

## New subgenera of Holarctic mayflies (Ephemeroptera: Heptageniidae, Leptophlebiidae, Ephemerellidae)

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Three new subgenera are described: (1) *Caucasiron* subgen. n. (type species *Cinygma caucasica* Tshernova, 1938) of the genus *Epeorus* s. l. (Heptageniidae), which includes several Caucasian and Middle Asian species formerly placed in the subgenus (or genus) *Iron*; (2) *Neoleptophlebia* subgen. n. (type species *Paraleptophlebia chocolata* Imanishi, 1937) of the genus *Leptophlebia* s. l. (Leptophlebiidae), which includes several Asian and North American species formerly placed in the subgenus (or genus) *Paraleptophlebia*; (3) monotypic subgenus *Amurella* subgen. n. (type species *Ephemerella gracilis* Tshernova, 1952) of the genus *Ephemerella* s. l. (Ephemerellidae).

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### Family HEPTAGENIIDAE

#### Genus *Epeorus* Eaton, 1881 (s. l.)

Type species *Epeorus torrentium* Eaton, 1881.

The genus *Epeorus* is accepted here in the broad sense (see Kluge, 1988, 1993). Larvae of the subgenera *Epeorus* s. str. and *Belovius* Tshernova, 1981 have tergaliae not forming complete suction discs. The species whose larvae have suction discs were initially placed by Eaton in the genus *Iron* Eaton, 1885; the name "*Iron*" means "a dissembler", that is associated with the fact that larvae of this genus have the same structure of suction disc as in the genus *Rhithrogena*, but in all other respects resemble *Epeorus* (Eaton, 1883-1888). A suction disc of the same structure appears in several genera of Ephemeroptera, namely in *Rhithrogena* and *Epeorus* s. l. (Heptageniidae) and in *Deleatidium* and *Lepeorus* (Leptophlebiidae). As species of *Epeorus* s. l. with suction discs have no other common characters separating them from other *Epeorus* s. l., monophyly of this group is not proved. At present, the representatives of *Epeorus* s. l. with suction discs are placed in two separate subgenera (or genera): *Iron* s. str. (with type species *I. longimanus* Eaton, 1885) and *Ironopsis* Traver, 1935 (with type species *Iron grandis*

Traver, 1935). One more subgenus of *Epeorus* s. l. with a suction disc is described here.

#### Subgenus *Caucasiron* subgen. n.

Type species *Cinygma caucasica* Tshernova, 1938.

**Diagnosis.** Larva. Hairs on anterior margin of head directed dorso-medially (as in *Ironopsis*, in contrast to other *Epeorus* s. l., where these hairs are directed forward). Tergaliae form complete suction disc (as in *Ironopsis* and many species of *Iron* s. str., in contrast to *Epeorus* s. str. and *Belovius*); tergaliae of pair I strongly expanded anteriorly and contiguous under thorax; tergaliae of pair VII with longitudinal fold which permits them to turn under apex of abdomen. Tergaliae of pairs I-VII (or at least anterior-most of them) with distinct projection on anterior-dorsal side of anterior margin (Sinitshenkova, 1976: Figs 31, 32; Braasch, 1978: Fig. 10; 1979: Figs 1p, 1q, 2i, 2j; Braasch & Soldan, 1979: Fig. 6) (in contrast to all other *Epeorus* s. l. and Ephemeroptera in general).

**Imago.** Penis lobes with a pair of titillators (in contrast to *Ironopsis*), without a pair of dorsolateral denticles (in contrast to *Iron* s. str.) (Tshernova, 1938: Fig. 5; Sinitshenkova, 1976: Figs 1-3; Braasch, 1979: Figs 1e, 1f, 2d, 2f, 3c, 4e, 4c).

**Distribution.** Caucasus and Middle Asia.

*Species examined.* *E. (C.) caucasicus* (Tshernova, 1938) (originally in *Cinygma*): lectotype and paralectotypes (Kluge, 1995) and imagos reared from larvae; *E. (C.) znojkoii* (Tshernova, 1938) (originally in *Iron*): lectotype (Kluge, 1995) and imagos reared from larvae; *E. (C.) alpestris* (Braasch, 1979) (originally in *Iron*): imagos reared from larvae; *E. (C.) magnus* (Braasch, 1978) (originally in *Iron*): imagos reared from larvae; *E. (C.) soldani* (Braasch, 1979) (originally in *Iron*): imagos reared from larvae; *E. (C.) guttatus* (Braasch & Soldan, 1979): imagos reared from larvae.

### Family LEPTOPHLEBIIDAE

#### Genus *Leptophlebia* Westwood, 1840 (s. l.)

Type species *Ephemera vespertina* Linnaeus, 1758.

Here this genus is accepted in the broad sense and includes the subgenus *Paraleptophlebia* Lestage, 1917. At present the subgenus (or genus) *Paraleptophlebia* is characterized only by the absence of apomorphies peculiar to the subgenus (or genus) *Leptophlebia* s. str.: branches of tergaliae II-VII in *Paraleptophlebia* are not widened, imaginal penis of various structure, but not as in *Leptophlebia* s. str. (Peters & Edmunds, 1970). Therefore *Paraleptophlebia* s. l. is regarded as a paraphyletic taxon. To make it more natural, the former subgenus *Paraleptophlebia* s. l. is divided here into two subgenera: *Paraleptophlebia* s. str. and *Neoleptophlebia* subgen. n.

#### Subgenus *Paraleptophlebia* Lestage, 1917 (s. str.)

Type species *Ephemera cincta* Retzius, 1783.

*Diagnosis. Larva.* Tergaliae with two lobes separated nearly up to base (in contrast to *Neoleptophlebia*), lobes of all tergaliae slender (in contrast to *Leptophlebia* s. str.); tergalial tracheae without additional branches. Terminal segment of labial palpi widest near its middle.

*Male imago.* Penis with a pair of ventral appendages arising from apex of each penis lobe and directed proximally.

*Relationship.* The presence of peculiar ventral appendages of the penis in male imago and the deep separation of tergaliae in larvae are probably synapomorphies of *Paraleptophlebia* s. str. and *Leptophlebia* s. str. indicating that these two taxa form a holophyletic group separate from *Neoleptophlebia*.

*Distribution.* Holarctic.

*Species examined.* *L. (P.) cincta* (Retzius, 1783): imagos reared from larvae; *L. (P.) longilobata* Tshernova, 1928: imagos - lectotype and paralectotypes (Kluge, 1995); *L. (P.) strandii* Eaton, 1901 [= *L. (P.) lunata* Tshernova, 1952]: imagos reared from larvae; *L. (P.) submarginata* (Stephens, 1835): imagos reared from larvae; *L. (P.) werneri* (Ulmer, 1919): imagos reared from larvae; *L. (P.) guttata* McDunnough, 1924: imagos reared from larvae; *L. (P.) packii* Needham, 1927: larvae.

#### Subgenus *Neoleptophlebia* subgen. n.

Type species *Paraleptophlebia chocolata* Imanishi, 1937.

*Diagnosis. Larva.* Tergaliae furcate far from their base; tergalial tracheae usually with additional branches, especially proximally from the furcation. Terminal segment of labial palpi widest near its base.

*Male imago.* Penis lobes without ventral appendages arising at apex and directed ventrally (other appendages may be present).

*Relationship.* The shape of larval tergaliae and palpi in *Neoleptophlebia* resemble those of *Habrophlebiodes*, *Calliarcys* and *Habrophlebiinae* and probably are synapomorphies of these taxa, indicating paraphyletic nature of the genus *Leptophlebia* s. l.

*Distribution.* Eastern Palaearctic, Oriental Region, Nearctic.

*Species examined.* *L. (N.) chocolata* (Imanishi, 1937): imagos reared from larvae; *L. (N.) vladivostokica* (Kluge, 1982): imagos reared from larvae; *L. (N.) mollis* (Hagen, 1861): imagos reared from larvae; *L. (N.) adoptiva* McDunnough, 1929: larvae.

### Family EPHEMERELLIDAE

#### Genus *Ephemerella* Walsh, 1862

Type species *Ephemerella excrucians* Walsh, 1862.

Here this genus is accepted in wide sense: it corresponds to the subtribe Ephemerellae sensu Allen, 1984 and includes subgenera *Drunella* Needham, 1905, *Caudatella* Edmunds, 1959, *Cincticostella* Allen, 1971, *Acerella* Allen, 1971, *Serratella* Edmunds, 1959, *Torleya* Lestage, 1917, *Uracanthella* Belov, 1979, *Caurinella* Allen, 1984, *Teloganopsis* Ulmer, 1939, *Crintitella* Allen & Edmunds, 1963 (some authors regard these taxa as separate genera). The genus *Ephemerella* s. l. can be separated from other Ephemerellidae by the absence of rudiments of tergaliae on

the abdominal segment I and presence of tergialae only on segments III-VII.

Subgenus *Amurella* subgen. n.

Type species *Ephemerella gracilis* Tshernova, 1952.

*Diagnosis. Larva.* Body slender (in contrast to *Torleya* and some others). Maxillae biting, not filtering (in contrast to *Uracanthella* and *Cincticostella*). Fore legs not grasping (in contrast to *Drunella*). Pronotum with straight anterior margin (in contrast to *Cincticostella*). Mesonotum without lateral projections (in contrast to *Acerella*). Abdominal terga with unpaired dorsal tubercles (in contrast to all other *Ephemerella* s. l., whose dorsal tubercles are paired or absent). All tergialae of abdominal segments III-VI with bifurcate ventral lamella (as in *Serratella*, *Torleya* and *Uracanthella*; in contrast to *Ephemerella* s. str., *Drunella*, *Caudatella* and *Cincticostella* whose tergialae of segment VI have unfurcate ventral lamella).

*Distribution.* Asian Far East (rivers Amur, Ussuri and Sungari).

*Species examined.* *E. (A.) gracilis* Tshernova, 1952: lectotype and paralectotypes (Kluge, 1995); larvae and subimago extracted from larva. Imagos of this species are unknown.

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