

NEW WESTERN EPHEMEROPTERA, III

VELMA KNOX MAYO

Nickel Plate, British Columbia

(Plate III, figures 9, 11)

Ameletus montana Mayo, new species

Male imago in alcohol. Head brown; ocelli white, bordered by dark brown at bases. Pronotum dark brown with fine tracheations laterally. No creamy areas on postero-lateral edges of pronotum as in *A. celeroides* McDunnough. Mesonotum dark brown with creamy white in unsclerotized area between prescutum, and scutum; also creamy spot on either side of midline near scutellum. Pleural sclerites dark brown; unsclerotized areas at bases of wings creamy white. Sternites brown. Forelegs pale yellowish-brown; middle and hind legs creamy. Wings with a reddish-brown tinge due to prominence of reddish-brown longitudinal veins, cross veins less distinct; stigmatic area milky. Abdomen semi-hyaline; first tergite dark brown, tergites 2-7 semi-hyaline, washed with pale tracheations; laterally tergites 2-7 very pale; 8-10 dark brown with pale streak on edges. Sternites paler than tergites; 2-8 with blackish ganglionic markings; anterior border and lateral edges of sternite 9 brown. Genitalia as in figure 11. Forceps and forceps base very pale yellowish brown. Penes are narrow, parallel, and slightly incurved at tips; at the base of each are three prominent spines. Tails white, with minute brown hairs. Each segment delicately bordered posteriorly with reddish brown.

Male, pinned. Thorax dark brown. Forelegs dark brown; middle and hind legs yellowish. Wings brown tinged; longitudinal veins prominent; cross veins less so, but not indistinct. Abdomen much as in alcoholic specimen, but the posterior borders show as darker bands of brown; segments 8-10 dark brown; tergites with dark tracheations; sternites paler than tergites with ganglionic areas blackish. Genitalia and tails brown. Length body, 10 mm; wing 10 mm.

Female in alcohol. More uniformly colored than male. Thorax light reddish-brown with same creamy areas at wing bases. Forelegs yellowish-brown, middle and hind legs pale yellow tinged with red on tarsi. Wings tinged with brown. Abdomen not semi-hyaline as in male. Tergites about same shade as thoracic notum, posterior borders darker, all tergites with fine tracheations. Sternites paler than tergites but not hyaline as in male. Ganglionic areas blackish. Subanal plate very small, covering less than half the eighth segment. Tails white, speckled with short brown hairs as in male.

Nymph. Head and thorax brown; median line of thoracic notum pale. Legs yellowish-brown with last tarsal segment dark reddish-brown. Abdominal tergites brown with dark submedian streaks from anterior margins; area between these streaks pale on segments 3 and 4; laterally dark streak extending from posterior margin near medial side of gill attachment nearly to antero-lateral corner of tergite. Tracheae of gills are numerous and readily seen under microscope, but cannot be seen with naked eye. Sclerotized band present on gills as far from margin as width of band (fig. 9). Ventrally, ganglionic markings distinct on sternites 2-8; sternite 1 pale; 2-4 and 8

uniformly brown; 5-7 pale except around ganglionic markings; 9 pale; each sternite with brown patches on either side of midline; small distinct white patches in antero-lateral corners. Tails fringed; pale basally, banded with dark brown medially and pale distally.

Holotype, male imago (in alcohol) MCGUIGAN CREEK, PAINE MOUNTAIN near NEW DENVER, BRITISH COLUMBIA, altitude 6,500 ft., August 29, 1940. *Allotype*, female imago same data. *Paratypes*, one vial, same data. One male imago, paratype, and one nymph in collection of California Academy of Sciences. Rest of material in collection of writer.

Ameletus montana new species is related to *A. celeroides* McDunnough. The distinguishing character is mainly in the genitalia. *A. montana* has three large spines on each penis whereas in *A. celeroides* there are but two small spines on each penis. *A. montana* is larger in body form.

EPTHEMERELLA FLAVILINEA McDunnough

Dr. McDunnough loaned me specimens of *Ephemerella flavilinea* McDunnough and I was thereby able to determine that the species occurred very commonly in the Jackson, California region in May, 1938. The nymphs were reared and both male and female imagos obtained. The imagos varied in color, some darker, others paler. It was found that the specimens taken from Jackson Creek were slightly smaller than those from Dry Creek in the same region.

Ephemerella delantala Mayo, new species

(Plate I, figure 2)

Nymph. (fig. 2). A member of the *E. simplex* group. Yellowish species with brown markings. Head yellowish on vertex; mouthparts brown. Maxillary palp present. Pronotum yellow, with faint traces of adult pattern showing through, more distinctly in male. Mesonotum yellow, with dark brown pattern as in fig. 2, giving a banded appearance across anterior third of mesonotum. Pleural and sternal sclerites brown. Forelegs yellowish; middle and hind coxae dark brown; trochanter and basal half of femora brown; tibiae and tarsi yellowish, amber colored near claws. Six or seven minute denticles on claws. Abdominal tergites 1-3 dark brown in both sexes; in the male the 4th tergite is brown laterally and yellow medially; in female, 4th tergite is more uniformly brown (fig. 2). In both sexes tergites 5-7 are wholly yellow, tergite 8 dark brown along posterior border and lateral angles, yellow anteriorly, tergite 9 wholly brown, tergite 10 yellow. The dorsal abdominal spines give the appearance of folds on either side of midline forming a pleat on tergites 4-8. The spines on tergites 4-8 are conspicuous and increase in size to rearward; they bear fine spicules. On tergites 2, 3, and 9 projections relative to spines on posterior margins are scarcely visible. Prominent postero-lateral spines present on segments 5-8 (fig. 2); these are curved up dorsally forming a trough between the lateral and dorsal spines in which lie the gills. Gills

present on segments 4-7 only; those on 4 semi-operculate. Ventrally, abdominal sternites 1-4 brown; 5-7 and anterior part of 8, yellow tinged with brown on either side of midline; lateral angles and posterior portion of 8 and anterior half of 9 dark brown. Tails yellowish with light fringe of hairs on distal half. Length: body of male nymph 5 mm; female nymph 6 mm.

Holotype, nymph (in alcohol) MARTIS CREEK near TRUCKEE, PLACER COUNTY, CALIFORNIA, altitude 6,000 ft., June 23, 1933. Collected by Dr. P. R. Needham and party. *Paratype*, one nymph, same data. Holotype in collection of the California Academy of Sciences. Paratype in collection of writer.

Ephemerella delantala new species is related to *E. margarita* Needham. It is a member of the *E. simplex* group and readily distinguishable from *E. attenuata* McDunnough and *E. simplex* McDunnough. The former has tubercles present on the head and thorax; in *delantala* there are no tubercles on head and thorax. *E. simplex* has no dorsal abdominal spines and no denticles on claws, both of which are present on *delantala*. *E. margarita*, to which *E. delantala* is most closely related, is larger; the legs are pale, tibiae and tarsi banded; in *E. delantala* the trochanter and basal half of the femora are dark brown; tibiae and tarsi not banded. Lateral extensions of abdominal segments 5-8 are well developed on *E. delantala*, present on segments 4 to 9 in *E. margarita*. "Rather short dorsal spines present on tergites 3-9" in *E. margarita*, prominent dorsal spines present on segments 4-8 of *E. delantala*. Abdomen broadest at segment 7 in *E. margarita*; broadest at segment 5 in *E. delantala*. Tails not banded in *E. delantala* as in *E. margarita*.

Baetis palisadi Mayo, new species

(Plate II, figures 3, 5. Plate III, figure 6)

Male imago (fig. 5). Head brown. Turbinate eyes fairly large; orange. Pronotum with dark brown lateral triangles; median area smoky; posterior margin widely banded with creamy. Mesonotum rich dark brown with creamy areas on either side of parapsidal grooves extending to tip of scutellum; laterally, brown. Metanotum and first abdominal tergite dark brown. Pleural sclerites deep brown, unsclerotized areas creamy. Wings hyaline; venation colorless, stigmatic area milky; cross veins in stigmatic area very indistinct, some appear to be anastomosed. Hind wing with well developed costal projection, three veins and no intercalaries; the third vein is well developed, extending to beyond the middle of hind margin (fig. 3). Legs pale, colorless; coxae pale with brown sutures; femora pale with faint tinge of brown near tibial joining, likewise tibia with pale brown tinge at tarsal joining; claws dissimilar, brown. Abdominal tergites 2-6 hyaline, tergite 2 with two pale smoky spots on anterior margin, but these are lacking on

remainder of tergites; tergites 7-10 yellowish-brown. Tails colorless. Laterally the tergites are faintly tinged with smoky around stigmatic area. Sternites 2-6 hyaline, sternite 1 yellowish, sternites 7-9 deeper yellow. Forceps pale yellowish; genitalia as in fig. 6. Length of body 8 mm; wing, 8 mm.

Female imago. In the female the coloring is more uniformly light brown. The brown thorax is much lighter than that of male. Wings hyaline, venation distinct, light brown. Legs yellowish with sutures outlined in brown; all femora with brown streak the entire length of anterior and posterior surfaces; tarsal joinings brown, claws brown. Abdomen not hyaline, but a yellowish brown; each tergite is marked near the anterior margin with two pair of small dark patches, one above the other on either side of midline; laterally near pleural fold each tergite has two brown markings. Sternites are pale yellow, marked as tergites with two brown streaks on either side of mid-ventral line near the anterior margin; sternite 9 shaded with brown. Tails pale. Length: body 8 mm; wing 8 mm.

Holotype, male imago (in alcohol), BIG PINE CREEK, SIERRA NEVADA MOUNTAINS, INYO COUNTY, CALIFORNIA, altitude 8,100 ft., July 5, 1939. Collected by the writer. *Allotype*, female imago, same data as male. *Paratypes*, three male imagos; one female imago, same data. Holotype in the collection of the California Academy of Sciences. Paratype, one female in same collection. Others in collection of the writer.

In type of genitalia *Baetis palisadi* new species is allied to *B. piscatoris* Traver and *B. adonis* Traver, from California, and *B. lasallei* Banks of Wisconsin. *B. palisadi* is considerably larger than any of these. It can readily be distinguished from *B. piscatoris* by the abdominal tergites which are not banded; from *B. lasallei* it can be separated by the absence of intercalaries in the hind wing; also by the absence of black dots on each tergite, in the male. The maculation of the entire body differs from that of *B. adonis*. In the hind wing the third vein is well developed in *B. palisadi*, in *adonis* it is short, ending in the basal third of hind margin.

***Ephemerella sierra* Mayo, new species**

(Plate I, figure 1, and Plate III, figures 7, 8)

Nymph (Plate I, fig. 1). Color of mature nymph dark brown with a distinct reddish tinge on abdomen and ventral surface. Immature nymphs light brown. Head with a pair of prominent, erect occipital tubercles; vertex light brown between tubercles. On the pronotum is a twin pair of long, pointed tubercles which are subequal, the posterior in some cases being slightly shorter; medially, next to posterior tubercles is a pair of shorter tubercles, plainly visible; on same level as anterior twin tubercle is a smaller sharp, lateral tubercle; between the twin tubercles the pronotum is light brown; laterally, dark brown. The tubercles are covered with small, heavy spines. There are three pairs of tubercles on the mesonotum; the first is near

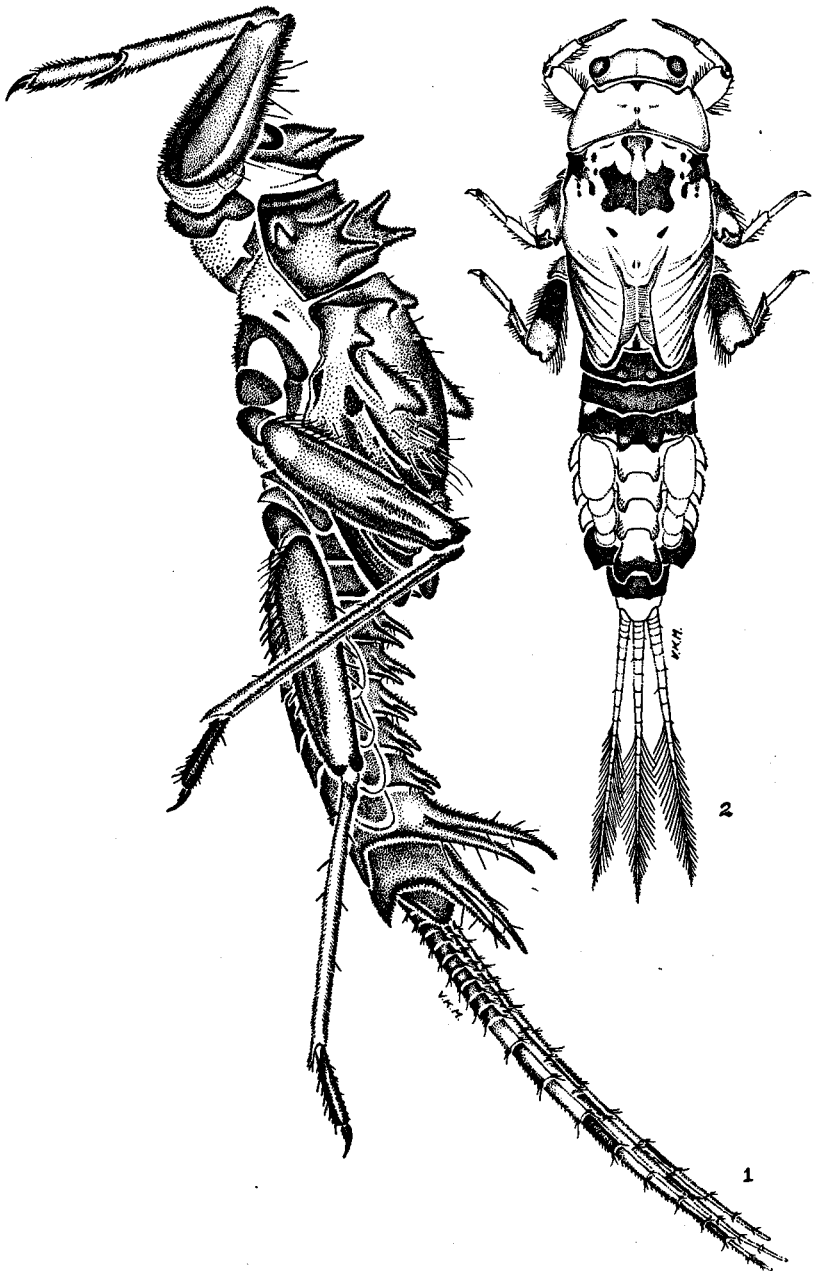


Plate I: Fig. 1 *Ephemerella sierra*, n. sp., nymph. Fig. 2. *Ephemerella delantala*, n. sp., nymph.

the anterior margin, one tubercle on either side of midline; a ridge extends from each short, blunt tubercle to the antero-lateral angle of mesonotum. Laterally and slightly posterior to the anterior tubercles is the second pair of longer ones in the middle portion of segment is a third pair, very much larger, wide basally and directed backwards. The area between the large tubercles and the scutellum is light brown; the rest of scutum is dark reddish brown; all tubercles and the area between them along midline are covered with short, heavy, black spines. On the posterior portion of mesonotum are numerous long hairs. There is a slight hump between wing pads which corresponds to the scutellum of the adult. Legs light, washed with darker brown; traces of a dark streak on each femur, fore femur with no teeth on anterior margin. Tibial thumb fairly sharp. Hind tibia as long as trochanter and femur combined. Prosternum with a long, blunt tubercle directed towards head. Mesosternum light reddish brown except for two distinct lunate, dark markings, one on either side of midline behind leg bases. Pleural sclerites dark brown; unsclerotized areas light. Abdominal tergites 2-9 each bears a pair of sharp tubercles on posterior margin; those on tergites 2-7 are approximately the same size and directed backwards, those on segments 5-6 are wider apart than the others. The tubercles on tergites 8-9 are very much longer, at least four times the length of those on segments 2-7 and bear numerous long, heavy bristles; the tubercles on tergite 8 are more erect than those on 9, which are directed backwards. Tergites 3-7 and 10 are deep reddish brown, very dark laterally, tergites 2 and 8-9 are light brown between tubercles and darker laterally. Gills on segments 3-7. Abdominal sternites reddish brown; laterally on each segment are two dark red markings on either side of midline; the medial of these is an oblique streak from anterior margin. There is a trace of a dark mid-ventral line on sternites 5-9; sternites 1-5 are lighter along midline. Lateral prolongations of abdominal segments as in fig. 8, pl. III. Tails dark brown in basal third, the outer two-thirds alternately light and dark, each segment ringed posteriorly with spines. Length: body 11-12 mm.

Holotype nymph, SOUTH FORK BISHOP CREEK, INYO COUNTY, CALIFORNIA, altitude 9,500 ft., August 28, 1938. *Paratype*: eight mature nymphs, same data. Two immature nymphs. American River, California, altitude 4,200 ft., July 24, 1938. Collected by the writer. Twenty immature nymphs collected by Dr. P. R. Needham and party as follows: Independence Creek, one mile above Independence, California, June 13, 1934. South Fork Bishop Creek, June 20, 1934, June 25, 1934. Megee Creek, Mono County, July 6, 1934. One paratype in collection of California Academy of Sciences.

One nymph collected July 4, 1938. South Fork Bishop Creek, Inyo County, California, altitude 9,500 ft., was removed to Mammoth Lakes, Mono County, California, altitude 8,000 ft., and reared to the subimago stage. The subimago emerged on August 28, 1938.

Following is a description of the specimen: Bright red species. Head reddish brown, yellow around bases of antennae. Ocelli white. Pronotum deep

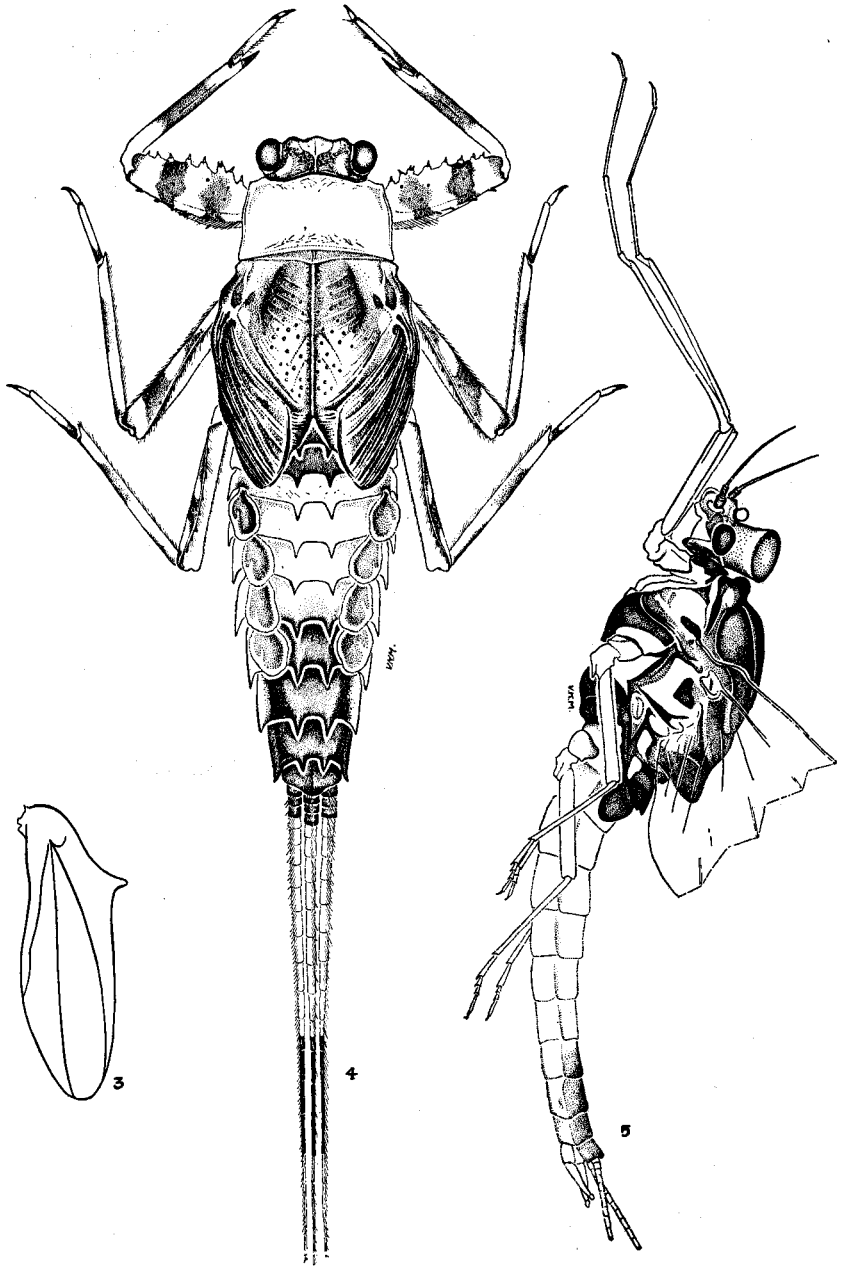


Plate II: Fig. 3. Hind wing *Baetis palisadi*, n. sp. Fig. 4. *Ephemerella wilsoni*, n. sp., nymph. Fig. 5. *Baetis palisadi*, n. sp., adult.

reddish brown laterally with a light red area in the medial portion. Mesoscutum lighter brown surrounded by bright red. Light area on either side of midline near scutellum. Pleural sclerites bright red tinged with rose; unsclerotized areas light and powdery white in part. Wing venation dark brown; adult subcostal vein shows through as bright red. Fore legs deep reddish brown, femora of middle and hind legs light yellow in basal half and bright red distally; tibiae yellowish and tarsi tinged with dark brown. All abdominal segments bright red; each tergite bordered posteriorly by yellowish white, the latero-posterior angles and pleural fold whitish. Ventrally all segments but the ninth are bordered posteriorly with yellowish white; each sternite with a dark lunate streak from anterior margin on either side of mid ventral line. Forceps base light reddish brown; forceps and penes dark reddish brown (see genitalia, fig. 7, pl. III). Tails blackish in basal half; brown apically. Length: body 11 mm; wing 14 mm; tails 10 mm.

Ephemerella sierra new species is a member of the *E. fuscata* group and allied to *E. autumnalis* McDunnough of British Columbia. Dr. McDunnough kindly loaned me specimens of *E. autumnalis* and I was able to determine that the nymphs which I reared from Wilson Creek near New Denver, British Columbia on August 10, 11, 12, 1940 at an altitude of 1,700 ft., were undoubtedly *E. autumnalis*. On the nymphs of *E. sierra* and *E. autumnalis* the tubercles are similar; the twin tubercles on the pronotum are subequal; this is the main difference between these species and *E. spinifera* Needham. The tubercles on abdominal segment 8 in *E. sierra* are erect and those on segment 8 of *E. autumnalis* are "bent backward and downward." The body of *E. sierra* is stouter than that of *E. autumnalis*.

I also reared an *Ephemerella* species closely related to *E. sierra*, from Shephard Creek, Brexton, British Columbia, altitude 3,500 ft., on July 1, 1940. I failed to rear the male imago, but obtained two female imagos. Judging from the marked difference in general appearance of the nymphs and also from the variation in dates of emergence, this Brexton species is certainly not *E. autumnalis* and further study on more material will be necessary to determine its relationship to *E. sierra*.

Ephemerella wilsoni Mayo, new species

(Plate II, figure 4 and Plate III, figure 10)

Male imago, pinned specimen (fig. 10). Blackish-brown. Head black, Thoracic notum blackish; unsclerotized areas on pleuron pale reddish-brown. Fore legs dark brown; middle and hind legs paler, with tibiae and tarsi yellowish. Wings hyaline; longitudinal veins dark brown; cross veins indistinct; finger-like prolongations of wing membrane extending well beyond tip of scutellum. Abdomen reddish-brown, pleural fold and posterior borders of

segments pale. Forceps light brown, penes blackish. Tails black basally, pale brown distally.

Female imago unknown.

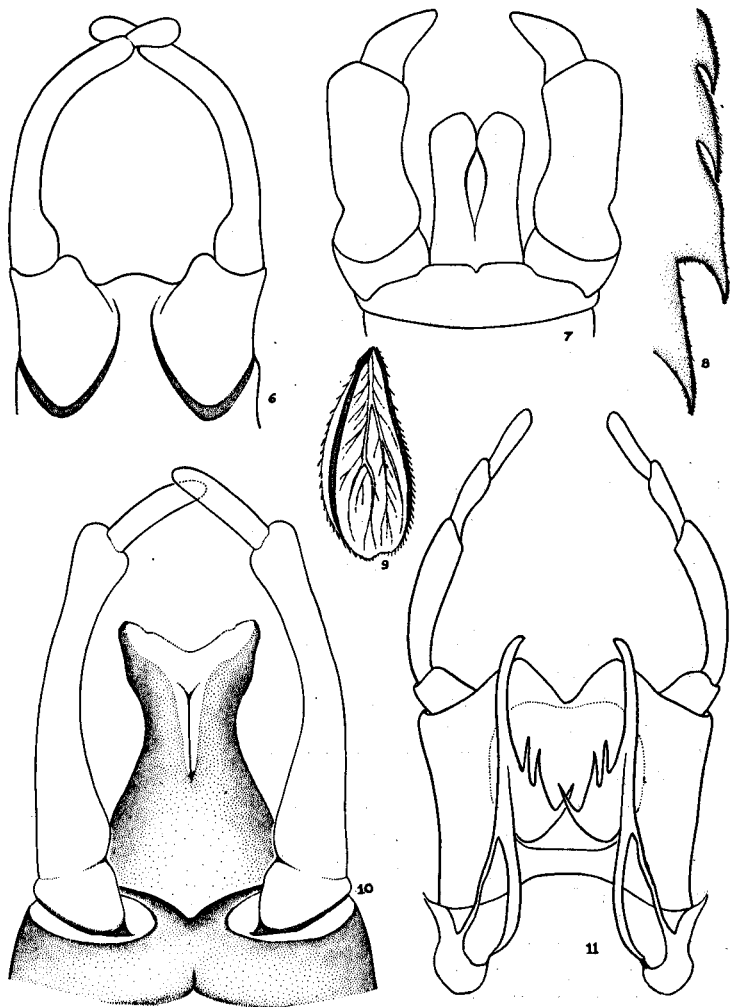


Plate III: Fig. 6. Male genitalia *Baetis palisadi*, n. sp. Fig. 7. Male genitalia subimago, *Ephemerella sierra*, n. sp. Fig. 8. Lateral prolongations of abdominal segments of nymph, *Ephemerella sierra*, n. sp. Fig. 9. Gill of nymph of *Ameletus montana*, n. sp. Fig. 10. Male genitalia of *Ephemerella wilsoni*, n. sp. Fig. 11. Male genitalia of *Ameletus montana*, n. sp.

Male imago in alcohol. Thorax blackish-brown; abdomen a light reddish-brown. Pronotum smoky with black tracheations; blackish on either side of midline; postero-lateral corners white. Mesonotum blackish-brown; distinct white strip between prescutum and scutum; prescutum black; white patch near prescutum on either side of scutum proper. Medially the entire scutum darker than the sides which have a reddish tinge; yellow patch laterally on postscutum light red patches medially and laterally on scutellum. That part of wing membrane attached to the scutellum is developed into a finger-like process extending well beyond the tip of scutellum. Pleuron of prothorax is white with delicate tracheations. On mesopleuron the sclerites are blackish-brown, and unsclerotized areas white with faint tracheations. The entire prosternum is white, unsclerotized with the exception of the basisternal sclerite, a small blackish brown area between fore coxae. Mesosternum blackish with white along midline. Fore legs dark brown; coxae and trochanters brown with black tracheations; femora, tibiae and tarsi blackish. Middle and hind legs pale yellowish with delicate black tracheations on coxae and trochanters; femora with margins pale yellow, centers smoky with dark tracheations, brownish tinge in outer third; tibiae pale with very delicate tracheations in basal portion, tarsi and claws tinged with brown on dorsal surface. Wings hyaline; longitudinal veins blackish; cross veins pale, indistinct; stigmatic area milky. Abdomen much lighter than thorax. Tergites with reddish brown markings on a yellow background, and dense network of tracheations; along the mid-dorsal line is a hyaline streak bordered on either side by reddish streaks which attain the anterior margins; these are prominent on segments 2-4. Tergites 1-2 smoky with dense tracheations; at anterior border on tergite 2 are wide, narrow hyaline patches on either side of mid-dorsal streak; on tergite 3 they are larger and on 4-7 they extend from the mid dorsal line to the lateral edge of tergite so that the reddish markings on these segments do not attain the anterior border, except at midline. The posterior borders of tergites 1-2 are dark smoky with dense tracheations; those of tergite 3 less so with irregular blackish spots; 4-8 yellowish and 9 reddish brown. Laterally each tergite is yellow; the stigmatic areas are marked with light patches surrounded by deep reddish-brown; these dark brown lateral patches are prominent on all tergites. Reddish brown coloring of segments 8-10 darker than that of other segments. The posterior borders of sternites 1-8 are distinctly yellow as is also the midline. Laterally each sternite with a prominent dark reddish brown area; these are marked with two oblique pale streaks extending from the anterior margin of each sternite and also in the central portion of each segment (except 9) near midline, are two small pale dots outlined with reddish brown. The antero-lateral angles of each sternite pale brown; ganglionic patches dark smoky on sternites 1 and 2, 4 and 5. Sternites with fewer tracheations than tergites. Tails black basally, reddish medially with distal half white. Genitalia (see fig. 10) reddish-brown. Forceps not swollen apically. Last segments of forceps white; first and second segments reddish brown. Length body 14 mm; wing 15 mm.

Nymph, male (fig. 4.) Alcoholic specimen dark brown with white pronotum. Living specimen black distinguished by prominent white pronotum. Head black, mottled with brown. Roughened area on vertex indicating very

slight occipital tubercles. No frontal horns or frontal shelf. Pronotum entirely white with faint tracheations. Mesonotum blackish with creamy patches on either side of midline near scutellum. Anterior border of scutum also creamy; heavy tracheations on scutum. Thoracic sternites pale with prominent dark ganglionic areas. Legs pale, banded with black. Coxae with well developed spinous ridge along anterior suture. Fore femora with heavy spines along anterior margin. Tibial thumb long, sharp. Abdominal tergites 1-9 with paired short spines. Tergites 3-6 white except under gills; spines on these segments also white; other tergites blackish with pale lateral margins; tergites 9 and 10 wholly dark, tergite 10 with long hairs from medial part anterior margin. Gills present on segments 3-7. Abdominal sternites light brown except 8 and 9 which are black; ganglionic markings on 1-7. Tails white except close to base where each is ringed with black, and beyond middle where a fifth of length is black. Length body 9 mm; tails 7 mm.

Holotype, male imago, pinned; WILSON CREEK, near NEW DENVER, BRITISH COLUMBIA, September 3, 1940, altitude 1,700 ft. *Paratypes*, two male imagos pinned, September 4 and 7, 1940, same locality. One male imago in alcohol, August 28, 1940, same data. One paratype, male imago pinned, and one nymph and cast skin in collection of California Academy of Sciences.

Ephemerella wilsoni new species is similar to *E. coloradensis* Dodds. Dr. McDunnough loaned specimens of *E. coloradensis*, both nymphs and adults, and the two species are readily distinguishable. The adults of *E. wilsoni* are much blacker than those of *E. coloradensis*. There is no distinct color contrast in nymph of *E. coloradensis* as in *E. wilsoni*. Occipital tubercles more prominent in *E. coloradensis*, and the tibial thumb is blunter than in *E. wilsoni* (see fig. 4). Also the abdominal spines are smaller than those of *E. wilsoni* and covered with spicules which are not present on the spines of *E. wilsoni*.

REFERENCES

McDUNNOUGH, J.

1934. New species of North American Ephemeroptera IV. Canadian Entomologist 66(7):154-164, 14 text figs.

NEEDHAM, J. G., J. R. TRAYER, and YIN-CHI HSU.

1935. The biology of mayflies with a systematic account of North American species. Comstock Publishing Co., Inc., Ithaca, New York.