NOTES ON NORTH AMERICAN *BAETIS* (EPHEMEROPTERA: BAETIDAE): *BAETIS MOFFATTI* NEW SYNONYM OF *B. TRICAUDATUS* AND RANGE EXTENSION FOR *B. BUNDYAE*[1]

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ABSTRACT: *Baetis moffatti* is synonymized with *B. tricaudatus* based on comparisons of the type material of the former with reared specimens of the latter, and on the apparent absence of any other *B. rhodani* group species larvae from the type locality and vicinity. The range of *Baetis bundyae* is extended into southern Wyoming.

The specific identity of *Baetis moffatti* Dodds (1923), originally described from adults from South Boulder Creek at Tolland, Gilpin County, Colorado, has remained unclear. The only records published for this species since its description were by Traver (1935) for female specimens from El Paso County and Gunnison County, Colorado, and by McDunnough (1925a) and Walley (1927) for specimens from Canada. Previous to the adults of *Baetis magnus* McCafferty and Waltz being described, McCafferty et al. (1993) suggested a possibility that *B. moffatti* and *B. magnus* were synonymous. Attempts have been made to collect and rear *B. moffatti* from the type locality, however, only the larvae of *B. bicaudatus* Dodds and *B. tricaudatus* Dodds have been collected and reared from this site (Durfee and Kondratieff 1993). The type material of *B. moffatti*, a holotype male and a female allotype, were examined and critically compared to the other *rhodani* group species known from Colorado: *B. bicaudatus*, *B. magnus* and *B. tricaudatus*. Both type specimens remain in relatively good condition and the apparent color patterns of the abdomen, legs and head are retained. The males of *B. bicaudatus* are distinguished from the others by the smaller turbinate eyes on a longer stalk and the uniformly brown abdominal tergites, and the adults of *B. magnus* are characterized by distinct femoral and abdominal markings (Durfee and Kondratieff 1993). Comparison of the types of *B. moffatti* with *B. tricaudatus*, however, indicates that *B. moffatti* falls within the range of known variation for *B. tricaudatus* in Colorado. Since the adults of many species in the *rhodani* group are so morphologically similar as to be inseparable without associated larvae, we do not propose a synonym solely on the basis of finding no discernible differences between adults of the two species. The number of intercalaries between veins two and three of the hind wing is the character used to distinguish these species.Traver (1935) used this character to separate *B. tricaudatus* (2 intercalaries), *B. intermedius* Dodds

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(now a junior synonym of *B. tricaudatus*, 1 intercalary) and *B. moffatti* (no intercalaries). We have reared series of *B. tricaudatus* in which the number of intercalaries between veins two and three of the hind wing varies from zero to two, and have found this character to be of no taxonomic value. Additionally, Dodds (1923) stated that both sexes of *B. moffatti* have been collected in South Boulder Valley, from "5,900 to 11,000 feet", which indicates this species does not have a restricted habitat. The Colorado mayfly fauna is now relatively well known (McCafferty et al. 1993, Durfee and Kondratieff 1994), and in particular, the streams in the vicinity of South Boulder Creek have been intensively surveyed (Ward 1986, Ward and Kondratieff 1992).To date, the only larvae in the *B. rhodani* group that have been collected from these streams are *B. bicaudatus* and *B. tricaudatus*. This does not mean that other *rhodani* group species could not occur here, however, based on the above evidence we propose that *B. moffatti* is a junior subjective synonym of *B. tricaudatus* and provide the following nomenclatural summary.

Baetis tricaudatus Dodds

Baetis tricaudatus Dodds, 1923: 111. Type locality: Tolland, Colorado.
Baetis intermedius Dodds, 1923: 110. Type locality: Tolland, Colorado. (Syn. Morihara and McCafferty, 1979a: 153, Article 24, Principle of the First Reviser).
Baetis moffatti Dodds, 1923: 112. Type locality: Tolland, Colorado. **New synonym.**
Baetis vagans McDunnough, 1925b: 219. Type locality: Covey Hill, Quebec. (Syn. Ide 1937: 221; Bergman and Hilsenhoff 1978: 133; Morihara and McCafferty, 1979a: 153).
Baetis sp. 1 Traver, 1932: 231. Type locality: Black Mountain, North Carolina. (Syn. Traver 1935: 691; McCafferty 1996: 24).
Baetis jesmondensis McDunnough, 1938: 25. Type locality: Jesmond, British Columbia. (Syn. Waltz and McCafferty 1990: 138).

Baetis bundyae Lehmkuhl

Baetis bundyae was originally described from larvae collected from shallow tundra ponds in the Northwest Territories, Canada, by Lehmkuhl (1973). It was treated as a subspecies of the northern European *B. macani* Kimmins by Morihara and McCafferty (1979b). However, species status was reinstated when populations of *B. macani* and *B. bundyae* were found to coexist as distinct species in Scandinavia (McCafferty 1994, Engblom 1996).

Four larvae of *B. bundyae* were collected in a sweep net sample from the following location in Wyoming: Carbon Co., near Sand Lake, Medicine Bow National Forest, 11 July 1996, R. B. Rader. These specimens were collected at an elevation of 3,017 m from a habitat similar to that described by Lehmkuhl (1973). Previously, the recorded distribution for this species included Alaska, Yukon, Northwest Territories, Manitoba, Quebec and Labrador (Harper and Harper 1981 as *B. m. bundyae*). Lager et al. (1982) provided an additional

record from a stream in Lake County in northeastern Minnesota. The discovery *B. bundyae* in southern Wyoming extends its range 750 km to the south. It is expected that additional populations of this species will eventually be discovered in similar habitats and elevations in other areas of the Rocky Mountains.

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SOCIETY MEETING OF OCTOBER 28, 1998

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MOLECULES, MORPHOLOGY AND INSECT EVOLUTION

Dr. Kjer began with a brief review of molecular systematics. He pointed out the need for good morphology-based systematics to support development of evolutionary hypotheses from molecular sequence data. He then offered an assessment of what has been learned from molecular studies about the phylogeny of insect orders.

He illustrated some of the problems that arise in sequence studies. Homoplasy, the independent acquisition of a character state in unrelated lines of descent, is sometimes tractable with morphological traits but frequent in molecular sequences, where one substitution (for example, T to A) is like another. Long branch attraction, when extended periods of parallel development follow a short separation between two lineages, leads to groups being lumped when they should be split. Site change rate variation, compositional bias (the tendency of certain bases to accumulate disproportionately) and multiple substitutions at the same site on a molecule, all add to the possibility of error. Arthropods change rapidly, the main branching of insect orders occurred hundreds of millions of years ago. Fast-evolving groups like Diptera are pushed toward the bottom of phylogenetic trees as their molecular distance from other groups increases. He stressed the need for more extensive sampling of diverse taxa and genes; many studies have been very narrow. To illustrate each of these potential pitfalls, Dr. Kjer showed a number of proposed phylogenies based on sequence data from different insects and molecules. The lack of consistency in the positions of the major and minor insect orders in these trees led him to conclude that much remains to be done before evolution of the insect orders is fully understood.

In notes of entomological interest, President Gelhaus reported that several members showed up for Bioblitz in Fairmont Park, Philadelphia, despite very rainy weather. Over 1,000 taxa were found in the mowed fields, play areas and remnant natural sites in the 24-hour inventory. It is hoped that this effort will be repeated annually at different sites within the region. President Gelhaus also noted that Insect Field Day attracted over one hundred participants; Hal White showed his pictures from the event. Hal also reported that the Calvert Award information is posted on the website. He also described a mass movement of larvae of the green June beetle, crawling, characteristically, on their backs with legs in the air. Bill Day noted that former President David Rentz has published *Grasshopper country: the Abundant Orthopteroid Insects of Australia,* which has been very favorably reviewed.

William J. Cromartie, Corresponding Secretary