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New species of *Cinygmula* McDunnough, 1933 and larval description of *Cinygmula irina* Tshernova & Belov, 1982 from the Russian Far East (Ephemeroptera: Heptageniidae)

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Abstract

Here, we describe *Cinygmula tetramera*, **sp. nov.** (Ephemeroptera: Heptageniidae), which has male imaginal forceps with three distal segments, based on male & female imagos reared from larvae. The structure of the penes of this species is similar to that of *Cinygmula irina* Tshernova & Belov, 1982, a description and drawing of which are also presented in this paper. The larvae of *C. irina* are described for the first time. We also describe the eggs of both species. Based on our data, egg characters provide useful data for species diagnoses in the genus *Cinygmula*.

Key words: Mayflies, *Cinygmula*, taxonomy, morphology, egg, Asia

Introduction

Representatives of the mayfly genus *Cinygmula* McDunnough, 1933 (Ephemeroptera: Heptageniidae) are distributed in the Eastern Palearctic and Nearctic regions. Ten species have been identified from North America (Scudder 1975, Slater & Kondratieff 2004, McCafferty & Newell 2007), six or seven species from the Himalayas (Braasch 1977, Braasch & Soldan 1987, Kustareva 1988, Wang & McCafferty 2004), seven from Japan (Ishiwata 2001), three from Korea (Bae & Yoon 1997), four from Northeast China (Quan *et al.* 2002), four from Mongolia (Soldan *et al.* 2009) and eleven species from the Far East of Russia (Tshernova & Belov 1982; Kluge 1997; Tiunova 2007, 2009). The Russian Far East taxa include the East Palearctic species *Cinygmula cava* (Ulmer, 1927), *C. kurenzovi* (Bajkova, 1965), *C. putoranica* Kluge, 1980, *C. sapporensis* (Matsumura, 1904) and *C. unicolorata* Tshernova, 1979; the East Asian continental species *C. brunnea* Tiunova, 1990, *C. irina* Tshernova & Belov, 1982, *C. levanidovi* Tshernova & Belov, 1982, *C. malaisei* Ulmer, 1927 and *C. autumnalis* Tiunova & Gorovaya, 2012; and the East Asian continental-island species *C. hirasana* Imanishi, 1935.

For most of the Far Eastern species in the genus *Cinygmula*, all stages of development have been described, but for *C. hirasana*, *C. irina*, *C. levanidovi*, *C. malaisei* and *C. unicolorata*, the larval stage remains unknown.

During the processing of the material collected by the first author many years ago, a new species, *Cinygmula tetramera*, **sp. nov.**, was identified based on morphology. This species differs from all known species of the genus *Cinygmula* by having imaginal forceps with three distal segments. This forceps structure is typical for the genus *Arthroplea* Bengtsson, 1908 (Arthropleidae) (Studemann *et al.* 1987). However, all other morphological characteristics of the new species, including the labium, gills and wing venation, are typical of the genus *Cinygmula* (McDunnough 1933, Webb & McCafferty 2008). It should be noted that N. Kluge considers all *Cinygmula* of the Russian Far East to be part of a subgenus of *Rhithrogena* Eaton, 1881 (Kluge 1988).

Because the penes structure in the new species most closely resembles that of *C. irina*, a description of all stages and drawings of this latter species are also presented herein.

All specimens are preserved in 75% ethanol. The material is deposited in the collection of the Institute of Biology and Soil Science, Far Eastern Branch, Russian Academy of Sciences, Vladivostok.