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## Revision of the metallic species of *Lasioglossum* (*Dialictus*) in Canada (Hymenoptera, Halictidae, Halictini)

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## Abstract

The bee subgenus *Dialictus* (Hymenoptera: Halictidae: *Lasioglossum*) comprises the most commonly collected bees in North America and have the most diverse social systems of any equivalent group of insects. Despite their importance, as pollinators and as model organisms for studying the evolution of social behaviour, *Dialictus* remain one of the greatest challenges in bee taxonomy. A taxonomic revision of the metallic species of Canadian *Dialictus* has been completed which resolves many of the difficulties of these bees. Complete species descriptions with illustrations are provided for 84 metallic *Dialictus* in Canada along with keys to identify males and females.

The following nineteen new species are described: *Lasioglossum (Dialictus) abundipunctum* new species, *L. (D.) atwoodi* new species, *L. (D.) dashwoodi* new species, *L. (D.) ebmerellum* new species, *L. (D.) ephialtum* new species, *L. (D.) imbrex* new species, *L. (D.) knereri* new species, *L. (D.) lilliputense* new species, *L. (D.) macroprosopum* new species, *L. (D.) packeri* new species, *L. (D.) prasinogaster* new species, *L. (D.) reasbeckae* new species, *L. (D.) sablense* new species, *L. (D.) sandhousiellum* new species, *L. (D.) sheffieldi* new species, *L. (D.) sitocleptum* new species, *L. (D.) taylorae* new species, *L. (D.) timothyi* new species, and *L. (D.) yukonae* Gibbs, new species.

*Lasioglossum (D.) mitchelli* is proposed as a replacement name for *L. atlanticum* (Mitchell) due to secondary homonymy with *Halictus interruptus atlanticus* Cockerell, a junior subjective synonym of *L. interruptum* (Panzer). The following forty-three new synonymies are proposed: *L. (D.) admirandum* (Sandhouse) (= *D. perspicuus* Knerer and Atwood); *L. (D.) albipenne* (Robertson) (= *Halictus palustris* Robertson, = *H. (Chloralictus) lactineus* Sandhouse, = *H. (C.) basilicus* Sandhouse); *L. (D.) albohirtum* (Crawford) (= *H. pilosellus* Cockerell); *L. (D.) brunneiventre* (Crawford) (= *H. pilosicaudus* Cockerell); *L. cattellae* (Ellis) (= *D. alternatus* Mitchell); *L. connexum* (Cresson) (= *H. (C.) politissi-*

*mus* Cockerell); *L. (D.) cressonii* (Robertson) (= *D. delectatus* Mitchell); *L. floridanum* (Robertson) (= *D. intrepidus* Mitchell); *L. (D.) foveolatum* (Robertson) (= *D. supraclypeatus* Mitchell); *L. (D.) imitatum* (Smith) (= *H. (C.) insolitus* Sandhouse, = *D. lectus* Mitchell); *L. (D.) incompletum* (Crawford) (= *D. ornduffi* Hurd); *L. (D.) laevissimum* (Smith) (= *H. (C.) astutus* Sandhouse, = *H. (C.) abundus* Sandhouse, = *H. (C.) jamesae* Cockerell, = *H. (C.) phaceliarum* Cockerell, = *H. (C.) praepes* Sandhouse, = *D. solidaginis* Mitchell, = *H. (C.) tranquillus* Sandhouse); *L. (D.) lineatulum* (Crawford) (= *H. (C.) latus* Sandhouse); *L. (D.) nigroviride* (Graenicher) (= *H. (C.) richardsoni* Cockerell); *L. (D.) obscurum* (Robertson) (= *D. orbitatus* Mitchell); *L. (D.) occidentale* (Crawford) (= *D. theodori* Crawford); *L. (D.) oceanicum* (Cockerell) (= *D. advertus* Mitchell); *L. (D.) pavoninum* (Ellis) (= *H. (C.) evestigatus* Sandhouse, = *H. (C.) pikei* Sandhouse, = *H. (C.) abietum* Michener); *L. (D.) perpunctatum* (Ellis) (= *D. highlandicus* Mitchell, = *D. junaluskenensis* Mitchell); *L. (D.) sagax* (Sandhouse) (= *Halictus (C.) accentus* Sandhouse); *L. (D.) semibrunneum* (Cockerell) (= *Halictus oleosus* Cockerell); *L. (D.) semicaeruleum* (Cockerell) (= *H. pruiniformis* Crawford, = *H. (C.) actuarius* Sandhouse); *L. (D.) subversans* (Mitchell) (= *D. perpunctatulus* Knerer and Atwood); *L. (D.) tenax* (Sandhouse) (= *H. (C.) meritus* Sandhouse, = *D. disabanci* Knerer and Atwood); *L. (D.) versans* (Lovell) (= *H. (C.) brevibasis* Cockerell); *L. (D.) versatum* (Robertson) (= *H. (C.) apertus* Sandhouse, = *H. (C.) genuinus* Sandhouse, = *H. subconnexus rohweri* Ellis); *L. (D.) zephyrum* (Smith) (= *H. (C.) academicus* Sandhouse). *Halictus (C.) unicus* Sandhouse is again treated as a junior synonym of *L. lineatulum*. Eleven subgeneric names recently proposed by Pesenko are treated as synonymies of *Dialictus*.

Some species names are used here in a sense different from those of most previous authors (e.g. *H. nymphaearus*, *H. versatus*). Names have often been misapplied in past usage sometimes subsuming multiple species. In some cases, even paratypes do not correspond to the same species as the name bearing type.

The following three species are resurrected from synonymy: *L. (D.) leucocomum* (Lovell) new combination, *L. (D.) oceanicum* (Cockerell) new combination, and *L. (D.) planatum*.

The species *L. (D.) atriventre* (Crawford) is considered a *nomen dubium*.

The following twelve new records for Canada are reported: *L. (D.) achilleae* (Mitchell), *L. (D.) brunneiventre* (Crawford), *L. (D.) callidum* (Sandhouse), *L. (D.) incompletum* (Crawford), *L. (D.) hudsoniellum* (Cockerell), *L. (D.) marinense* (Michener), *L. (D.) pacatum* (Sandhouse), *L. (D.) pallidellum* (Ellis), *L. (D.) punctatoventre* (Crawford), *L. (D.) sagax* (Sandhouse), *L. (D.) weemsi* (Mitchell) and *L. (D.) zophops* (Ellis). The Canadian records of two species, *L. (D.) disparile* (Cresson) and *L. (D.) ceanothi* (Mitchell), do not seem reliable and these species are not included in the revision.

Two species, *L. testaceum* (Robertson) and *L. rufulipes* (Cockerell), are transferred from the *L. (Dialictus)* to *L. (Evyllaenus) sensu stricto*.

**Key words:** Sweat bee, new species, new synonymy, taxonomy, DNA barcoding

## Introduction

The bee family Halictidae has been called “the despair of taxonomists” (Wheeler 1928). In particular, the subgenus *Dialictus* Robertson (Halictidae: *Lasioglossum* Curtis) is notorious for being “morphologically monotonous” (Michener 1974, 2007; Packer 1997). Species in this subgenus typically differ by only subtle characters of surface sculpture (Gibbs 2009a, c). These subtle differences have resulted in many unidentified or misidentified specimens in collections, ecological surveys and pollination studies (e.g., Bartholomew *et al.* 2006; Giles & Ascher, 2006; Grixti & Packer 2006; Tepedino *et al.* 2008). The close similarity among species is likely a consequence of a rapid evolutionary expansion of the group since its origin during the Late Oligocene/Early Miocene, approximately  $22 \pm 7$  million years ago (Brady *et al.* 2006).

The taxonomic difficulties of the group are increased by the unusually high number of species for a bee subgenus. Over 630 species of *Dialictus* (*sensu* Michener 2007) are known worldwide with nearly half (more than 274) occurring in North America (Ascher & Pickering 2010). The large number of species that may occur within even a single region (Knerer & Atwood 1962b) makes identification difficult. Few keys to North American *Dialictus* exist with only two (Sandhouse 1924; Mitchell 1960) including a large enough number of species to be of much practical use. Neither one of these keys was intended to include the Canadian fauna.

*Dialictus* are well-known for their numerous social systems (reviewed in Michener 1974, 1990; Packer 1993; Yanega 1997). Solitary, communal, semisocial, primitively eusocial and socially parasitic species have