

THE NORTH AMERICAN EPHEMEROPTERAN TYPES OF THE REV. A. E. EATON

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In his various studies on the Ephemeroptera of the world, Eaton described and named thirty-one species of North and Central American ephemerids. The types of all but seven of these species are in the McLachlan collection. This extremely important ephemeropteran collection has been acquired recently by the British Museum (Natural History), where I was able during the summer of 1939 to study Eaton's North and Central American series.¹

At the suggestion of Messrs. N. D. Riley and Martin E. Mosely, I have designated lectotypes of twenty-two of the American species. Although Eaton did not designate types, he clearly stated in his descriptions where the material had been collected, by whom, and in what collection it was located. By comparing his description with the original material, it was usually possible to determine from which specimen Eaton had derived his description. When such connection could be ascertained, the specimen was designated as the lectotype.

Eaton's descriptions in general are accurate and rather complete. In reading them, however, it should be remembered that he used relatively low power magnification when studying his specimens. Mr. Mosely, who knew Eaton personally, informs me that Eaton always employed a hand lens.

The alcoholic material of the Eaton collection is not yet available for study, and I therefore did not see the nymphal type of *Ephemerella hecuba* Eaton. Since this species is so well known, however, there is no doubt as to its correct identity.

The synonymy given with each species is not complete, but merely that part which seems pertinent to the present paper.

¹I wish to thank Messrs. N. D. Riley, D. E. Kimmins, and Martin E. Mosely for the kindness and helpfulness shown me on my trip to England and the British Museum (Natural History). Mr. Kimmins made invaluable preparations of the genitalia of various male ephemerids.

Hexagenia venusta Eaton

Hexagenia venusta Eaton, Revisional Mono. Rec. Ephemeridae, part 1, p. 54, 1883.
 Ulmer, Archiv. f. Naturg., Band 87, Abt. A, Hft. 6, pp. 235, 237, 239, 1921.
 Needham, Traver, Hsu, etc., Biology of Mayflies, p. 274, 1935.

Eaton based the species upon material from "Texas, Dallas, Waco, and W. Texas," and from "Utah Lake." The species is represented in the McLachlan collection by the following specimens: 2 ♀ imagoes, Dallas, Tex.; 4 ♂ imagoes, Dallas, Tex.; 1 ♂ subimago, Dallas, Tex.; 6 ♀ subimagoes, W. Tex., Belfrage; 3 ♀ imagoes, W. Tex., Belfrage; 3 ♀ imagoes, Bosque Co., Tex., Belfrage; 1 ♀ imago, Tex.; 1 ♀ imago, Tex., Belfrage; 2 ♀ subimagoes, Tex., Belfrage. A female subimago from "California" and another from "North America" had been erroneously included in the species.

Eaton's description is adequate and the present concept of the species as set forth by Traver (1935) is correct. The four male imagoes from Dallas correspond exactly to the original description and I have therefore designated one of them as the lectotype. Recently identified material agrees perfectly with the type.

The McLachlan collection also has 3 ♂ imagoes and 6 ♂ subimagoes which Belfrage collected in "Bosque Co., Texas, W. Texas" and in "Texas." These agree with the type except that the darkly pigmented areas, especially those of the abdomen, are much enlarged and also the metathoracic wings have dark spots in the disks due to the infuscation of the cross veins. These specimens apparently are merely dark individuals of *H. venusta*. Species of *Hexagenia* are notorious for the amount of individual and specific variability they display, and it is quite inadvisable to create a new subspecies unless adequate series are available.

Iron longimanus Eaton

Epeorus n. g. Eaton, Ent. Month. Mag., vol. 18, p. 26, 1881.
Iron longimanus Eaton, Revisional Mono. Rec. Ephemeridae, part 4, p. 245, 1885.
 Needham, Traver, Hsu, etc., Biology of Mayflies, p. 406, 1935.
Iron proprius Traver. Needham, Traver, Hsu, etc., Biology of Mayflies, p. 408, 1935.

Eaton based his species upon specimens from "Colorado," represented in the McLachlan collection by seven male imagoes, all labeled "Colorado." The present concept of this well known and common western species is correct. I have designated one of the syntypes as the lectotype.

Cinygma integrum Eaton

Cinygma integrum Eaton, Revisional Mono. Rec. Ephemeridae, part 4, p. 248, 1885.
 Needham, Traver, Hsu, etc., Biology of Mayflies, p. 367, 1935.

Eaton based his species upon material from the "Washington Territory and Mt. Hood, Oregon." It is represented in the McLachlan collection by 2 ♂ imagoes, 2 ♀ imagoes, and 1 ♀ subimago from "Mt. Hood" and 1 ♂ imago and 1 ♂ subimago from the "Washington Territory." I have designated a male from Mt. Hood as the lectotype. Utilizing this lectotype, Eaton's description can be supplemented as follows:

Clypeal area smoky brown; an ochreous band from the dorsal end of carina, running below antennal fossae laterally. This line becomes narrower laterally. Antennae smoky brown with lighter colored fossae; vertex and areas around ocelli rufous brown; a bright ochreous area contiguous with compound eye on level of median ocellus. Metathoracic femur with two indistinct dark bands instead of "single indistinct dark band beyond the middle."

Cinygma integrum is closely related to the lighter colored *C. dimicki* McD., from which it can be distinguished by the darker coloration of its abdomen. Traver (1935, fig. 99) presents drawings of the genitalia of specimens which she associates with these two species. The genitalia of a syntype, when cleared and stained, agree with Traver's figure of *dimicki* rather than with her figure of *integrum*. In studying the syntype, I observed no postero-ventral spines such as Traver has indicated in her drawings, but Dr. McDunnough, in private communication, informs me that his prepared genitalic specimens of *integrum* do show these minute spines when observed under very strong light. Perchance re-study of the syntype will show the spines to be present. McDunnough's figure of the genitalia (Canad. Ent., vol. 58, Pl. 3, fig. 10, 1926) is more typical for the species than is that of Traver.

A comparison of recently collected and identified material with the type shows the present concept of *C. integrum* to be correct.

Cinygmula mimus (Eaton)

Cinygma mimus Eaton, Revisional Mono. Rec. Ephemeridae, part 4, p. 249, 1885.

Cinygmula mimus (Eaton). McDunnough, Canad. Ent., vol. 65, p. 121, 1933. Needham, Traver, Hsu, etc., Biology of Mayflies, p. 389, 1935.

Eaton described the species from individuals that had been collected in "Colorado" and "Manitou, Col." The species is represented in the McLachlan collection by six male imagoes from "Colorado." Eaton indicated that the coloration of abdominal segments 2-7 was "light purplish brown" in some specimens and "madder brown" in others. The lectotype that I have selected is of the latter color. The genitalia of a syntype, when cleared and stained, agree with McDunnough's figure (Canad. Ent., Vol. 56, p. 114, fig. 7, 1924). The concept of the species as given by McDunnough and Traver is correct.

Cinygmula par (Eaton)

Cinygma par Eaton, Revisional Mono. Rec. Ephemeridae, part 4, p. 249, 1885.

Cinygmula par (Eaton). McDunnough, Canad. Ent., vol. 65, p. 75, 1933. Needham, Traver, Hsu, etc., Biology of Mayflies, p. 589, 1935.

Eaton based the species on specimens from "Arizona." There are in the McLachlan collection eight males from "Arizona" that are labeled as belonging to *Cinygmula par*. All except one have the abdomens collapsed. The single exception must have been the specimen Eaton utilized for his description, since only its tergites show the "three longitudinal linear streaks." I have designated it as the lectotype. The genitalia of a syntype (fig. 4) are close to those of *C. confusa* McD. and *C. hyalina* McD. Traver's figure (1935, fig. 103) is not typical, probably

because certain membranous areas of the penes were destroyed in the preparation of her mount.

Eaton's description is adequate and correct. Recently collected material from Colorado, apparently belonging to this species, is much more darkly pigmented than are the types. Typically *C. par* (Eaton) is a southwestern species that has a large component of brown and yellowish brown in its coloration rather than the purplish brown of more northern specimens.

Ironodes geminatus (Eaton)

Cinygma geminatum Eaton, Revisional Mono. Rec. Ephemeridae, part 4, p. 250, 1885. McDunnough, *Canad. Ent.*, vol. 65, p. 75, 1933.
Ironodes geminatus (Eaton). Traver, *Canad. Ent.*, vol. 67, p. 31, 1935. Needham, Traver, Hsu, etc., *Biology of Mayflies*, p. 418, 1935.

Eaton based the species upon specimens from the "Washington Territory," "California," and "Arkansas Canon, Col." The specimens from the latter locality belong to the Museum of Comparative Zoology. The species is represented in the McLachlan collection by 1 ♀ imago, 6 ♀ subimagos, and 7 ♂ subimagos from the "Washington Territory," 1 ♂ subimago from "Mt. Hood" and 1 ♀ subimago which is labeled "California Walsingham." I have designated the female imago as the lectotype. Eaton's description of this specimen can be supplemented as follows:

General color bright yellow; tibio-tarsal joining, the tarsal joinings, and the femur of fore leg a slightly darker yellow than the remainder of the leg; joinings of abdominal tergites darkened due to the infuscation of bister into the yellow ground color; remainder of abdomen and all of thorax bright yellow; seven costal veins before bulla; three cross veins in bullar area, not crowded; fifteen cross veins beyond bulla. Length female imago, 5 mm.; length mesothoracic wing, 7 mm.

A comparison of the subimago males with the female indicates that Eaton's association of the individuals of the two sexes is correct. Traver's decision that *geminatus* belongs to *Ironodes* is also clearly correct. This was further confirmed by clearing and staining the genitalia of a male subimago.

The species can be separated from *I. nitidus* by its small size and bright yellow coloration. It is closely related to *I. lepidus* but the males of *geminatus* lack a small spine-like structure at the apex of each division of the penes.

Ironodes nitidus (Eaton)

Iron nitidus Eaton, Revisional Mono. Rec. Ephemeridae, part 4, p. 246, 1885. McDunnough, *Canad. Ent.*, vol. 56, p. 129, 1924.
Ironodes nitidus (Eaton). Traver, *Canad. Ent.*, vol. 67, p. 31, 1935. Needham, Traver, Hsu, etc., *Biology of Mayflies*, p. 419, 1935.

Eaton described the species from specimens that had been collected on "Mt. Hood, Oregon" and in "California." It is represented in the McLachlan collection by 7 ♂ imagos and 2 ♀ imagos from "Mt. Hood," as well as by 1 ♀ imago from "California." This last specimen belongs to *I. californicus* Banks. The Mt. Hood specimens agree well

with Eaton's description. One male is paler than the others and represents Eaton's variation. The genitalia of a syntype (fig. 3) differ from those shown by Traver (1935, fig. 108), perhaps due to the fact that the penes of Traver's specimen had become somewhat distorted. Note, moreover, that the spines are on the medial surface of each division of the penes rather than on the ventral surface as Traver shows them. This medial surface is membranous. At the mediodistal end of each arm of the penes is located a small, round seminal opening.

Eaton's description is adequate and the present concept of the species is correct.

Ameletus dissitus Eaton

Ameletus dissitus Eaton, Revisional Mono. Rec. Ephemeridae, part 3, p. 210, 1885. McDunnough, Canad. Ent., vol. 61, p. 174, fig. 11, 1929. Needham, Traver, Hsu, etc., Biology of Mayflies, p. 452, 1935.

Eaton based the species upon material from California. In the McLachlan collection are four male imagoes labeled "California Edwards." These, Eaton's types, are in a poor state of preservation, apparently having been damaged before Eaton received them. It is easily possible, however, to determine which specimen Eaton utilized for his description, and this individual I have designated as the lectotype. It is whole except for the loss of the left metathoracic wing, both mesothoracic wings, and one cerci.

The genitalia of one of the syntypes, when cleared and stained, agree with McDunnough's figure (1929). Comparison of the lectotype with recently collected and identified individuals which Dr. McDunnough had loaned me showed that the present concept of the species as given by McDunnough and Traver is correct and adequate.

Ameletus exquisitus Eaton

Ameletus exquisitus Eaton, Revisional Mono. Rec. Ephemeridae, part 3, p. 212, 1885. Needham, Traver, Hsu, etc., Biology of Mayflies, p. 453, 1935.

Eaton's specimens of *Ameletus exquisitus* came from the "Washington Territory" and "Mt. Hood." The species is represented in the McLachlan collection by three male imagoes from the "Washington Territory" and a much smaller individual from "Mt. Hood." The latter belongs to *Ameletus suffusus* McD. Thus the three larger males are Eaton's syntypes. From Eaton's description, it is possible to identify the specimen upon which the original description was based, and I have designated it as the lectotype. Using the lectotype, Eaton's description can be supplemented as follows:

Head blackish with lightly colored areas at base of antenna, lateral to antennal fossae and in the middle of the vertex. Mesonotal areas lateral to the scutellum pitch brown; anterior end of metanotum brownish ochreous; thoracic pleurae pitch brown except for the elevated areas which are ochreous; thoracic sterna blackish brown; genitalia (fig. 8) similar to those of *A. falsus* McD.; mesothoracic wing length, 15 mm.

A. exquisitus, as shown by the coloration and the genitalia, is related to *A. falsus* McD. from which it can be separated by its large size.

Subsequent collecting may show that these two are geographical subspecies.

***Ameletus subnotatus* Eaton**

Ameletus subnotatus Eaton, Revisional Mono. Rec. Ephemeridae, part 3, p. 211, 1885. McDunnough, *Canad. Ent.*, vol. 60, p. 9, 1928; *Canad. Ent.*, vol. 63, p. 89, 1931. Needham, Traver, Hsu, etc., *Biology of Mayflies*, p. 457, 1935 [partim, nec. fig. 117].

Eaton described the species from material collected in "Colorado." Four ♀ imagoes, 1 ♂ imago, and 1 ♂ subimago from "Colorado" represent the species in the McLachlan collection. I have selected the male imago as the lectotype. Eaton's description can be supplemented as follows:

♂ imago—Antennae and the clypeus deep brown; frontal area rufous brown with antennal fossae lighter colored; vertex pitch brown with rufous central area. Within the dorsal "longitudinal stripe" of the abdomen are submedial pitch brown dashes which extend posteriorly from the anterior edges of the tergites. Genitalia as in figures 5 and 7.

♀ imago—Antennae and clypeus brown, shading to pitch brown on the medial carina and the areas lateral to it; a rufous brown stripe runs posteriorly from each dorsal ocellus and ends on rear margin of head; the areas between these lines and the compound eyes ochreous. These ochreous areas extend anteriorly and surround the median ocellus and the antennae. Ganglionic markings visible on the venter of abdomen. Abdomen collapsed and somewhat discolored.

The species can be readily identified by its unique genitalia. Specimens from Lethbridge, Alta., loaned to me by Dr. McDunnough, agree closely with the types. Traver's figure (1935) of the genitalia is not that of the true *subnotatus* but of another species apparently allied to *A. exquisitus* and *A. falsus*.

***Siphonurus occidentalis* Eaton**

Siphonurus occidentalis Eaton, Revisional Mono. Rec. Ephemeridae, part 3, p. 218, 1885.

[non] *Heptagenia brunnea* Hagen [partim], *Ann. Rept. U. S. Geol. and Geo. Sur. Terr.*, part 3, Zool., 581, 1875.

Siphonurus occidentalis Eaton. Needham, Traver, Hsu, etc., *Biology of Mayflies*, p. 473, 1935.

Eaton based his species mainly upon specimens from Colorado which are in the McLachlan collection. He had available other individuals from Washington, Nevada and Wyoming. The species is represented in the McLachlan collection by 7 ♂ imagoes, 2 ♀ imagoes, and 1 ♀ subimago from "Colorado," 2 ♂ imagoes and 6 ♀ imagoes from the "Washington Territory," and 1 ♀ imago from "Mt. Hood." I have selected one of the males from Colorado as the lectotype, and consider all the others except the Mt. Hood specimen as syntypes.

Study of the types, aided by a cleared and stained mount of the genitalia of one of the syntypes from Colorado, shows the present concept of the species as set forth by Traver to be correct. The variations that Eaton listed are easily seen and represent, as he indicated, individual rather than specific differences.

Siphonurus typicus Eaton

Siphonurus typicus Eaton, Revisional Mono. Rec. Ephemeridae, part 3, p. 222, 1885.

Siphonurus typicus Eaton. McDunnough, Occ. Papers, Boston Soc. Nat. Hist., vol. 5, p. 75, 1924. Needham, Traver, Hsu, etc., Biology of Mayflies, p. 477, 1935.

Siphonurus berenice McDunnough, Canad. Ent., vol. 55, p. 49, 1923. Needham, Traver, Hsu, etc., Biology of Mayflies, p. 468, 1935.

Eaton based his description of the species upon material from "Denham, Mass.," and from "Worcester, Mass." The latter belongs to the Museum of Comparative Zoology. The species is represented in the McLachlan collection by 2 ♂ imagoes and 4 ♀ imagoes from "Denham, Mass.,"; 1 ♂ imago, 2 ♀ imagoes, and 1 ♀ subimago from "North America," and 1 ♂ subimago from "Mt. Washington." I have designated a male imago from "Denham, Mass." as the lectotype and consider only the specimens from that locality as the syntypes.

Eaton's description, although detailed, is not as clear and concise as it might be. Especially misleading is the statement: "Wings vitreous, with a small brownish cloud along the axillar fold of the hind wing." This statement has confused subsequent workers. The types do have a very small, faint infuscation in the area where the anal veins meet. Such an infuscation, however, is found in most species of *Siphonurus*. Eaton (1885, p. 219) described *S. alternatus* fully without mentioning such a pigmented area even though it is clearly present.

Careful study of the type, aided by the cleared and stained genitalia of one of the syntypes, and comparison with recently identified specimens clearly show that *S. berenice* McD. is a synonym of *S. typicus* Eaton. If allowance is made for fading, the lectotype and the other syntypes fit the description of *S. berenice* as given by Traver (1935).

Isonychia intermedia (Eaton)

Chirotonetes intermedius Eaton, Revisional Mono. Rec. Ephemeridae, part 3, p. 207, 1885.

Isonychia intermedius (Eaton). McDunnough, Canad. Ent., vol. 63, p. 157, 1931.

Isonychia intermedia (Eaton). Needham, Traver, Hsu, etc., Biology of Mayflies, p. 491, 1935.

Eaton based his species upon material from "Arizona." It is represented in the McLachlan collection by a single male imago from "Arizona." Eaton's description is accurate except that the "very small indistinct spot or abbreviated streak in the middle of the base" of each tergite actually is quite distinct on segments 6-10, inclusive. Eaton's use of relatively low power magnification is probably responsible for this discrepancy. The genitalia (fig. 2) indicate that the species is a close relative of *I. sicca*. The distinctive color pattern separates *I. intermedia* from all other known species.

Isonychia sicca manca Eaton

Isonychia manca Eaton [partim, nec male imago and subimago], Trans. Ent. Soc. Lond., part 1, p. 134, 1871. Needham, Traver, Hsu, etc., Biology of Mayflies, p. 492, 1935.

Chirotonetes mancus (Eaton), Revisional Mono. Rec. Ephemeridae, part 3, p. 206, 1885.

Isonychia sicca manca Eaton. McDunnough, Canad. Ent., vol. 63, p. 160, 1931.

On material from "Texas" Eaton described the species. In 1885 he

indicated that the males he had described in 1871 really belong to *Ameletus dissitus* Eaton. At the same time he included a "Montana" specimen in *manca*. *I. manca* is represented in the McLachlan collection by 10 ♀ subimagos and 10 ♀ imagoes from "West Texas, Bel-frage," and by 1 ♀ imago from "Montana." The last mentioned specimen belongs to *campestris* McD. rather than to *manca* Eaton. I have designated an imago of the original syntypic series as the lectotype.

Comparison of recently collected material with the type shows that the present concept of this subspecies as given by McDunnough (1931) is correct.

***Paraleptophlebia gregalis* (Eaton)**

Leptophlebia gregalis Eaton, Revisional Mono. Rec. Ephemeridae, part 2, p. 98, 1884. McDunnough, Canad. Ent., vol. 56, p. 221, 1924; Canad. Ent., vol. 58, p. 297, 1926.

Paraleptophlebia gregalis (Eaton). Needham, Traver, Hsu, etc., Biology of Mayflies, p. 521, 1935.

The species was described by Eaton from material collected on "Mt. Hood, Oregon." It is represented in the McLachlan collection by 15 ♂ imagoes, 1 ♀ imago, 7 ♀ subimagos, and 1 ♂ subimago, all from "Mt. Hood." The male subimago and six of the female subimagos do not belong to *gregalis*. I have designated one of the male imagoes as the lectotype. Eaton's description of the male can be supplemented as follows:

Longitudinal veins posterior to the radius almost hyaline; costa, subcosta, and radius brown. Abdomen mostly brown with the joinings opaque; segment one completely brown; tergites 2-7, inclusive, with a double row of sub-medial piceous dashes; anterior borders of the tergites 2-7 narrowly semi-hyaline and these semi-hyaline borders partly surround the submedial piceous dashes. Sternites 2-7, inclusive, brown with narrow semi-hyaline anterior borders. Segments eight and nine opaque with the tergites tinged with yellow; sternites eight and nine yellowish brown. First segment of genital forceps tapers sharply near base, then parallel for a distance, and finally the last one-third tapers gradually. Penes (fig. 6) with seminal openings at tips of recurved processes.

P. gregalis is extremely closely allied to *invalida* McD. and *sculleni* Trav. They will probably all prove to be geographical subspecies. Traver's figure of *gregalis* (1935, fig. 133) is not typical enough to be helpful in the separation of the species from its relatives.

***Paraleptophlebia praepedita* (Eaton)**

Leptophlebia praepedita Eaton, Revisional Mono. Rec. Ephemeridae, part 2, p. 99, 1884.

Paraleptophlebia praepedita (Eaton). Needham, Traver, Hsu, etc., Biology of Mayflies, p. 527, 1935.

Eaton based the species upon material from "Denham, Mass." It is represented in the McLachlan collection by 6 ♂ imagoes and 3 ♀ subimagos from "Denham, Mass.," as well as by 11 ♂ imagoes and 1 ♂ subimago from "N. America." I am considering only the Denham material as being syntypic, and have designated one of the males as the

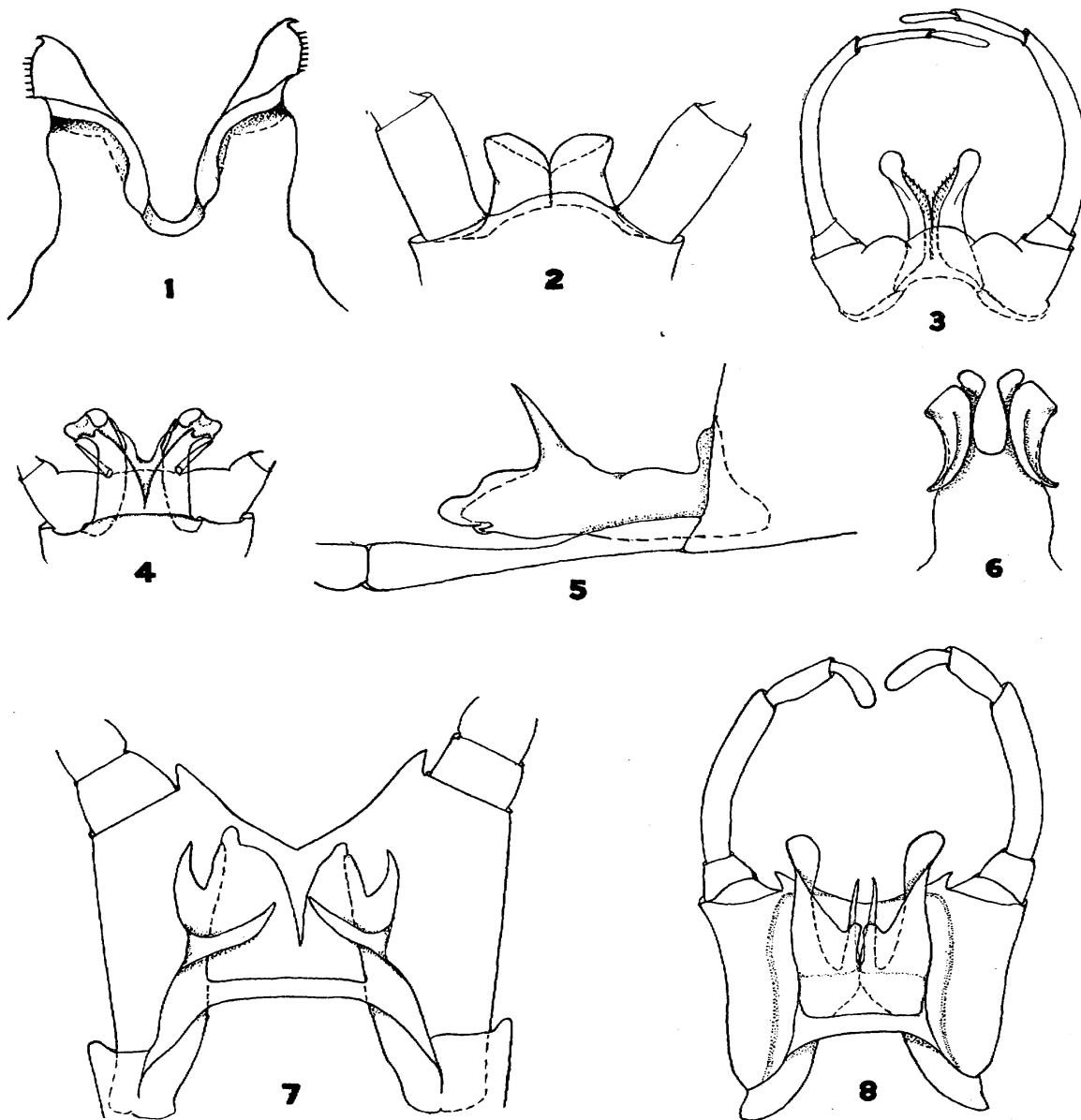


Fig. 1. Dorsal view of penes of *Blasturus gravastellus* Eaton.
 Fig. 2. Ventral view of genitalia of *Isonychia intermedia* Eaton.
 Fig. 3. Ventral view of genitalia of *Iron nitidus* Eaton.
 Fig. 4. Dorsal view of genitalia of *Cinygmula par* Eaton.
 Fig. 5. Lateral view of genitalia of *Ameletus subnotatus* Eaton.
 Fig. 6. Dorsal view of penes of *Paraleptophlebia gregalis* Eaton.
 Fig. 7. Dorsal view of genitalia of *Ameletus subnotatus* Eaton.
 Fig. 8. Dorsal view of genitalia of *Ameletus exquisitus* Eaton.

lectotype. Recently collected and identified material corresponds exactly with the lectotype. The present concept of this well known species is correct.

Paraleptophlebia rufivenosa (Eaton)

Leptophlebia rufivenosa Eaton, Revisional Mono. Rec. Ephemeridae, part 2, p. 99, 1884. McDunnough, *Canad. Ent.*, vol. 56, p. 221, 1924.

Paraleptophlebia rufivenosa (Eaton). Needham, Traver, Hsu, etc., *Biology of Mayflies*, p. 528, 1935.

Eaton based the species upon material from "Mt. Hood," the "Washington Territory" and "S. Raphael, Cal." It is represented in the McLachlan collection by 3 ♀ imagoes from Mt. Hood and 2 ♀ subimagoes and 1 ♀ imago from the "Washington Territory." I have designated a female imago from Mt. Hood as the lectotype.

Two of the Washington specimens, the imago and one subimago, are smaller than the others. With the exception of the size and the pterostigmal veins, they do not differ from the other syntypes. The present concept of the species as given by McDunnough (1924) and Traver (1935) is correct.

Paraleptophlebia vaciva (Eaton)

Leptophlebia vaciva Eaton, Revisional Mono. Rec. Ephemeridae, part 2, p. 97, 1884. McDunnough, *Canad. Ent.*, vol. 58, p. 296, 1926.

Paraleptophlebia vaciva (Eaton). Needham, Traver, Hsu, etc., *Biology of Mayflies*, p. 530, 1935.

Eaton based the species on material from Mt. Hood, Oregon. It is represented in the McLachlan collection by thirteen male imagoes which are labeled either "Mt. Hood" or "Mount Hood." I have designated one of these as the lectotype. Eaton's description is adequate. The present concept of the species as set forth by Traver (1935) is correct.

Blasturus gravastellus Eaton

Blasturus gravastellus Eaton, Revisional Mono. Rec. Ephemeridae, part 2, p. 102, 1884. Needham, Traver, Hsu, etc., *Biology of Mayflies*, p. 537, 1935.

The species was based upon specimens from "Montana," and is represented in the McLachlan collection by 3 ♂ imagoes, 4 ♀ imagoes, and 1 ♀ subimago from "Montana." I have designated one of the male imagoes as the lectotype. The male genitalia (fig. 1) are similar to those of *B. cupidus* (Say). Study of the types leaves no doubt that *cupidus* and *gravastellus* are closely allied. Eaton's description of the type is accurate and the concept of the species as given by Traver is correct.

Ephemerella grandis Eaton

Ephemerella grandis Eaton, Revisional Mono. Rec. Ephemeridae, part 2, p. 128, 1884. Needham, Traver, Hsu, etc., *Biology of Mayflies*, p. 601, 1935.

The species was based by Eaton upon material from "Colorado" and "The Geysers, Yellowstone, 4th May." The latter belongs to the Museum of Comparative Zoology. *E. grandis* Eaton is represented in the McLachlan collection by 2 ♀ imagoes and 1 ♀ subimago, all from Colorado. The two imagoes, as Eaton indicated, show some variation, one being much more ochreous in color than is the other.

The color pattern, however, is identical in both individuals. I have designated the more ochreous specimen as the lectotype. Comparison of the syntypes with recently collected material shows that the species is rather variable in the intensity of its coloration. Eaton's description is adequate and the concept of the species, as set forth by Traver (1935), is correct.

Tricorythodes explicatus (Eaton)

Tricorythus explicatus Eaton, Biol. Centr.-Amer., Ephem., p. 11, 1892.

Tricorythodes explicatus (Eaton). Kimmins, Ann. and Mag. Nat. Hist., Ser. 10, vol. 14, p. 346, 1934. Needham, Traver, Hsu, etc., Biology of Mayflies, p. 634, 1935.

Kimmins (1934) has designated the lectotype of the species. The original material was collected in "N. Sonora, Mexico." This species is closely related to the northern *T. fallacina* McD. and the far western *T. fallax*. It is distributed in the southwestern part of the United States and extends as far north as Yellowstone Park, Wyo. The present concept of the species is correct.

Callibaetis montanus Eaton

Callibaëtis montanus Eaton, Revisional Mono. Rec. Ephemeridae, part 3, p. 196, 1885; Biol. Centr.-Amer., Ephem., p. 15, 1892. Needham, Traver, Hsu, etc., Biology of Mayflies, p. 668, 1935.

Eaton based the species upon material from "Aceytuno (5100 ft.)." Aceytuno or Aceituno was a plantation near Guatemala City, Guatemala. The species is represented in the McLachlan collection by three female imagoes which are labeled "Aceytuno 5100." There is also a specimen, labeled "Amazon Forest 1554," which may belong to the species, but which I have not considered as a syntype. The three syntypes are in a poor state of preservation. I have designated one of them as the lectotype. Eaton's description can be supplemented as follows:

The distal third of first antennal joint fuscous, and the basal two-thirds much lighter; second antennal joint fuscous; base of flagellum light with remainder fuscous; frontoclypeal area light brown; vertex fuscous. Eaton's drawing of the wing (1885, fig. 28d) is excellent. Note that the infuscation is of three distinct intensities, i. e., intense infuscation behind the subcosta, much less intense before the subcosta (the costal area) and intermediate between these two in the base of the wing. None of the specimens shows "seven rudimentary" cross veins in the pterostigmal area. All cross veins are simple. One specimen has twenty-five cross veins behind the vittae and another has thirty-five.

Callibaetis pictus (Eaton)

Baëtis pictus Eaton, Trans. Ent. Soc. Lond., part 1, p. 122, 1871.

Callibaëtis pictus (Eaton), Ent. Mon. Mag., vol. 17, p. 196, 1881; Revisional Mono. Rec. Ephemeridae, part 3, p. 195, 1885. Needham, Traver, Hsu, etc., Biology of Mayflies, p. 671, 1935.

Eaton (1871) based this species upon material from "Texas." In 1885 he concluded that the species was "widely distributed in the southern parts of N. America" and listed specimens from California, Texas, and Guatemala as belonging to *C. pictus*. The McLachlan

collection has material from "Aceytuno 5100," "Guatemala 5000 ft.," "California Edwards," "Texas," "Bosque Co. Belfrage," "Texas, Belfrage," and "Colorado" which are included in *C. pictus*. Inspection of the material showed that the Colorado specimens were what Eaton had when he described an unnamed new species of *Callibaëtis* (Monograph, p. 195). The remaining individuals, all females except for one male from Texas, apparently belong to the same species. The fifteen specimens from Texas are labeled "*Baëtis pictus* Etn." I am considering them as the syntypes and have selected the single male as the lectotype. It is also the genotype of *Callibaëtis*.

Eaton's description can be supplemented as follows:

♂ imago.—Prothoracic notum pitch brown; mesothoracic notum light pitch brown posteriorly and lighter anteriorly; metathoracic notum light pitch brown. Pleurae with ochreous elevated areas and brown depressed areas. Longitudinal veins of mesothoracic wings light brown except for the radius and subcosta which are transparent in the basal two-thirds; cross veins faintly pigmented; costal area with seven cross veins, three incomplete and four complete. Entire wing has thirty-four cross veins, of which twenty-two are behind the vitta. All marginal areas of wing from the subcosta to the cubitus, inclusive, with paired intercalaries. Venation of metathoracic wing wholly light brown. Metathoracic leg mostly pale yellow, the tibia and tarsus lighter than the femur; four longitudinally distributed brown spots on femur; areas on coxa, as well as the base and apex of tibia, the tarsal joinings and claws light fuscous. Abdomen closely punctulate with dark red brown. In addition to the punctulations, there is on each sternite a pair of light brown submedial longitudinal dashes and a pair of small deep fuscous spots in the anterolateral corners. Tergites mostly dark brown except for the following light areas: (1) posterolateral corners of tergites two to nine, inclusive; (2) a medial dash and two subdorsal spots on the anterior half of tergite five; (3) the fusion of these three areas in tergite six forming a "W" which fills most of the dorsal part of the segment; (4) a medial dash in tergites seven, eight, and nine; (5) the posterior edge of tergite nine. Except in these light areas the punctulations are obscured. Cerci white, banded with dark gray.

♀ imago.—Pigmentation similar to that of the male except for a general tendency toward lighter coloration. Costal edge of mesothoracic wing with brown clouds. In the distal part of the wing these extend behind the vitta. Costal cross veins more numerous than in male and evenly distributed; longitudinal veins one to four with alternate light and dark areas. Abdominal color pattern somewhat as in male. A pair of piceous brown dashes just above lateral edge of each tergite, forming a dark longitudinal streak along the side of the abdomen; area of tergite lateral to dashes light; posterior edges of tergites light. Tergites five, six, nine, and posterior part of eight light. In some specimens tergites two, three, and four are light colored in the median area. Cerci as in the male, with darker joinings.

There is considerable variation between females of the type series, especially in the coloration of the abdomen.

Length of male imago, 7 mm.; mesothoracic wing, 7.5 mm.

Length of female imago, 6.5 mm.; mesothoracic wing, 8 mm.