

**A NATURAL SUBGENERIC CLASSIFICATION OF
EPHEMERELLA BARTONI AND RELATED
SPECIES (EPHEMEROPTERA: EPHEMERELLIDAE)¹**

W. P. McCafferty²

ABSTRACT

Phyletic relationships indicate that *Ephemerella bartoni* Allen should be excluded from the subgenus *Dannella* in order to prevent a polyphyletic and impractical classification. A classification in the subgenus *Eurylophella* is more consistent with the species' phyletic relationships.

The phyletic relationships within that group of *Ephemerella* species which lack gills on abdominal segment 3 have recently been shown (McCafferty, 1977) and clearly indicate that each of the four subgenera within this group (Edmunds, 1959) are monophyletic. Independent of the phyletic study, Allen (1977) proposed modifications in the subgeneric limits within this group in order to accommodate a newly described species into the subgenus *Dannella*. Since *E. bartoni* Allen (known only from the larval stage) did "not fit the published characterization" of *Dannella*, this subgenus was radically redefined by Allen.

The examination of *E. bartoni* material, in light of phyletic relationships and total larval characters, has indicated that its placement in *Dannella* is unnatural, and that *Dannella*, as redefined by Allen, is polyphyletic. The classificatory integrity of related subgenera was also weakened by this redefinition.

E. bartoni shares the commonly derived character states of gill operculation, setaceousness, and lateral development of the abdomen with *Eurylophella*, *Dannella*, and *Timpanoga*. It thus can be easily excluded from consideration in *Attenella*. However, with only this much evidence, three possibilities regarding *E. bartoni*'s phyletic position remain. It could be part of the *Dannella-Timpanoga* lineage, part of the *Eurylophella* lineage, or it could have evolved prior to the split into the above two lineages but after the origin of *Attenella*.

E. bartoni does not possess either of the two exclusively derived character states which delimit the *Dannella-Timpanoga* lineage, i.e., the loss of denticles on the claws and the reduction of medial maxillary setae. The complete loss of dorsal abdominal tubercles is another derived character state which has previously characterized *Danella*, but is not found in *E. bartoni*. There is, therefore, no apparent phyletic evidence that would indicate a position on the *Dannella-Timpanoga* lineage.

On the other hand, *E. bartoni* possesses three synapomorphic larval character states that delineate the *Eurylophella* lineage. This evolution included the loss of maxillary palpi, the apical rounding of the gills, and the reduction of the midlengths of abdominal segments 5, 6, and 7. The midlength of segment 9 shows a slight tendency towards elongation in my specimens of *E. bartoni*, although this is not the case in the figure of Allen (1977).

Larval characters of *E. bartoni* clearly indicate that the species does not belong to the *Dannella-Timpanoga* lineage, but that its origin is with the *Eurylophella* lineage. Ecological observations also lend support to this conclusion. Larvae of *E. bartoni* were found

¹Purdue Agricultural Experiment Station Journal No. 7066.

²Department of Entomology, Purdue University, West Lafayette, IN 47907.

sparsely along the limestone shores of northern Lake Huron (D. R. Barton, pers. comm.) at less than 2 m depth and within 400 m of the shoreline. Patches of boulders or smaller stones and sometimes a fine layer of silt were present on the limestone shelving substrate. *Dannella* species (McCafferty, 1977) are not known from lake habitats. *Eurylophella* species are commonly taken in lake habitats.

In terms of the relative sizes of abdominal segments, *E. bartoni* is obviously not as highly specialized as other species of the *Eurylophella* lineage. Because of this, it can be inferred that *E. bartoni* is of relatively early origin in the *Eurylophella* lineage. The species also demonstrates a unique condition of having dorsal abdominal tubercles on segments 5, 6, and 7 only.

It remains to be seen whether or not adult males of *E. bartoni* possess the uniquely shaped penes typical of *Eurylophella*, or whether or not the eggs of *E. bartoni* have lost the polar cap (Koss, 1968) which is also typical of *Eurylophella*. These derived character states of other life stages may or may not have already been acquired in the *Eurylophella* lineage prior to the origin of *E. bartoni*.

From all of the above, it is appropriate to exclude *E. bartoni* from the subgenus *Dannella* and thus maintain a natural classification. I would suggest, at least until adults and eggs of *E. bartoni* are known, that it be conservatively considered in the subgenus *Eurylophella*. The erection of a new subgenus to include this species may eventually be justified, possibly if, e.g., there prove to be large gaps in adult and egg characters between *E. bartoni* and other *Eurylophella*. In either case, a natural classification will have been retained.

Dannella larvae will continue to key out effectively with the use of Edmunds et al. (1976). *E. bartoni* will definitely not key to *Dannella*, but will only roughly key to *Eurylophella*. The special taxonomic characteristics, ecology, and distribution of this species should, therefore, be kept in mind.

LITERATURE CITED

- Allen, R. K. 1977. A review of *Ephemerella* (*Dannella*) and the description of a new species (Ephemeroptera: Ephemerellidae). Pan-Pac. Entomol. 53:215-7.
- Edmunds, G. F., Jr. 1959. Subgeneric groups within the mayfly genus *Ephemerella* (Ephemeroptera: Ephemerellidae). Ann. Entomol. Soc. Amer. 52:543-7.
- Edmunds, G. F., Jr., S. L. Jensen, and L. Berner. 1976. The mayflies of North and Central America. Univ. Minn. Press, Minneapolis.
- Koss, R. W. 1968. Morphology and taxonomic use of Ephemeroptera eggs. Ann. Entomol. Soc. Amer. 61:696-721.
- McCafferty, W. P. 1977. Biosystematics of *Dannella* and related subgenera of *Ephemerella* (Ephemeroptera: Ephemerellidae). Ann. Entomol. Soc. Amer. 70:881-9.