

NEW WESTERN EPHEMEROPTERA, IV, WITH NOTES

VELMA KNOX MAYO

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Ephemerella lodi Mayo, new species

(Figures 1, 3, 10)

Male imago (fig. 10). Member of *bicolor*-group. Head yellow; dark brown around ocelli. Pronotum yellowish-brown tinged with red; reddish-brown penciling anteriorly on midline and laterally. Thorax reddish-brown. Mesonotum yellowish-brown dorsally, paler along midline. Laterally mesonotum reddish. Pleural sclerites reddish-brown with unsclerotized areas powdery white. Wings slightly amber tinged; venation yellow; veins in stigmatic area anastomosed. Legs yellow; fore coxae tinged with red anteriorly; femora yellow; no dark apical dot; fore tibiae yellow, reddish at tarsal joining; fore tarsi yellow, joinings narrowly penciled with red; claws reddish-brown; hind legs pale yellow, not marked with red at joinings. Abdomen lighter than thorax. Tergites 1-3 reddish-brown, bordered posteriorly by a wide brown band. On either side of midline are blackish streaks, prominent anteriorly and faded out towards posterior margin. The midline of all tergites marked with a reddish streak. Tergites 4-10 yellowish, washed with reddish-brown posteriorly. Tergites 8-9 with reddish streak near pleural fold. Blackish spots on either side of midline are very prominent, the streaks less distinct than those on tergites 1-3. Laterally each tergite marked with black oblique streak near pleural fold. Dark tracheations along pleural fold. Abdominal sternites with a distinct curved row of four dark dots, represented by two oblique streaks, and medially, by prominent dots. No ganglionic markings on sternites. Segments 3-5 pale, other segments with reddish tinge. Genitalia yellow. Tails yellow, joinings dark reddish-brown. Length: body 10.5 mm., wing 10 mm.

Female imago (fig. 3). Head yellowish with red pencilings on vertex and two red spots anterior to ocelli, blackish around bases of ocelli. Pronotum yellowish; irregularly marked with red, red streak along midline. Mesothorax reddish-brown. Mesonotum more red than that of male. Scutellum marked medially with red streak, and laterally wing bases tinged with red as in male. Legs yellow; claws faintly tinged with brown. Wings as in male except for reddish coloring at bases of subcosta and radius on anterior surface of wing. Abdomen more reddish than that of male; tergites irregularly mottled with red; along middorsal line is a wide mottled streak; tergites 1-5 with wide reddish-brown streaks on either side of midline; where the lateral streaks touch the anterior border, the margin is narrowly streaked with black; red, medially; on tergites 6-10 prominent black dots take the place of the reddish-brown streaks of preceding segments; irregular reddish markings on lateral tergites; pleural fold red; sternites paler than tergites, yellowish; row of curved black dots on sternites, prominent on segments 1-5; mid ventral ganglionic area reddish-brown on sternite five, absent on others. Dark tracheations prominent laterally. Tails as in male. Subanal plate as in fig. 3.

Holotype: male imago (in alcohol). DRY CREEK NEAR DRY

TOWN, CALIFORNIA, June 2, 1938, altitude 1700 ft. Allotype, female imago (in alcohol) same data. Paratypes one male imago, two female imagos, same data. In collection of writer, except the male paratype which is in the California Academy of Sciences, San Francisco.

The *bicolor*-group has not heretofore been represented among the known western species. *E. lodi* Mayo is allied to *E. temporalis* McDunnough and to *E. doris* Needham, but is larger than the eastern forms. Alcoholic specimens of *E. temporalis* McDunnough were loaned for comparison. The general coloring is more reddish than that of *E. temporalis*. The wings are yellow tinged and the venation yellow in contrast to the hyaline wings of *E. temporalis*. No dark dot apically on femora as in *E. temporalis*. Abdominal tergites not deep brown. No ganglionic markings on sternites of male.

BICOLOR nymph

(Figure 1)

Mr. George F. Edmunds, Jr. presented to me for study the *bicolor* nymph figured in fig. 1. I do not declare this the nymph of *Ephemerella lodi* because it has not as yet been reared. However, due to the larger size of both the nymph here figured and also of *Ephemerella lodi*, and to the similarity in type localities I recognize the possibility that the two might be the same species and enter both descriptions here.

General color dark brown sprinkled with pale dots and larger pale areas as in figure. No occipital tubercles in female. Dorsal abdominal tubercles lacking on segment 1. On segment 2 they are better developed than on other tergites, but not very long; about half the length of the distance between them, and rounded at the ends; smoky in color and marked at base with pale area. Three or four pale dots on tergites between tubercles. On tergite 3 dorsal spines smaller than those on tergite 2 and all dorsal spines decrease in size to rearward; those on segments 9-10 very minute. Spines on all tergites parallel. Width between dorsal abdominal spines on segments 5-7 less than length of tergites in median line. Tergites between tubercles rich brown sprinkled with pale dots; lateral to tubercles is a pale streak from anterior to posterior margins of segment. On segments 9-10 two narrow, pale streaks extend from anterior margins to tubercles; large pale areas as in figure. Tails dark brown, banded with pale areas; long fringe of hairs. Tails cut short in figure. Length body, 11-12 mm. Tails 8 mm.

Two female nymphs, in the collection of Mr. George F. Edmunds, Jr. Collected by E. P. Hughes north of Peoria Slough, altitude 259 ft., near Corvallis, Oregon, May 16, 1947.

HEPTAGENIA KENNEDYI McDunnough

(Figures 8, 9)

These were found to be common in the Jackson area in Amador County, California. The genitalia were treated in KOH and the number of median spines apparent are of interest (see figs. 8, 9).

Male imago, pinned (figs. 8, 9). Head brown, eyes black. Pronotum blackish along posterior border. Mesonotum yellowish-brown, bordered by dark brown on prescutum. Sutures rose tinged. The mesoscutellum and metanotum brown, speckled near wing bases. Pleuron yellow. Wings hyaline, iridescent; venation white. Fore coxae and trochanters yellow; femora reddish-brown; tibiae and tarsi dark brown, lighter than femora; femora and tibiae blackish at joinings; claws black. First tarsal segment one-fifth length of second. Middle and hind legs yellow tinged with brown along anterior border of femora and tarsi. Abdominal tergites all dark brown on posterior borders giving a distinct ringed appearance. Tergites 2-6 hyaline; tergites 7-9 brown with three yellow streaks along midline; tergite 10 lighter. Abdominal sternites 1-6 hyaline, 7-9 opaque; pale yellow. Tails brown tinged with rose, darker basally. Forceps amber tinged with rose; segments 3 and 4 of forceps together not quite as long as segment 2; 3 longer than 4. Penes amber; each with apical lobe, also with small lateral spines (see figs. 8, 9); ventrally there are three pair of spines, one very prominent, heavily sclerotized at tip, with an unsclerotized ring-like area behind tip; the other two sclerotized pieces are not so prominent, but easily detected in a specimen treated with KOH; dorsally there is a fourth pair of very large, heavily sclerotized spines. Length: body, 6-7 mm., wing, 8 mm.

Alcoholic specimens: eyes grey in some, black in others. Forelegs more pale; femora yellowish-brown, tibiae yellow with blackish joinings. Tails more pale.

Female imago, pinned; similar to male, but abdominal tergites not so distinctly ringed. In alcohol, the abdomen not ringed.

Specimens taken from Dry Creek near Dry Town, Amador County, California, June 1, 2, 14, 1938. One male imago, Amador Creek near Amador, California, May 29, 1938. This specimen is larger; length body 9.5 mm., wing 9 mm., tails pale. One imago in alcohol in collection of California Academy of Sciences. Rest of material in collection of writer.

HEPTAGENIA species number 1

(Figures 2, 6)

Male imago; reddish brown. Bases of ocelli black. Eyes grey. Pronotum mottled with red medially; anterior and posterior margins dark reddish. Pronotum yellowish laterally. Mesonotum reddish-yellow washed with red in anterior portion; sutures posteriorly tinged with red. Tergites 3-6 semi-hyaline, washed with red; 1-2 more mottled with red; 7-10 opaque, reddish-brown. Wings hyaline; veins pale yellow; stigmatic area milky. Pro- and mesopleura marked with dark reddish-brown stripe, which extends across the procoxa, around the first spiracle on the mesoepisternum and on the

epimeron at base of mesocoxa; a whitish area above first spiracle anterior to wing base. Pleuron reddish-yellow; metapleuron tinged with red around bases of coxa. All trochanters yellow (rest of legs missing in this specimen). Abdominal tergites and sternites pale along pleural fold. Large tracheal trunk and branches visible but colorless. Sternites pale except last three of abdomen which are opaque, reddish-yellow. Penes with four pair of spines (see fig. 6). The large medial spines (fig. 2) are bent at an acute angle and from the ventral view only the tips can be seen; on each side there is a sclerotized ridge for the attachment of heavy muscles (see fig. 6). The fourth segment of forceps is only slightly more than one-half the length of third segment. Segments 3 and 4 together are slightly more than one-half length second segment. Length: body, 7 mm., wing 7 mm.

One specimen taken from Dry Creek, near Dry Town, California, June 1, 1938. In collection of the writer. This specimen is undoubtedly closely allied to several western forms; *H. otiosa* McDunnough from Oregon; *H. criddlei* McDunnough from Wyoming; *H. rodocki* Traver from Idaho; *H. rubroventris* Traver, California, and *H. rosea* Traver, Oregon. The general coloration and details of the genitalia separate it from all but *H. rodocki*. I do not believe the median spines on penes of "*H. species number 1*" are capable of rotation near middle as are those of *H. rodocki*. The abdominal maculation differs in the one specimen at hand. I hope to be able to make a more thorough study of this group when more material is available.

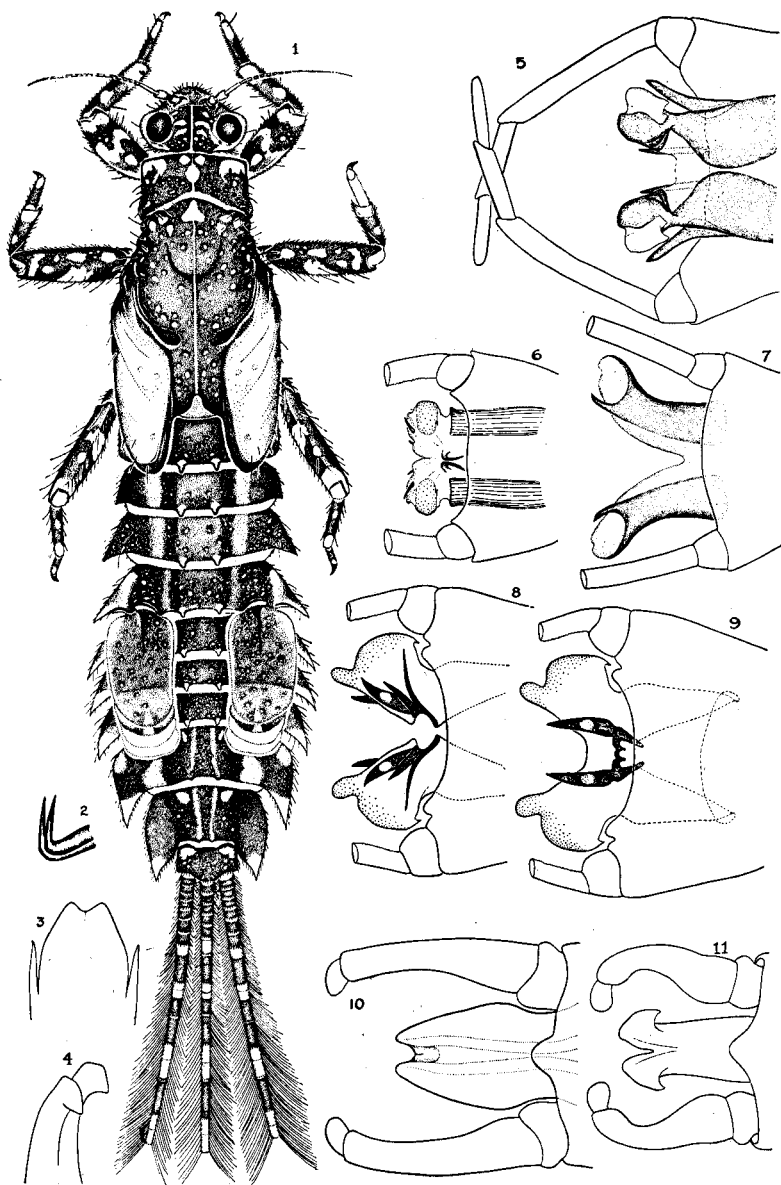
CINYGMULA PAR Eaton

(Figure 5)

Male imago, pinned (fig. 5). Head reddish-brown; white around bases of antennae. Thoracic notum black with a bluish tinge; tinged with brown laterally at wing bases. Pleural sclerites black; unsclerotized areas brown, with a pale area at wing base. Pleural wing recess black. Thoracic sternum black. Wings hyaline, iridescent except near base where they are tinged with brown; also lightly tinged in stigmatic area; venation light brown; cross veins not margined. Forelegs black; claws lighter, dissimilar; middle and hind legs dark brown; tarsi paler. Abdomen semi-hyaline; tergites washed with light brown in posterior portions, posterior borders slightly darkened with brown; anterior borders of segments 2-7 hyaline, producing an annulated effect; tergites 1-2 darker brown, 3-7 pale, 8-10 dark brown; all tergites with brown tracheations. Abdominal sternites 1-2 light brown;

EXPLANATION OF FIGURES

Figure 1—Nymph of *bicolor*-group of *Ephemerella*. Figure 2—Median spines on penes of *Heptagenia* species number 1. Figure 3—Subanal plate female, *Ephemerella lodi*, new species. Figure 4—Lateral view penes, *Ephemerella* species number 2. Figure 5—Male genitalia *Cinygmula par* Eaton. Figure 6—Male genitalia *Heptagenia* species number 1. Figure 7—Male



genitalia *Cinygmula tioga* new species. Figure 8—Ventral view male genitalia *Heptagenia kennedyi* McDunnough. Figure 9—Dorsal view, same, of *H. kennedyi*. Figure 10—Male genitalia *Ephemerella lodi* new species. Figure 11—Male genitalia *Ephemerella* species number 1.

2-6 hyaline except for prominent dark brown ganglionic markings; 7 opaque white, 8-9 darker. Forceps and forceps base blackish. Penes with lateral and medial spines (sclerotized areas of penes represented by shading in figure), tails dark brown basally, lighter distally.

Female, pinned. More uniformly colored than male. Head blackish-brown; thorax black; notum black tinged with brown posteriorly. Wings hyaline, tinged but slightly near base; much less so than in male. Legs reddish-brown. Abdominal sternites more uniformly brown than those of male; sternites 3-6 pale with dark brown ganglionic markings, 7-8 brown, 9 pale with subanal plate dark smoky. Tails light brown.

Two male imagos, pinned. Shadow Creek near Mineret Glacier, Madera County, Sierra Nevada of California; altitude 9,560 ft., September 10, 1939. Female imago, pinned, same data; vial of alcoholic material both sexes, same data.

General coloring different from that of the type of *C. par*, black in contrast to the light brown coloring of the type. Dr. Herman T. Spieth writes the following about the type of *C. par* Eaton:

"There is no sign of the blackish or sepia pigmentation being intermixed into the brown ground color. The specimens appear brownish yellow rather than blackish brown . . . Penes very much like those of *confusa* McD. and *C. hyalina* McD."

The wings of these specimens are not grey-tinged as are those of the type. One male imago in alcohol in California Academy of Sciences. Other specimens in collection of writer.

Cinygmula tioga Mayo, new species

(Figure 7)

Male imago (fig. 7). Pale species with uniform amber tinged wings. Head yellowish; wide black bands around ocelli; fine brown pencilings on vertex. Pronotum visible only from sides, penciled with reddish brown. Mesonotum yellowish brown. Sutures and medial part of scutellum powdery white. Postscutellum and metanotum brown. Pleuron pale yellowish brown with powdery white in unsclerotized areas, particularly anterior to wing base. Wings tinged with amber; veins narrowly dark brown. Forelegs pale; femora yellowish, slightly smoky at tibial joining. Dark brown elbow at joining of tibiae and tarsus. First tarsal segment three-fourths length second. Joining of fourth and fifth tarsal segments narrowly brown. All claws similar; washed with brown. Tergites 1-8 semi-hyaline. The anterior margins of segments 2-8 are pale, the remainder of segments washed with brown, giving a banded appearance. Dark lateral tracheations on each of tergites 1-8. Tergites 8-10 yellowish brown. Sternites more pale than tergites; segments 1-8 hyaline; 8-9 opaque, yellowish brown. Slight traces of ganglia apparent by a few brown ventral markings in some specimens. Forceps brown (segments 3-4 have been broken off in all specimens). Sclerotized portions of penes brown, unsclerotized portions white. Penes each with one pair of medial spines. Tails light brown. Length: body 8 mm., wing 8.5 mm.

Female imago similar to male, but with paler wings. Abdominal tergites more opaque due to eggs in abdomen. Tracheations same as in male. No ventral ganglionic markings.

Holotype, male, and 7 male imagos (in alcohol) LEEVINING CREEK, SIERRA NEVADA MOUNTAINS, MONO COUNTY, CALIFORNIA, August 21, 1938, altitude 9,900 ft. Eight female imagos, same data. Four males in alcohol in collection of California Academy of Sciences. The rest in collection of writer.

Cinygmula tioga Mayo is related to *C. mimus* Eaton. In general appearance *C. tioga* is paler, yellowish-brown; whereas *C. mimus* is more of a chestnut brown. The wings of *C. minus* are darker in basal half of fore wing and in hind wing. In *C. tioga* they are uniformly tinged a lighter amber as in *C. uniformis* McDunnough. Venation in *C. mimus* paler than that of *C. tioga*. The abdominal markings vary somewhat. There are no tracheations on tergites of *C. mimus* and these are prominent on *C. tioga*. Traces of dark ventral markings entirely lacking on *C. mimus*. Genitalia of the same type, but the spines on *C. tioga* are longer.

EPHEMERELLA species number 2

(Figures 4, 11)

Male imago (figs. 4, 11). Head yellowish-orange; dark brown around bases of antennae and ocelli. Prothorax yellowish-orange with dark brown tracheations. Cervical membrane rose colored. Mesonotum yellowish-orange, tinged with rose posteriorly, and around wing bases. Unsclerotized areas of the entire thorax are distinctly rose colored. The mesoepisternum posterior to spiracle and the epimeron are brown. Wings hyaline except in the stigmatic area. Venation very faint. Legs pale yellow. Fore femora yellowish apically, tibia tinged with brown at apical joinings and claws light brown. Abdominal tergites rose colored, darkened laterally. Anterior and posterior margins hyaline giving an annulate appearance to abdomen. Brown tracheations on tergites. Sternites also rose colored, but pale; the lateral anterior corners are darker rose and the prominent ganglionic markings are light brown. Genitalia somewhat as in *E. micheneri* Traver. Tails white with reddish joinings. Length: body 8 mm., wing 7 mm.

Two male imagos were taken from Dry Creek, near Dry Town, California, May 30, and June 2, 1938. In collection of writer.

"*Ephemerella* species number 2" is a member of the Serrata group and is similar to *E. micheneri* Traver. Possibly it may be identified as *E. micheneri* when more material is at hand, but in the two male imagos collected there are variable characters which are of interest. Coloring of entire body distinctly reddish. Blackish markings on pleura, coxae and sterna as described in *E. micheneri*. Forceps similar to those of *E. micheneri* and penes separated api-

cally by a V-shaped cleft. Each side is bent forward and ends in a sharp process which does not project upward in lateral view of *E. micheneri*. More conclusive evidence as to the identity of "E. species number 2" may be revealed when the nymphs are known and reared.

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SUGGESTIONS ON PREVENTING OUTBREAKS OF BARK BEETLES IN CALIFORNIAN PINE FORESTS

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The following suggestions result from observations made in Shasta County, California, during 1951. It is a pleasure to express my indebtedness to Dr. Ralph Hall and Mr. F. P. Keen, who enabled me to make use of the facilities of the entomological laboratory at Hat Creek, Shasta County.

The commonest and most important bark beetles in Californian forests are the following (quotations are from F. P. Keen's book "Insect enemies of western forests," U. S. Dept. Agric., Miscell. Publ. No. 273; 210 pp., 92 text figs. 1938).

1. *Dendroctonus brevicomis* LeConte.—"Normally it breeds in a few overmature trees, in windfalls, unhealthy trees, or in trees weakened by drouth, stand stagnation or fires."

2. *Dendroctonus monticolae* Hopkins.—"During endemic infestations there is a tendency for the beetles to select the weaker, less vigorous trees for attack, but no such selection is apparent during epidemic conditions."

3. *Dendroctonus jeffreyi* Hopkins.—"Although it often attacks trees that are apparently in a healthy condition it seems to prefer trees that are retarded in growth by droughts or defoliations."

4. *Ips emarginatus* LeConte.—"The emarginate ips (*I. emarginatus* Lec.) is most frequently found associated with the mountain pine beetle in its attacks on ponderosa pine, lodgepole pine,