A NEW MAYFLY GENUS FROM CALIFORNIA

(Ephemeroptera)

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On July 4, 1945, Harry P. Chandler, on a University of California field trip, collected a single nymph on Willow Creek, Madera County, California, that resembled in a general way the large nymphs of the Siphlonurus of this region, yet showed important morphological differences from any known species of this genus. Further collecting on Willow Creek by the writer and his wife during July and August of 1951 resulted in the rearing of adults from nymphs of this new species. In the author's opinion, this species cannot be included in any known genus of the Ephemeroptera.

In now erecting a new genus for the Willow Creek specimens above referred to, I take pleasure in naming it *Edmundsius*, in honor of Dr. George F. Edmunds, Jr.

Genus **Edmundsius** Day, new genus

Adult: Large mayflies, male adult of genotype having body 16.5, forewing 16.0, tails 20.0 and foreleg 11.2 mm. long; female adult of same size, with foreleg 8.0 mm. in length. Eyes of male contiguous, not divided, with lower portion darker; eyes of female separated by one and one-half times their diameter. Nasal carina very high, thin, and prominent. Posterior margin of head straight. Lengths of segments of foreleg of male genotype are: coxa plus trochanter 1.2, femur 2.6, tibia 2.2, and tarsus 5.2 mm., the tarsus being divided as follows: first tarsus 1.4, second tarsus 1.4, third tarsus 1.2, fourth tarsus .9, and fifth tarsus .5 mm. Claws similar on all legs, sharply pointed and hooked at tips. Lengths of segments of hind leg of male genotype are: femur 2.2, tibia 1.5, and tarsus 2.0 mm.; first tarsal segments of middle and hind legs completely fused with tibiae. The genotype has a compact group of 30 to 40 small spines in proximal half of fore femur of male adult, these being situated on the anterior surface; all tibiae of both sexes bear scattered small spines on margins, and coarser spines on all tarsi. Venation of wings as in figures 1 and 2, Plate IX. Styliger plate of male adult with a deep median V-shaped cleft on posterior margin, fully half as deep as wide. Forceps of male adult four-segmented; first segment short, ring-like, and partly fused with second segment which is over one and one-half times as long as third and fourth segments combined. Penes made up of overlying paired ventral and dorsal portions much as in numerous species of Siphlonurus. Ovipositor of female large, with heavy, raised lip. Two tails; vestigial median tail about .75 mm. in length.

Nymph: The large nymph, from 15 to 17 mm. in length, is perfectly streamlined. Head hypognathous and frontal margin deeply cut away on each side so that almost entire mandible is exposed; from the posterior margin to clypeus, median portion of head is somewhat elevated, presenting the appear-

ance of a low, longitudinal ridge as wide as the distance between the eyes. Posterior margin of head straight. Labrum deeply excavated in central portion; one-half as long as wide. Mandibles wide and strong, with heavy teeth on each. Maxillae somewhat conical at apex, with a few hairs on inner and upper margins at tip, and with four strong spines in same area on inner margin; palpi with three segments and one-third longer than the galea-lacinia; third segment of palpi quite dark. Labium as in figure 6, Plate IX; the three-segmented palpi with second and third segments completely fused, third segment being dark, very wide, and semi-truncate. Anterior margin of prothorax slightly concave and that of posterior margin straight. Pronotum slightly wider than head, and three times as wide as long. Mesonotum short and wide. A sharply ridged tubercle on scutelli of both mesonotum and metanotum. Legs of equal length and approximately three-tenths the length of the body. Claws long, slender, and without pectinations. In a typical specimen, the femur of the foreleg is 1,7, tibia 1.2, tarsus 1.4, and claw .65 mm. in length. On the middle and hind legs, the claw is twice as long as that of the foreleg, and slightly longer than the tarsus. Length of segments of hind leg are: femur 2.0, tibia 1.0, tarsus 1.2, and claw 1.3 mm. The thin, flattened lateral margins of the abdominal segments bear prominent and fine-pointed postero-lateral spines. Large, regularly oval gills are borne on segments 1–7, and are double on segments one and two; gills on segments six and seven about 15 per cent smaller than preceding gills; dorsal lamella of each double gill similar in form to, and about half again as large as ventral lamella; tracheae abundant, pinnate, dark, and easily seen. Tails, three of equal length, about two-fifths as long as the body; middle tail heavily fringed with long hairs on each side, and outer tails heavily fringed in inside.

Type of the genus, *Edmundsius* agilis Day, n. sp.

Remarks: The new genus *Edmundsius* can be placed in the subfamily Siphlonurinae as defined by Traver in "The Biology of Mayflies," 1935, page 443, but falls outside the limits of the genus *Siphlonurus,* to which it seems closest, in a number of important particulars. In *Siphlonurus,* the foreleg of male adult is at least as long as the body; in *Edmundsius,* it is only two-thirds as long. Compared to *Siphlonurus,* the new genus has hindwings relatively somewhat narrower and of slightly different shape. The long forceps base of the male adult of *Siphlonurus* is produced, straight, or very slightly convex in the various species, but in *Edmundsius* the apical margin is deeply and sharply cleft. The claws of the middle and hind legs of the nymph of *Edmundsius* are twice as long as those of any species of *Siphlonurus.* In all known *Siphlonurus* nymphs with double gills on the first and second abdominal segments are smoothly oval in form. Comparisons between the mouthparts, the dorsal and ventral lamellae of any pair are of equal size and have retuse distal margins; in *Edmundsius,* the ventral lamella

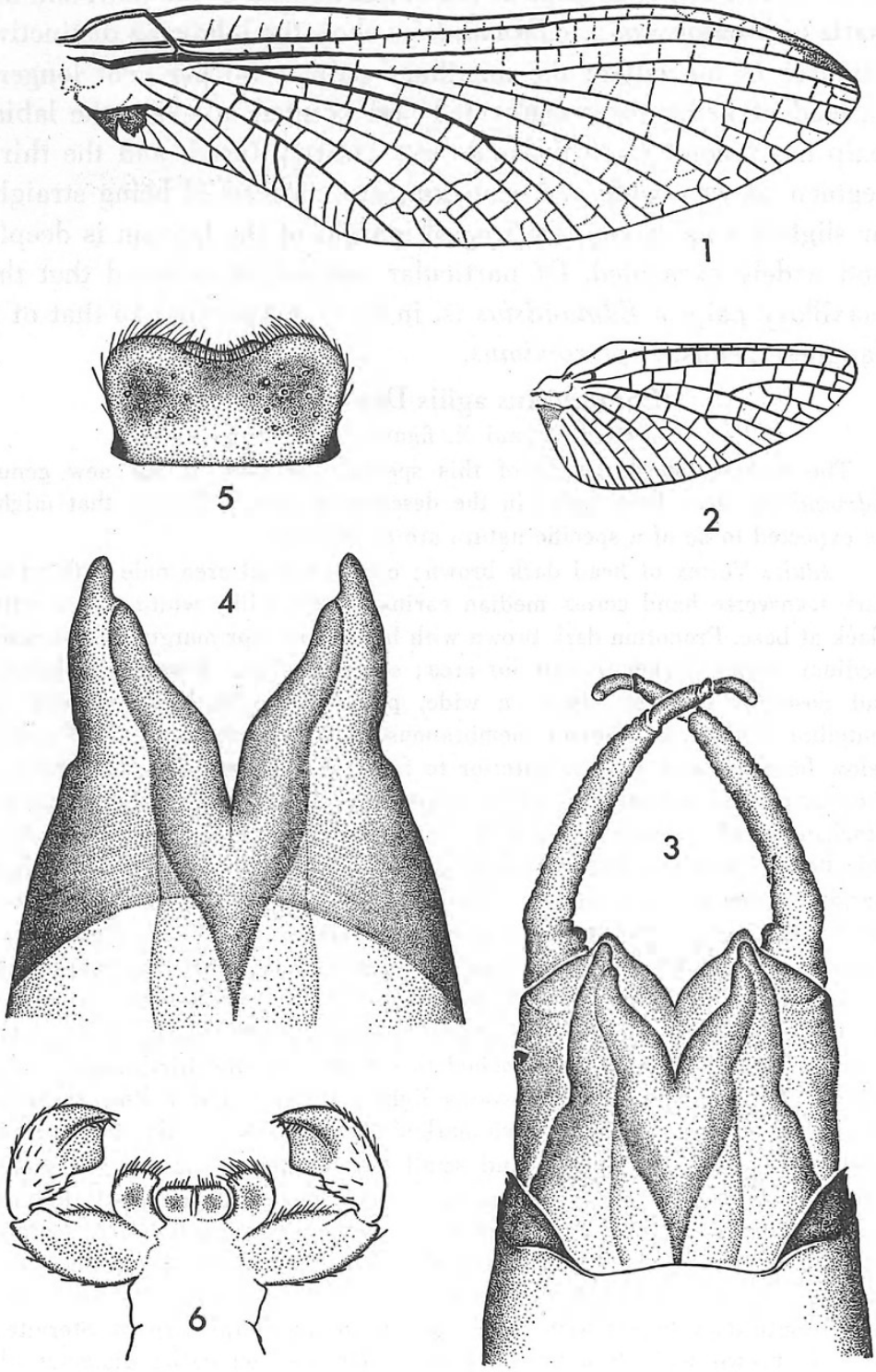

PLATE IX. *Edmundsius agilis*

Fig. 1. Forewing, male imago. Fig. 2. Hindwing, male imago. Fig. 3. Genitalia of male imago, dorsal aspect. Fig. 4. Penes of male imago, dorsal aspect. Fig. 5. Labrum of nymph. Fig. 6. Labium of nymph.

is about two-thirds as large as the dorsal lamella of the pair, and the parts of *Siphlonurus* and *Edmundsius* show the following distinctive features in the latter: the maxillary palp is 50 per cent longer; instead of being three-segmented and pointed apically, the labial palp has second and third segments entirely fused, and the third segment is very wide and semi-truncate; instead of being straight or slightly emarginate, the frontal margin of the labrum is deeply and widely excavated. Of particular interest, it is noted that the maxillary palp of *Edmundsius* is, in fact, very similar to that of a Japanese genus, *Dipteromimus*.

Edmundsius agilis Day, new species

(Plates IX and X, figures 1–13, incl.)

The morphological details of this species, the type of the new genus *Edmundsius*, have been given in the description above. Details that might be expected to be of a specific nature are as follows:

Adult: Vertex of head dark brown; clypeo-frontal area pale with wide, dark transverse hand across median carina; ocelli milky white ringed with black at base. Pronotum dark brown with black posterior margin. Mesonotum medium brown, darker in anterior area; scutellum paler brown with lateral and posterior margins black; a wide, pale, transverse band anterior to scutellum. Pleura dark brown, membranous areas milky white; a black stripe below forewing and another anterior to forecoxa. Mesosternum dark brown. Prosternum and metasternum white. Coxae brown with irregular lighter areas. Trochanters white, each with a single dark brown band on outside. Forelegs pale brown, proximal halves of femora and all tarsi slightly paler; ventral margins of femora narrowly edged with dark brown; a narrow, dark brown band partly around leg at proximal ends of femora and tibiae; claws same shade as tarsi. Middle and hind legs little paler than forelegs and marked in a like manner. Longitudinal veins of forewing dark chocolate brown; crossveins medium brown in basal portion, paling apically; crossveins of the costal strip dark only where attached to subcosta. In the hindwings, longitudinal veins dark brown; crossveins lighter in tone and paling apically. Abdominal tergites 2–9 light brown marked with fuscous as follows: a narrow band across posterior margins and small postero-lateral triangles; a short, oblique dash on each side of median line, arising one-third caudad of anterior margin; laterad of submedian dashes, a wide longitudinal band extending almost from anterior to posterior margins in basal segments, and becoming progressively shorter in apical segments. First tergite solid dark brown and tenth tergite dark brown with pale areas in antero-lateral corners. Sternites 1–8 pale brown with dark brown semicircular area on each; diameter of semicircle lies on posterior margins, being two-thirds as long as width of sternite on which situated; each sternite with dark brown oval ganglionic mark. Sternite nine solid dark brown. Styliger plate, forceps, and penes of male a concolorous tone of dark brown. Tails dark brown at base, paling distally.

Holotype: Male imago, reared from nymph; collected by Helen

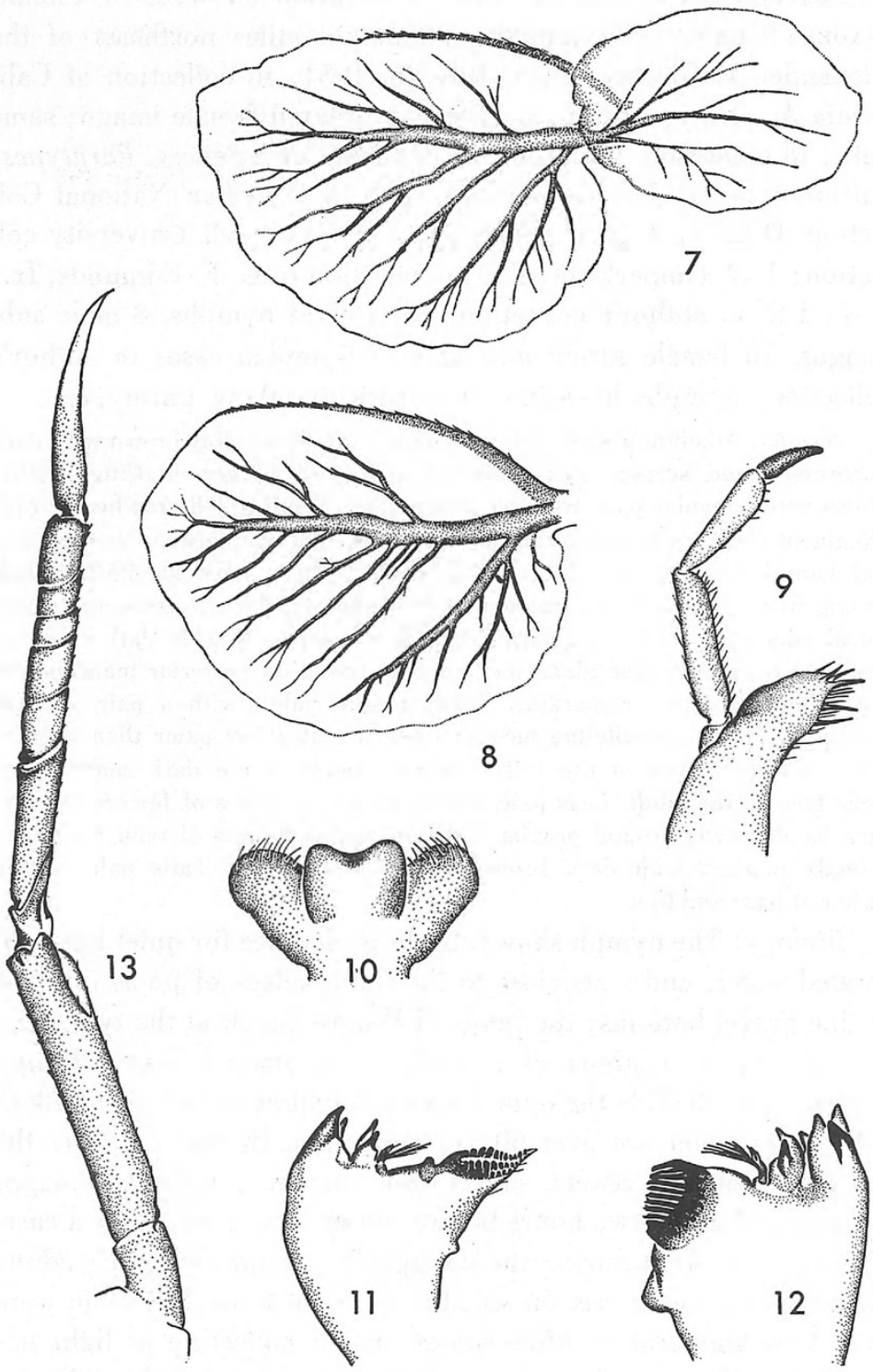

PLATE X. *Edmundsius agilis*

Fig. 7. Double gill of nymph, from first segment. Fig. 8. Gill of nymph, from third segment. Fig. 9. Maxilla of nymph. Fig. 10. Hypopharynx of nymph. Fig. 11 and 12, Mandibles of nymph. Fig. 13. Hind leg of nymph.

L. Day and W. C. Day at 7600 ft. elevation on WILLOW CREEK, MADERA COUNTY, CALIFORNIA, about six miles northeast of the Alexander McGilvray ranch, July 20, 1951; in collection of California Academy of Sciences. *Allotype:* Reared female imago; same data; in collection of California Academy of Sciences. *Paratypes:* All topotypical; 1♂ (imperfect), 1 ♀, in Canadian National Collection, Ottawa; 1 ♂ (imperfect), 1 ♀, in Cornell University collection; 1 ♂ (imperfect), 1 ♀, in collection of G. F. Edmunds, Jr.; 1 ♂, 1 ♀, in author's collection. Forty-eight nymphs, 8 male subimagos, 10 female subimagos, and 27 nymphal cases in author's collection; nymphs have been sent with the above paratypes.

Nymph: Medium gray-brown in general tone. Head gray-brown with dark transverse band across face; occiputal area with darker mottling. Notum brown with irregular pale areas on mesonotum. Tergites 2–8 gray-brown with prominent clear white spots, one on each side, halfway between median line and lateral margin; mesad of white spots, a short, dark submedian dash arising from point close to anterior margin; laterad of white spots and under dorsal edge of gill, a wide, dark longitudinal stripe. A wide dark mark on segments eight and nine along median line, based on posterior margins and approximating anterior margins. Tenth tergite paler, with a pair of dark submedian stripes paralleling median line. Sternites 1–9 paler than tergites and with indications in the fully mature nymph of the dark semicircular areas seen in the adult. Legs pale brown, proximal halves of femora lighter; dark bands partly around proximal ends of tibiae; joints of tarsi finely but strongly marked with dark brown. Claws pale brown. Tails pale brown, darker at base and tips.

Biology: The nymph shows strong preference for quiet but well-aerated water, and rests close to the shady edges of pools on sand or fine gravel bottoms; the pools of Willow Creek at the type location are quiet portions of a cool, fresh, small stream of high gradient. In late July the nymphs were found at elevations of 7400-7900 ft. in water not over 60° F. maximum. In rearing cages the nymphs emerged between sunset and sunrise, and the subimagos transformed about two hours before sunset. For three weeks a careful watch was kept during the daylight hours for swarming adults or for specimens at rest on shrubbery or on trees, but none were seen. Low temperature after sunset, makes collecting at light unproductive. In captivity, the nymphs experienced little difficulty in transforming into the first winged stage, but the subimagos failed in four out of five instances, to pass into the final adult form.

REFERENCES

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