (1919) based on adults collected in Tabasco, Mexico. Examination of Ulmer's figure of the male genitalia suggests that the specimen belongs in the genus *Stenonema*, and *H. mexicana* is tentatively placed in this genus until the type specimen can be examined. Nymphs collected in Guatemala are associated as *Stenonema mexicana* on the basis of their geographic proximity to this species and their geographic isolation of other described populations.

***Stenonema mexicana* (Ulmer) new combination**

Heptagenia mexicana Ulmer, 1919: 70.

Nymph. Length: body 8–10 mm; caudal filaments 13–15 mm. General color brown with pale and dark markings. Head brown with pale markings and pale freckling; anterior margin of head with median and two sublateral pale maculae; pale macula at anterolateral eye margins and median posterior margin of occiput. Thoracic nota brown with pale markings; pronotum brown with pale median and sublateral markings; mesonotum brown with pale markings; metanotum pale (Fig. 14); thoracic sterna pale; legs brown with pale

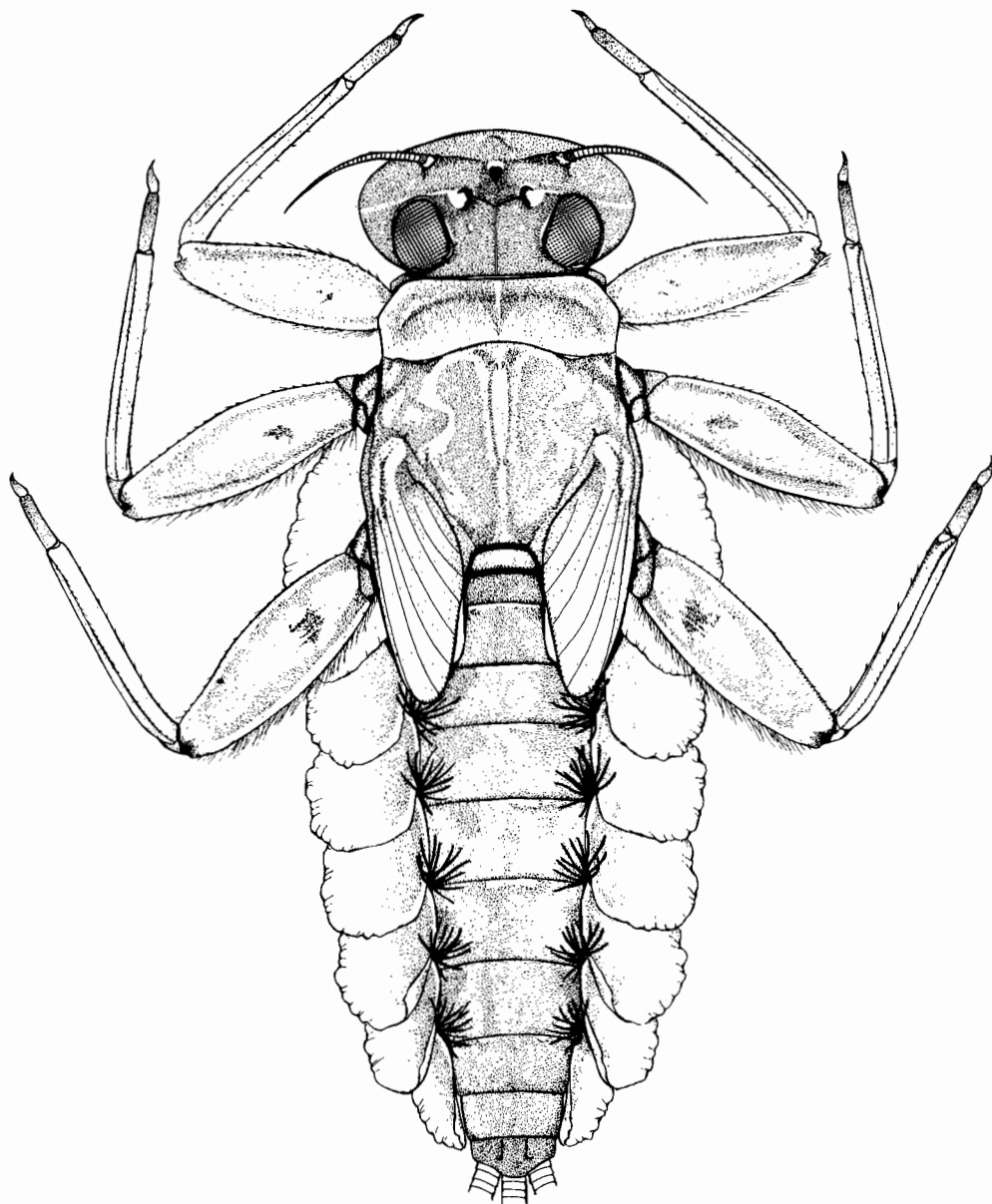


FIG. 12. *Rhithrogena notialis*, mature nymph, dorsal view.

markings; femora brown with subbasal, median, and subapical pale diamond-shaped bands (Fig. 14); femoral surface covered with small dark spines; outer margin femora with 8–11 long spines, numerous short spines, and sparse setae; tibiae brown with subbasal and apical pale bands, inner margin with 6–10 short spines; middle and hind tibiae with sparse setae; tarsi brown with pale apical band; tarsal claws without denticles. Abdominal terga brown with pale and dark markings; tergum 1 brown with pale median area; terga 2–3 brown with dark median longitudinal band surrounded by pale submedian bands; terga 4–5 brown with wide longitudinal band, median dark triangular macula within band, and pale at lateral margins; terga 6–7 brown with large dark median macula surrounded by pale area; tergum 8 brown with pale median longitudinal band;

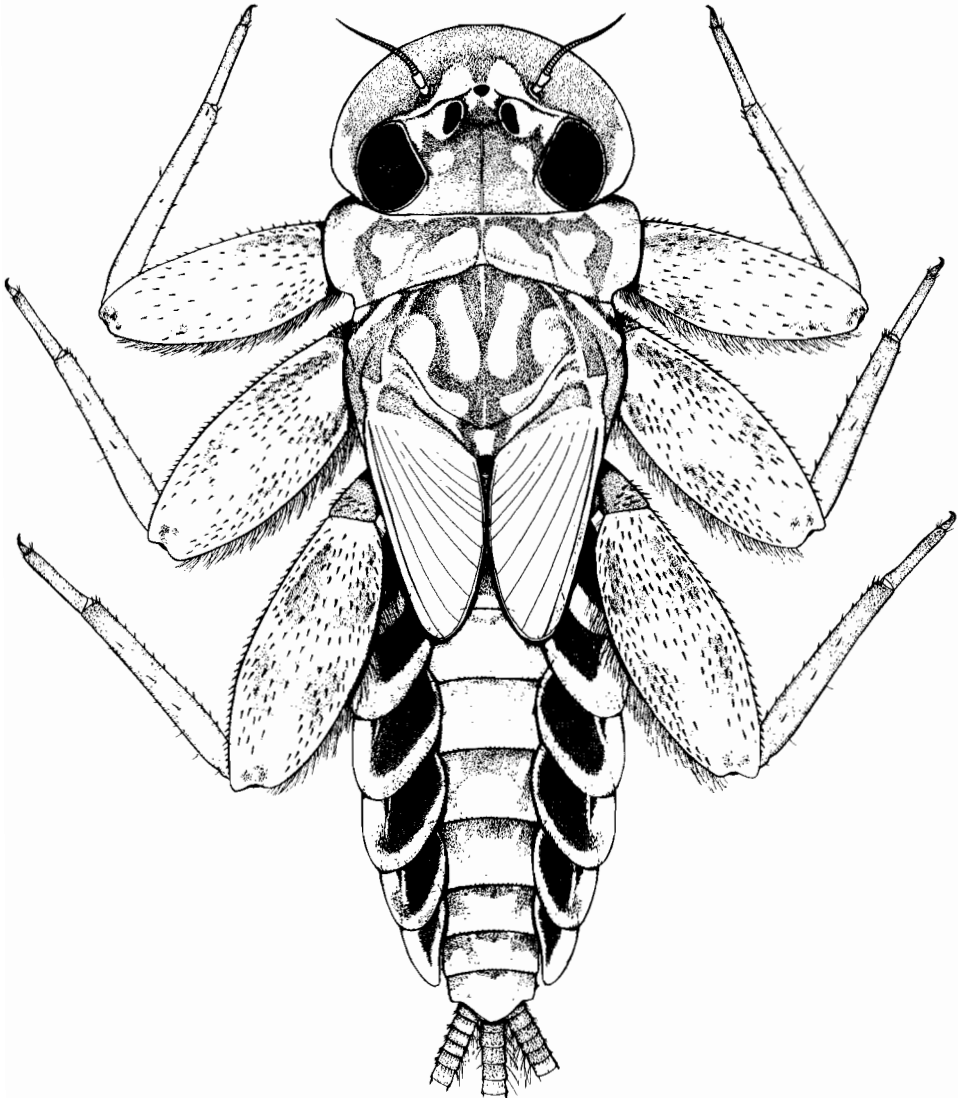


FIG. 13. *Heptagenia bella*, mature nymph, dorsal view.

tergum 9 brown with pale anterior median macula; tergum 10 brown with pale longitudinal median streak (Fig. 14); terga 7-9 with posterolateral angles produced into small spines, spine on tergum 7 longer than 9; abdominal gills on segments 1-6 truncate and slightly emarginate at apices (Fig. 14); lamellate portion gill dark with pale margins and dark trachea; fibrilliform portion dark gray, subequal in length to lamellate portion; gill 7 slender, fringed with setae, and without trachea; abdominal sterna pale. Caudal filaments brown, pale every fourth segment in posterior two-thirds.

NEW RECORDS. GUATEMALA: Rio Latoma at km 182 on Highway 2, 24-X-68, RKA; Rio Negro between Esquintla and Taxisco, 25-X-68, RKA; Esquintla, 15-VI-62, G. G. Musser, in collection University of Utah.

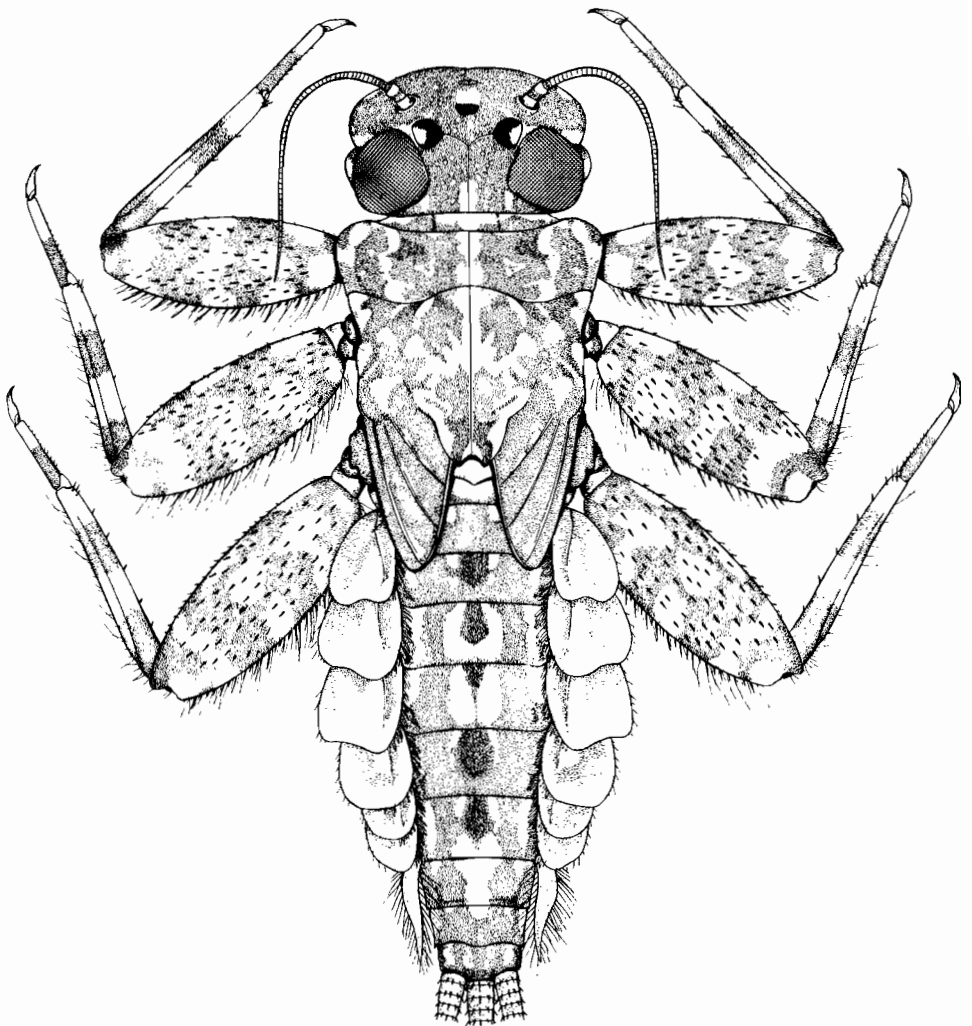


FIG. 14. *Stenonema mexicana*, mature nymph, dorsal view.

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References

- Banks, N. 1910. Notes on our eastern species of the mayfly genus *Heptagenia*. *Can. Ent.* **42**: 197-202.
- Burks, B. D. 1953. The mayflies, or Ephemeroptera, of Illinois. *Bull. Ill. nat. Hist. Surv.* 26 (Art. 1). 216 pp.
- Curtis, J. 1834. Descriptions of some nondescript British species of mayflies of anglers. *Philos. Mag. Ser. 3*, No. 20: 120-125; No. 21: 212-218.
- Eaton, A. E. 1871. A monograph on the Ephemeridae. *Trans. ent. Soc. Lond.* 1871. 164 pp.
- 1881. An announcement of new genera of the Ephemeridae. *Entomologist's mon. Mag.* **17**: 191-197.
- 1883-1888. A revisional monograph of recent Ephemeridae or mayflies. *Trans. Linn. Soc. Lond. (Ser. Zool.)* **3**: 1-352.
- 1892. *Biologia Centrali-Americana*, Insects, Neuroptera, Ephemeridae, 1-18.
- Edmunds, G. F., L. Berner, and J. R. Traver. 1958. North American mayflies of the family Oligoneuriidae. *Ann. ent. Soc. Am.* **51**: 373-382.
- Kimmins, D. E. 1934. Notes on the Ephemeroptera of the Godman and Salvin collection, with descriptions of two new species. *Ann. Mag. nat. Hist.* **14**: 338-353.
- McDunnough, J. 1923. New Canadian Ephemeridae with notes. *Can. Ent.* **55**: 39-50.
- 1931. The genus *Isonychia* (Ephemeroptera). *Can. Ent.* **63**: 157-163.
- Navas, L. 1924. *Insectos de la America Central*. *Broteria* **21**: 55-86.
- Needham, J. G. and H. E. Murphy. 1924. Neotropical mayflies. *Bull. Lloyd Lib. (Ent. Ser. 4)*. 79 pp.
- Spieth, H. T. 1938. Two interesting mayfly nymphs with a description of a new species. *Am. Mus. Novit.* 970. 7 pp.
- Traver, J. R. 1933. Mayflies of North Carolina, Pt. III. *J. Elisha Mitchell Soc.* **48**: 141-206.
- 1935. Systematic, Part II, pp. 267-739. In J. G. Needham, J. R. Traver, and Yin-Chi Hsu, *The biology of mayflies*. Comstock, Ithaca, N.Y. 759 pp.
- 1964-65. A new species of the subgenus *Iron* from Mexico (Ephemeroptera: Heptageniidae). *Bull. Brooklyn ent. Soc.* **59-60**: 23-29.
- Traver, J. R. and G. F. Edmunds, Jr. 1968. A revision of the Baetidae with spatulate-clawed nymphs (Ephemeroptera). *Pacif. Insects* **10**: 629-677.
- Ulmer, G. 1919. Neue Ephemeroptera. *Arch. Naturgesch.* **19**: 1-80.
- Walker, F. 1853. List of neuropterous insects in the British Museum. Pt. III. Termites and Ephemeridae. pp. 533-585.

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