

# The Canadian Entomologist

Vol. 131

Ottawa, Canada, January/February 1999

No. 1

## TWO NEW *AMELETUS* MAYFLIES (EPHEMEROPTERA: AMELETIDAE) FROM WESTERN NORTH AMERICA

JACEK ZLOTY

Division of Ecology, Department of Biological Sciences, The University of Calgary,  
Calgary, Alberta, Canada T2N 1N4

and FRANÇOISE HARPER

Département de Sciences Biologiques, Université de Montréal, C.P. 6128, Succursale  
Centre-Ville, Montréal, Québec, Canada H3C 3J7

### Abstract

*The Canadian Entomologist* 131: 1 – 9 (1999)

Two new species, *Ameletus minimus* sp.nov. and *Ameletus quadratus* sp.nov., are described and illustrated from material collected in Oregon. Diagnostic features for these two species and their relationships with other *Ameletus* species are discussed. An identification key to the western species of the *Ameletus celer* Group is also included.

Zloty, J., et F. Harper. 1999. Deux nouvelles espèces d'*Ameletus* (Ephemeroptera: Ameletidae) de l'ouest nord-américain. *The Canadian Entomologist* 131 : 1–9.

### Résumé

On trouvera ici la description illustrée de deux nouvelles espèces, *Ameletus minimus* sp.nov. et *Ameletus quadratus* sp.nov., trouvées en Oregon. Les caractéristiques diagnostiques de ces deux espèces ainsi que leur position par rapport aux autres espèces d'*Ameletus* font l'objet d'une discussion. Une clé d'identification permettra de reconnaître les espèces du groupe *Ameletus celer* dans l'ouest nord-américain.

### Introduction

Since the revision of Nearctic *Ameletus* (Ephemeroptera: Ameletidae) was published (Zloty 1996a), examination of more material from Oregon has revealed two new species. These species were previously identified as *Ameletus* sp. A and *Ameletus* cf. *velox* Dodds by the second author (Harper et al. 1995). In this paper, we describe and illustrate all developmental stages of these two new species. We also list diagnostic characters that separate them and we discuss their relationships with other *Ameletus* species. An identification key to the western species of the *Ameletus celer* McDunnough Group (sensu Zloty 1996b) is presented.

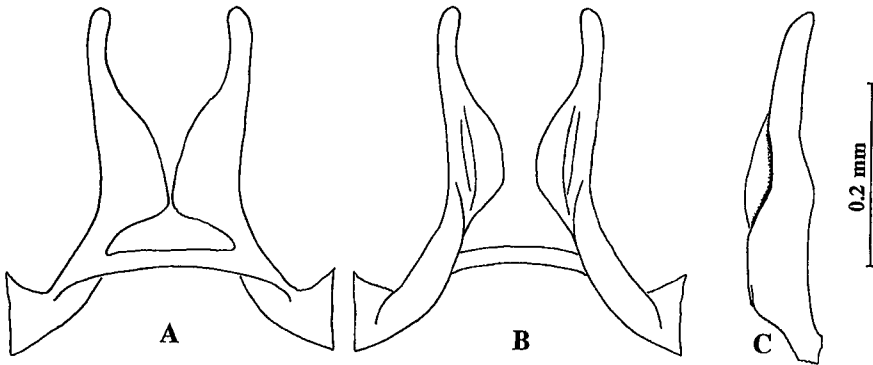


FIG. 1. Penes of *Ameletus minimus* sp.nov., Quartz Creek, Oregon. (A) Dorsal view. (B) Ventral view. (C) Right lateral view.

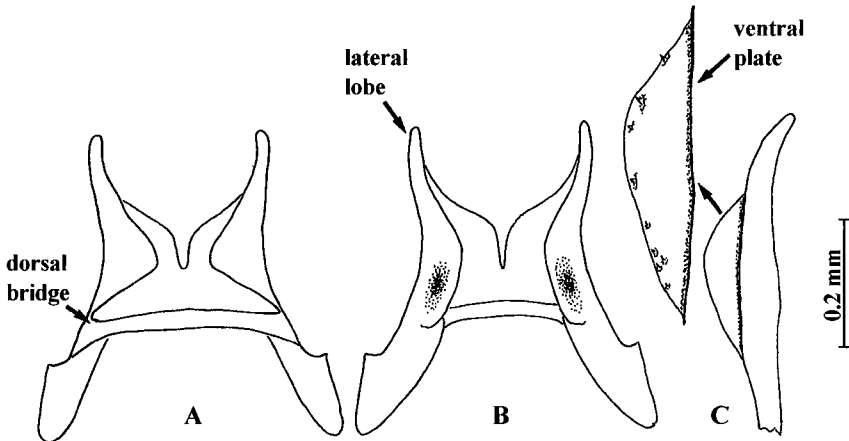


FIG. 2. Penes of *Ameletus quadratus* sp.nov., Mack Creek, Oregon. (A) Dorsal view. (B) Ventral view. (C) Right lateral view.

### Species Descriptions

#### *Ameletus minimus* sp.nov. (Figs. 1A–1C, 3A–3G)

**Male Imago (in alcohol).** Body length 6–7 mm, forewings 7–7.5 mm. Head generally brown with light brown vertex and dark brown ocellar tubercles; upper portion of compound eyes grey, lower portion brown. Prothoracic tergum dark brown; mesotergum dark brown with two opaque-white markings in front of scuto-scutellar impression; scutellum brown; infrascutellum dark brown; metatergum brown with two opaque white spots anteriorly; thoracic pleuron brown with opaque white between plates, at the centre of the katepimeron, and at the base of the legs and wings. Forelegs amber-brown; middle and hind legs yellow. Wings transparent; forewings with milky suffusion in stigmatic area, with brown longitudinal veins and white, faintly visible, cross-veins. First abdominal tergite brown to dark brown; tergites 2–9 light brown without contrasting pattern, but with brown posterior margins; tergite 10 light brown. Abdominal sternite 1 brown; sternites 2–8 opaque white; sternite 9 pale with extensive brown suffusion on

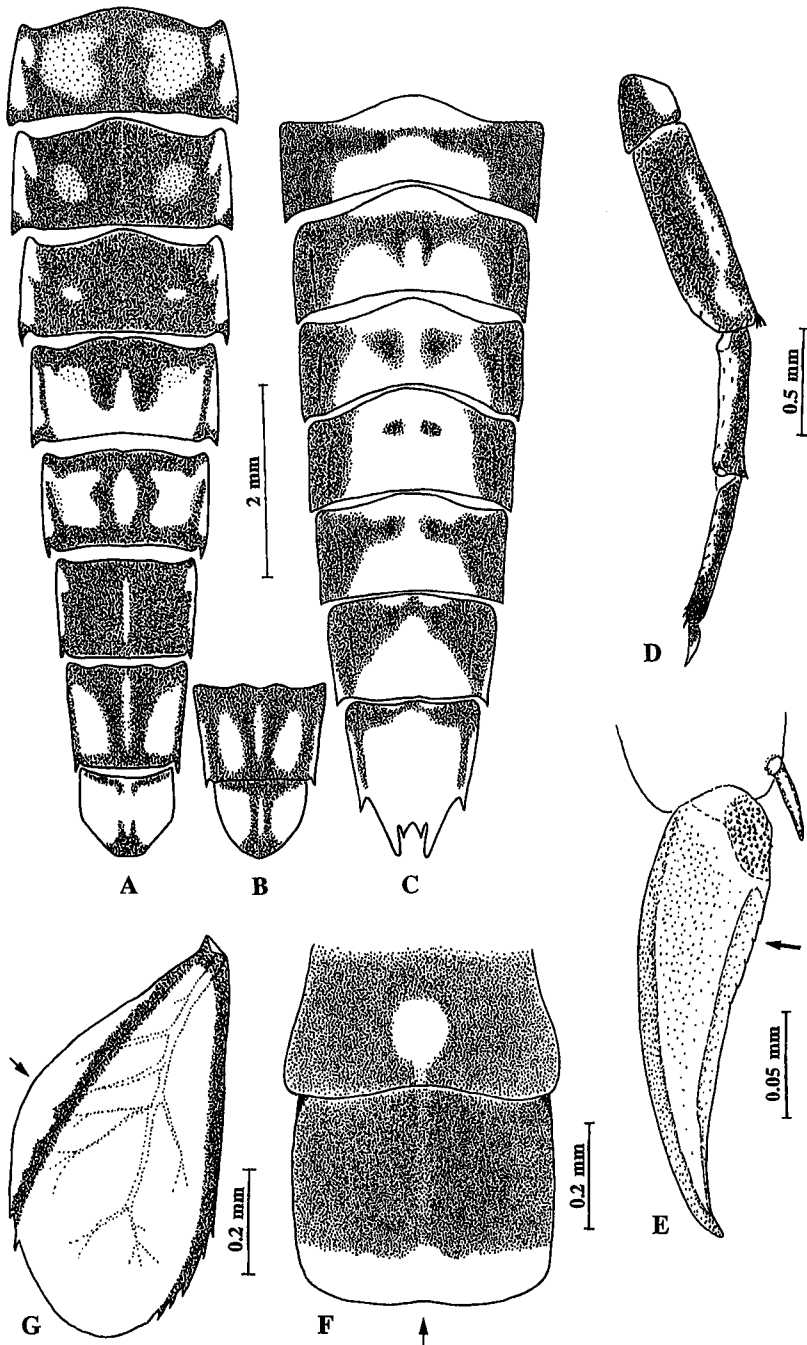


FIG. 3. Larval morphological characters of *Ameletus minimus* sp.nov., Quartz Creek, Oregon. (A) Abdominal tergites 3-10. (B) Tergites 9 and 10 (dark form). (C) Sternites 3-9. (D) Right foreleg. (E) Claw of the right foreleg; arrow indicates denticles. (F) Labrum; arrow indicates distal edge with shallow indentation. (G) Abdominal gill 4; arrow indicates mesal extension.

anterior 2/3; no ganglionic markings. Penes with relatively long lateral lobes (Fig. 1A); ventral plates well developed without accessory spines (Figs. 1B, 1C). Caudal filaments uniformly golden brown.

Male genitalia of *A. minimus* are similar to those of *A. celer*, *Ameletus quadratus*, and *Ameletus tolae* Zloty, but the lack of ganglionic markings from abdominal sternites 2–8 and the absence of accessory spines from the ventral plates of the penes (Fig. 1C) are diagnostic. *Ameletus inopinatus* Eaton and *A. velox* are the only two other Nearctic *Ameletus* species that do not have accessory spines on the ventral plates, but in these species the ventral plates are greatly reduced and lateral lobes are elongated and twisted at the apical end (Zloty 1996a, Figs. 9C and 10C). Individuals of this species were identified as *Ameletus* sp. A in Harper et al. (1995).

**Female Imago (in alcohol).** Body length 6–7.5 mm, forewings 7–7.5 mm. Mesotergum light brown; a pair of yellow lines lateral to the scuto-scutellar impression which are fused in front and form a large yellow patch; yellow streaks along the lateroparapsidal sutures; scutellum light brown. Wings transparent; forewings with milky suffusion in stigmatic area, with brown longitudinal veins and white, faintly visible, cross-veins. Abdominal tergites uniformly light brown. Abdominal sternites without ganglionic markings. Posterior margin of the subanal plate without indentation (Zloty and Pritchard 1997, Fig. 31K). Caudal filaments white, with a narrow, deep brown to black ring at the proximal and distal end of each segment. Eggs flattened (Zloty and Pritchard 1997, Fig. 32A).

There is no single character that will distinguish females of *A. minimus* from other small *Ameletus* species (e.g., *Ameletus cooki* McDunnough, *Ameletus pritchardi* Zloty, *Ameletus suffusus* McDunnough). However, *A. minimus* is usually found in first-order streams together with *Ameletus andersoni* Zloty, from which it is easily separable by the appearance of the front wings (cross-veins margined with smoky brown giving them a speckled appearance in *A. andersoni*, but without speckled appearance in *A. minimus*).

**Larva (in alcohol).** Body length 6.5–8 mm. Antennae mostly brown, with some pale lateral and mesal patches on the basal ~20 segments. Labrum mainly brown, but pale distally (about 1/4) (Fig. 3F); length to width ratio about 0.8:1; distal edge with shallow indentation (Fig. 3F). Incisor area of left mandible with the second denticle much smaller than the first (Zloty and Pritchard 1997, Fig. 25A). Dorsal surface of front femora with a few short spines (Fig. 3D) and with a fringe of hairs (about 1/2 the width of the femur); anterior surface of front femora brown with a pale patch dorsodistally (Fig. 3D); claws without denticles (Fig. 3E). Abdominal tergites and sternites with distinct colour pattern (Figs. 3A, 3C); in some individuals, tergite 10 is much darker (Fig. 3B). Gills on abdominal segments 3–5 with prominent mesal extension (about 25% of maximum gill blade width) and with pronounced yellowish-brown tracheation (Fig. 3G). Posterolateral spines on abdominal segments 8 and 9, seen in lateral view, 1.5–2 times as long as their basal widths (Zloty and Pritchard 1997, Fig. 27B). Posterior edge of sternites 6–8 with only few small spines laterally; ganglionic marking sometimes visible on sternite 8. Caudal filaments with a very narrow basal pale band (about 5–7 segments), followed by a broad dark band covering about 1/2 the length of each filament, grading to pale segments that cover about 1/3 the length of each filament, and with a few dark apical segments.

Larvae of *A. minimus* are distinguished from all other *Ameletus* species by the combination of the following characteristics: (1) small body size; (2) colour pattern of tergite 10 (Figs. 3A, 3B); (3) colour pattern of sternites 3–9; and (4) colour pattern of labrum. Larvae were collected primarily in first-order streams, where their density was

very high. The only other *Ameletus* species found in this habitat was *A. andersoni*. Because water often does not flow in these streams during the summer months, *A. minimus* probably has a univoltine life cycle with a long egg diapause.

**Type Material.** Male holotype: "No name stream on Rd #1506, tributary of Lookout Creek, 100 m upstream from Blue River Reservoir, H.J. Andrews Experimental Forest, Lane Co., Oregon, 25 June 1997 (reared from larva collected on 11 June), J. Zloty." Female allotype: "No name stream on Rd #1506, tributary of Lookout Creek, 100 m upstream from Blue River Reservoir, H.J. Andrews Experimental Forest, Lane Co., Oregon, 25 June 1997 (reared from larva collected on 11 June), J. Zloty." Paratypes: 10♂♂ and 10♀♀ (25–29 July 1997) reared from larvae collected on 19 July from the same location as holotype; Quartz Creek, 5 km northeast of Blue River, H.J. Andrews Experimental Forest, Lane Co., Oregon, 9 July – 12 August 1982, G.W. Courtney (emergence trap) (2♂♂), and also same location and collector but collected between 26 June and 6 July 1982 (1♂), and on 7 July 1986 (1♂). The holotype and allotype will be deposited in the Canadian National Collection (CNC), Ottawa, Ontario; paratypes will be housed in l'Université de Montréal (UM), Montréal, Québec (2♂♂ and 2♀♀), Oregon State University (OSU), Corvallis, Oregon (2♂♂ and 2♀♀), and the University of Calgary (UC), Calgary, Alberta (remaining material).

**Etymology.** *minimus*, from the Latin, meaning least, smallest; this is one of the smallest *Ameletus* species currently known.

**Distribution.** Known only from Lane Co., Oregon; adults collected June–August.

*Ameletus quadratus* sp.nov.

(Figs. 2A–2C, 4A–4F)

**Male Imago (in alcohol).** Body length 8–9 mm, forewings 8–8.5 mm. Head uniformly brown; upper portion of compound eyes grey, lower portion brown. Prothoracic tergum brown; mesotergum yellow with light brown anteriorly and laterally; scutellum yellow; infrascutellum light brown to brown; metatergum light brown; thoracic pleuron light brown to brown with extensive opaque white areas between plates, at the centre of the katepimeron, and at the base of the legs and wings. Forelegs light brown; middle and hind legs yellow. Wings transparent; forewings with milky suffusion in stigmatic area, with brown longitudinal veins and white, faintly visible, cross-veins. First abdominal tergite light brown; tergites 2–9 opaque white, with light brown lateral margins; tergite 10 light brown. Abdominal sternite 1 light brown; sternites 2–8 opaque white; sternite 9 pale with some light brown anteriorly. Ganglionic markings on sternites 2–8. Length of lateral lobes of genitalia (measured from the dorsal bridge to the tip) about equal to the width of the penes (Fig. 2A); ventral plates enlarged with few minute spinules (Fig. 2C). Caudal filaments golden brown.

Genitalia of *A. quadratus* are similar to those of *A. celer*, *Ameletus edmundsi* Zloty, *A. minimus*, and *A. tolae*, but lack of ganglionic markings distinguishes *A. minimus*, and the shape of the penes (width of the penis about equal to the length of lateral lobes; Fig. 2A) is very distinctive in *A. quadratus*. *Ameletus celer*, *A. edmundsi*, and *A. tolae* are easily differentiated by the diagnostic characters given in the key. Individuals of this species were identified as *A. cf. velox* in Harper et al. (1995).

**Female Imago (in alcohol).** Body length 7.5–9 mm, forewings 8–8.5 mm. Mesotergum light brown, a pair of pale lines along the lateroparapsidal sutures that are fused anteriorly; scutellum light brown. Wings transparent; forewings with milky suffusion in

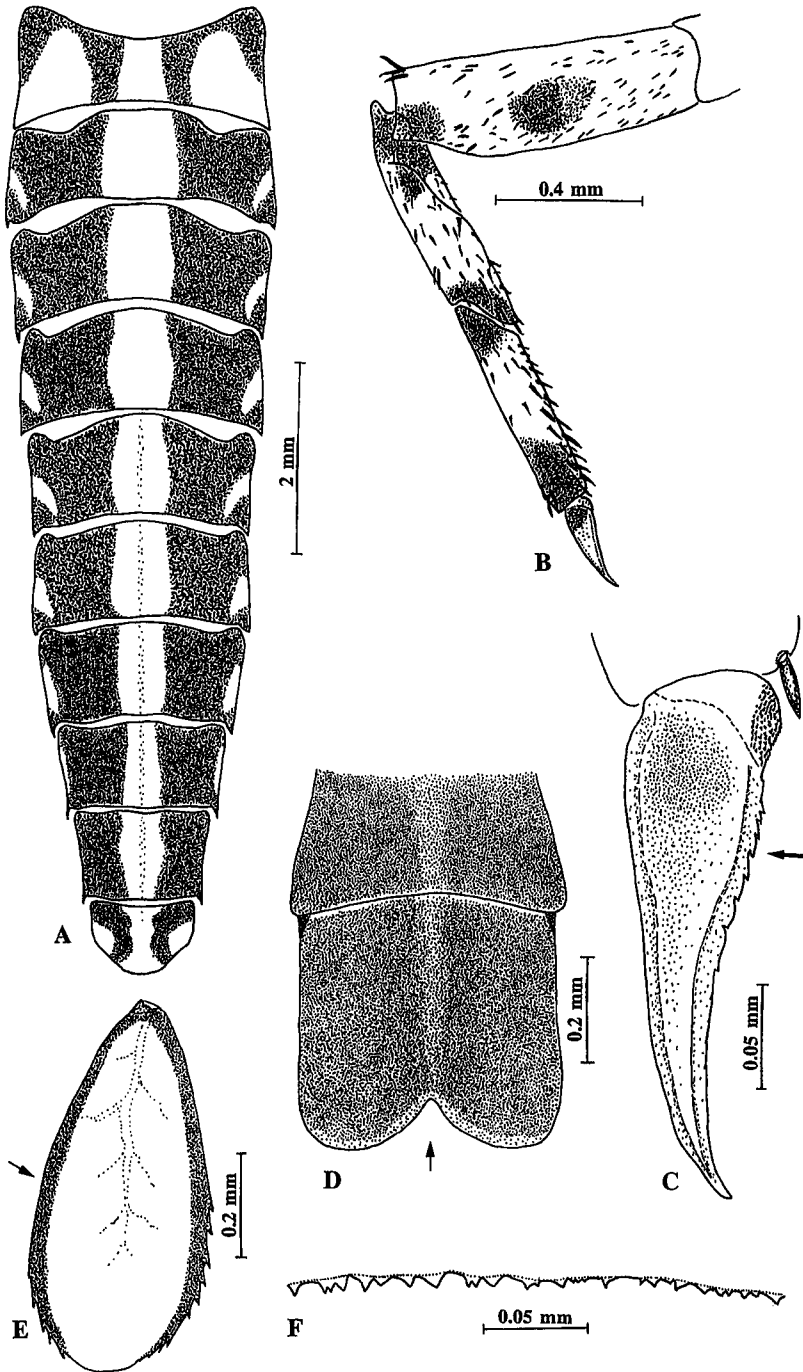


FIG. 4. Larval morphological characters of *Ameletus quadratus* sp. nov., Mack Creek, Oregon. (A) Abdominal tergites 1–10. (B) Right foreleg. (C) Claw of the right foreleg; arrow indicates denticles. (D) Labrum; arrow indicates distal edge with deep indentation. (E) Abdominal gill 4; arrow indicates lack of mesal extension. (F) Middle section of the posterior margin of abdominal sternite 8.

stigmatic area, with light brown to brown longitudinal veins and white, faintly visible, cross-veins. Abdominal tergites light brown with a pale line running along the centre of each tergum (similar to Fig. 4A). Abdominal sternites 2–8 with ganglionic markings. Posterior margin of the subanal plate with a moderate indentation (Zloty and Pritchard 1997, Fig. 31J). Caudal filaments white. Eggs flattened (Zloty and Pritchard 1997, Fig. 32A).

The presence of ganglionic markings on abdominal sternites 2–8 is shared only by *A. celer*, *Ameletus similior* McDunnough, and *A. tolae*, but none of these species is found in the Cascade Range in Oregon.

**Larva (in alcohol).** Body length 8–9 mm. Antennae light brown proximally with increasing pigmentation toward apical segments and with a few pale apical segments. Labrum brown; length to width ratio about 1:1; distal edge with deep indentation (about 1/5 its length) (Fig. 4D). Incisor area of left mandible with the second denticle much smaller than the first (Zloty and Pritchard 1997, Fig. 25A). Dorsal surface of front femora with numerous long spines (Fig. 4B) and with a fringe of sparse and relatively short hairs (about 1/4 the width of the femur); anterior surface of front femora pale with a small brown patch at the middle (Fig. 4B); claws with denticles (Fig. 4C). Abdominal tergites brown with a pale line running along the middle of each segment (Fig. 4A). Abdominal sternites brown without distinct colour pattern. Gills on abdominal segments 3–5 without mesal extension and with faintly visible tracheation (Fig. 4E). Posterolateral spines on abdominal segments 8 and 9, seen in lateral view, 1.5 times as long as their basal widths (Zloty and Pritchard 1997, Fig. 27B). Posterior edge of sternites 6–8 covered with numerous small spines (Fig. 4F). Ganglionic markings present on sternites 2–8. Basal 2/3 of caudal filaments brown (first few basal segments light brown), followed by a narrow pale band (about 5–7 segments), and with a few dark apical segments.

Larvae of *A. quadratus* are distinguished from all other western *Ameletus* species by the colour pattern of the abdominal tergites (Fig. 4A) and by characteristics of the labrum [length to width ratio about 1:1; posterior edge with deep indentation (Fig. 4D)]. Also, abdominal gills lack mesal extensions (Fig. 4E), a characteristic shared only with *A. inopinatus*. However, *A. inopinatus* is known only from northern British Columbia, the Northwest Territories, and Alaska.

**Type Material.** Male holotype: "Mack Creek, H.J. Andrews Experimental Forest, Lane Co., Oregon, 24 June – 2 July 1982, G.W. Courtney (emergence trap)." Female allotype: "Mack Creek, H.J. Andrews Experimental Forest, Lane Co., Oregon, 24 June – 2 July 1982, G.W. Courtney (emergence trap)." Paratype: same data as holotype (1♂); Mack Creek, H.J. Andrews Experimental Forest, Lane Co., Oregon, 25 June 1997 (reared from larva collected on 11 June), J. Zloty (1♀). The holotype and allotype will be housed in CNC; paratypes will be deposited in UC.

**Etymology.** *quadratus*, from the Latin, meaning squared; in reference to the square shape of the genitalia.

**Distribution.** Known only from a single site in Lane Co., Oregon; adults collected June–July.

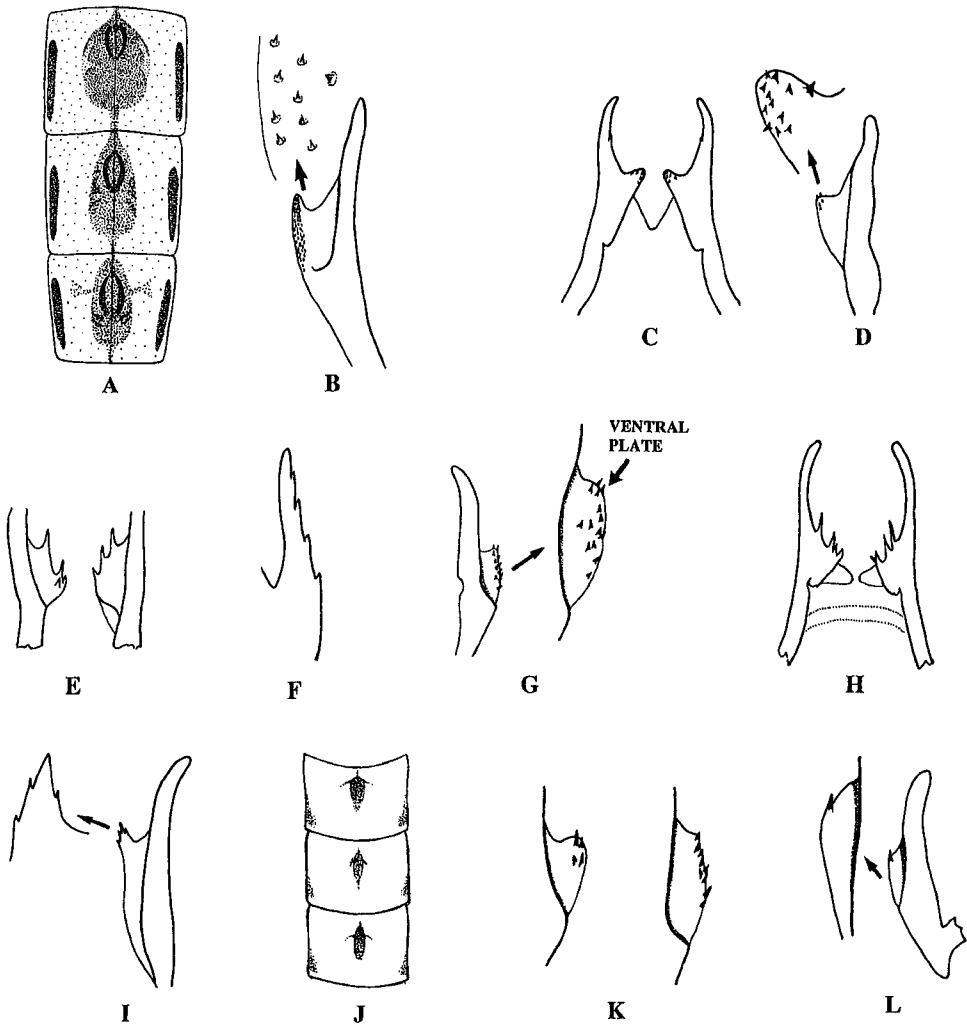


FIG. 5. Morphological characteristics of *Ameletus* adult males (after Zloty 1996a). (A, B) *Ameletus edmundsi*: A, sternites 3-5; B, right lateral view of penes. (C, D) *Ameletus shepherdii*: C, ventral view of penes; D, right lateral view of penes. (E) *Ameletus similior*: ventral plates of penes, ventrolateral view. (F) *Ameletus tarteri*: apex of ventral plate of penes, left lateral view. (G) *Ameletus celer*: left lateral view of penes. (H) *Ameletus similior*: ventral view of penes. (I) *Ameletus pritchardi*: right lateral view of penes. (J, K) *Ameletus celer*: J, sternites 4-6; K, ventral plates of penes, left lateral view. (L) *Ameletus tolae*: right lateral view of penes.

### Key to Adult Males of Western North American Species of the *Ameletus celer* Group

The key is intended for the identification of males of the two new species, *A. minimus* and *A. quadratus*, and for their separation from all other western North American *Ameletus* species of the *A. celer* Group (Zloty 1996b). Species in this group possess numerous small spines, teeth, or minute spinules on the well-developed ventral plates of the penes. Currently, there are 10 Nearctic species (*A. celer*, *A. edmundsi*, *A. minimus*, *A. pritchardi*, *A. similior*, *Ameletus shepherdii* Traver, *Ameletus tarteri*



Burrows, *Ameletus tertius* McDunnough, *A. tolae*, and *A. quadratus*) that have this type of genitalia, and all except *A. tarteri* and *A. tertius* are found in western North America. Additional information on the morphology and distribution of these species can be found in Zloty (1996a) and Zloty and Pritchard (1997).

- 1. Abdominal sternites with black lateral lines and with black patches at the centre of each segment (Fig. 5A); ventral plates of penes covered with numerous minute spinules (>30) (Fig. 5B) . . . *edmundsi*
- Abdominal sternites without black lateral lines and without black patches at the centre of each segment, ganglionic markings present or absent; <15 minute spinules on ventral plates of penes . . . . . 2
- 2. Forewings lightly suffused with brown at the basal half (Zloty 1996a, Fig. 47A); ventral plates of penes elongated, mace-shaped apically (Figs. 5C, 5D) . . . . . *shepherdi*
- Forewings transparent; ventral plates of penes, if elongated, not mace-shaped apically. . . . . 3
- 3. Ventral plates of penes with prominent spines or teeth (Figs. 5E, 5F) . . . . . 4
- Ventral plates of penes with or without small spinules but without prominent spines or teeth (Fig. 5G) 5
- 4. Ventral plates of penes with 2–5 large spines (Figs. 5E, 5H) . . . . . *similior*
- Ventral plates of penes somewhat elongated with 2–6 small teeth on apical end (Fig. 5I) . . . *pritchardi*
- 5. No ganglionic markings; ventral plates of penes without accessory spinules (Fig. 1C) *minus sp.nov.*
- Ganglionic markings present (Fig. 5J); ventral plates of penes with accessory spinules (Figs. 2C, 5K, 5L) . . . . . 6
- 6. Length of penes equal to their width (Figs. 2A, 2B) . . . . . *quadratus sp.nov.*
- Length of penes greater than their width (Figs. 1A, 5H) . . . . . 7
- 7. Ventral plates of penes with 3–14 spinules (Fig. 5K) . . . . . *celer*
- Ventral plates of penes with 1 spinule (Fig. 5L) . . . . . *tolae*

### Acknowledgments

The work was supported by research grants from the Natural Sciences and Engineering Research Council of Canada to G. Pritchard, and from the Biodiversity Grants Program (administered by the Department of Biological Sciences, University of Alberta, for the sportsmen of Alberta and the Alberta Department of Environmental Protection, Fish and Wildlife Trust Fund) to J. Zloty.

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(Date received: 16 March 1998; date accepted: 6 August 1998)