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Revision of the metallic *Lasioglossum* (*Dialictus*) of eastern North America (Hymenoptera: Halictidae: Halictini)

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Abstract

Bees in the subgenus *Lasioglossum (Dialictus)* are commonly collected, behaviourally diverse and taxonomically challenging. The metallic species of *Lasioglossum (Dialictus)* occurring east of the Mississippi River are revised. Taxonomic treatments of all 97 species are provided with complete descriptions and illustrations given for the 40 species, which have not been recently described elsewhere. Identification keys for males and females are provided.

The following eleven new species are described: *Lasioglossum (Dialictus) arantium* new species, *L. (D.) ascheri* new species, *L. (D.) batya* new species, *L. (D.) curculum* new species, *L. (D.) furunculum* new species, *L. (D.) georgeickworti* new species, *L. (D.) gotham* new species, *L. (D.) izawsum* new species, *L. (D.) katherineae* new species, *L. (D.) rozeni* new species, and *L. (D.) trigeminum* new species. *Lasioglossum ascheri*, *L. curculum*, *L. furunculum*, *L. izawsum*, and *L. rozeni* are believed to be social parasites or cleptoparasites of nest-building *L. (Dialictus)*. *Lasioglossum (D.) smilacinae* (Robertson) is resurrected from synonymy with *L. laevissimum* (Smith). *Lasioglossum (D.) nymphaeorum* (Robertson) is resurrected from synonymy with *L. albipenne* (Robertson).

Lasioglossum rufulipes (Cockerell) and *L. testaceum* (Robertson) are removed from *Evylaeus* and placed in *Dialictus*.

The following eleven new synonymies are proposed (junior subjective synonym listed second): *L. (D.) flaveriae* (Mitchell) = *Dialictus tahitensis* Mitchell; *L. (D.) leucocomus* (Lovell) = *Dialictus otsegoensis* Mitchell; *L. (D.) lionotum* (Sandhouse) = *Paralictus asteris* Mitchell; *L. (D.) longifrons* (Baker) = *L. (Chloralictus) robertsonellum* Michener; *L. (D.) nigroviride* (Graenicher) = *Evylaeus pineolensis* Mitchell; *L. (D.) simplex* (Robertson) = *Halictus (Chloralictus) malinus* Sandhouse; *L. smilacinae* (Robertson) = *Halictus zophops* Ellis, = *D. philanthanus* Mitchell; *L. (D.) testaceum* (Robertson) = *Halictus (Chloralictus) scrophulariae* Cockerell, = *Lasioglossum (Chloralictus) sandhouseae* Michener; and *L. (D.) versans* (Lovell) = *Evylaeus divergenoides* Mitchell.

Lectotypes are designated for *Halictus albipennis* Robertson (1890), *Halictus albitarsis* Cresson (1872), *Halictus cressonii* Robertson (1890), *Halictus disparilis* Cresson (1872), *Halictus hortensis* Lovell (1905), *Halictus nubilus* Lovell (1905), *Halictus pilosus leucocomus* Lovell (1908), *Halictus planatus* Lovell (1905), *Halictus stultus* Cresson (1872), *Halictus subconnexus rohweri* Ellis (1915), *Halictus tegularis* Robertson (1890), *Halictus versans* Lovell (1905), and *Halictus viridatus* Lovell (1905).

Key words: Sweat bees, Halictinae, taxonomy, new species, new synonymy, lectotype, DNA barcoding

Introduction

Sweat bees (subfamily Halictinae) are infamous for being “morphologically monotonous” (Michener 1974, 2007; Packer 1997) and “the despair of taxonomists” (Wheeler 1928). *Lasioglossum* Curtis subgenus *Dialictus* Robertson, in particular, is considered one of the most taxonomically challenging groups of North American bees. *Lasioglossum (Dialictus) sensu lato* is both speciose, with approximately 250 known species in North America and 600 species globally (Ascher & Pickering 2010; see Ebmer 2002 for conflicting classification), and abundant; often accounting for the plurality or majority of individuals in bee surveys (MacKay & Knerer 1979; Kalhorn *et al.* 2003; Campbell *et al.* 2007; Ngo *et al.* in prep.).

Lasioglossum (Dialictus) are well known for their diverse behaviours. The subgenus includes species that may be solitary (Packer 1994), communal (Eickwort 1988), semisocial (Sakagami & Kuribayashi 1979), or eusocial (Batra 1966; Eickwort 1986), with colony sizes ranging from small (mean worker number less than 2, Packer 1992) to large (>100 workers, Michener 1966). Several species are social parasites (Wcislo 1997; Gibbs 2010b). The relatively recent origin of the subgenus (approximately 22±7 million years ago; Brady *et al.* 2006), diversity of behaviours (reviewed in Michener 1974, Yanega 1997), independent origins of brood parasitism (Gibbs 2009b), and high species richness make them ideal for studying the evolution of social behaviour and social parasitism using comparative approaches (Schwarz *et al.* 2007). Unfortunately, frequent caste differentiation, as well as sexual dimorphism, also contribute to the taxonomic challenges of this group (Mitchell 1960).

The difficulty of identifying species of *L. (Dialictus)* inhibits additional studies of social behaviour, biodiversity, and pollination biology. Three major taxonomic works on North American *L. (Dialictus)* have been published previously. Sandhouse (1924) published an early taxonomic study of *L. (Dialictus)* (as *Chloralictus* Robertson) but lacked a geographical focus, which limited the practical value of the associated identification keys. The *L. (Dialictus)* of the eastern USA were revised previously by Mitchell (1960). This revision has been frequently used (*e.g.* MacKay & Knerer 1979; Sheffield *et al.* 2003; Grixti & Packer 2006; Tuell *et al.* 2009) and greatly improved taxonomic understanding of this difficult group. Lastly, Gibbs (2010b) revised the metallic *L. (Dialictus)* occurring in Canada further clarifying the taxonomy of the group. Gibbs (2010b) synonymised 42 names, in addition to describing 19 new species. Most of these new species belong to the poorly studied western fauna but many of the synonymies affect eastern species. Additional valid species in the eastern USA have been described or named by Baker (1906), Cockerell (1901, 1916, 1938a), Crawford (1902a, 1904, 1906, 1932), Cresson (1872), Dalla Torre (1896), Ellis (1913), Engel (2001a), Gibbs (2009a), Graenicher (1910, 1927), Knerer and Atwood (1966a), Lovell (1905a, 1905b, 1908), Robertson (1890, 1892, 1893, 1895, 1897, 1901, 1902a, 1902b), and Smith (1853).

The subgenus *Lasioglossum (Dialictus) sensu lato* in the eastern United States includes species with the head and mesosoma in three distinct colour forms: brown to black, dull metallic, and bright iridescent. Black species were included in *Evylaeus* Robertson by Mitchell (1960). The most current phylogenetic understanding of *Lasioglossum s. l.* suggests that *Evylaeus sensu* Mitchell (1960) is paraphyletic with respect to *L. (Dialictus)* as well as other subgenera (Danforth 1999; Danforth *et al.* 2003). In a cladistic classification, the “acarinate *Evylaeus*” (including black North American species) is now included in *L. (Dialictus)* (Michener 2007, but see Ebmer 2002 for an alternative view). The dull metallic colour form is the most common in North America and these species are equivalent to *Dialictus sensu* Mitchell (1960). The colouration of the third form is similar to the bright green of *Agapostemon* and augochlorine bees in the area (Mitchell 1960). *Lasioglossum (D.) eleutherense* (Engel), is the only species of this colour form in the United States with only a