A REVIEW OF THE SUBFAMILIES OF EPHEMERELLIDAE (Ephemeroptera)

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ABSTRACT

The systematic history of the family is outlined. The five genera of the Ephemerellidae are divided into three subfamilies. The new subfamily Teloganodinae includes the genera *Teloganodes* Eaton, *Ephemerellina* Lestage, and *Teloganella* Ulmer; those previously named are Ephemerellinae including only the genus *Ephemerella* Walsh, and Melanemerellinae with the genus *Melanemerella* Ulmer. The nominal genus *Austremerella* Riek is tentatively regarded as a subgenus of the genus *Ephemerellina*, and the monotypic genus *Teloganopsis* Ulmer is reduced to a subgenus of the genus *Ephemerella*.

The family Ephemerellidae was first recognized by Eaton (1884) when he included the genera *Ephemerella* Walsh and *Teloganodes* Eaton as Section 6 of *Ephemerella*. The authorship of the family was not established until 1909 when Klapálek regarded the genus *Ephemerella* as a separate family.

Edmunds, Allen and Peters (1963) in the most recent treatment of the entire family regard the Ephemerellidae as being composed of two subfamilies and six genera. The genera *Ephemerella* Walsh, *Ephemerellina* Lestage, *Teloganella* Ulmer, *Teloganodes* Eaton, and *Teloganopsis* Ulmer are placed in the subfamily Ephemerellinae, whereas the genus *Melanemerella* Ulmer is placed in the Melanemerellinae.

Demoulin (1955) transferred the genus *Melanemerella* from the Ephemerellidae to the Tricorythidae, and placed it in the monotypic subfamily Melanemerellinae. Edmunds, Allen and Peters (1963) returned the genus to the Ephemerellidae; however, they recognized Demoulin's placement of the genus into a separate subfamily. The nymphal and male imago stages are unknown and the systematic position of *Melanemerella* will continue to be uncertain until these stages are described.

The nymphs and male imagoes of the genera *Teloganodes* and *Ephemerellina* bear a close resemblance to the primitive members of the Tricorythidae. The nymphs of these genera have lamellate tracheal gills on abdominal segments 2 to 5 or 2 to 6, and they are very similar to the tricorythid genus *Ephemerythus* Gillies described from Africa. The genital forceps of the male imagoes of *Teloganodes* and *Ephemerellina* are also tricorythid-like as the first and second segments are subequal in length.

The nymphs of the very diverse genus *Ephemerella* possess lamellate tracheal gills on abdominal segments 3 to 7 or 4 to 7, and the second segment of the genital forceps of the male imagoes is more than three times as long as segment 1. It is obvious that *Teloganodes* and

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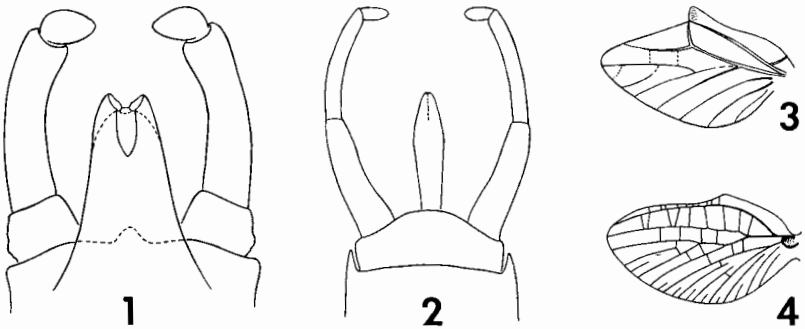

Fig. 1. *Ephemerella* (*Eurylophella*) *coxalis* McD., male genitalia, dorsal view. Fig. 2. *Teloganodes tristis* (Hag.), male genitalia, ventral view (after Ulmer, 1924). Fig. 3. *Teloganopsis media* Ulmer, hind wing (after Ulmer, 1939). Fig. 4. *Ephemerella* (*Serratella*) *tibialis* McD., hind wing.

Ephemerellina are closely allied to one another and are distinct from the more specialized genus *Ephemerella*. For these reasons the former genera are herein assigned to a separate subfamily, Teloganodinae.

The subdivision of the Ephemerellidae into three subfamilies is a more natural classification, and the inclusion of *Teloganodes* and *Ephemerellina* into a separate subfamily helps to point out the close relationship of these genera to the Trocorythidae.

SUBFAMILY TELOGANODINAE, New Subfamily

The Teloganodinae is characterized in the male imago as the basal segment of the genital forceps is subequal in length to the second segment (Fig. 2). The forewings are proportionately narrow with single, short, unconnected intercalaries (Eaton 1884: pl. 15). The hind wing is proportionately small with reduced venation, the radial sector occupies nearly three-fourths of the wing area, and only a single vein persists behind the radius. The costal projection is large and acute. The nymphal stage is characterized by having lamellate tracheal gills on abdominal segments 2 to 5 or 2 to 6, and two or three caudal filaments. The median terminal filament is vestigial in *Teloganodes*, but it is fully developed in the other genera.

The genus *Teloganodes* is known from Ceylon, Java, Sumatra, and the Philippine Islands, whereas *Ephemerellina* has a disjunct distribution in South Africa and Kiangsi Province, China.

The genus *Austremerella* Riek (1963) was described from Queensland, Australia. The male imago is unknown; however, the description of the nearly mature nymph and the description and examination of the female imago indicate that *Austremerella* may be a junior synonym of *Ephemerellina*. The cubital area of the forewings of *Austremerella* has three long basally-connected intercalaries, whereas in *Ephemerellina* two long intercalaries are present, and only one of these is connected in

specimens I have examined. The nymphal stages differ only in two minor characters. The nymph of *Austremerella* has paired occipital tubercles and rudimentary maxillary palpi, whereas occipital tubercles and maxillary palpi are absent in *Ephemerellina*. The presence or absence of maxillary palpi, and the presence or absence of occipital, thoracic, and abdominal tubercles is variable within most of the subgenera of the genus *Ephemerella*. In one species, *Ephemerella* (*Timpanoga*) *hecuba* (Eaton), abdominal tubercles are present or absent in geographic variants. The known differences between *Austremerella* and *Ephemerellina* cannot be regarded as of generic significance, and it appears probable that *Austremerella* is synonymous with *Ephemerellina*. However, since the characters of the males of *Austremerella picta* Riek are unknown, and our knowledge of the characters of the species is incomplete, *Austremerella* is herein tentatively regarded as a subgenus of *Ephemerellina*.

The genus *Teloganella* was described by Ulmer (1939) from a single female subimago collected in Sumatra. The characters of the male imago and nymphal stages are unknown and the placement of this genus is uncertain at this time. *Teloganella umbrata* Ulmer is herein included in the Teloganodinae; however, its placement in this subfamily is provisional until the unknown stages are discovered.

SUBFAMILY EPHEMERELLINAE

The subfamily Ephemerellinae is distinguished from Teloganodinae and Melanemerellinae as the basal segment of the genital forceps is less than one-half as long as the second segment (Fig. 1). The forewings are proportionately narrow with single, short, unconnected intercalaries (Allen and Edmunds, 1963: fig. 9), and the hind wings are variable with moderate to sparse venation. The hind wings of all subgenera except *Teloganopsis* are proportionately large with moderate venation, and the radial sector occupies approximately only one-half of the wing area. The medial vein of the hind wing is clearly forked and the costal projection is usually small and rounded (Fig. 4). The hind wings of *Teloganopsis* are proportionately small with few veins, and the radial sector includes nearly two-thirds of the wing area. The medial veins are without a fork, and the costal projection is large and rounded (Fig. 3). The nymphal stages have lamellate tracheal gills on abdominal segments 3 to 7 in some subgenera and on 4 to 7 in others. All subgenera possess three caudal filaments.

The subfamily, as treated here, includes only the genus *Ephemerella*. The distribution of the genus is Holarctic and Oriental, and it is divided into eleven subgenera. Five subgenera, *Attenuatella* Edmunds, *Caudatella* Edmunds, *Dannella* Edmunds, *Serratella* Edmunds, and *Timpanoga* Needham are restricted to North America. *Ephemerella* Walsh *s. s.* is Holarctic in distribution and is known from North America, Europe, Asia, and North Africa. *Drunella* Needham is known from North America and Asia, whereas *Eurylophella* Tiensuu

is known from North America and Europe. *Torleya* Lestage occurs in Europe and Asia, while *Crinitella* Allen and Edmunds is known from only Nepal.

The monotypic genus *Teloganopsis* Ulmer is known from Java and Sumatra, and Ulmer (1939) stated that it was related to the genus *Teloganodes* Eaton. The nymphs of *Teloganopsis media* Ulmer have lamellate tracheal gills on abdominal segments 3 to 7, and the genital forceps of the male imago have short basal and apical segments and a long second segment as in Fig. 1. The penes of the male imago are similar to the species placed in the subgenus *Serratella* of *Ephemerella* as they lack spines and have lateral subapical projections; however, the reduced hind wings of this species (Fig. 3) are distinctly different from those of the subgenus *Serratella* (Fig. 4) and all other known *Ephemerella*. The totality of nymphal and adult characters indicate that *Teloganopsis* is a subgenus of *Ephemerella*. The nymph which has been associated with the imagoes of *Teloganopsis media* with almost absolute certainty is in all respects a typical member of the genus *Ephemerella*, and only the unique character of the hind wings of the imagoes would indicate that *Teloganopsis* could be regarded as a separate genus. This single character is inadequate for the placement of this species in a separate genus.

SUBFAMILY MELANEMERELLINAE

The genus *Melanemerella* was erected for *M. brasiliana* Ulmer which was described from a single female imago collected in Espirito Santo, Brazil. The relationships of this genus are tentative until the male imago and the nymphal stages are discovered.

The characters of the wings of *M. brasiliana* suggest that it be maintained as a separate subfamily in the Ephemerellidae. The forewings are proportionately broad with the short, unconnected intercalaries usually in threes (Ulmer 1919: fig. 32). The hind wings are proportionately small with numerous veins, and the region of the radial sector includes approximately two-thirds of the wing area. MA_1 and MA_2 of the hind wing are not clearly forked as they appear to be united by a crossvein, and the costal projection is small and round.

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