DESCRIPTION OF ADULTS OF *BAETIS MAGNUS*, (EPHEMEROPTERA: BAETIDAE)[1]

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ABSTRACT: Male and female adults of *Baetis magnus* McCafferty and Waltz are described for the first time, and are distinguished from a common and related sympatric species, *Baetis tricaudatus* Dodds. Variations in hindwing venation are briefly discussed and biological notes for *B. magnus* are given.

In their revision of the known *Baetis* larvae of North America, Morihara and McCafferty (1979) provided descriptions for three species without assigning formal names. One of these species was designated *Baetis* sp. B, with material listed from Arizona and New Mexico. Later, McCafferty and Waltz (1986) proposed the formal name *Baetis magnus* for *Baetis* sp. B, with the holotype larva chosen from Dawes Co., Nebraska. This species is a member of the *Baetis rhodani* group in which the larvae are characterized by having robust setae on the antennal scapes and pedicels and on the paraprocts (Morihara and McCafferty 1979). Other Nearctic species currently placed in the *rhodani* group include: *Baetis adonis* Traver, *B. bicaudatus* Dodds, *B. caelestis* Allen and Murvosh, *B. foemina* McDunnough, *B. moffati* Dodds, *B. palisadi* Mayo, *B. parallelus* Banks, *B. persecutus* McDunnough, *B. piscatoris* Traver, and *B. tricaudatus* Dodds. Three species in this group, *B. bicaudatus, B. foemina,* and *B. tricaudatus,* are known from both larvae and adults, and two species, *B. caelestis* and *B. magnus,* are known from larvae only. The remaining species in this group are known only from adult material.

McCafferty *et al.* (1993) suggested the possibility that *B. moffati* and *B. magnus* represent the same species. However, neither the original description of *B. moffati* presented by Dodds (1923) nor Traver's (1935) redescription agree with our reared material of *B. magnus.* We have attempted to collect *B. moffati* from its type locality (South Boulder Creek near Tolland, Colorado), but to date, no *Baetis* species have been collected or reared from this locality that match these descriptions. Additionally, no larvae of *B. magnus* have been collected from South Boulder Creek, however, *B. tricaudatus* and *B. bicaudatus* are abundant in this stream.

In this paper, we do not attempt to distinguish the adults of *B. magnus* from other adults of the *rhodani* group. A comprehensive revision of the genus *Baetis* sensu McCafferty and Waltz (1990) is necessary to establish diagnostic characters for the adults. Our purpose here is to provide regional biologists with a description of a commonly collected mayfly species, and to

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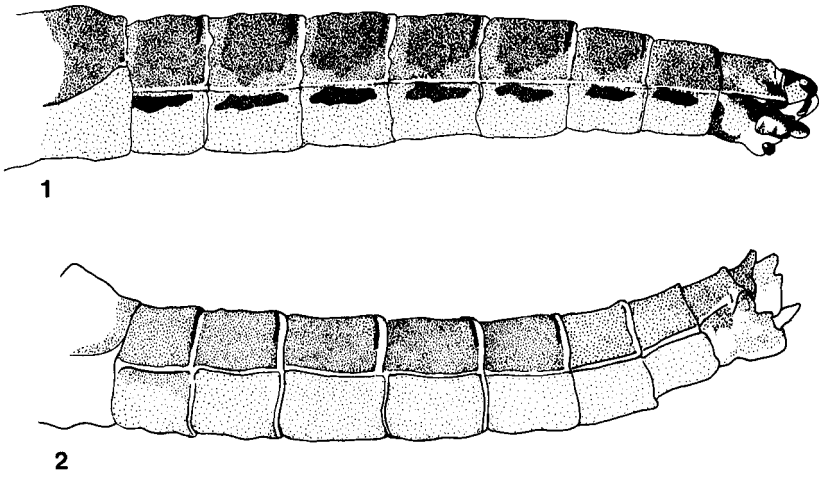
provide characters to distinguish adults of *B. magnus* from a common and related sympatric species, *B. tricaudatus*.

During this study we noted significant variability in certain hindwing venation characters. Hindwings of *B. magnus* reared from two disjunct localities in Colorado, as well as those of *B. tricaudatus* reared from six localities throughout Colorado, are illustrated to show variations in previously utilized taxonomic characters. Only reared adults with associated larval exuviae were used in the following descriptions.

Baetis magnus McCafferty and Waltz

Adult male. Length of body 6.0-8.5 mm, forewings 6.0-7.5 mm, hindwings 1.2-1.5 mm. Head brown; antennae pale to light brown, scapes with red-brown, square shaped mark on ventral surface, pedicels with red-brown, elongate mark on ventral surface (Fig. 3). Turbinate eyes rusty brown basally, white medially, rusty brown dorsally. Thorax generally medium to dark brown. Foretibiae and tarsi medium brown, forefemora light brown; middle and hindlegs pale, second, third, and fourth tarsal segments and apical third of first tarsal segment stained with brown (Fig. 5); all femora with prominent subapical brown mark (Fig. 5). Wings hyaline, longitudinal veins light to medium brown, intercalaries pale, stigmatic area cloudy, anastomosed. Shape of costal projection of hindwings similar to a shark's dorsal fin (Figs. 8-12), a straight, more gradual slope on the leading edge, steeper slope on the hind edge; hindwings with three longitudinal veins. Abdominal tergum 1 dark brown, terga 2-10 usually light red-brown, with dark red-brown shading near lateral margins, posterior margins of terga 2-8 with narrow transverse rusty brown band. Terga 2-8 with pair of submedian light brown oblique marks near anterior margin and smaller pair of light brown dots. Sterna white to pale yellow, sterna 2-8 with red-brown, longitudinal mark below pleural fold (Fig. 1), sterna 2-7 with pair of submedian, light brown, oblique marks near anterior margin and smaller pair of light brown dots. Forceps medium to dark brown,

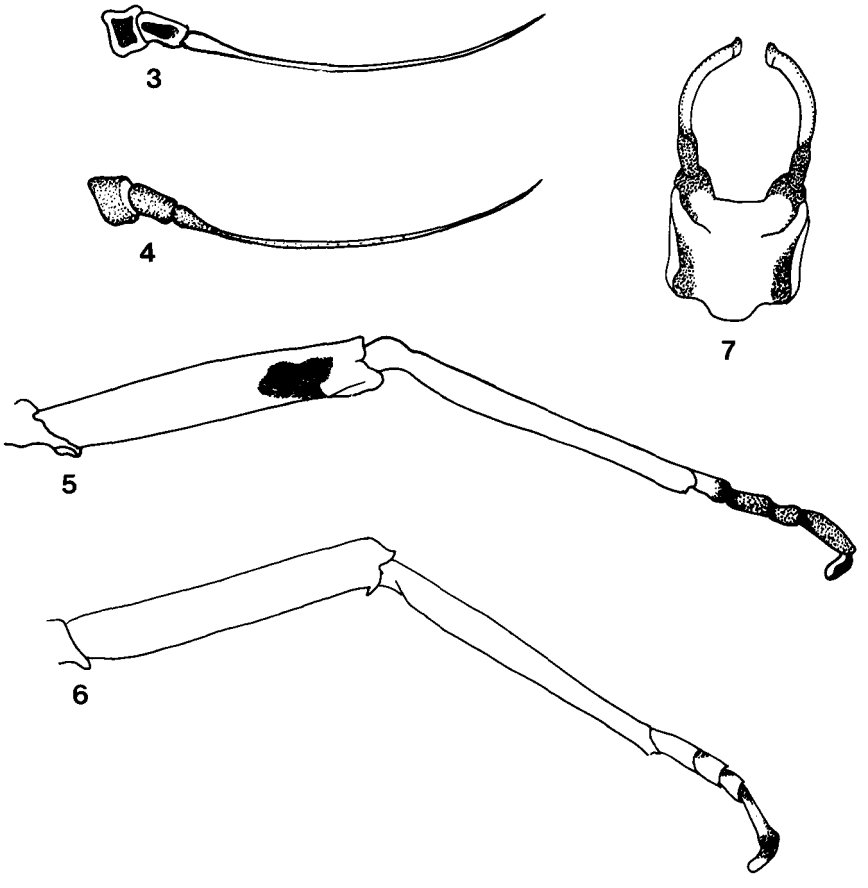


Figs. 1-2. Adult male abdomen, lateral view. 1. *B. magnus*, 2. *B. tricaudatus*.

shaped as in Figure 7. Caudal filaments light to medium brown.

Adult female. Length of body 6.5-10.0 mm, forewings 6.5-8.5 mm, hindwings 1.0-1.3 mm. Head pale brown, antennae light brown, markings on scapes and pedicels as in male. Thorax light brown. Fore tibiae and tarsi stained with light brown, middle and hindlegs generally pale, all tarsal segments except basal half of first stained with brown, all femora marked as in male. Wings hyaline with light brown venation, shape of costal projection and hindwing venation as in male. Abdominal terga light brown and sterna pale olive. Abdominal markings as in male. Caudal filaments golden brown.

Material examined. *B. magnus*: Chaffee Co., CO, Trout Cr., 16 January 1993, T. Eckberg and R. Durfee, 9 males, 14 females (reared); Larimer Co., CO, Hewlett Gulch, 10 March 1991, B.



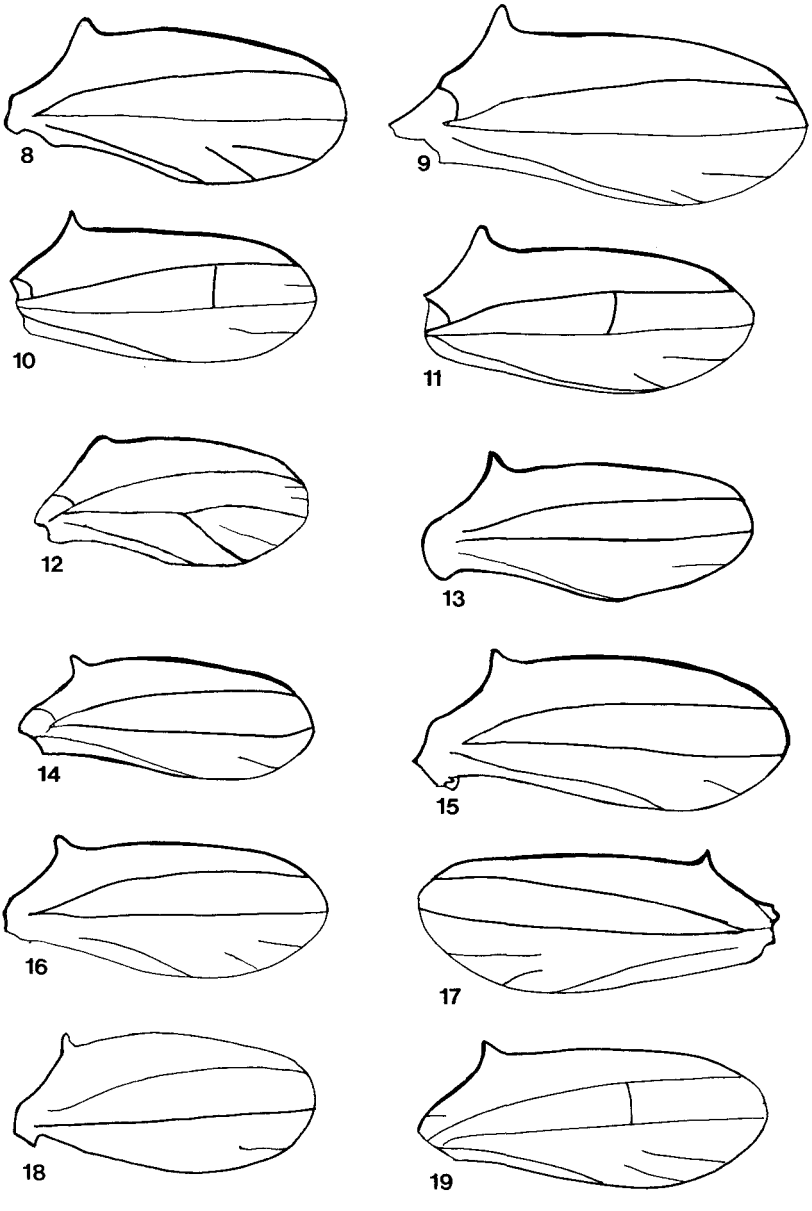
Figs. 3-7. Adult male antennae, ventral view. 3. *B. magnus*, 4. *B. tricaudatus;* Adult male, left hind leg. 5. *B. magnus*, 6. *B. tricaudatus;* 7. *B. magnus*, male genitalia, ventral view.

Kondratieff and R. Durfee, 2 males, 6 females, [1 gynandromorph] (reared); Hewlett Gulch, 23 March 1991, R. Durfee and M. Harris, 9 males, 4 females (reared); Hewlett Gulch, 23 March 1993, R. Durfee,, 6 males, 25 females (reared); Skin Gulch, 8 May 1993, R. Durfee and B. Kondratieff, 2 males, 1 female (reared). *B. tricaudatus:* Chaffee Co., CO, Trout Cr., 16 January 1993, T. Eckberg and R. Durfee, 5 males, 9 females (reared); Elbert Co., CO, Kiowa Cr., 26 April 1986, B. Kondratieff, 10 males, 12 females (reared); Garfield Co., CO, Colorado River, 4 May 1991, B. Kondratieff, 1 male (reared); Gunnison Co., CO, Gunnison River, 31 August 1991, B. Kondratieff and R. Durfee, 1 male (reared); Larimer Co., CO, Buckhorn Cr., 28 May 1991, B. Kondratieff and R. Durfee, 1 female (reared); Hewlett Gulch, 23 March 1991, R. Durfee and M. Harris, 3 males (reared); Poudre River, 8 April 1987, B. Kondratieff, 11 males, 10 females (reared); Poudre River, 8 May 1993, B. Kondratieff and R. Durfee, 5 males and 3 females (reared); Young's Gulch, 21 July 1991, B. Kondratieff and R. Durfee, 4 males, 3 females (reared).

DISCUSSION

Adults of *B. magnus* are similar to *B. tricaudatus* and the available descriptions of *B. moffati.* Both male and female adults of *B. magnus* can be distinguished from these other two species by the red-brown, longitudinal marks below the pleural fold on sterna 2-8 (Fig. 1), and a subapical brown mark on the femora (often faint in the female) (Fig. 5). Additionally, *B. magnus* has a red-brown, square-shaped mark on the ventral surface of the antennal scapes, and a red-brown, elongate mark on the ventral surface of the pedicels (Fig. 3). These conspicuous markings were absent in all specimens of *B. tricaudatus* examined (Figs. 2,4,6), and are not mentioned in the descriptions of *B. moffati* (Dodds 1923, Traver 1935).

Adults of the *rhodani* group are very similar in habitus and are difficult to separate at the species level. The primary characters that have been used in the past have included size, color, hindwing venation, shape of costal projection and shape of forceps (Burks 1953, Day 1956, Edmunds *et al.* 1976, Jensen 1966). During this study it was noted that certain hindwing venation characters previously used to distinguish adults of *Baetis* species can vary when a series of specimens of a single species are examined from various localities. The number of intercalaries between longitudinal veins 1 and 2 can vary from 0-2 and the number of intercalaries between longitudinal veins 2 and 3 can vary from 1-2 (Figs. 8-19). Additionally, 4 reared adults (1 male, 3 females) of *B. magnus* were found to possess a crossvein between longitudinal veins 1 and 2 (Figs. 10-11). The location of this vein varied from just beyond the middle of the wing to about the apical third. This crossvein often occurs in one wing only and was also found in three reared male adults of *B. tricaudatus* (Fig. 19). Another significant hind wing variation noted in *B. magnus* was a symmetrically forked second longitudinal vein (Fig. 12). This unusual variation was found in 2 reared adults (1 male, 1 female), and in both cases appeared on only one wing. This character has been used to distinguish *Diphetor* Waltz and McCafferty (1987) from other adult baetids. These authors, however, noted that the forked second vein of



Figs. 8-19. Hindwings. 8-12. *B. magnus*, 8. Hewlett Gulch, 9. Trout Creek, 10. Hewlett Gulch, 11. Hewlett Gulch, 12. Hewlett Gulch; Figs. 13-19, *B. tricaudatus*, 13. Trout Cr., 14. Gunnison River, 15. Hewlett Gulch, 16. Poudre River, 17. Kiowa Cr., 18. Colorado River, 19. Poudre River.

the hind wing is not unique to the genus *Diphetor*, and has been found in another North American species of *Baetis*.

From present collection records, it appears that *Baetis magnus* is an early season species with adults emerging from January to May. The occurrence of a second generation later in the year is probable in perennial streams. *Baetis magnus* appears to be restricted to smaller, usually spring-fed and often intermittent streams.

A large population of *B. magnus* was discovered in the Trout Creek Spring area of the upper Arkansas River Basin in Chaffee County, Colorado. This unique stream was characterized by Flint and Herrmann (1976). Larvae of *B. magnus* were abundantly associated with water cress (*Rorippa nasturtium-aquaticum* (L.). Mature larvae and even adults could be collected at this location in January, undoubtedly because of the spring-fed nature of this stream (annual water temperature 13.2-15.9 °C). *Baetis tricaudatus* was also common in this stream.

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