

**Larvae of *Ephemerella inermis* and *E. infrequens***

(Ephemeroptera: Ephemerellidae)

Stephen C. Johnson

Dept. of Biology, University of Utah, Salt Lake City, 84112

The larvae of the mayfly *Ephemerella infrequens* McDunnough and the cognate species, *Ephemerella inermis* Eaton are very similar. To date, the best descriptions of the larvae are given by Allen and Edmunds (1965), but the characters described are highly variable and display enough overlap to make positive identification of most specimens impossible, even with large series of larvae. The larva of a third closely related species, *E. lacustris* Allen and Edmunds, known only from Yellowstone Lake, Wyoming, can be easily distinguished from the other two by the presence of distinct posterolateral projections on abdominal segments 3-9 and claws with 10-13 denticles, while larvae of *E. inermis* and *E. infrequens* have projections on abdominal segments 4-9 and claws with 6-10 denticles.

Photomicrographic examination of an assemblage of reared material of both species generously provided by W.R. Good of the University of Wyoming, enabled recognition of morphological characters that will separate the larvae of the two species. The specimens were collected by W.R. Good from two localities in Wyoming: *E. infrequens* from Nash Fork Creek, Albany Co. and *E. inermis* from the Snake River at Cattle bridge, Teton Co. A subsequent redetermination of the extensive collection of preserved larval *E. inermis* and *E. infrequens* at the University of Utah has provided more information concerning their range, habitats, and biology.

**Taxonomy**

Adults of the two species are distinguished by the shape of the male genitalia (Fig. 1), however, no reliable morphological differences between the larval stages have been reported by earlier authors. Needham (1927) described the larvae and adults of *E. inermis* from material reared on the Logan River, Utah. McDunnough (1928) pointed out that the genitalia figured by Needham in his description were those of *E. infrequens*, not *E. inermis*. It seems probable that the larvae were also *E. infrequens* and it is therefore interesting to note that while the larvae described by Needham had distinct paired pale spots on the abdominal terga, later authors (Traver, 1935; Day, 1956; Allen, 1960, 1968; Allen and Edmunds, 1965; Jensen, 1966) indicate that larvae of *E. inermis* have distinct spots on the terga and larvae of *E. infrequens* do not.

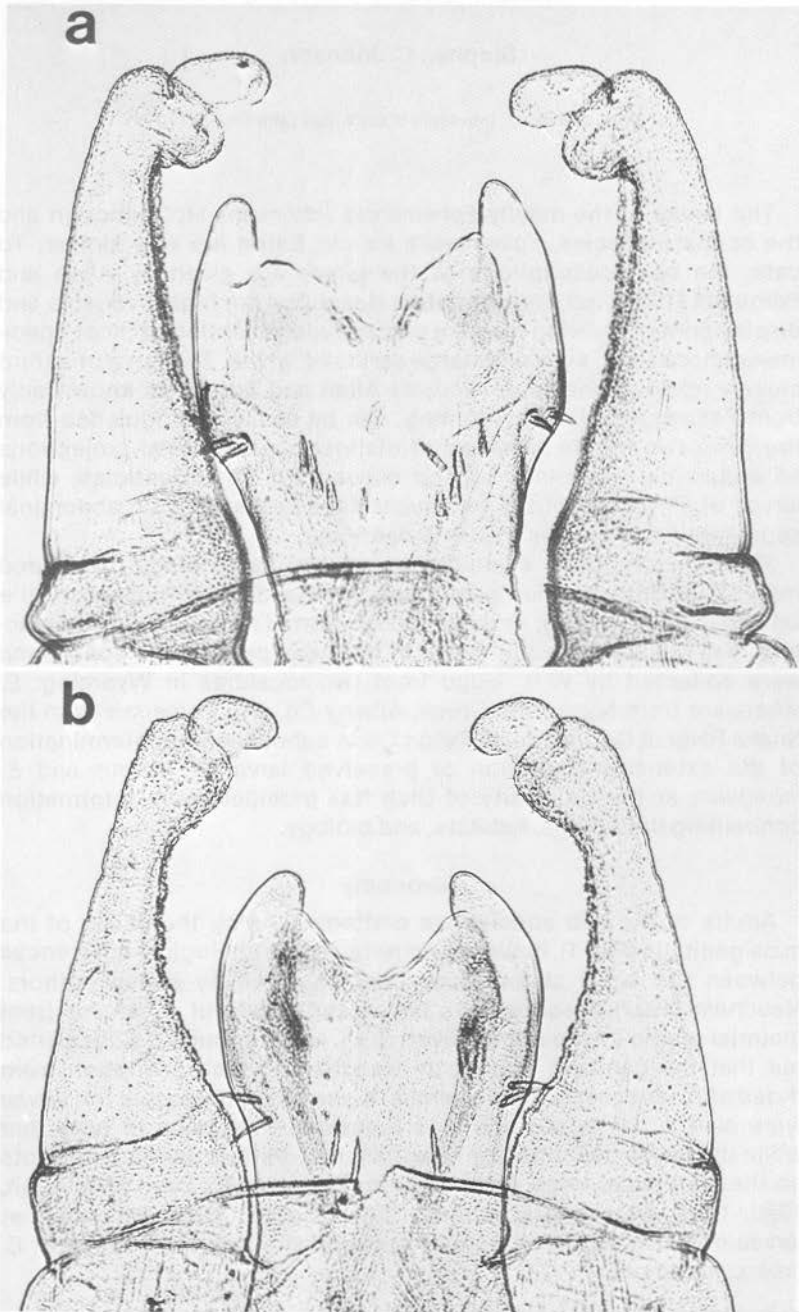


Fig. 1. Photomicrograph of male genitalia, (a) *E. infrequens* and (b) *E. inermis*, magnification 172X.

In the material I have examined, both *E. inermis* and *E. infrequens* may have paired submedian spots on the posterior margin of the abdominal terga, but the spots are variable and often indistinct or absent. The color is similar and extremely variable in the two species; body coloration is usually light to dark reddish or chocolate brown with variable pale markings, but it is not uncommon to find specimens that are uniformly pale or concolorous dark brown. Legs are usually pale with conspicuous dark bands but also may be concolorous.

Allen and Edmunds (1965) and Jensen (1966) have noted that the larvae of *E. inermis* often have small paired undulations or protuberances on the posterior margin of some abdominal terga, and use the presence of the character to identify the species. My observations indicate this character occurs with equal frequency in both species.

The new characters described below, which are differences in leg armature and claw morphology, show consistent interspecific differences. Mature larvae of both *E. inermis* and *E. infrequens* have one or more rows of spines on the posterior margins of the femora (Figs. 2a, c). However, the spines of *E. infrequens* are generally .07-.09 mm or longer (Fig. 2a). This is considerably longer than those of *E. inermis* which are usually .02-.05 mm long with only a few as long as .06-.07 mm (Fig. 2c). *E. infrequens* also has a distinct subapical band of spines on the dorsal surface of the forefemora (Fig. 2a) while *E. inermis* has no band or at most a sparse indistinct subapical band consisting of only a few spines (Fig. 2c). Also the rows of spines on the posterior margin of the forefemora of *E. inermis* may be inconspicuous or absent (Fig. 2c).

The least variable difference between the larvae of these two species is the shape of their claws. Both *E. inermis* and *E. infrequens* have claws with 7-10 denticles. However, the anterior margin of the claw of *E. inermis* is strongly curved between the most distal denticle and the tip, often with an arc of 90 degrees or more (Fig. 2d). In contrast the claw of *E. infrequens* is very gently curved in this region (Fig. 2b).

#### Characters common to *Ephemerella inermis* and *E. infrequens*

Mature larva. General body color either uniform light to dark reddish or chocolate brown, or light to dark reddish or chocolate brown with highly variable pale markings. Head brown with variable pale markings at vertex. Thoracic notum brown with variable pale sinuate markings; lateral margin of pronotum usually pale; femora pale with variable brown markings; posterior margins of femora with one or more rows of spines; tibiae concolorous pale or pale to light brown with one basal and one midlength dark brown band; tarsi uniformly pale or pale to light brown with basal dark brown band;

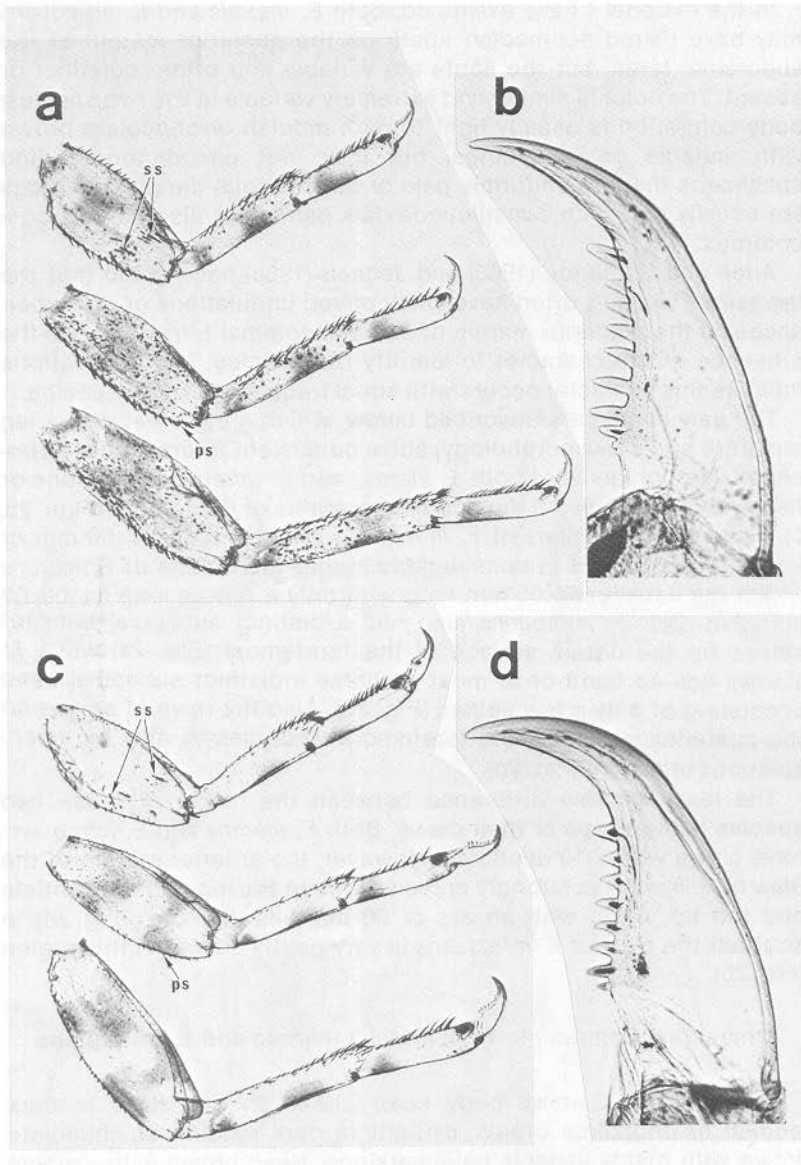


Fig. 2. Photomicrographs of: (a) fore, middle, and hind legs of *E. infrequens*, row of spines on posterior margin of femora (ps) and subapical band of spines on dorsal surface of forefemora (ss), magnification 25X. (b) claw of *E. infrequens*, magnification 260X. (c) fore, middle, and hind legs of *E. inermis*, magnification 25X (d) claw of *E. inermis*, magnification 260X.

claws with 6-10 denticles. Abdominal terga may be uniformly pale to light or dark brown, or brown with a pale median longitudinal stripe and variable pale submedian spots on the posterior margins; postero-lateral projections on segments 4-9, lateral margins of projections pale; well developed paired abdominal tubercles absent, however slight paired projections or undulations sometimes may be present on posterior margin of any or all terga of abdominal segments 3-9; abdominal sterna light brown. Caudal filaments pale with brown transverse bands, whorls of spines on posterior margin of segments in basal two-thirds, heavily setaceous on distal one-third.

### *Ephemerella inermis* Eaton

Mature larva. Body length 5-9 mm, terminal filaments 4-5 mm. Pale stripe across face at anterior medial margin of eyes; stripe often interrupted at center of frons. Posterior margins of femora with one or more rows of short spines, .02-.05 mm long, which may be inconspicuous or absent on forefemora; forefemora with sparse dorsal subapical band of spines, or subapical band absent or represented by only a few spines; claws sharply curved.

Distribution: *E. inermis* is lower boreal and widely distributed in western North America from central British Columbia austrad to southern California, and central Arizona and New Mexico (Fig. 3).

### *Ephemerella infrequens* McDunnough

Mature larva. Body length 5-11 mm, terminal filaments 4-6 mm; pale stripe across face usually interrupted at center of frons to form two pale spots or medially extending bars at the anterior medial margin of the eyes; posterior margins of femora with one or more rows of spines .07-.09 mm long, always present on forefemora; forefemora with distinct subapical band of spines on dorsal surface; claws gently curved.

Distribution: *E. infrequens* is a mid-boreal species extending from central Alaska austrad to central California and northern New Mexico along the Cascade-Sierra and Rocky Mountain ranges (Fig. 3).

Collections used to derive the ranges given by Allen and Edmunds (1965) and Allen (1968) probably consisted of composites of both species and do not accurately represent their distribution. My modification of the northward extent of the two species is based upon the identification of all available specimens from Northern British Columbia and Alaska as *E. infrequens*. Particular northern locality records which were originally identified as *E. inermis* and have been subsequently identified as *E. infrequens* are as follows: Alaska: Anon Creek, S.E. Mainland, 25', 26-IV-58, G.L. Miller; McMannus Creek, 60 mi. N.E. Fairbanks, 23-VIII-66, L. Boddis (Allen, 1968); British Columbia: Terrace, 12-VII-72, G.F. Edmunds, Jr.

### Biology

Larvae of *E. infrequens* may be found in clear, fast-flowing streams with rocky substrates. They inhabit the underside of rocks in the riffles of a stream and seem to prefer rocks of medium size over small stones or pebbles. They range in elevation from sea level in Alaska

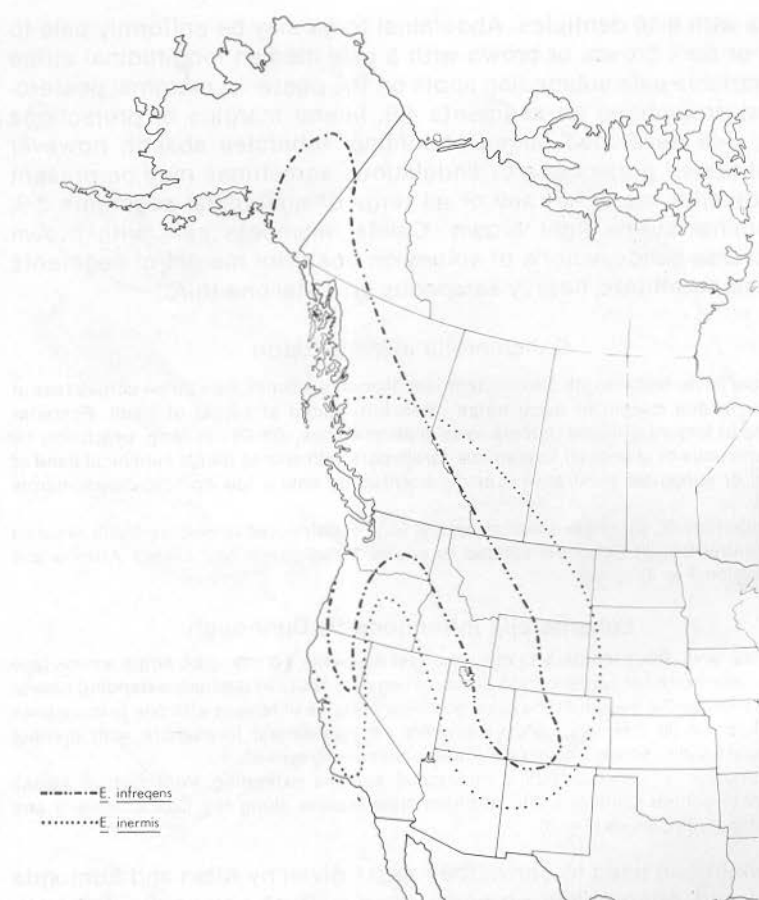


Fig. 3. Distribution map of *E. infrequens* and *E. inermis*.

and the coastal streams of Oregon, Washington and British Columbia to 4,000-10,000 ft. in the rest of western U.S. and Canada. They are less tolerant of silt than *E. inermis* and may be abundant in streams at high elevations.

Larvae of *E. inermis* may be found in a wide variety of streams from sea level to 7,000 ft. in western North America, but are generally more abundant in clear rather than silty water (Allen and Edmunds, 1965). These larvae occur in a wide range of current speeds that include currents slower than those suitable for *E. infrequens*. They also appear able to tolerate a broader temperature range than *E. infrequens* and are frequently found in cool streams at lower elevations. Larvae inhabit a wide range of substrate types and are commonly found on various sized rocks and pebbles in midstream and on rocks and vege-

tation near the edge of a stream.

Presently there are two rivers from which both *E. inermis* and *E. infrequens* are known, the Weber River in Utah and the Teton River in Idaho. In both cases the species appear to be allopatric with *E. inermis* occurring downstream from *E. infrequens*.

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