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Eric Whiting

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**RAPTOHEPTAGENIA CRUENTATA, GEN. NOV. (EPHEMEROPTERA:
HEPTAGENIIDAE), NEW ASSOCIATION OF THE LARVA PREVIOUSLY THOUGHT
TO BE ANEPEORUS WITH THE ADULT OF HEPTAGENIA CRUENTATA WALSH**

ERIC R. WHITING and D.M. LEHMKUHL

Department of Biology, University of Saskatchewan, Saskatoon, Saskatchewan, Canada S7N 0W0

Abstract

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Adult males were reared from larvae of the type previously associated with *Anepeorus*. These adult males key to and fit the description of *Heptagenia cruentata* Walsh. Because the larvae are very different from those of other *Heptagenia* species, a new genus, *Raptoheptagenia*, is proposed for *cruentata*. Adult males of *Raptoheptagenia* differ from those of *Heptagenia* in the anastomosis of two or more crossveins in the stigmatic area of the forewing, and in the subequal lengths of the foretarsus and tibia.

Résumé

Les auteurs ont élevé des adultes mâles à partir de larves du genre précédemment associé avec *Anepeorus*. Ces mâles suivent les critères et descriptions pour *Heptagenia cruentata* Walsh. A cause que les larves sont très différentes de celles d'autres espèces de *Heptagenia*, nous proposons un genre nouveau, *Raptoheptagenia*, pour *cruentata*. Les adultes mâles de *Raptoheptagenia* diffèrent de ceux de *Heptagenia* par l'anastomose de deux ou plus veines croisées dans la région stigmatique des ailes antérieures, et par les longueurs quasi-égales des tarsi et tibia antérieurs.

Introduction

Burks (1953) suggested (with little conviction) that a rare larva from Illinois might be the immature stage of *Anepeorus*. Although this association has not been confirmed by rearing, it has been widely accepted. Larvae of this type have been collected in Illinois (Burks 1953; three specimens), Indiana (Mancini *et al.* 1976; four specimens), Ohio (Beckett 1977; four specimens), and Saskatchewan (Lehmkuhl 1972, 1976; Whiting 1985; approximately 200 specimens). They are extremely rare except in Saskatchewan.

We have reared larvae of the type Burks (1953) thought might be *Anepeorus* and obtained four adult males and nine adult females. The adult males key to *Heptagenia cruentata* Walsh in Traver (1935), and fit the descriptions of *H. cruentata* in Traver (1935) and Burks (1953). They are indistinguishable from the types of *H. reversalis* McDunnough (1924) (= *H. cruentata*; McDunnough 1929). We therefore conclude that the larva that Burks associated with *Anepeorus* is the immature stage of *Heptagenia cruentata*, which was previously unknown. *Heptagenia cruentata* adults are known from Illinois (Walsh 1863; Burks 1953), Nebraska (Traver 1935), Tennessee (Berner 1977), and Manitoba (McDunnough 1929).

Because the larvae are very different from those of other *Heptagenia* species, we propose a new genus, *Raptoheptagenia*, for the species *cruentata*.

Raptoheptagenia, gen. nov.

Description and diagnosis. Adult males of *Raptoheptagenia* are very similar to those of *Heptagenia* and key to *Heptagenia* in all recent keys, including Flowers (1980). Adult males of *Raptoheptagenia* and *Heptagenia* (as defined by Flowers 1980) differ only in the relative lengths of the foretarsus and tibia, and anastomosis of crossveins in the stigmatic

area of the forewing. In *Raptoheptagenia*, the foretarsus and tibia are subequal in length; in *Heptagenia*, the foretarsus is 1.25 times as long as the tibia. Two or more anastomoses are present in the stigmatic area of *Raptoheptagenia*; stigmatic crossveins are usually not anastomosed in six *Heptagenia* species examined [*H. adequata* McDunnough, *H. diabasia* Burks, *H. elegantula* (Eaton), *H. flavescens* Walsh, *H. pulla* (Clemens), and *H. solitaria* McDunnough]. Adult females of *Raptoheptagenia* and *Heptagenia* are morphologically indistinguishable. Species-level descriptions of *R. cruentata* (as *Heptagenia cruentata*) adult males, which may be useful in distinguishing *R. cruentata* from *Heptagenia* species, are given in Walsh (1863), Traver (1935), and Burks (1953).

Larvae of *Raptoheptagenia* (as *Anepeorus*) have been described by Burks (1953), Jensen (1972), and Edmunds *et al.* (1976). Figures of the mouthparts are given in Jensen (1972) and McCafferty and Provonsha (1986). The larvae can be distinguished from those of all other heptageniid genera by the predaceous mouthparts (especially the long, slender incisors and reduced molars area of the mandibles), the slender lamellae and ventral insertions of the abdominal gills, and the dense setation on the dorsum of the abdomen (Edmunds *et al.* 1976).

Type-species. *Raptoheptagenia cruentata* (Walsh) 1863.

Etymology. *Raptoheptagenia*, rapto — to seize or plunder (Latin), referring to the predaceous habits of the larva; and heptagenia — indicating the resemblance of the adults to those of *Heptagenia*.

Distribution. Illinois, Indiana, Nebraska, Ohio, Tennessee, Manitoba, and Saskatchewan. In Saskatchewan, *R. cruentata* has been collected at four locations upstream from Lake Diefenbaker on the South Saskatchewan River, at Lloydminster Ferry (30 km north of Lloydminster), North Battleford, Maymont Ferry (10 km south of Maymont) and Cecil Ferry (15 km east of Prince Albert) on the North Saskatchewan River, and at a site 10 km south of Lashburn on the Battle River (a tributary of the North Saskatchewan River). Larvae are most abundant and most easily collected at Lemsford Ferry (40 km south of Kindersley) on the South Saskatchewan River. The larvae from which adults were reared were collected at this site on 17 June 1983 and 1 July 1984.

Biology. Larvae are found predominantly in large rivers. They appear to prefer fast currents, loose gravel or cobble substrates, and depths greater than approximately 0.5 m. They are active carnivores.

In Saskatchewan, *Raptoheptagenia* exhibits a univoltine summer life cycle. Larvae are present from mid-May until early August.

Discussion

In Jensen's (1972) phylogeny of heptageniid genera, "*Anepeorus*" is derived from the base of a lineage containing *Heptagenia*, *Stenonema*, *Stenacron*, and several palaearctic genera (Phyletic Line IIB2), primarily because of the structure of the ventral nerve cord and Malpighian tubules of the larva. The association of these larvae with a very *Heptagenia*-like adult supports Jensen's phylogenetic conclusions. Relative to those of other genera in this lineage, *Raptoheptagenia* larvae are very derived but the adults are quite primitive. Because similarities between *Raptoheptagenia* and *Heptagenia* adults are symplesiomorphic, it is unclear whether the two genera are closely related or merely both early derivatives of the lineage.

Because *Raptoheptagenia* apparently belongs to a relatively derived lineage of heptageniids (within the Heptageniinae), and because its adults are very similar to those of *Heptagenia*, we believe that *Raptoheptagenia* should be placed within the subfamily Heptageniinae. Although the larvae are very distinctive and were previously placed in a separate subfamily, the adults are clearly heptageniine.

The larvae of *Anepeorus* is unknown. A new larva, which was recently discovered in Saskatchewan and Alberta (Whiting and Lehmkuhl 1987), might be the immature stage of *Anepeorus*. However, this new larva has not been reared, and, because of its rarity and threats to its habitat, probably never will be.

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