

**REVISIONS TO THE GENUS *CRINITELLA*
(EPHEMEROPTERA: EPHEMERELLIDAE)**

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Abstract.—Our studies of the Ephemeroptera family Ephemerellidae have revealed new synonyms and a new combination for species that have been placed in the genus *Crinitella* Allen and Edmunds. The type species, *Crinitella coheri* (Allen and Edmunds), is variable in color, and the shape of the left mandible is the same as that of *C. permkami* Wang and Sites, indicating that *C. coheri* (Allen and Edmunds) 1963 = *C. permkami* Wang and Sites, 1999, *new synonymy*. *Drunella nasiri* (Ali), *new combination*, was included in *Crinitella* previously. All other species previously included in *Crinitella* are synonyms of species in different genera, as follows: *Cincticostella levanidovae* (Tshernova) 1952 = *Crinitella swatensis* (Ali) 1971, *new synonymy*, and *Torleya nepalica* (Allen and Edmunds) 1963 = *Crinitella wahensis* (Ali) 1971, *new synonymy*.

Our study of the systematics of the Ephemeroptera family Ephemerellidae has revealed important data regarding species placed in the Oriental genus *Crinitella* Allen and Edmunds. *Crinitella* was described originally as a subgenus of *Ephemerella* Walsh by Allen and Edmunds (1963) and later elevated to generic status by Allen (1980). *Crinitella* is relatively poorly known, and a paucity of material in collections has hampered attempts to study it (e.g., Landa et al., 1982). Five species have been listed in *Crinitella*. The type species, *C. coheri* (Allen and Edmunds), was described from Nepal (Allen and Edmunds, 1963) and subsequently reported from northern India and western Malaysia (Allen, 1980). Ali (1971a, b) described *Ephemerella nasiri* Ali, *E. swatensis* Ali, and *E. wahensis* Ali from Pakistan. Hubbard and Peters (1978) listed these three species as *Crinitella*, and recent workers have maintained their placement there (e.g., Wang and Sites, 1999; Sites et al., 2001; Soldán, 2001). *Crinitella permkami* Wang and Sites was described from material collected in Thailand (Wang and Sites, 1999; Sites et al., 2001). Each of these five species is known only from the larval stage.

Crinitella larvae may be recognized by the morphological characters given by Allen and Edmunds (1963), which include a greatly reduced labium; reduced maxillary palpi; imbricate gills that are not operculate; and tarsal claws having a group of basal denticles and a series of long, apical denticles. Based on our review of all five species that historically resided in *Crinitella*, only *C. coheri* and *C. permkami* had been placed correctly. Wang and Sites (1999) differentiated *C. permkami* from *C. coheri* by general coloration, the morphology of the left mandible, and the length of the apical segment of the labial palp. Specimens we examined, including type material of both *C. coheri* and *C. permkami*, showed a gradation of coloration that included the uniform color type of *C. coheri* and the darker, patterned color type of *C. permkami*. Furthermore, more recently collected material had darker color and a more pronounced color pattern. We also examined mandibles from paratypes of *C. coheri* and found that the left mandible of *C. coheri* evidently was rotated on the slide from which it had been illustrated. When the mandible is rotated so that the external lateral edge is tilted toward the viewer, it appears as illustrated by Allen and Edmunds (1963: Fig. 18). However, when the mandible is viewed in its flat plane, it appears as illustrated for *C. permkami* by Wang and

Sites (1999: Fig. 4). The apical segment of the labial palp varied slightly in length. In light of these observations, we propose the following new synonymy: *C. coheri* (Allen and Edmunds) 1963 = *C. permkami* Wang and Sites, 1999, **new synonymy**.

The other three species included in *Crinittella* by Hubbard and Peters (1978) actually belong to certain other ephemerellid genera. For example, *C. nasiri* has well-developed tubercles on the ventral margin of the forefemora, a broad frontal shelf on the head, lateral frontoclypeal projections, and a median ocellar tubercle (Ali, 1971b). These are characteristic of the genus *Drunella* Needham (sensu Allen, 1980). Therefore, we recognize this species as *Drunella nasiri* (Ali) 1971, **new combination**. Saleem and Ahmad (1987) described and illustrated, but did not name, two species from Pakistan that they placed in the genus *Ephemerella*. The first of these species (Saleem and Ahmad, 1987: 394) is referable to *D. nasiri*.

Crinittella swatensis has maxillae and a laterally expanded thorax (Ali, 1971a) that are characteristic of the genus *Cincticostella* Allen (sensu Allen, 1975, 1980). The description and illustrations of *Crinittella swatensis* given by Ali (1971a) are consistent with those given for the larva of *Cincticostella levanidovae* (Tshernova) (see e.g., Tshernova, 1952; Allen, 1971; Yoon and Kim, 1981). Specimens of *Cincticostella levanidovae* that we examined also were consistent with *Crinittella swatensis*. Therefore, we propose the following new synonymy: *Cincticostella levanidovae* (Tshernova) 1952 = *Crinittella swatensis* (Ali) 1971, **new synonymy**. The second unnamed *Ephemerella* species from Pakistan described and illustrated by Saleem and Ahmad (1987: 395) is referable to *C. levanidovae*.

Crinittella wahensis possesses characters that are typical of certain species placed the genus *Torleya* Lestage, such as operculate gills 3. The description and illustrations of *C. wahensis* provided by Ali (1971b) coincide with those given for *T. nepalica* (Allen and Edmunds) by Allen and Edmunds (1963). Specimens of *T. nepalica* that we examined, including type material and one larva from Pakistan, fit the concept of *C. wahensis*. The only ostensible difference between the two species is the number of denticles on the tarsal claws: 6–8 for *T. nepalica* versus 9 for *C. wahensis* (Allen and Edmunds, 1963; Ali, 1971b). This difference is within the expected range of variability of claw denticle numbers, based on our experience with large series of many Ephemerellinae species. In light of these observations, we propose the following new synonymy: *T. nepalica* (Allen and Edmunds) 1963 = *C. wahensis* (Ali) 1971, **new synonymy**.

As a result of the above revisions, the composition of the genus *Crinittella* is reduced to the type species, *C. coheri*. Alate forms, which remain unknown, will be important for resolving the relationships of this genus. All materials examined are deposited in the Purdue University Entomological Research Collection, West Lafayette, Indiana, USA.

Cincticostella levanidovae (Tshernova)

Material examined. KOREA, Kwang Nung, 3-IV-1960, G. Field, eight larvae (*C. castanea* holotype and paratopotypes); Seoul, 27-IV-1954, Bullock, two larvae (*C. castanea* paratypes).

Crinittella coheri (Allen and Edmunds)

Material examined. INDIA, **Kashmir**, 22 mi W of Srinagar on road to Tangmarg, ca. 6,500 ft elev., 5-IX-1968, C. Weins, one larva. MALAYSIA (west), **Selangor**, Gombak R., 9 mi N of Kuala Lumpur on Bentong Rd., 27-VIII-1969, J. E. Bishop, one larva (parts in vial). **Perak**, Sungai Jor, Cameron, Highlands Rd., mile 19, 22-IX-1978, G. F. & C. H. Edmunds, one larva. NEPAL, Palung, ca. 5,850 ft elev., 17-IV-1957, E. I. Coher, three larvae (*C. coheri* holotype).

and paratypes; one set mouthparts on slide, one set mandibles in vial). THAILAND, **Chiang Mai Prov.**, Nam Chai River above hydro station intake at Fang Horticultural Station, 15-XI-1985, J. T. & D. A. Polhemus, one larva. **Songkhla Prov.**, stream at Buddhist temple, Ton Nga Chang National Park, 6-VII-1997, R. W. Sites, five larvae (*C. permkami* paratypes); same locale, 7-I-1995, Sites & Nichols, two larvae (*C. permkami* paratypes).

Torleya nepalica (Allen and Edmunds)

Material examined. NEPAL, Pelung, 5,850 ft elev., 17-IV-1957, E. I. Coher, five larvae (*T. nepalica* holotype and paratypes); PAKISTAN (west), **Hazara Dist.**, Balzkot, mt. stream at ca. 3,400 ft elev., 27-IX-1962, A. Dean Stock, one larva.

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