Bees of the Pacific Northwest: Key to *Lasioglossum* species for Females of the Subgenera *Hemihalictus, Sphecodogastra,* and *Evylaeus* in Oregon (Hymenoptera: Halictidae)



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Cover Image: "Lasioglossum villosulum on Hypochaeris radicata" **Interior Cover Images:** "Lasioglossum (Dialictus) sp. on Nemophila menziesii var. atomaria "Lasioglossum ovaliceps on Rudbeckia occidentalis" © August Jackson 2024.

Bees of the Pacific Northwest: Key to Lasioglossum species for Females of the Subgenera Hemihalictus, Sphecodogastra, and Evylaeus in Oregon (Hymenoptera: Halictidae)

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Introduction:

The following taxonomic keys are adapted in part from the subgeneric and species descriptions and keys produced by McGinley (2003), Gibbs et al. (2013) and Gardner and Gibbs (2022). Additional identification information was provided by Jason Gibbs, Thilina Hettiarachchi (University of Manitoba), and Joel Gardner (Washington State University). While these resources were invaluable for crafting the keys provided below, only 6 of the 22 Oregon species presented below are treated within these earlier keys. This key to the species of Oregon is intended to fill the gap in knowledge and available identification resources for these subgenera in the region while acknowledging that the subgenera still require thorough taxonomic revision. Only a revision for the subgenus *Hemihalictus* is currently in progress (J. Gibbs pers. comm., Sept. 2021, Thilina Hettiarachchi pers. comm., Jan. 2024).

The morphological characteristics differentiating species in this key are primarily derived from Master Melittologist Oregon Bee Atlas (OBA), Oregon State University, (Best et al 2021, 2022) collected specimens with some supplemental information from the publications cited above and holotype/lectotype descriptions (Table 1). Species concept boundaries were clarified through an iterative method supported by coI-mtDNA barcoded specimens. DNA barcodes aided verification and/or delineation within and among some species and species-groups. Some Oregon species are known from only a few localized specimens and therefore the intraspecific morphological variation throughout their geographic range may not be represented. These inconsistencies, if they exist, will need to be resolved in the future. Thorough western-wide revisions of the subgenera are needed to address some of these remaining morphological and molecular deficiencies. Therefore, some specimens may only be identifiable to a species-group using this key.

As titled, this key only covers females known to occur in Oregon and collected by the Oregon Bee Atlas and prior US Fish and Wildlife Service sampling efforts in the region. At this time, only 16 of the 23 species in the OBA collection have corresponding male specimens, with 2 additional unidentified species being represented by males only. Therefore, a key for the male *Lasioglossum* within these subgenera has not been included.

As a product of the Oregon Bee Atlas, this key is geared toward the volunteer workforce that provide the specimens and elect to learn bee taxonomy as part of their training in the Master Melittologist program. It is expected that users have a working knowledge of bee morphology and terminology. The terminology in this key follows the previous works on *Lasioglossum* from McGinley (2003), Gibbs (2010), Gibbs et al. (2013), and Gardner and Gibbs (2022). Users of this document are encouraged to consult those resources to further their understanding of the genus *Lasioglossum* and the characters used for identifying them. This document provides both subgeneric and species keys. These are stand-alone keys, therefore using the species key does not require working through the subgenus key first.

Most *Lasioglossum* species are small, and it follows that a well mounted specimen is essential for identifying them. Important characters are found on the mesoscutum, mesepisternum, and propodeum, therefore misplaced pins and

excessive glue can result in undetermined specimens. Also, the spurs on the metatibia (tibia of hind legs) can be important for making both subgeneric and species identifications, so legs should be pulled away from the body during the drying process and excessive pollen removed from at least one hind leg if possible. In support of the characters used in the key, at the end of this document we have provided face and profile photographs of all species.

Species	Authority	Identification References
Lasioglossum (Evylaeus)		
L. argemonis	Cockerell 1897	Cockerell 1897; Crawford 1907a
L. robustum ¹	Crawford 1907a	Crawford 1907a
Lasioglossum (Hemihalictus)		
L. aspilurum	Cockerell 1925	Cockerell 1925
L. buccale	Perez 1903	Perez 1903; J. Gibbs, pers. comm. (July 2020)
L. diatretum	Vachal 1904	Vachal 1904, Crawford 1906
L. glabriventre	Crawford 1907b	Crawford 1906, Crawford 1907b
L. inconditum	Cockerell 1916	Cockerell 1916, Gibbs 2013, Mitchell 1960
L. kincaidii	Cockerell 1898	Cockerell 1898, Crawford 1906, Crawford 1907b; Michener 1937
L. macoupinense ²	Lovell 1905	Gibbs 2013, Mitchell 1960, Robertson 1890, Crawford 1907b
L. ovaliceps	Cockerell 1899	Cockerell 1899, Crawford 1907b; Michener 1937
L. pulveris	Cockerell 1930	Cockerell 1930
L. sequoiae ³	Michener 1936	Michener 1936
L. villosulum	Kirby 1802	Gibbs, pers. comm. (July 2020, Sept. 2021); Pauly et al 2019
Lasioglossum (Sphecodogastra)		
L. aberrans	Crawford 1903	McGinley 2003
L. allonotus	Cockerell 1936	Cockerell 1936; J. Gibbs pers.comm. (Feb. 2022)
L. boreale	Svensson, Ebmer, Sakagami 1977	Gibbs 2013
L. cooleyi	Crawford, 1906	Crawford 1906; Crawford 1907b
L. cordleyi	Crawford 1906	Crawford 1906, Crawford 1907b
L. lusoria	Cresson 1872	McGinley 2003
L. nigrum	Viereck 1903 ["1902"]	Viereck 1903
L. occultum	Vachal 1904	Crawford 1906, Vachal 1904
L. quebecense	Crawford 1907b	Crawford 1907b, Gibbs 2013

Table 1. Reference List for Species' Descriptions

¹ Barcoding indicates that Oregon specimens differ from the single California specimen, therefore this group may represent two species.

 2 Barcoding and morphological analysis indicates that this is a previously undescribed species (T. Hettiarachchi pers. comm., Jan. 2024). For purposes of this key, we have maintained the name of the closest relative pending publication of the new species' description.

³ Barcoding indicates that the Oregon specimens may represent two species.

Author Contributions:

The cited authors provided their individual expertise to produce this key for the Master Melittologist program. The aim was to provide an accurate but not overly technical key that allows program volunteers to delve further into the identification of these *Lasioglossum* subgenera. Product contributions are as follows: Engler - introductory material, specimen determinations, and the taxonomic keys; Gorman - photography, photo composition and layout; Cappaert - photography; Stanton - stylized illustrations of key bee characteristics; Best - DNA barcoding, document editing; Jackson - technical editing and final layout.

Acknowledgements

The development of this key was made possible through the hard work and dedication of the hundreds of Oregon Bee Atlas volunteers who collected and curated the bee specimens utilized in this project. We are particularly thankful to Jean Natter who supported DNA barcoding of *Lasioglossum* specimens. We are also grateful to the Jerry and Judith Paul "Native Pollinator Fund" which has been instrumental in the development and success of the Master Melittologists program, and to Andony Melathopoulos and Jen Larsen for their tireless efforts in keeping the program operating and on track. Lastly, we appreciate the willingness of Jason Gibbs, Joel Gardner, and Thilina Hettiarachchi to share their expertise on *Lasioglossum*.

Notes on Descriptions

Basal hair bands: Referring to the hair bands on the basal portion of the terga, usually denser and lighter in color than the other hairs. Often referred to as tomentum, these hairs are thickened or plumose, lying flat (appressed) on the integument in contrast to being filamentous and erect or semi-erect. The tomentum can be obscured due to terga not being fully extended (especially on T4-5), or if tergal hairs are matted and/or wet. Complete basal bands extend across the width of the tergum; some species have bands that are found only laterally and therefore absent in the middle of the tergum (incomplete bands). Some complete bands may appear to only be lateral due to the medial overlap in the terga. These bands are important characteristics for identifying some species, so care is needed when interpreting the presence and extent of bands across the terga.

Punctures and microsculpture of the integument: The distance between punctures is an important identifying characteristic. The interspace (distance) between the punctures is designated in terms of the diameter of the punctures. For example, i = 2d, means that the space between punctures is twice the average diameter of a puncture. This is to be used more as an estimate than a precisely measured feature. Viewing the integument surface at various angles is useful, as puncture width can appear different depending upon the viewing angle. Puncture spacing is quite variable, therefore distance estimates refer to the preponderance of punctures and not the outliers.

Punctures can be fine (like a pin point) to coarse (an obvious pit). Punctures as noted are by default small pits, and should be considered as deep as wide, with a relatively smooth border. Shallow and coarse punctures are more crater-like, wider than deep and often irregular in shape. When evaluating mesoscutal punctures, unless otherwise noted, the best place to look at these punctures is on the central and/or central-posterior part of each half of the mesoscutum (as defined by the longitudinal medial line). Generally, punctures tend to be crowded anteriorly around the rim of the mesoscutum, and down the medial (center) line, and therefore not always useful in estimating the interspatial distance. Other characteristics include whether the integument is polished (smooth) and shiny, or lightly to strongly microsculptured in which the integument is creased with fine shallow lines, thus making the integument look duller. The microsculpturing can be difficult to discern and may only be visible at certain angles. These characters are best observed under a bright but diffuse light source.

Hind Tibial Spurs: The inner hind tibial spur can be useful to determine both subgenera and species. Tooth

iv

shape, number, and length in reference to the main spur (rachis), have been utilized in many *Lasioglossum* species descriptions. However, it should be noted that the teeth can be variable in number and length for a given species, and therefore use of this character is kept to a minimum.

Head Length versus Width Ratios: The ratio between the head length and width (L/W) is often used for identifying both subgenera and species. These are difficult measurements and small variances can give erroneous results. Within this document, ratios are kept to a minimum; instead we use terms such as wider than long, longer than wide, and as wide as long (round). While this is more subjective than ratios, it caters to those without adequate microscope measuring equipment. For the reasons above, length measurements are also generalized. Reference galleries of both face and profile photos are provided, starting page 39 and 45, respectively.

Propodeal Carinae: The raised ridges of the propodeal carinae are important characteristics for separating subgenera, and in some cases species. The propodeum consists of 4 main areas: the metapostnotum (also referred to as the propodeal triangle), the posterior propodeal surface (near vertical portion), the dorsolateral slope, and the lateral propodeal surface (see Gibbs 2013, page 9 for additional clarification). Lateral carinae originate at the base of the posterior surface and reach near vertically toward the metapostnotum on each side of the posterior propodeum. This separates all or part of the posterior surface from the lateral surface. The oblique carina meets the lateral carina at the dorsolateral slope near or at the metapostnotal rim. It angles inward (medially) and sometimes horizontally along the lower (posterior) rim of the metapostnotum. Oblique carinae, when present, can be strong ridges or in some cases can be thin and difficult to discern.

Depending on the subgenus and species, the carinae can be complete (**Fig. 1**) or incomplete (**Figs. 2** and **3**). Complete carinae extend unbroken where the lateral carina transitions into the oblique carina along the dorsolateral slope. Incomplete carinae break laterally, usually before reaching the dorsolateral slope, thereby allowing a relatively smooth transition between the posterior and lateral surfaces of the propodeum. However, this transition may differ in sculpturing. The oblique carinae may be present or absent when the carinae are incomplete.



Fig. 1: Complete carinae occur when the lateral \ and oblique carinae meet on the dorsolateral slope forming a continuous carina (ridge). The oblique carina can vary in length along the posterior rim of the metapostnotum depending on the species. Most *Sphecodogastra* females have complete carinae.



Fig. 2: Incomplete carinae occur when the lateral carinae are truncated, reaching 1/3rd to 2/3rd the distance to the metapostnotal rim. Oblique carinae are absent (as above) or barely discernable. Most *Hemihalictus* and *Evylaeus* females have short lateral carinae and no oblique carinae.



Lasioglossum

Fig. 3: Incomplete carinae can also occur when the lateral carinae and oblique carinae are present. However, the carinae are separated at the dorsolateral slope. This area of separation allows a somewhat smooth transition between the posterior and lateral surfaces of the propodeum, though the sculpturing of each surface may differ. The oblique carinae are often difficult to discern, usually being short and narrow. This configuration occurs in a few *Evylaeus* and *Sphecodogastra*.

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Key to *Lasioglossum* subgenera for Females



Key to Sexes:

1a Flagellomeres 10; metasomal terga - 6; tibial scopa present; T-5 with pseudopygidial area \rightarrow Females

1b Flagellomeres 11; metasomal terga - 7; tibial scopa absent; T-5 without pseudopygidial area \rightarrow Males (not included)



Fig. 1a: Veins 2-rm and 2m-cu weakened [L. (Lasioglossum) pacificum]

1a Vein 2-rm weakened, and usually 2m-cu also weakened (Fig.1a); size ranges from 7.5 - 11.5 mm; anterior slope of T1 with an acarinarium (glabrous, hairless) or erect hairs \rightarrow *Lasioglossum sensu stricto*

1b Veins 1-rm, 2-rm, and usually 2m-cu weakened (Fig. 1b); size ranges from 4.0 to 8.0 mm; anterior slope of T1 variable $\rightarrow 2$

Fig. 1b: Veins 1-rm, 2-rm, and 2m-cu weakened [L. (Sphecodogastra) aberrans]





Fig. 2a: Head and thorax metallic green [*L.* (*Dialictus*) *cressonii*]



Fig. 2b: Anterior slope of T1 with appressed hairs in fan-like array [*L.* (*Dialictus*) sp.]

2a Integument of head, thorax (and sometimes the abdomen) with a metallic green, bronze, gold, or blue tinge which may be obvious to barely discernible (Fig. 2a); anterior slope of T1 usually with appressed hairs forming a fan-like configuration (Fig. 2b), a few species with suberect to erect hairs lacking the fan-like configuration \rightarrow *Lasioglossum (Dialictus)*

2b Integument of head and thorax black to brown, dull to shiny (Fig. 2c); abdomen color variable; anterior portion of T1 without appressed hairs but with sparse to moderately dense erect to semi-erect hairs (Fig. 2d), or with an acarinarium (Fig. 2e); in a few species there may be sparsely scattered hairs within the acarinarium but the preponderance of the area is glabrous and hairless $\rightarrow 3$

Fig. 2c: Head and thorax brown [*L.* (*Hemihalictus*) *macoupinense*]

Fig. 2d: Anterior slope of T1 with erect hairs [*L.* (*Sphecodogastra*) *cooleyi*]



Fig. 2e: Anterior slope of T1 with acarinarium [*L.* (*Hemihalictus*) *inconditum*]





Fig. 3a: Propodeum with distinct lateral and oblique carinae [*L.* (*Sphecodogastra*) *nigrum*]



Fig. 3b: Propodeum with distinct lateral and oblique carinae [*L.* (*Sphecodogastra*) *cooleyi*]

3a Anterior slope of T1 with moderately dense to dense erect hairs and propodeum with distinct lateral and oblique carinae (Fig. 3a, Fig. 3b), lateral carinae reaching the posterior rim of the metapostnotum \rightarrow *Lasioglossum* (*Sphecodogastra* s.l.)

3b Anterior slope of T1 and propodeal carinae not as above (Figs. 3c, 3d, 3e) \rightarrow **4**

Fig. 3c: Lat. carina weak; no obl. carina [*L.* (*Hemihalictus*) glabiventre]



Fig. 2d: Strong lat. carina, weak obl. carina [*L.* (*Sphecodogastra*) *boreale*]



Fig. 2e: Strong lat. carina, weak obl. carina [*L*. (*Hemihalictus*) *inconditum*]





Fig. 4a: Ventral ridge of hind femora with row of rake-like scopa [*L.* (*Sphecodogastra*) *aberrans*]



Fig. 4b: Anterior slope of T1 with erect hairs [*L.* (*Sphecodogastra*) *cooleyi*]

4a Ventral ridge of the hind femora with a single row of rake-like scopa, hairs of scopa curved or hooked at the end (Fig. 4a); anterior slope of T1 with moderately dense erect to semi-erect hairs (Fig. 4b); propodeum with lateral carina reaching or within $\frac{3}{4}$ of metapostnotal rim and oblique carina absent to very weak \rightarrow *Lasioglossum* (*Sphecodogastra* s.s.)

4b Femoral scopa with abundant plumose hairs (Fig. 4c); anterior slope of T1 with an acarinarium (Fig. 4d) or moderately dense erect to semi-erect hairs; propodeum with lateral carina usually reaching 2/3rds the distance or less to metapostnotal rim and oblique carina usually absent $\rightarrow 5$

Fig. 4c: Femoral scopa with abundant plumose hairs [*L.* (*Sphecodogastra*) *cooleyi*]



Fig. 4d: T1 with acarinarium (glabrous, mostly hairless) [*L.* (*Hemihalictus*) *inconditum*]





Fig. 5a: Lateral carina weak, no oblique carina [*L.* (*Hemihalictus*) glabiventre]



Fig. 5b: Inner hind tibial spur with distinct teeth [*L.* (*Hemihalictus*) glabiventre]

5a Anterior slope of T1 with an acarinarium or occasionally with very sparse hairs; integument coloration black; propodeum with weak lateral carina usually reaching less than 2/3rds the distance to the metapostnotal rim, oblique carina absent or rarely weak (Fig. 5a); if lateral carina is strong and reaches metapostnotal rim then mesosoma is coarsely sculptured and mesepisternum and metapostnotum are rugose; inner hind tibial spur usually pectinate with distinct teeth and basal teeth equal to or longer than the width of the rachis (Fig. 5b)

→ Lasioglossum (Hemihalictus)

5b Anterior slope of T1 with dense to moderately dense erect to semi-erect hairs; integument coloration brown to dark brown; propodeum with weak lateral carina usually not reaching the metapostnotal rim, oblique carina absent to weak; inner hind tibial spur with denticulate-serrate teeth, teeth less than 1/2 the width of rachis, small and often indistinct (Fig. 5c); mesepisternum usually rugulose; head broad \rightarrow Lasioglossum (*Evylaeus*)



Fig. 5c: Inner hind tibial spur with denticulate-serrate teeth, often small and indistinct [*L.* (*Evylaeus*) *robustum*]

Key to Species for Female Hemihalictus, Sphecodogastra, and Evylaeus in Oregon



Key to Sexes:

1a Flagellomeres 10; metasomal terga - 6; tibial scopa present; T-5 with pseudopygidial area \rightarrow Females

1b Flagellomeres 11; metasomal terga - 7; tibial scopa absent; T-5 without pseudopygidial area \rightarrow Males (not included)

Index:

- Lasioglossum (Sphecodogastra) aberrans.....2, 26, 35
- Lasioglossum (Evylaeus) argemonis.....15, 23, 29
- Lasioglossum (Sphecodogastra) allonotus.....16, 26, 36
- Lasioglossum (Hemihalictus) aspilurum.....6, 23, 30
- Lasiglossum (Sphecodogastra) boreale.....20, 26, 36
- Lasioglossum (Hemihalictus) buccale.....10, 23, 30
- Lasiglossum (Sphecodogastra) cooleyi.....21, 27, 37
- Lasiglossum (Sphecodogastra) cordleyi.....18, 27, 37
- Lasioglossum (Hemihalictus) diatretum.....14, 24, 31
- Lasioglossum (Hemihalictus) glabriventre.....4, 24, 31
- Lasioglossum (Hemihalictus) inconditum.....13, 24, 32
- Lasioglossum (Hemihalictus) kincaidii.....4, 24, 32
- Lasiglossum (Sphecodogastra) lusoria.....2, 27, 38
- Lasioglossum (Hemihalictus) macoupinense.....12, 25, 33
- Lasiglossum (Sphecodogastra) nigrum.....20, 27, 38
- Lasiglossum (Sphecodogastra) occultum.....21, 28, 39
- Lasioglossum (Hemihalictus) ovaliceps.....6, 25, 33
- Lasioglossum (Hemihalictus) pulveris.....14, 25, 34
- Lasiglossum (Sphecodogastra) quebecense.....19, 28, 39
- Lasioglossum (Evylaeus) robustum.....15, 23, 29
- Lasioglossum (Hemihalictus) sequoiae.....12, 25, 34
- Lasioglossum (Hemihalictus) villosulum.....11, 26, 35



Fig. 1a: Ventral ridge of hind femora with row of rake-like scopa [L. (Sphecodogastra) aberrans]

1a Hind femoral scopa composed of a single row of rake-like hairs which are curved or hooked at the end (Fig. 1a); metasoma brown to dark brown; lateral propodeal carina reaching $\frac{3}{4}$ or more to the posterior metapostnotal rim $\rightarrow 2$ *Lasioglossum (Sphecodogastra s.s.)*; oligoleges on select Onagraceae east of the Cascades

1b Hind femoral scopa comprised of numerous plumose hairs (Fig. 1b) \rightarrow **3**

Fig. 1b: Hind femora with plumose hairs [L. (Sphecodogastra) cooleyi]



Species remaining: L. lusoria, L. aberrans, L. kincaidii, L. glabriventre, L. ovaliceps, L. aspilurum, L. buccale, L. villosulum, L. macoupinense, L. sequoiae, L. inconditum, L. pulveris, L. diatretum, L. robustum, L. argemonis, L. allonotus, L. cordleyi, L. quebecense, L. boreale, L. nigrum, L. cooleyi, L. occultum



Fig. 2a: Mesepisternum with short, white appressed hairs [L. (Sphecodogastra) lusoria]

2a Mesepisternum with short, appressed white pubescence beneath longer erect hairs (Fig. 2a); mesoscutal hairs short, subequal to diameter of median ocellus; hairs of head and thorax white; ocelli large, ocular-ocellar distance about 1.5x the lateral ocellus diameter $\rightarrow L$. (*Sphecodogastra*) *lusoria*

2b Mesepisternum without short appressed white pubescence beneath longer erect hairs (Fig. 2b); mesoscutal hairs long, about 1.5x the diameter of median ocellus; hair of head and thorax ochraceous; ocular-ocellar distance about 2.0x the lateral ocellus diameter $\rightarrow L$. (*Sphecodogastra*) *aberrans*

Fig. 2b: Mesepisternum without short, white appressed hairs [L. (Sphecodogastra) aberrans]



Species remaining: *L. kincaidii, L. glabriventre, L. ovaliceps, L. aspilurum, L. buccale, L. villosulum, L. macoupinense, L. sequoiae, L. inconditum, L. pulveris, L. diatretum, L. robustum, L. argemonis, L. allonotus, L. cordleyi, L. quebecense, L. boreale, L. nigrum, L. cooleyi, L. occultum*



Fig. 3a: Tegula elongate and punctured throughout [L. (Hemihalictus) kincaidii]

3a Tegula punctured throughout (Fig. 3a), elongate, about twice as long as wide, or longer $\rightarrow 4$

3b Tegula with punctures (when present) confined to anterior half of tegula (Fig. 3b); tegula ovoid, less than twice as long as wide $\rightarrow 5$

Fig. 3b: Tegula relatively impunctate and more ovoid [L. (Hemihalictus) inconditum]



Species remaining: L. kincaidii, L. glabriventre, L. ovaliceps, L. aspilurum, L. buccale, L. villosulum, L. macoupinense, L. sequoiae, L. inconditum, L. pulveris, L. diatretum, L. robustum, L. argemonis, L. allonotus, L. cordleyi, L. quebecense, L. boreale, L. nigrum, L. cooleyi, L. occultum



Fig. 4a: Rugose mesepisternum and hypoepimeral area [*L.* (*Hemihalictus*) kincaidii]



Fig. 4b: Mesoscutum with coarse punctation and microsculpturing [*L.* (*Hemihalictus*) kincaidii]

4a Mesepisternum entirely & coarsely rugose and hypoepimeral area rugose (Fig. 4a); tegula black, similar to mesoscutum coloration; mesoscutum coarsely and densely punctured (i < 2.0 d centrally) with coarse microsculpturing in the interspaces (Fig. 4b); lateral propodeal carina strong, reaching or nearly reaching the metapostnotal rim, oblique carina weak to well developed; T2 and T3 with distinct white lateral hair patches

 \rightarrow L. (Hemihalictus) kincaidii

Fig. 4c: Hypoepimeral area polished centrally

4b Mesepisternum finely sculptured with a few sparse punctures; hypoepimeral area polished centrally with few to no punctures (Fig. 4c); tegula brown, lighter posteriorly, contrasting with the mesoscutum coloration; mesoscutum finely and densely punctured centrally (i < 1.5d) interspaces polished or with fine microsculpturing (Fig. 4d); lateral propodeal carina weak, reaching less than 3/4 distance to metapostnotal rim, oblique carina absent; T2 and T3 with indistinct small white lateral hair patches $\rightarrow L$. (*Hemihalictus*) glabriventre



Fig. 4d: Mesoscutum finely punctured with +/- polished interspaces [*L.* (*Hemihalictus*) glabriventre]





Fig. 5a: Abdominal terga red [L. (Hemihalictus) ovaliceps]

5a Abdominal terga red (Fig. 5a) \rightarrow **6**

5b Abdominal terga brown to black (Fig. 5b) \rightarrow 7

Fig. 5b: Abdominal terga brown to black [L. (Hemihalictus) kincaidii]





Fig. 6a: Head distinctly longer than broad [L. (Hemihalictus) ovaliceps]

6a Head distinctly longer than broad (Fig. 6a); mesoscutum densely punctate (i < 1d); metapostnotum with longitudinal rugae reaching about $\frac{1}{2}$ or less to the posterior rim $\rightarrow L$. (*Hemihalictus*) ovaliceps

6b Head slightly broader than long (Fig. 6b); mesoscutum moderately punctate (i = 1-2d); metapostnotum with fine longitudinal rugae reaching or nearly reaching the posterior rim $\rightarrow L$. (*Hemihalictus*) aspilurum

Fig. 6b: Head slightly broader than long [L. (Hemihalictus) aspilurum]





Fig. 7a: Lateral carina weak and oblique carina absent [*L.* (*Hemihalictus*) glabriventre]



Fig. 7b: Lateral carina less than 1/2 distance to postnotal rim and oblique carina absent [*L.* (*Hemihalictus*) *diatretum*]

7a Propodeum with lateral carina barely discernible, or if distinct then usually reaching $\frac{1}{2}$ or less the distance to the metapostnotal rim, oblique carina absent (Figs. 7a, 7b) or rarely faint $\rightarrow 8$

7b Propodeum with lateral carina reaching or nearly reaching the metapostnotal rim, oblique carina distinct (Fig. 7c) or rarely faint (Fig. 7d) $\rightarrow 16$

Fig. 7c: Lateral carina reaching metapostnotal rim and oblque carina distinct [*L.* (*Sphecodogastra*) *nigrum*]



Fig. 7d: Lateral carina reaching metapostnotal rim and oblique carina faint [*L*. (*Sphecodogastra*) *boreale*]





Fig. 8a: Head and thorax black; pubescence sparse [*L.* (*Hemihalictus*) *buccale*]



Fig. 8b: Head longer than broad [L. (Hemihalictus) buccale]

8a Head and thorax black, pubescence generally sparse, whitish (Fig. 8a); head longer than or as long as broad (Fig. 8b); anterior face of T1 with an acarinarium or with semi-erect sparse to moderately dense hairs \rightarrow **9**

8b Head and thorax brown to dark brown, pubescence moderately dense, yellowish (Fig. 8c); head broader than long (Fig. 8d); anterior face of T1 with moderately dense erect hairs $\rightarrow 15$

Fig. 8c: Head and thorax dark brown; pubescence more dense [*L.* (*Evylaeus*) *argemonis*]



Fig. 8d: Head broader than long [*L. (Evylaeus) argemonis*]





Fig. 9a: Mesepisternum punctate [*L.* (*Hemihalictus*) *buccale*]



Fig. 9b: Punctation confined to posterior edges of mesepisternum [*L.* (*Hemihalictus*) villosulum]

9a Mesepisternum and usually hypoepimeral area punctate (Fig. 9a), sometimes punctation obscure and confined to the posterior edge (Fig. 9b) $\rightarrow 10$

9b Mesepisternum rugulose to tessellate, lacking distinct punctures (Fig. 9c) \rightarrow **13**

Fig. 9c: Mesepisternum rugulose [*L.* (*Hemihalictus*) *inconditum*]





Fig. 10a: Head elongate and supraclypeal area convex [*L.* (*Hemihalictus*) *buccale*]



Fig. 10b: Inner hind tibial spur hooked at aped with 8-10 short teeth [*L.* (*Hemihalictus*) *buccale*]

10a Head very elongate, supraclypeus distinctly convex (Fig. 10a); mesepisternum polished with distinct sparse punctures; hind and mid tibial spurs hooked at apex, inner hind tibial spur with 8-10 short dentate teeth, shorter than width of the rachis (Fig. 10b); anterior portion of T1 with sparse hairs $\rightarrow L$. (*Hemihalictus*) *buccale*

10b Head elongate to round (Fig. 10c); mesepisternum variable, punctures distinct or obscure; tibial spurs not distinctly hooked; inner hind tibial spur with 7 or fewer teeth, basal teeth longer, gradually shortening toward the apex of spur (Fig. 10d); T1 with or without a distinct acarinarium $\rightarrow 11$

Fig. 10c: Head not so elongate [*L.* (*Hemihalictus*) *villosulum*]



Fig. 10d: Inner hind tibial spur not so hooked and with at most 7 teeth, longer basally [*L.* (*Hemihalictus*) glabriventre]





Fig. 11a: Mesoscutal punctures coarse and sparse [*L.* (*Hemihalictus*) *villosulum*]



Fig. 11b: Anterior surface of T1 with sparse hairs oriented laterally [*L.* (*Hemihalictus*) *villosulum*]

11a Mesoscutal punctures coarse and relatively sparse (i = 1-3 pd) on central disc (Fig. 11a); mesepisternum with punctures often obscure and confined to the glabrous posteroventral edge, hypoepimeral area punctate; anterior surface of T1 with sparse to relatively dense semi-erect hairs that orient laterally (Fig. 11b); metapostnotum with rugae > 1/2 distance to posterior rim, sometimes reaching rim; terga with lateral basal hair bands lacking

\rightarrow L. (Hemihalictus) villosulum

11b Mesoscutal punctures fine and dense, slightly sparser centrally (i < 1.5 pd) (Fig. 11c); anterior surface of T1 glabrous with few to no hairs medially usually forming an acarinarium (Fig. 11d); metapostnotum variable; terga with or without basal hair bands \rightarrow **12**



Fig. 11d: Anterior surface of T1 with glabrous acarinarium [*L.* (*Hemihalictus*) *sequoiae*]





Fig. 12a: T1 polished and impunctate [*L.* (*Hemihalictus*) *macoupinense*]



Fig. 12b:Metapostnotum with rugae halfway to rim [*L. (Hemihalictus) macoupinense*]



Fig. 12c: Hind tibial spur with 3-5 pectinate teeth [*L.* (*Hemihalictus*) macoupinense]

12a Dorsal surface of T1 polished and virtually impunctate (Fig. 12a), sometimes with diffuse reddish tinge to disc; metapostnotum with rugae reaching 1/2 distance to rim (Fig. 12b); distinct white lateral hair bands on T2 and T3; tegula yellow to reddish-yellow; hind tibial spur with 3-5 pectinate teeth, the basal tooth at least as long as the width of the rachis (Fig. 12c); T2 polished, apical area with scattered fine punctures (i > 3d)

\rightarrow L. (Hemihalictus) macoupinense

12b Dorsal surface of T1 polished with sparse punctures (i <3d) especially medially (Fig. 12d), contrasting with the denser punctation and hairs of T2-5; metapostnotum with rugae reaching the posterior rim (Fig. 12e); small, often indistinct lateral basal hair bands on T2 and T3; tegula dark brown with light spot posteriorly; hind tibial spur with 4-6 very short conical teeth, almost indiscernible (Fig. 12f); T2 coriarious especially apically, apical area with punctures moderately dense (i < 2d) $\rightarrow L$. (*Hemihalictus*) sequoiae

Fig. 12d: T1 polished with sparse punctures [*L.* (*Hemihalictus*) *sequoiae*]

Fig. 12e: Metapostnotum with rugae reaching rim [*L. (Hemihalictus) sequoiae*]

Fig. 12f: hind tibial spur with 4-6 very short teeth [*L*. (*Hemihalictus*) *sequoiae*]



Species remaining: *L. inconditum, L. pulveris, L. diatretum, L. robustum, L. argemonis, L. allonotus, L. cordleyi, L. quebecense, L. boreale, L. nigrum, L. cooleyi, L. occultum*



Fig. 13a: Metapostnotal rugae reaching lateral rim [*L.* (*Hemihalictus*) *inconditum*]



Fig. 13b:Posterior corner of dorsolateral slope rugulose [*L. (Hemihalictus) inconditum*]



Fig. 13c: P. corner of dorsolateral slope lightly sculptured [*L.* (*Hemihalictus*) *inconditum*]

13a Metapostnotum with rugae reaching the posterior and lateral rims (Fig. 13a); posterior corner of the dorsolateral slope rugulose to lightly sculptured without distinct punctures (Figs. 13b, 13c); acarinarium with a few hairs at extreme base; tegulae dark brown; T2 apical impressed area nearly impunctate, distinctly sparser than basal area punctures $\rightarrow L$. (*Hemihalictus*) *inconditum*

13b Metapostnotum with rugae not reaching the posterior rim, leaving a lightly sculptured to polished rounded margin (Fig. 13d); posterior corner of dorsolateral slope with distinct punctures on a polished to lightly sculptured integument (Figs. 13e); tegula variable; acarinarium present \rightarrow 14

Fig. 13d: Metapostnotal rugae not reaching rim, rim shiny and rounded [*L.* (*Hemihalictus*) *pulveris*]



Fig. 13e: Posterior corner of dorsolateral slope lightly sculptured and punctate [*L.* (*Hemihalictus*) *diatretum*]



Species remaining: *L. pulveris, L. diatretum, L. robustum, L. argemonis, L. allonotus, L. cordleyi, L. quebecense, L. boreale, L. nigrum, L. cooleyi, L. occultum*



Fig. 14a: Tegula translucent yellow [*L. (Hemihalictus) pulveris*]



Fig. 14b: T2-4 light brown to testaceous at apex [*L.* (*Hemihalictus*) *pulveris*]

14a Tegula translucent yellow (Fig. 14a); T2-4 with apical impressed areas broadly light brown to testaceous, thinly yellow at edge (Fig. 14b); mesoscutum centrally between the parapsidal and medial lines with punctation dense (i < 1.5d), the integument in this area with distinct microsculpture $\rightarrow L$. (*Hemihalictus*) pulveris¹

14b Tegula testaceous to brown, sometimes with yellowish spot posteriorly (Figure 14c); T2-4 with apical impressed areas blackish similar to the basal area (Figure 14d), if lighter than basal area then coloration generally does not extend anteriorly to the basal area; mesoscutum centrally with some punctation sparse (i = 2-3d), the integument of this area polished to very lightly sculptured $\rightarrow L$. (*Hemihalictus*) *diatretum*¹

Fig. 14c: Tegula testaceous to brown [*L. (Hemihalictus) diatretum*]



Fig. 14d: T2-4 apices of similar color to basal areas [*L.* (*Hemihalictus*) *diatretum*]



Species remaining: *L. robustum, L. argemonis, L. allonotus, L. cordleyi, L. quebecense, L. boreale, L. nigrum, L. cooleyi, L. occultum*



Fig. 15a: Mesoscutum with moderately dense punctures [*L. (Evylaeus) robustum*]



Fig. 15b: Metapostnotum and metanotum subequal in length [*L. (Evylaeus) robustum*]



Fig. 15c: T1-2 with large impunctate patches laterally [*L. (Evylaeus) robustum*]

15a Integument black; mesoscutum polished with moderately dense punctures (i =1-2 pd) centrally between the medial and parapsidal lines (Fig. 15a); metapostnotum and metanotum subequal in length (Fig. 15b); terga black, moderately shiny; T1-2 polished basally, lightly coriarious apically; T1-2 moderately punctate (i = 1-2d) but with large impunctate patches laterally (Fig. 15c); T2-3 with ochraceous basal hair bands laterally

\rightarrow L. (Evylaeus) robustum

15b Integument dark brown; mesoscutum finely sculptured with dense punctures (i < 1 pd) centrally between the medial and parapsidal lines (Fig. 15d); metapostnotum slightly longer than metanotum (Fig. 15e); terga finely sculptured, almost unnoticeable basally, apical areas distinctly coriarious (Fig. 15f); terga with fine dense punctation (i = 1-3d), all terga uniformly dull dark brown, except anterior portion of T1 polished

\rightarrow L. (Evylaeus) argemonis

Fig. 15d: Mesoscutum with dense punctures [*L. (Evylaeus) argemonis*]

Fig. 15e: Metapostnotum slightly longer than metanotum [*L. (Evylaeus) argemonis*]

Fig. 15f: Terga with apical areas distinctly coriarious [*L.* (*Evylaeus*) argemonis]



Species remaining: *L. allonotus, L. cordleyi, L. quebecense, L. boreale, L. nigrum, L. cooleyi, L. occultum*



Fig. 16a: Mesoscutum polished and with very sparse punctures [*L.* (*Sphecodogastra*) *allonotus*]



Fig. 16b: Oblique carina V-shaped at junction with lateral carina [*L.* (*Sphecodogastra*) *allonotus*]

16a Integument of head, thorax, and abdomen polished and shiny black to dark brown; mesoscutum with very sparse punctures (i = 3-6 pd) (Fig.16a); oblique carina usually V-shaped at junction with lateral carina (Fig. 16b); T2-4 with whitish basal hair bands laterally (when visible) $\rightarrow L$. (*Sphecodogastra*) *allonotus*

16b Integument variable; mesoscutum with dense to moderately dense punctures (i < 2 pd) (Fig. 16c); junction of lateral and oblique carinae rarely V-shaped at junction (Fig. 16d) \rightarrow **17**

Fig. 16c: Mesoscutum with moderately dense punctures [*L.* (*Sphecodogastra*) occultum]



Fig. 16d: Junction of lateral and oblique carinae not V-shaped [*L.* (*Sphecodogastra*) *cooleyi*]



Species remaining: *L. cordleyi, L. quebecense, L. boreale, L. nigrum, L. cooleyi, L. occultum*



Fig. 17a: T2-3 without obvious basal bands [*L.* (*Sphecodogastra*) *cordleyi*]



Fig. 17b: T2 basal area coriarious and impunctate [L. (Sphecodogastra) nigrum]

17a Small bees, generally <7 mm; pubescence relatively sparse on head and thorax; T2-3 with or without obvious basal bands (Fig. 17a); head, mesoscutum and scutellum uniform dull dark gray due to strong microsculpturing; mesoscutal punctures shallow and dense (i < 1d), punctures sometimes failing centrally along medial line; T1 mostly impunctate and polished, T2 with basal and apical areas usually coriarious and impunctate, but may have some obscure punctures throughout the disk (Figure 17b); T3 mostly coriarious with few punctures apically, more punctures basally \rightarrow **18**

17b Larger bees, usually >7 mm; golden to ochraceous pubescence throughout; T2-3 and sometimes T4-5 with complete basal bands, central portion of T2-3 sometimes hidden under previous segment (Fig. 17c); mesoscutum and scutellum shiny to moderately shiny, dark brown to black; punctures distinct and dense (i < 1d), integument of mesoscutum polished to lightly sculptured; T1 shiny and sparsely punctate, T2 and T3 with puncture density variable but present throughout the disk, T2 usually at most lightly coriarious apically (Fig. 17d); combination of hyaline rims of terga and underlying light basal bands giving the abdomen a banded appearance in most specimens $\rightarrow 21$



Fig. 17c: T2-3 with complete basal bands [*L.* (*Sphecodogastra*) *cooleyi*]

Species remaining: *L. cordleyi, L. quebecense, L. boreale, L. nigrum, L. cooleyi, L. occultum*







Fig. 18a: Inner hind tibial spur with blunted teeth [*L.* (*Sphecodogastra*) *cordleyi*]



Fig. 18b: T4 with tomentum throughout [*L. (Sphecodogastra) cordleyi*]



Fig. 18c: Mesocutum and scutellum elongate and grayish [*L.* (*Sphecodogastra*) *cordleyi*]

18a Inner hind tibial spur with 3-5 short blunt to rounded teeth (Fig. 18a); T4 with tomentum throughout disc (Fig. 18b); mesoscutum and scutellum elongate tending toward dull dark gray with very dense areolate microsculpturing (Fig. 18c); punctures sparse to absent posteromedially; metapostnotal rugae with some to considerable side branching (anastomosing), rugae reaching the posterior rim; when visible, T2-3 with complete basal hair bands though can be difficult to see $\rightarrow L$. (*Sphecodogastra*) cordleyi (avalonense)²

18b Inner hind tibial spur with mostly tapered teeth (Fig.18d); mesoscutum ovoid, tending toward black (Fig. 18e), punctures variable but usually not obliterating postero-medially; metapostnotal rugae with little side branching, not reaching the posterior rim, generally fading about $\frac{1}{2} - \frac{3}{4}$ to rim; T2-3 at most with basal hair bands at lateral corners; T4 with filamentous hairs throughout but little to no tomentum (Fig. 18f) \rightarrow **19**

 Fig. 18d: Inner hind tibial spur with tapered teeth [L. (Sphecodogastra) nigrum]
 Fig. 18e: Mesoscutum ovoid and black [L. (Sphecodogastra) nigrum]
 Fig. 18e: Tay with filamentous hairs [L. (Sphecodogastra) nigrum]

 Image: Sphecodogastra in the teeth [L. (Sphecodogastra) nigrum]
 Image: Sphecodogastra intervention
 Fig. 18e: Mesoscutum ovoid and black [L. (Sphecodogastra) nigrum]

 Image: Sphecodogastra intervention
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Species remaining: L. quebecense, L. boreale, L. nigrum, L. cooleyi, L. occultum



Fig. 19a: Inner hind tibial spur with basal teeth longer than width of rachis [*L. (Sphecodogastra) quebecense*]



Fig. 19b: T1 dull, color and sheen similar to T2-3 [*L.* (*Sphecodogastra*) *quebecense*]

19a Head longer than broad; lateral and oblique carinae strong; inner hind tibial spur with teeth pectinate, basal teeth longer than width of rachis, shortening apically (Fig. 19a); T1 dull, color and sheen similar to T2-3 (Fig. 19b)

\rightarrow L. (Sphecodogastra) quebecense³

19b Inner hind tibial spur with teeth pectinate, teeth generally equal to or less than the width of the rachis (Fig. 19c); T1 polished, shinier than T2-3 (Fig. 19d) \rightarrow **20**

Fig. 19c: Inner hind tibial spur with basal teeth less than or equal to width of rachis [*L.* (*Sphecodogastra*) *nigrum*]



Fig. 19d: T1 polished and shinier than T2-3 [*L.* (*Sphecodogastra*) *boreale*]



Species remaining: L. boreale, L. nigrum, L. cooleyi, L. occultum



Fig. 20a: Metapostnotum with oblique carina weak [*L.* (*Sphecodogastra*) *boreale*]



Fig. 20b: T1 with very few punctures [*L.* (*Sphecodogastra*) *boreale*]

20a Fine lateral carina weak to failing near metapostnotal rim, oblique carina faint, often disconnected from lateral carina (Fig. 20a); teeth on the inner hind tibial spur shorter than the width of the rachis; mesepisternum lightly rugulose becoming smoother ventrally; T1 nearly impunctate and noticeably shinier than subsequent terga (Fig. 20b); T2 apical impressed area impunctate to sparsely punctate; mesoscutum densely punctate (i > .5d) but with distinct polished to finely sculptured spacing between punctures, especially postero-medially; T2-3 with lateral basal bands indistinct; metasoma pubescence yellowish $\rightarrow L$. (*Sphecodogastra*) *boreale*³

20b Lateral and oblique carinae strong (Fig. 20c), sometimes V-shaped where carina meet; mesoscutum densely punctate (i < 1d) and densely sculptured; punctures somewhat shallow but remain distinct throughout; T1 polished to faintly sculptured with very sparse fine punctures (i > 4), apical rim testaceous (Fig. 20d); T2 moderately coriarious throughout, basal area finely punctate (i=2-3d), apical rim testaceous; T3 coriarious throughout, punctation very fine almost invisible (i=2-3d), moderately hairy throughout, apical rim testaceous; T2-3 with lateral basal bands distinct; T4 similar to T3 but more densely haired $\rightarrow L$. (*Sphecodogastra*) *nigrum*³

Fig. 20c: Metapostnotum with lateral and oblique carinae strong [*L.* (*Sphecodogastra*) *nigrum*]



Fig. 20d: T1 finely but more evenly punctured [*L.* (*Sphecodogastra*) *nigrum*]



Species remaining: L. cooleyi, L. occultum







Fig. 21b: Mesoscutum with distinct sculpturing [*L.* (*Sphecodogastra*) *cooleyi*]



Fig. 21c: Pronotal lobe prominent and sharply angled [*L.* (*Sphecodogastra*) *cooleyi*]

21a Punctures laterad and along inner parapsidal line very dense (i < 1/2 d) to touching (Fig. 21a); mesoscutum usually with distinct microsculpturing throughout most of disc (Fig. 21b); pronotal lobe prominent and sharply angled, approaching a right angle (Fig. 21c); T1 medio-laterally with distinct patch of whitish appressed and raised hairs (in most subpopulations); apical portion of T1-2 with a relatively wide hyaline rim, that hyaline rim edged by narrow brownish-red anteriorly; tegula yellowish to testaceous throughout most of disc; T2-5 with complete whitish to yellowish basal bands (often difficult to see on T4-5) $\rightarrow L$. (*Sphecodogastra*) cooleyi⁴

21b Punctures dense laterad and along inner parapsidal line but usually with distinct polished spaces between punctures (i <1d) (Fig. 21d); mesoscutum mostly polished except anteriorly and along medial line (Fig. 21e); pronotal lobe less obvious and generally obtuse, some may approach a right angle but corner rounded (Fig. 21f); T1 medio-laterally with sparse erect to short suberect light hairs, without noticeable appressed hairs; apical portion of T1-2 with a narrow yellowish-red rim; tegula mostly dark tending toward yellowish-brown on the outer posterior portion of disc; T2-5 with complete basal bands (often difficult to see on T4-5) $\rightarrow L$. (Sphecodogastra) occultum⁴

Fig. 21d: Punctures inner to parapsidal line less dense [*L.* (*Sphecodogastra*) occultum]



Fig. 21e: Mesoscutum mostly polished [*L.* (*Sphecodogastra*) *occultum*]



Fig. 21f: Pronotal lobe obtuse with corner rounded [*L*. (*Sphecodogastra*) occultum]



Footnotes

¹ *L. pulveris* and *L. diatretum* are closely related; some specimens have intermediate coloration on the tegula and/or the apically impressed area of the terga rendering an identification difficult. The literature, morphological variation and barcode differences suggest that additional cryptic species may exist.

² L. cordleyi and L. avalonense (Cockerell 1938) appear indistinguishable from each other based on their holotype descriptions and cannot be separated based on the current DNA barcoding available. These may prove to be the same species. As the holotype of L. cordleyi was described from Oregon, we have chosen to use that name until a future taxonomic revision is complete.

³ *L. quebecense*, *L. boreale*, *L. comagenense*, and *L. nigrum* cannot be positively separated through DNA barcoding. The descriptions for the former 2 species are based on Gibbs et al (2013); some OBA specimens are consistent with these descriptions. *L. nigrum* and *L. comagenense* are also very similar based on male genitalia and female descriptions. As *L. nigrum* is considered a western species, and *L. comagenense* mainly an eastern species, we have chosen to use the former name until a future taxonomic revision can resolve the identification. Aside from these species, two additional species based on male genitalia and/or barcoded specimens likely belong within this species complex. Corresponding females are not known currently, so are not included in this key.

⁴ *L. cooleyi* and *L. occultum* are closely related both morphologically and through barcodes. Both species also vary geographically, therefore distinguishing between these two species can be difficult given the extent of morphological variation. Notably, some *L. cooleyi* specimens in NE Oregon have indistinct to absent lateral and/or oblique carinae making them difficult to identify to subgenus. Current barcoding indicates that *L. cooleyi* occurs primarily east of the Cascades with a disjunct group occurring in the Klamath-Siskiyou Mountains of SW Oregon, while *L. occultum* occurs primarily west of the Cascades and along the eastern slopes of the Cascades.

One additional species occurs in this morpho group based on male genitalia and barcoding; however, no corresponding Oregon females are known at this time. *L. orthocarpi* is also expected to occur in the state. This species is morphologically like *L. cooleyi* and *L. occultum*, but may be distinguished from them by a near complete absence of punctation on T1 and white hairs at the apex of the abdomen (J. Gardner pers. comm., Jan. 2024).

Face Gallery



L. (Evylaeus) argemonis



L. (Hemihalictus) aspilurum



L. (Evylaeus) robustum



L. (Hemihalictus) buccale



L. (Hemihalictus) diatretum



L. (Hemihalictus) glabriventre



L. (Hemihalictus) inconditum



L. (Hemihalictus) kincaidii



L. (Hemihalictus) macoupinense



L. (Hemihalictus) ovaliceps



L. (Hemihalictus) pulveris



L. (Hemihalictus) sequoiae



L. (Hemihalictus) villosulum



L. (Sphecodogastra) aberrans



L. (Sphecodogastra) allonotus



L. (Sphecodogastra) boreale



L. (Sphecodogastra) cooleyi



L. (Sphecodogastra) cordleyi



L. (Sphecodogastra) lusoria



L. (Sphecodogastra) nigrum





L. (Sphecodogastra) occultum

L. (Sphecodogastra) quebecense

Profile Gallery



L. (Evylaeus) argemonis





L. (Hemihalictus) aspilurum



L. (Hemihalictus) buccale



L. (Hemihalictus) diatretum



L. (Hemihalictus) glabriventre



L. (Hemihalictus) inconditum



L. (Hemihalictus) kincaidii



L. (Hemihalictus) macoupinense



L. (Hemihalictus) ovaliceps



L. (Hemihalictus) pulveris



L. (Hemihalictus) sequoiae



L. (Hemihalictus) villosulum



L. (Sphecodogastra) aberrans



L. (Sphecodogastra) allonotus



L. (Sphecodogastra) boreale



L. (Sphecodogastra) cooleyi





L. (Sphecodogastra) lusoria



L. (Sphecodogastra) nigrum



L. (Sphecodogastra) occultum





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