



# Article

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## Systematic review of the *Dasymutilla monticola* species-group (Hymenoptera: Mutillidae): using phylogenetics to address species-group placement and sex associations

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### Table of Contents

Abstract . . . . .	1
Introduction. . . . .	2
Material and methods. . . . .	3
Taxa chosen for this study. . . . .	3
Morphological methods. . . . .	3
Molecular methods . . . . .	3
Phylogenetic results . . . . .	4
Taxonomic results . . . . .	6
<i>Dasymutilla monticola</i> species-group (Mickel, 1928) . . . . .	6
<i>Dasymutilla archboldi</i> Schmidt & Mickel 1979 . . . . .	7
<i>Dasymutilla arenerronea</i> Bradley 1916, stat. resurr. . . . .	10
<i>Dasymutilla birkmani</i> (Melander 1903) . . . . .	12
<i>Dasymutilla bonita</i> Mickel 1928. . . . .	15
<i>Dasymutilla canella</i> (Blake 1871). . . . .	15
<i>Dasymutilla eurynome</i> Mickel 1928. . . . .	16
<i>Dasymutilla macilenta</i> (Blake 1871). . . . .	17
<i>Dasymutilla monticola</i> (Cresson 1865). . . . .	18
<i>Dasymutilla radkei</i> Manley in Manley & Radke 2006 . . . . .	19
<i>Dasymutilla saetigera</i> Mickel 1928 . . . . .	20
<i>Dasymutilla vesta</i> (Cresson 1865). . . . .	21
Additional results. . . . .	23
Key to species of the <i>Dasymutilla monticola</i> species-group in the USA . . . . .	25
Discussion . . . . .	26
Acknowledgments . . . . .	27
References . . . . .	27

### Abstract

Using the internal transcribed spacer regions (ITS) 1 and 2, the phylogeny of the *Dasymutilla monticola* species-group is reconstructed. The purpose of this analysis is to determine the monophyly of the *D. monticola* species-group and to determine the species-group placement of numerous unplaced *Dasymutilla* species. Taxonomic changes are made based on these results. New synonymy is proposed for *Mutilla birkmani* Melander 1903, ♀ (= *Dasymutilla corcyra* Mickel 1928, ♀, **syn. nov.**; = *Dasymutilla arcana* Mickel 1928, ♂, **syn. nov.**), *Mutilla macilenta* Blake 1871, ♂ (= *Dasymutilla chattahoochei* Bradley 1916, ♀, **syn. nov.**), *Dasymutilla saetigera* Mickel 1928, ♀ (= *Dasymutilla polia* Mickel 1928, ♂, **syn. nov.**). The currently associated male of *D. chattahoochei* belongs to *D. arenerronea* (♀), **stat. resurr.**, which was previously recognized as a synonym of *D. chattahoochei*. The currently recognized male of *D. archboldi* belongs to *D. vesta*; the true male of *D. archboldi* is newly described. *Dasymutilla vesta*, *D. radkei*, and *D. archboldi* are transferred into the *D. monticola* species-group. A male identified as *D. fasciventris* (♂), which has gray

apical tergal setae like many males of the *D. monticola* species-group, was recognized as a member of the *D. quadriguttata* species-group; the true *D. fasciventris* was not studied. *Dasymutilla chalconecephala* (♀) and *D. spilota* (♀), which bear a superficial resemblance to the *D. monticola* species-group, are determined to not belong to any currently recognized species-group. Inferences are made about the homology of tubercles on the female's posterior margin of the head, the necessity for phylogenetic research on species-group placement, and the necessity for both morphological and molecular data.

**Key words:** Sphaerophthalmi, Bayesian phylogenetic reconstruction

## Introduction

*Dasymutilla* Ashmead 1899 is a diverse velvet ant genus, including some of the largest and smallest mutillid species (Mickel, 1928; Manley & Pitts, 2007). While widely generalist species can occur in small sizes, many mutillid taxa appear to have consistently diminutive stature. Of the Nearctic members of *Dasymutilla*, many of the smallest species belong to the *D. monticola* and *D. caneo* species-groups (Mickel, 1928). These species appear to form a natural group based on shared morphology and are clearly members of *Dasymutilla*, but it is unclear which *Dasymutilla* taxa are their closest relatives.

When first described by Mickel (1928), the *D. monticola* species-group comprised *Dasymutilla* species known from males only, while the *D. caneo* species-group consisted of females only. Recent sex associations confirmed Mickel's initial belief that these species-groups were opposite sexes of a single species-group (Manley, 2003; Pilgrim *et al.*, 2008). There was not complete overlap between the two species-groups, however. Additional sex associations have matched females from the *D. quadriguttata* species-group with males from the *D. monticola* species-group (Krombein, 1951, 1954). Also, one member of the *D. subhyalina* species-group, which Mickel (1928) admitted was an unnatural group, was associated with *D. bonita* Mickel from the *D. caneo* species-group (Mickel, 1974). To date, the *D. monticola* species-group (including members of the synonymous *D. caneo* species-group) includes five species known from both sexes: *D. canella* (Blake) (Figs 1, 14, 29), *D. birkmani* (Melander) (Figs 11, 26), *D. bonita* (Figs 12, 28), *D. chattahoochei* Bradley (Figs 10, 25), and *D. monticola* (Cresson) (Figs 19, 33); two species known from females only: *D. saetigera* Mickel (Fig. 21) and *D. eurynome* Mickel (Fig. 17); and three species known from males only: *D. macilenta* (Blake) (Fig. 32), *D. polia* Mickel (Fig. 34), and *D. arcana* Mickel (Fig. 27).

Subgenera are not used in *Dasymutilla*. Because of its tremendous size, however, species-groups are useful for identifying patterns of diversity within *Dasymutilla*. Sadly, however, most new *Dasymutilla* species published since Mickel's first revision (1928) were never conclusively placed into species-groups (Mickel, 1936, 1938; Manley & Pitts, 2007). Typically, rather than explicitly conjecturing about inter-specific relationships or species-group placement, authors have implied relations by discussing species identification and providing characters to separate new taxa from previously established species (*e.g.*, Mickel, 1938; Schmidt & Mickel, 1979; Manley & Radke, 2006). In the Neotropical region, there appears to be a homogenous mixture of species that readily fit into Mickel's species-groups and other species that readily fit into undefined species-groups composed of closely related Neotropical taxa (Manley & Pitts, 2007). Many of the species described after Mickel (1928) [*e.g.*, *D. archboldi* Schmidt & Mickel (Fig. 9), *D. fasciventris* Mickel (Fig. 30), and *D. spilota* Manley & Pitts (Figs 2, 22)], have been associated with members of the *D. monticola* species-group either explicitly by direct statements of similarity or relation (*e.g.*, Schmidt & Mickel, 1979), or implicitly by placement in keys (*e.g.*, Manley & Pitts, 2007).

In this study, we use molecular data to reconstruct the phylogeny of the *D. monticola* species-group and use molecular, distributional, and morphological data to address required taxonomic changes. Specifically, we aim to determine the affiliation of multiple *Dasymutilla* species (females from other species-groups and taxa never categorized in species-groups) to the *D. monticola* species-group. We also seek to test the monophyly of the *D. monticola* species-group. Necessary taxonomic changes, including male genitalia descriptions, sex associations, synonymies, and species-group placement are addressed in light of these results.