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**COMMENTARY ON AMETROPUS SPECIES (EPHEMEROPTERA:  
AMETROPODIDAE) IN NORTH AMERICA**W. P. McCafferty<sup>1</sup>**ABSTRACT**

*Ametropus albrighti* is shown to be a junior subjective synonym of *A. neavei*, n. syn. *Ametropus neavei* sensu lato demonstrates stable structural characteristics with respect to male genitalia and larval morphology, whereas degree of maculation and therefore abdominal patterning varies both among populations and within populations. *Ametropus ammophilus* is distinctive, and the two North American species are apparently allopatric based on known distributions, which are reviewed.

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The Holarctic mayfly genus *Ametropus* Albarda was originally discovered in Europe (Albarda 1878) and is now known from Asia and North America as well. Bengtsson (1913) placed this distinctive genus in a separate higher taxon Ametropodidae (originally spelled Ametropidae) where it has resided either at the family or subfamily level ever since. McCafferty (1981) referred to these mayflies as the sand minnow mayflies because of the peculiar adaptations of the larvae for life in sand substrates of rivers (e.g., Soluk and Craig 1988), and workers in general have regarded the group's relationships to be with the pisciform mayflies (e.g., Edmunds et al. 1976, McCafferty 1991).

McDunnough (1928) first discovered the genus in North America. His report was based on a single female adult from Alberta that he described as *Ametropus neavei* McDunnough. Traver (1935) described a second species, *A. albrighti* Traver, based on a series of larvae taken from the San Juan River in extreme northwest New Mexico. Edmunds (1954), Woodbury and Argyle (1963), and Pearson et al. (1968) all referred to additional larval populations of *A. albrighti* from the Green River in northeastern Utah. Newell (1970) listed *A. neavei* from Montana but provided no substantiating locale data (presumably he saw a female adult that matched McDunnough's [1928] description). Allen and Edmunds (1956) listed an unnamed species of *Ametropus* from Oregon, and later Allen and Edmunds (1976) described that species as *A. ammophilus* Allen and Edmunds based on male and female adults and larvae from Oregon, Washington, and western Montana. At the same time, Allen and Edmunds (1976) described the male adult and female subimago of *A. albrighti*, and provided additional records of that species from northwestern Utah, northeastern Colorado, and southwestern Wyoming. Allen and Edmunds (1976) also provided descriptions of the male adult and larva of *A. neavei* for the first time, along with a record of the species from Saskatchewan.

Allen and Edmunds (1976) concluded that *A. neavei* was restricted to Alberta and Saskatchewan; that *A. albrighti* was restricted to the Colorado River Drainage System in Colorado, New Mexico, Utah, and Wyoming; and that *A. ammophilus* was restricted to Oregon, Washington, and areas east to western Montana. Subsequent to the review of the genus *Ametropus* in North America by Allen and Edmunds (1976), however, several additional reports under the various species names were forthcoming. *Ametropus albrighti* was reported from Saskatchewan by Lehmkuhl (1976a) and by Dossdall and Lehmkuhl (1989). *Ametropus ammophilus* was reported from northern California by Allen (1977). *Ametropus neavei* was reported from additional localities in Alberta by Clifford

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and Barton (1979), Barton (1980), and Soluk and Craig (1988); from the upper peninsula of Michigan by Steven and Hilsenhoff (1979); from the Northwest Territories by Cobb et al. (1995); and again from Montana by Waltz et al. (1998).

### ANALYSIS OF SPECIES

*Ametropus ammophilus* is a distinctive species within *Ametropus* with respect to its much larger size, cleft penes of its male genitalia, and complex abdominal color pattern. These distinctions are accurately reflected in the species treatment and key provided by Allen and Edmunds (1976) and therefore all reports under that name can reasonably be expected to have been applied to the correct species. It is known to range from northern California north through Oregon, Washington and, in the north, east to western Montana, including a first report from Idaho by Lester et al. (2002). It may also occur in Alberta (see below).

My study of materials of *Ametropus* from north-central and far eastern Montana and re-examination of most of the materials on which Allen and Edmunds (1976) based their review suggested that reports variously assigned to *A. albrighti* or *A. neavei*, other than those of the types, may not be reliable. Importantly, the key provided by Allen and Edmunds (1976), and probably used by every worker since that time when faced with identifying *Ametropus* larvae and adults, is inaccurate based on the actual concepts of the species. This fact was borne out by the examination of specimens used by Allen and Edmunds (1976) in their study. Couplet 2 indicated that *A. neavei* had abdominal terga 5-7 with inverted T-shaped markings. That statement actually is referable to *A. albrighti* based on the descriptions and figures provided by Allen and Edmunds (1976) and all prior descriptions. In the same sense, the key statement that abdominal terga 5-7 have triangular shaped markings in *A. albrighti* would actually have been applicable to *A. neavei* based on available descriptions at the time. If workers had used the maculation characters as stated in the Allen and Edmunds key, in the absence of further checking of formal descriptions, then identifications certainly could have been, and probably were, confused.

Ostensibly, *A. neavei* and *A. albrighti* differed in the intensity of the brown coloration of the mesothorax in the adults, in slight size differences, and in the abdominal tergal patterning. No differences in male genitalia and no larval structural differences (generally the important species characters in many Ephemeroptera species) had been identified, and I have not been able to find any.

My examination of mature larval and adult specimens belonging to populations from northern Saskatchewan to New Mexico demonstrate no reliable size differences that could be correlated with the coloration patterns that Allen and Edmunds assigned to *A. albrighti* and *A. neavei*, and certainly the "usually less than 16 mm" (*A. albrighti*) vs. "usually greater than 17 mm" (*A. neavei*) could not be applied with any consistency.

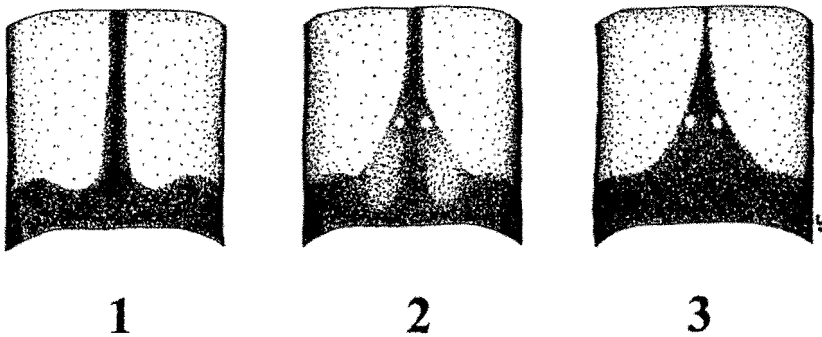
*Ametropus albrighti* adults were thought to have dark brown mesonota, and larvae and adults were thought to have inverted T-shaped markings on middle abdominal terga. *Ametropus neavei* were thought to have light brown mesonota in the adults and triangular markings on middle abdominal terga in larvae and adults. However, whereas some populations I examined appeared to be consistent with respect to thoracic or abdominal characteristics that had been associated either with *A. albrighti* or *A. neavei*, a few populations showed a mixture of shape and degree of abdominal markings or mixture of thoracic color intensity. In addition, most adults with a dark brown thorax, as previously associated with *A. albrighti*, also possessed well maculated abdominal terga (i.e., extensive triangular markings) as previously associated with *A. neavei*. The variation found on abdominal tergum 6 of three male adults of the same population from the North Saskatchewan River is shown in Figures 1-3.

It is strongly suggested from this that the difference between an inverted T and the triangle described by Allen and Edmunds is a matter of degree of maculation. The one larva I have from far eastern Montana has tergal patterning that is intermediate between the two extremes (close to Figure 2). Such degrees of maculation are often intraspecifically variable among populations, within populations, or may be influenced by temperature of developmental regime over time (e.g., see McCafferty and Periera 1984).

Allen and Edmunds (1976) also stated that abdominal tergum 2 in *A. albrighti* had an inverted T-shaped marking. In all specimens that would otherwise appear to be *A. albrighti* based on most other characteristics, this tergum always had a variously developed triangular marking, including the larval specimens identified and examined as *A. albrighti* by Allen and Edmunds (1976). The dark brown medial stripe described for tergum 9 of *A. neavei* may or may not be present in individual larvae of the same populations of both of what otherwise would appear to be *A. neavei* or *A. albrighti*.

Based on all of the above, it is apparent that *A. albrighti* and *A. neavei* represent a single North American species that is structurally stable but inconsistently variable with respect to degree of maculation. Therefore, I here place *A. albrighti* as a subjective junior synonym of *A. neavei*, **new synonym**.

This synonymy obviates the potential problems with the assignments of distribution records commented on above. The two now-recognized North American species, *A. ammophilus* and *A. neavei*, are not only easily characterized from each other, but they appear, to a large degree, to be allopatric. *A. ammophilus* has been reported from the Pacific Coast states and Idaho and Montana, as mentioned previously. Although both North American species possibly occur in the Athabasca River region of Alberta (J. M. Webb, pers. comm.), the only other state or province in which they both have been reported to occur is Montana, where they are clearly disjunct. In Montana, the records associated with *A. ammophilus* are from Missoula and Lake Counties (Allen and Edmunds 1976), both in the mountainous western part of that state, whereas the records associated with *A. neavei* are from Custer (Waltz et al. 1998) and Hill Counties (see Material Examined below), from the eastern and central plains area of the state, respectively. In addition to Alberta and central and eastern Montana, *Ametropus neavei* is now known from western Colorado, northern Michigan, northern New Mexico, the Northwest Territories, Saskatchewan, northeastern Utah, and southwestern Wyoming.



Figures 1-3. *Ametropus neavei* male adults, single Saskatchewan population, abdominal tergum 6: Fig.1, individual variant 1; Fig. 2, individual variant 2; Fig. 3, individual variant 3.

Distributions of certain other mayflies also encompass ranges from New Mexico to Saskatchewan, for example, *Camelobaetidium warreni* (see McCafferty and Randolph 2000) and *Lachlania saskatchewanensis* (see McCafferty et al. 1997). Such patterns are explicable in view of historical biogeography that shows connections between the Pleistocene Saskatchewan, Columbia, and Colorado drainage systems (see Lehmkuhl 1976b). It remains to be seen if *A. neavei* still exists in New Mexico or if it has been recently extirpated as a result of impoundments on the San Juan River (see McCafferty et al. 1997). It would also be important to determine if populations still exist in the Green River in Utah below Flaming Gorge Dam. The somewhat rare western psammophilous species *Anaetris eximia* Edmunds of the family Acanthametropodidae has been taken at the same locales as *A. neavei* in Wyoming (at the Black's Fork River [Edmunds and Koss 1972]), the same habitat in Saskatchewan (in the Saskatchewan River [Lehmkuhl 1976b]), the same locale in Alberta (in the Athabasca River [Barton 1980]), and from the same locale in Montana (reported here for the first time from the Milk River, see material examined below).

### MATERIAL EXAMINED

All of the following materials are deposited in the Purdue Entomological Research Collection, West Lafayette, Indiana. *Ametropus ammophilus*: Montana, Lake Co., Swan R., 4 mi S Swan River City, VII-12-1965 (one larva, one male adult/larval exuviae reared); Oregon, Jackson Co., Rogue R. at junction St. Hwys. 230 & 62, VIII-24-1954, Edmunds and Allen (one larval exuviae paratype), Deschutes Co., small stream at Lapine, IV-18-1964, M. O. Roberts (three larval paratypes); Washington, Whatcom Co., Nooksack R., nr. Lynden, V-10-1967, K. E. Vander Mey (male adult holotype, two female subimago paratypes, one male adult paratype, four male subimago paratypes, four larval paratypes, nine larval exuviae), V-26-1967 (one male adult/larval exuviae reared). *Ametropus neavei*: Colorado, Moffat Co., Deerlodge Park, Dinosaur National Monument, 5600 ft., VIII-1-1962, D. Q. Anderson (one larva); Montana, Custer Co., Powder R., XI-11-1976, G. Romero (one larva), Hill Co., Milk R. above St. John's Br., X-23-1999, D. L. Gustafson (five larvae) (with numerous co-occurring larvae of *Anaetris eximia*); New Mexico, Farmington, V-1-1935, P. N. Albright (one larva); Saskatchewan, North Saskatchewan R., Borden, Hwy 5, V-19-1974, VI-4-1974, R. Demaray (three female adults/larval exuviae reared, 16 larvae, three male adults/larval exuviae reared); Utah, Uintah Co., Green R. at Jensen, VI-5-1963, Edmunds, Jensen and Peters (two larvae, one male subimago/larval exuviae reared); Wyoming, Sweetwater Co., Black's Fork River at I-80 west of Green River City, VII-6-1968, R. & D. Koss (five larvae, one male adult/larval exuviae reared, one female adult/larval exuviae reared), VIII-2-1969, A. V. Provonsha (25 larvae), Black's Fork R., I-80 6 mi E Little America, S. L. Jensen and A. V. Provonsha (three larvae), Green River, VI-4-1959, Smith and Musser (one larva).

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