SCIENTIFIC NOTE

First record of the *Lasioglossum* (*Dialictus*) *petrellum* species group in Canada (Hymenoptera: Halictidae)

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In the past decade, several taxonomic publications focusing on and/or including the Canadian bee fauna (e.g., Gibbs 2010, 2011; Gibbs *et al*. 2013; Sheffield *et al*. 2011; Dumesh and Sheffield 2012; Williams *et al*. 2014) have greatly increased our knowledge of species diversity in the country. In turn, this increased knowledge has facilitated the assessment of seven bee species by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (www.cosewic.gc.ca/eng/sct1/searchform_e.cfm) and the first national general status assessment of Canada's bees to be published later this year in the Wild Species 2015 report (R. Hébert, pers. comm., 2015). However, our knowledge of the bee fauna of Canada, though comprehensive, still contains many gaps due to the expansive size of the country, diverse plant communities and habitats, and the high proportion of these habitats that have been poorly sampled for bees or have not been sampled at all.

The Western Interior Basin of southern British Columbia is the smallest ecozone in Canada (approximately 56,500 km2), and also one of the most species rich. The high diversity of bees in this ecozone in Canada is largely due to the Western Interior Basin being the northernmost extent of the Great Basin shrub–steppe grasslands and dry interior low-elevation forest ecosystems that extend from Mexico, northward through the central–western United States, to the southern in the Okanagan and Similkameen valleys (Pryce *et al*. 2006). The Okanagan and Similkameen valleys are also home to a number of angiosperms (see British Columbia Conservation Data Centre 2015) and invertebrates (see Scudder 1994; British Columbia Conservation Data Centre 2015) that, in Canada, are geographically restricted to this area, often representing the northern edges of the species' ranges in the Great Basin (Straley *et al*. 1985). Arid climate conditions, like those of this region, are known globally to promote bee diversity (Michener 1979, 2007) and thus contribute to the Western Interior Basin's high diversity of bees. The region contains half of Canada's bee species, and approximately one-third of those species occur in Canada only in the Western Interior Basin (Sheffield *et al*. 2014).

From an entomologist's perspective, the lowlands and surrounding hillsides of the Western Interior Basin may hold many more surprises. For instance, two of the 19 new species of *Lasioglossum* (subgenus *Dialictus*) described by Gibbs (2010) seem to be restricted in their distributions in Canada to this area, as are the ranges of four additional species covered in the same comprehensive 2010 treatment. Similarly, almost 25% of *Megachile* species found in Canada are found only in this ecozone (Sheffield *et al*. 2011).

The bee fauna of the Western Interior Basin may also be among Canada's most vulnerable. Large portions of the low-elevation grassland habitats are fragmented by urban, rural and agricultural development, which is known to have severe impacts on bees within the arid habitats of the Great Basin in the United States (e.g., Cane *et al*. 2006). As such, the Western Interior Basin has great conservation value to Canada, and it is important to fully document the species in the area.

The purpose of this scientific note is to record for the first time the presence of a member of the *Lasioglossum petrellum* species group in Canada (as described by Gibbs 2009), and to summarize characteristics to help entomologists recognize it among the *Lasioglossum* subgenus *Dialictus* in Canada, a group containing at least 84 other species that Gibbs revised (2010).

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The *Lasioglossum petrellum* species group is considered distinctive within the subgenus *Dialictus* in North America, based on both morphological and molecular characters (Gibbs 2009). Members of both sexes have elongate heads—particularly the malar space—compared to other *Dialictus* in North America (Fig. 1). In addition, females typically have reddish to orange–yellow coloration on the metasoma and lack an acarinarial fan of appressed hairs on the basal area of tergum 1 (Gibbs 2009); among other Canadian Dialictus (following the classification of Gibbs *et al*. 2013), this characteristic would be shared by only females of *L. ruidosense* (Cockerell) *s.l.* and *L. versans* (Lovell), both which have dark abdomens (Gibbs 2010). The male genitalia in the *L. petrellum* species group have a unique retrorse lobe of the genital capsule; the lobe is greatly reduced compared to most other North American *Dialictus* and is replaced by a small tubercle with bristles (Gibbs 2009; Fig. 2B).

Two male specimens, deposited in the Royal Saskatchewan Museum, Regina, Saskatchewan (RSKM_ENT_E-90049, RSKM_ENT_E-90050), were collected in the Western Interior Basin, from Mt. Kobau within the South Okanagan Grasslands Protected Area, west of Osoyoos, in southern British Columbia [49.11064, –119.66534; 1175 m; collected on Aug. 29, 2013, by C. Sheffield, J. Heron, L. Gardiner, and O. Dyer; ex. *Antennaria*]. Although the specimens from British Columbia were clearly members of the *L. petrellum* species group (as per Gibbs 2009), specific identification could not accurately be made by morphology alone, as males of two of the species are unknown.

To resolve this, tissue samples from these specimens were sequenced for the DNA barcode region of cytochrome c oxidase subunit 1 (Sheffield *et al*. 2009), and the sequences were compared to those analyzed by Gibbs (2009). DNA sequences, photographs, and specimen data are now in BOLD (Project LEPTC, BOLD Process IDs WASPS304-14, WASPS303-14), with BankIt (1853627) and GenBank accession numbers (KT695599, KT695600). The resulting sequences from material from British Columbia shared 99.2%–99.54% similarity with specimens from California (*L. tuolumnense* Gibbs) and 98.2%–98.6% similarity with specimens from Utah (*L. griswoldi* Gibbs). *Lasioglossum tuolumnense* (Fig. 2) was described from specimens collected from high elevations in the Sierra Nevada in California, and until this account of its presence in

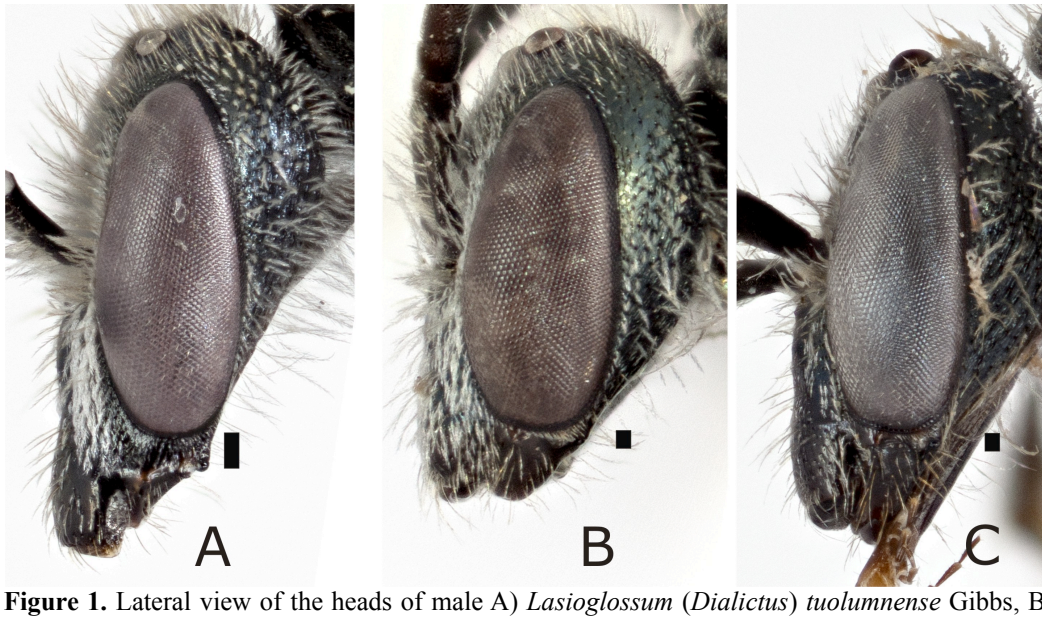

Figure 1. Lateral view of the heads of male A) *Lasioglossum* (*Dialictus*) *tuolumnense* Gibbs, B) *L.* (*D.*) *anomalum* (Robertson), and C) *L.* (*D.*) *cressonii* (Robertson); images scaled to show comparable compound eye length. Black boxes show the respective malar space height of each species.

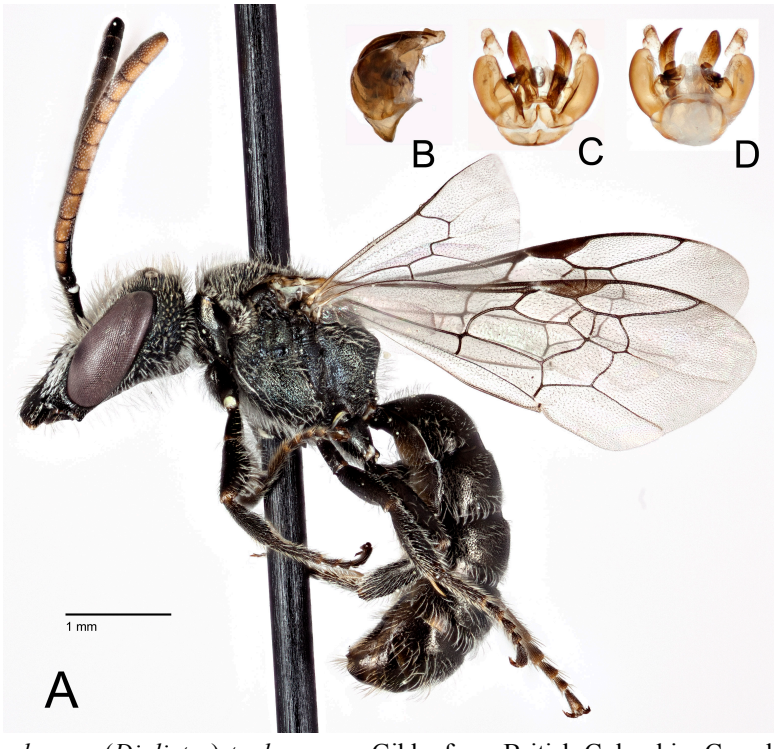

Figure 2. *Lasioglossum* (*Dialictus*) *tuolumnense* Gibbs from British Columbia, Canada. A) Male lateral view, with genitalia in B) lateral, C) dorsal, and D) ventral views.

western Canada, was known only from that state (Gibbs 2009). Thus, it is the only member of the *L. petrellum* species group known from Canada and all other species are currently known from the southwestern United States (California, Arizona, Colorado, Utah, and Texas) and adjacent Mexico (Gibbs 2009; Scott *et al*. 2011).

Gibbs (2009) addressed the close relatedness of *L. tuolumnense* and *L. griswoldi* genetically, suggesting their monophyly was not supported in all phylogenetic analyses of DNA barcode data, despite distinct morphological differences in the females. Unfortunately, the male of *L. griswoldi* is unknown (Gibbs 2009), and females were not found in the present study, so morphological comparisons of all taxa cannot be made at present. As such, because of the morphological similarity of the male specimens from British Columbia to *L. tuolumnense* and the high DNA barcode similarity, including a shared fixed-nucleotide substitution as per Gibbs (2009), we hesitate at this time to consider the Canadian representative of the *L. petrellum* group a distinct new species, despite large geographic separation (> 1000 km) from the most similar taxa in the southwestern United States. Additional sampling in high-elevation regions between the Sierra Nevada and the mountains of southern British Columbia (Okanagan and Similkameen) may resolve this species' range, although at present most species in the *L. petrellum* species group seem to be restricted geographically (Gibbs 2009).

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