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 anteriormost 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.) znojkoi* (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, 1958.

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, *Crinitella* 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 tergaliae 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 tergaliae 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 tergaliae 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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