

The Bees of the Willamette Valley

A Comprehensive Guide to Genera



By August Jackson

**This guide is dedicated to Oregon's bees and to their future;
to my parents for encouraging my love of natural history from a young age;
and to Amy Warnock for her patient support of this project, encouragement, and advice, and
especially to her growing love of bees. A good number of the specimens photographed in this
guide were caught by Amy.**



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All text and photographs by August Jackson

Distribute Freely

The author welcomes correspondence at augustjackson@ecolingual.com

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1. Introduction

1.1 The Bees of the Willamette Valley

Well over 500 species of bees may be found in Oregon. The number of species in the Willamette Valley likely lies in the range of 150-250. Some species have been extirpated or perhaps pushed to extinction since the beginning of Euro-American settlement in the mid-19th century. In a recent instance, the western bumblebee (*Bombus occidentalis*) was extirpated from the Valley in the late 1990's. However, many species are still abundant and some appear to be thriving. Nearly forty species can be found in my garden in downtown Springfield, and that number has grown as I've worked to increase the diversity and abundance of native plants in my yard.

1.2 The Need for a Guide

While interest in the conservation of native bees has grown significantly among natural resources professionals over the past decade, the low number of individuals who are able to identify bees may present a substantial barrier to effective conservation. Attempts at conservation would be best informed by comprehensive data on species composition, abundance, distribution, and floral records--none of which is currently available for our region.

Interest in native bees has also grown significantly among gardeners and naturalists. Watching bees in the garden or in natural areas is a life-affirming activity, and many individuals have a desire to identify the bees they encounter, whether for their own edification or to contribute to a greater understanding of the region's fauna. Unfortunately, attempts to begin learning bee identification can be frustrating. A regional guide has the potential to make identification more accessible by narrowing the subject matter to a more manageable scope.

W.P. Stephen, G.E. Bohart, and P.F. Torchio released an excellent guide to Pacific Northwest bees in [*The Biology and External Morphology of Bees*](#) (1969), but the nomenclature is now out of date in many instances, and the focus is broad. There has not yet been a regional guide to the bees of the Willamette Valley, and to my knowledge there has not been a guide and key anywhere in North America with such a narrow focus. The Willamette Valley presents a unique opportunity to test the effectiveness of a regional guide. With roughly 70% of the population of the state of Oregon, the region also contains a large number of natural areas, a conservation-oriented populace, and a bee fauna that is both under-studied and not too daunting in size. With practice, interested individuals with



Heriades carinata found in my yard in June

little to no experience with insects can learn to recognize and expand the knowledge of the bees in our region, and thereby contribute to their conservation.

1.3 Scope of Guide

For the purposes of this guide, the Willamette Valley includes all of the lowland areas from Cottage Grove at the southern end, to the Willamette River's confluence with the Columbia River in Portland at the northern end, as well as the immediate surrounding foothills. The guide should also be useful up through the interior maritime valleys of Washington and southern British Columbia. The chances of encountering additional genera not covered in the guide increase outside the region, especially east of the Cascades and south of the Rogue-Umpqua divide.

1.4 Purpose of Guide

This guide is focused on identification to the level of genus. Identification of species is often considerably more challenging and well beyond the scope of this guide. The guide aims to make bee identification more accessible and to serve as a useful tool for natural resources professionals, naturalists, students, and gardeners. The needs and the background knowledge of each group and individual is diverse, and this guide attempts to serve as a useful tool for each group. Technical, anatomical language is unavoidably used throughout the guide. These terms are necessary to learn, especially for those who find themselves moving on to species-level identification. Illustrations are provided for most of the anatomical terms to aid in comprehension.

Furthermore, my hope is that this guide increases the awareness and appreciation of the native bees with which we share this landscape. Each species of bee, even those that visit a plethora of flowers, has a unique relationship with both the native and introduced flora. Bees also express a range of behaviors regarding mating, sociality, territoriality, and nesting. Bees are diverse, and most importantly, the loss of a single species is an avoidable tragedy.



Lasioglossum sp. with non-native *Hypochaeris*

1.5 How to Use the Guide

Readers should begin by familiarizing themselves with the common anatomical and descriptive terms used throughout the guide. Viewing the anatomical diagrams and reading through the short glossary will greatly aid in comprehension. These are not full accounts of bee anatomy, but limit focus instead to the primary characters used in this guide.

Two different keys are offered to help readers identify bees. A traditional dichotomous key based on

physical, often microscopic characteristics, is the foundation of this guide. This key assumes the presence of a pinned specimen and a hand lens or, ideally, a microscope. In some instances, high resolution photographs will suffice. This key will enable users to confidently identify bees to the genus level. An alternative “field key” focuses on the general look and feel of a bee and enables users to narrow down their options based on photos or memory. Genus level IDs may often be obtained using this method, though the level of confidence in an identification will naturally be lower.

The latter portion of the guide is composed of genus accounts, with most including multiple photographs. Genus accounts are provided for all but a handful of the genera covered in the keys. These accounts provide descriptions for use in identification, and additionally provide some information about the phenology and life histories of each genus, especially pertaining to the species found in our region. The genus accounts are organized by family, and then alphabetically by tribe or subfamily. I shy away from using common names throughout this text, as I’m not sure that they are useful in learning bees or communicating about them, and unlike with birds, butterflies, and even plants, they lack real meaning unless one also knows the scientific names.

2. Getting to Know Bees

2.1 Becoming Familiar With Bees

It can be challenging and intimidating to begin learning about bees. I am self-taught in bee identification, and my introduction to bees was slow. The learning process developed in fits and starts over a few years until a passion grew to the point that it became a greater focus of mine. Do not be afraid to move slowly, and expect to find yourself frustrated at times. You may find it useful to take a season to become familiar with some of the common, recognizable bees that are ubiquitous in backyards and urban green spaces, such as *Bombus*, *Agapostemon*, *Osmia*, and *Halictus*. Gaining an understanding of the look and “feel” of these bees can provide a good basis with which to compare all unfamiliar bees in the future.

Collecting specimens will aid immensely in identifying bees. Many people are understandably averse to killing insects. They will be happy to know that, with patience, much can be learned without taking specimens. However, for those who wish to consistently be confident in their identification, or pursue identification to the level of species, specimen collection becomes a necessary means of studying bees. For detailed information on how to begin collecting bees, see Sam Droege’s [*The Very Handy Manual: How to Catch and Identify Bees and Manage a Collection*](#).

2.2 Sexing Bees

It is usually fairly easy to differentiate between male and female bees at a glance, based primarily on the presence of pollen-carrying structures in females. However, these structures are completely lacking in cleptoparasitic bees and occasionally modified or reduced in others. Male bees in our area always have 13 antennal segments (11 flagellar segments plus the scape and pedicel), while females have 12 (10 flagellar segments plus the scape and pedicel). Male bees generally have seven exposed metasomal terga (though there are instances in which the 7th is completely hidden by the 6th), while females generally have six exposed terga (though there are instances in which the 6th is hidden). Only female bees possess the capacity to sting, as the sting apparatus is a modified ovipositor.

2.3 Photographing Bees

Photographing bees is an enjoyable pastime and can be an excellent way to begin to learn their identification and behavior. In the first several years, nearly all of my learning was through photography. DSLRs, point-and-shoot digital cameras (especially those with a macro mode), and even phone cameras (especially with a clip-on macro lens) produce results of a high enough quality to aid in identification. If the goal is identification, several photos of the same bee, from multiple angles, will be the greatest help. Clear photos of the wings can be especially useful.

Aside from its usefulness in identification, photographing bees is a welcome excuse to spend time in their world as a quiet observer. Over time, you will likely begin to notice differences in behavior

between groups of bees, the time of year and time of day you're most likely to see them, the way they interact with other bees, and even the different sounds they make (if they're large enough to produce audible noises). All these observations are useful for recognizing patterns that can aid in identification.

All in-the-field photos in this guide were taken with a Canon Rebel T3 or, more recently, a Canon 80D, equipped with Canon's 100mm macro lens and a 430exii Speedlite flash. All studio photos were taken with a Canon 80D, and either the 100mm macro, or Venus Laowa's 25mm 2.5-5x ultra macro lens, a Speedlite flash, or Yongnuo's YN-24EX dual flash.

For those interested in seriously pursuing bee photography, a good macro photography setup can be assembled for under \$1,000, or possibly much less if one is willing to take the time to track down used gear. Additionally, it is no longer necessary to limit oneself to the well-known brand names to find quality gear. Newer Chinese companies are consistently producing quality gear at lower costs, and Venus Laowa is producing high quality, innovative lenses that rival the big-name brands.

While many photographers are able to produce excellent images of insects using only natural light, relying on ambient light can be incredibly limiting.

For that reason, I consider a good flash essential for photographing bees. A flash allows for obtaining greater depth of field by augmenting whatever natural light may be present, and the flash can also be used to overpower the harsh shadows and glare produced by the sun at mid-day--generally the time at which bees are most active. A high depth of field is particularly important in resolving physical characteristics which are useful in identification. In most cases I try to shoot with an aperture between f8 and f13, which I find to be the sweet spot in maximizing depth of field and image quality and clarity.

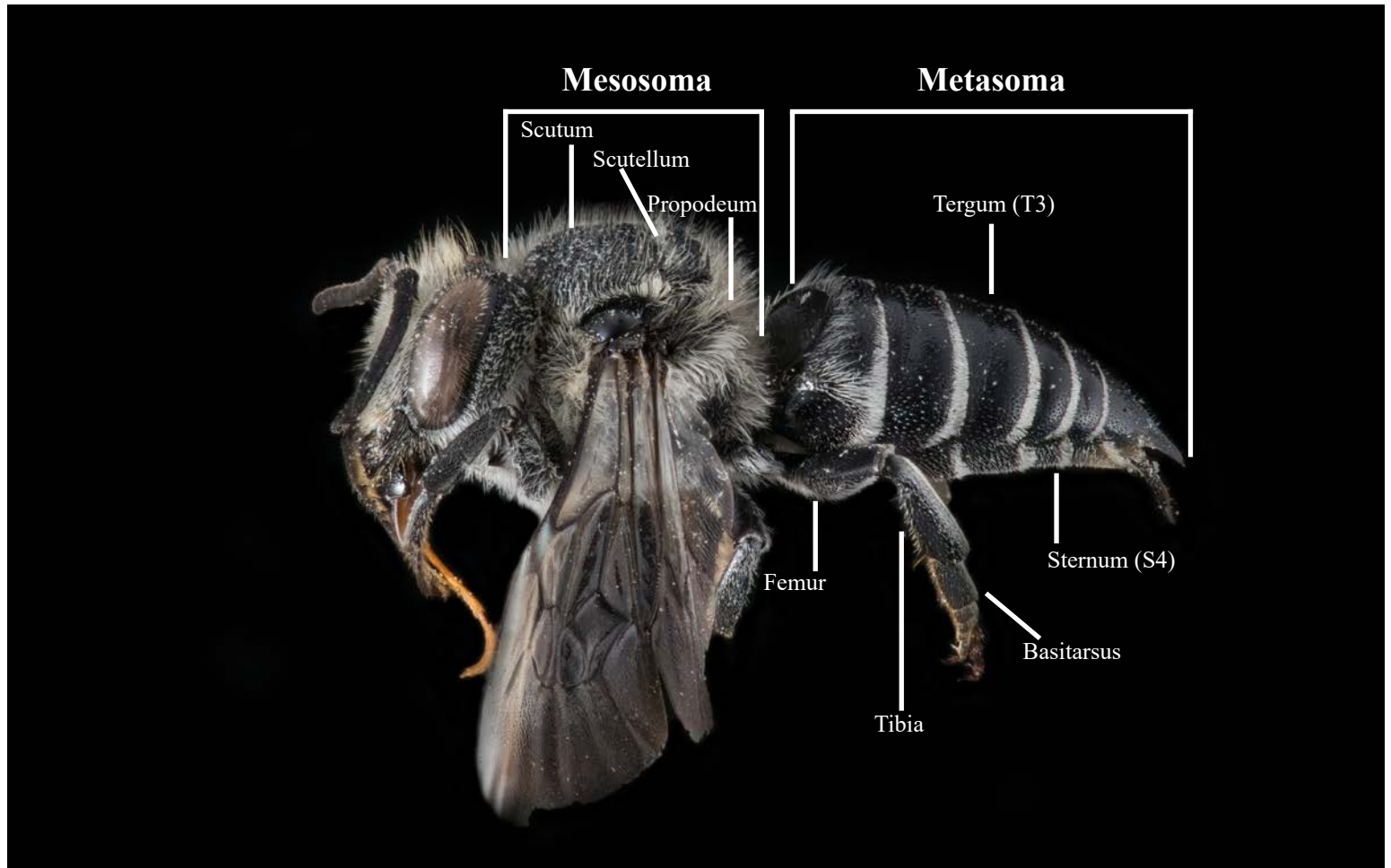


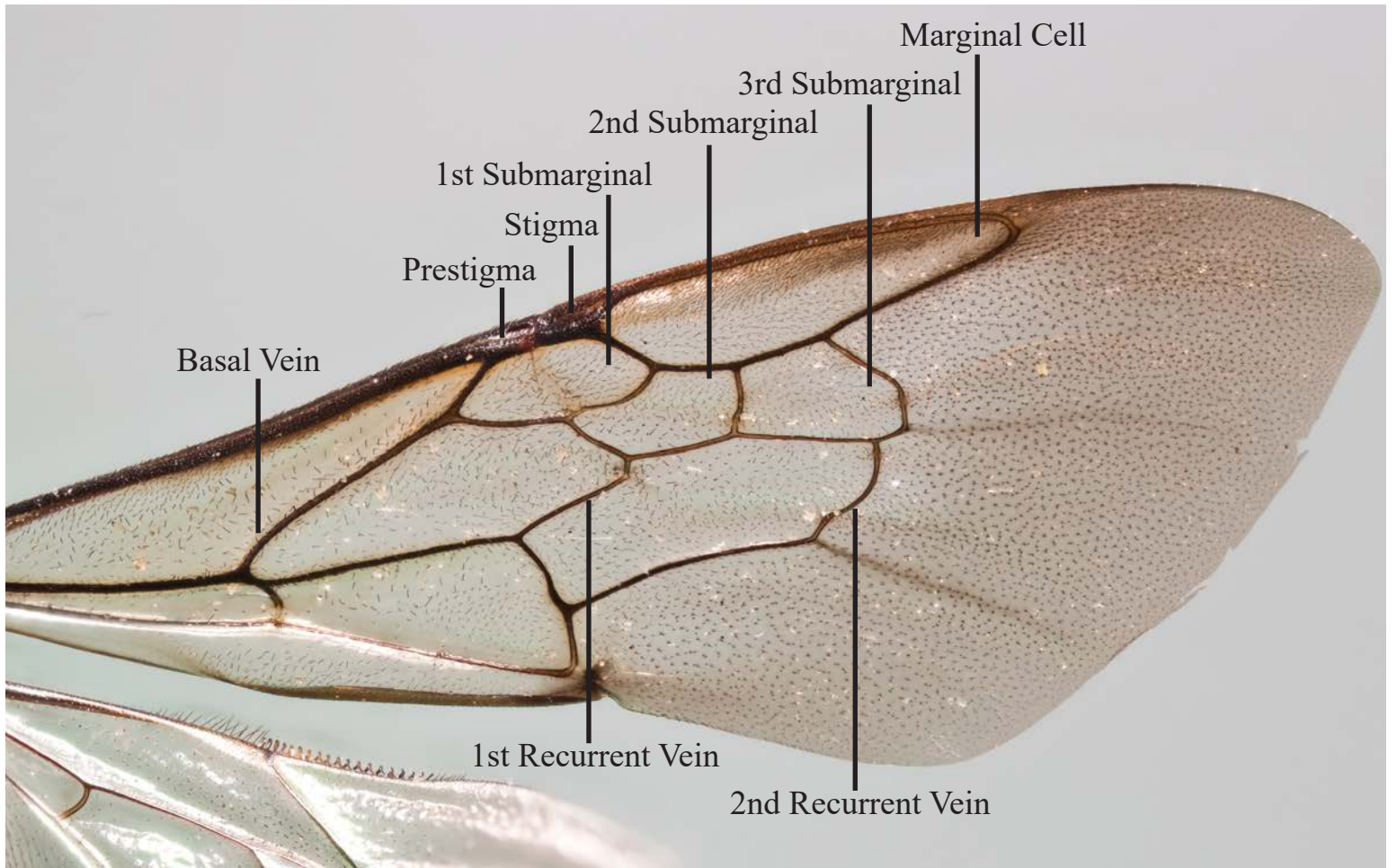
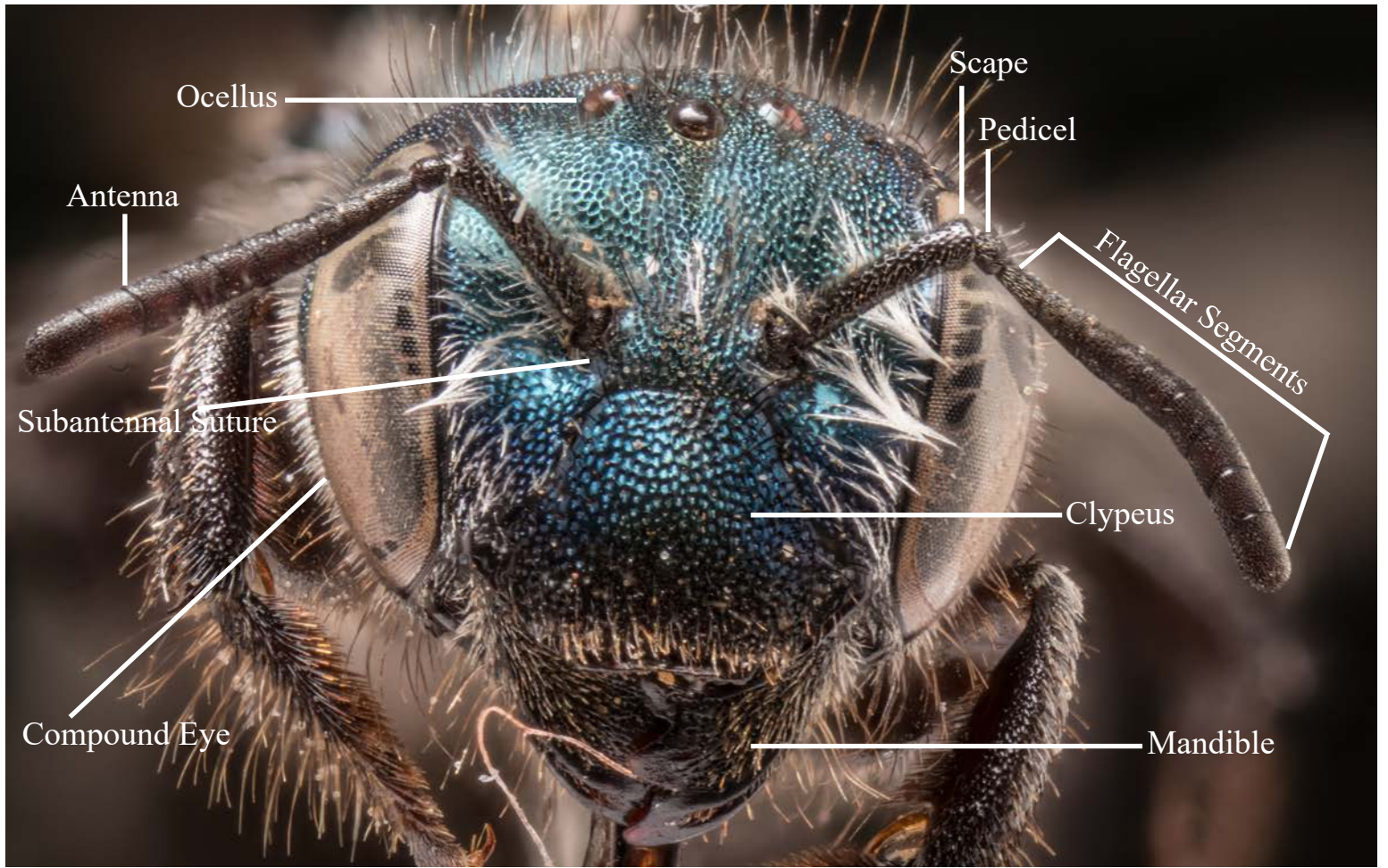
My field set-up with 100mm macro and diffused flash

3. Select Anatomy

The following diagrams provide an overview of select anatomical characteristics of bees. These diagrams are far from comprehensive, focusing instead on the characters most widely used in the guide, making it an easy reference when working through the keys. A glossary on the following pages provides descriptions of many of the more esoteric anatomical terms.

The first diagram is a bee in profile, focusing on the anatomy of the mesosoma, metasoma, and legs. The second diagram is a face-on view, focusing on some elements of the head. The third diagram illustrates some of the important forewing characteristics. Complete and comprehensive diagrams can be found in Charles Michener's [*The Bees of the World*](#).





4. Glossary of Terms

Antenna (pl. antennae): One of a pair of sensory organs located on the face of a bee.

Arolium (pl. arolia): The pad between the tarsal claws on the feet of some bees.

Basitarsus: The first and largest tarsal segment, located directly beneath the tibia.

Carina: An elevated keel or ridge.

Clypeus: The plate on the face directly below the antennae and above the labrum.

Corbicula: A smooth, largely bare area surrounded by long hairs, which is used to transport pollen.

Flagellum (pl. flagella): One of the antennal segments after the scape and pedicel. Females have ten flagellar segments, males have eleven.

Fovea: A shallow, but distinct depression in the integument, most notably on the face of Andrenid bees.

Integument: The external, protective layer on the body of an insect.

Labrum: The flap that covers the mouthparts and is attached at the apical edge of the clypeus.

Mandible (pl. mandibles): One of the pair of oral appendages near the mouth of a bee, generally used for cutting, chewing, molding, or grasping.

Mesepisternum: The lateral, anterior portions of the mesosoma.

Mesosoma: The middle body part, composed of what is traditionally known as the thorax, and the propodeum, which is anatomically the first abdominal segment.

Metasoma: The third and final body part, composed of all the abdominal segments, save for the propodeum.

Ocellus (pl. ocelli): One of the three simple eyes located near the top of the head, used for the detection of light and directional orientation.

Parapsidal lines: Depressions in the integument on each side of the scutum near the base of the wings.

Pedicel: The second, articulating segment of the antenna.

Pronotal lobe: A small lobe on the pronotum--the first mesosomal segment, which is usually collar-shaped. The pronotal lobe is a defining characteristic of bees and Apoid wasps.

Propodeum: The rear, vertical portion of the mesosoma. Anatomically, the propodeum is the first abdominal segment.

Psuedopygidial area: An area in the middle of T5 of some female bees which is similar in appearance to a pygidial plate.

Pygidial plate: A well-defined plate at the apex of the metasoma, which is present in many ground-nesting bees.

Scape: The first, basal segment of the antenna.

Scopa (pl. scopae): A brush of long, dense hairs modified for pollen transport.

Scutum: The largest dorsal segment of the mesosoma, located directly behind the pronotum.

Scutellum: A dorsal segment of the mesosoma lying just behind the scutum.

Sternum (pl. sterna): A ventral segment of the metasoma. Generally, six segments are exposed in both males and females.

Tarsus (pl. tarsi): The last segment of the leg, itself composed of five segments in bees.

Tegula: A sclerotized plate above the base of the forewing.

Tergum (pl. terga): An upper, dorsal segment of the metasoma. Females generally have six exposed terga, and males generally have seven.

5. Field Key to Bees

This simple, five-step key is designed to help those new to bees in pursuing an identification either in the field or from a photo. While this key does not provide a positive identification to genus, it creates a system for comparison between different, artificial groupings of bees that helps narrow the options to several genera with superficially similar “looks,” after which the genus accounts later in the guide may further help to narrow the options. This is a good way to begin to train your eyes to recognize differences in groups of bees.

1. Body brightly metallic [fig. 1]...Consider: *Agapostemon* (pg. 57), *Osmia* (pg. 81), *Ceratina* (pg. 35), some *Lasioglossum* (pg. 61)

Body variously colored. If metallic, then more weakly so [fig. 2]...2



Fig. 1: Body brightly metallic



Fig. 2: Body weakly metallic

- 2(1). Very small, sparsely-haired dark bee with pale markings at most on face and legs [fig.3] ...Consider: *Hylaeus* (pg. 55), *Panurginus* (pg. 51), *Hoplitis* (pg. 79), *Heriades* (pg. 78), *Ceratina* (pg. 35), some *Lasioglossum* (pg. 61), *Dioxys* (pg. 70)

Bee larger and/or differently colored and/or hairy [figs. 4,5]...3



Fig. 3: Pale markings on face and legs



Fig. 4: Pale markings throughout



Fig. 5: Bee more densely-haired

3(2). Bee with cream, yellow, orange, or red markings on body [figs. 6,7]...Consider: *Nomada* (pg. 44), *Anthidium* (pg. 66), *Stelis* (pg. 68), *Sphecodes* (pg. 63), *Ashmeadiella* (pg. 76)

Bee lacking pale markings on body, or if present, these markings restricted to the face [fig. 8]...4



Fig. 6: Bee with cream markings



Fig. 7: Bee with red markings



Fig. 8: Bee with pale markings only on face

4(3). Bee with distinct and complete pale hair bands on all or most metasomal terga, alternating with relatively hairless areas [figs. 9,10]...Consider: *Halictus* (pg. 59), *Lasioglossum* (pg. 61), *Andrena* (pg. 48), *Colletes* (pg. 53), *Anthophora* (pg. 29), *Eucera* (pg. 39), *Melissodes* (pg. 41), *Coelioxys* (pg. 72)

Bee without distinct and complete pale hair bands on metasomal terga. Bee either more densely-haired or with large portions of the metasoma sparsely-haired, sometimes smooth and shiny, occasionally metallic [fig. 11]...5



Fig. 9: Bee with distinct pale hair bands



Fig. 10: Bee with thin but distinct hair bands



Fig. 11: Bee more densely-haired

5(4). Bee with metasoma sparsely-haired, at least after second tergum; hairs often messy and uneven when present [**fig. 12**]...Consider *Andrena* (pg. 48), *Lasioglossum* (pg. 61), *Dufourea* (pg. 65), *Xylocopa* (pg. 46), *Osmia* (pg. 81)

Bee usually densely-haired throughout [**fig. 13**]...Consider: *Bombus* (pg. 32), *Diadasia*, (pg. 37), *Anthophora* (pg. 29), *Melissodes* (pg. 41)



Fig. 12: Metasoma sparsely-haired



Fig. 2: Body densely-haired throughout

6. Key to the Bee Genera of the Willamette Valley



Using the Key:

Users of this key will ideally have a specimen in hand. A high quality photo or a chilled specimen will occasionally suffice, especially with experience. Each step (couplet) consists of two possible, mutually exclusive choices. Each couplet is numbered, and the number of the preceding couplet is noted in parentheses. With few exceptions, the most important characteristics in each couplet are illustrated. With each illustration, the color of the border represents the minimum magnification required to view the characteristic:

0-10x

10x-20x

20x-60x

The first character in the key refers to the number of submarginal cells on the forewing. To simplify the key, *Andrena*, *Nomada*, and *Sphecodes* are only included amongst genera with three submarginal cells. On rare occasions, species in each of these genera may only possess two submarginal cells and will not key appropriately. If there is any confusion, the key is simple enough to run a specimen through both ends of the key without investing much time.

This key borrows in format from the CANPOLIN Key to Bee Genera of Canada (2012).

1. Forewing with three submarginal cells [fig. 1]...2

Forewing with two submarginal cells [fig. 2]...19



Fig. 1: Forewing with three submarginal cells

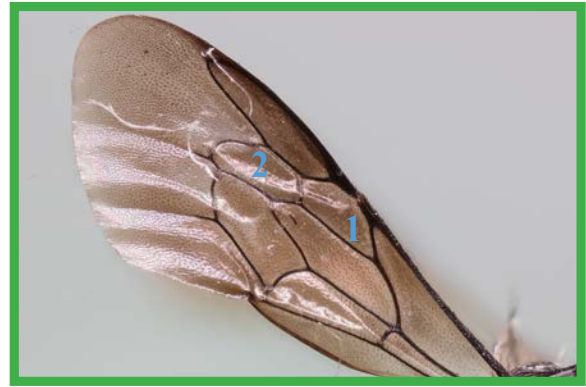


Fig. 2: Forewing with two submarginal cells

2(1). Hind tibial spurs absent [fig. 3]; eyes conspicuously hairy [fig. 4]; females with tibial corbicula; males with eyes holoptic...*Apis mellifera* (pg. 31)

Hind tibial spurs present [fig. 5]...3



Fig. 3: Hind tibial spurs absent



Fig. 4: Eyes conspicuously hairy



Fig. 5: Hind tibial spurs present

3(2). Hindwing without jugal lobe [fig. 6]; densely hairy throughout, with contrasting dark and pale colors; females with tibial corbicula, except in subgenus *Psithyrus*...*Bombus* (pg. 32)

Jugal lobe present on hindwing [fig. 7]; females lacking tibial corbicula...4



Fig. 6: Jugal lobe absent on hind wing

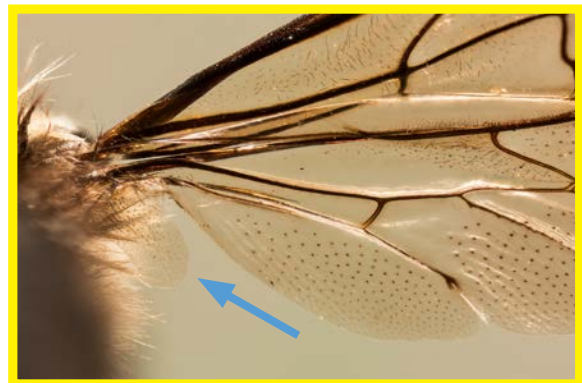


Fig. 7: Jugal lobe present on hind wing

4(3). Forewing with basal portion of second recurrent vein arched outwardly, approximating an S-shape [fig. 8]...*Colletes* (pg. 53)

Forewing with basal portion of second recurrent vein not outwardly arched, though vein may be sinuous along its length [fig. 9]...5



Fig. 8: 2nd recurrent vein outwardly arched basally



Fig. 9: 2nd recurrent vein not outwardly arched basally

5(4). Forewing with basal vein strongly arched in basal portion [fig. 10]; females typically with pseudopygidial area on T-5--an area of short, dense hair or fine punctation. [fig. 11]...6

Forewing with basal vein not strongly arched in basal portion [fig. 12]; females lacking pseudopygidial area on T-5 [fig. 13]; if present, then in parasitic genera lacking scopa...9



Fig. 10: Basal vein strongly arched basally



Fig. 11: Female T5 with pseudopygidial area



Fig. 12: Basal vein not strongly arched basally



Fig. 13: Female T5 lacking pseudopygidial area

6(5). Head and mesosoma, and sometimes metasoma in females, brilliant metallic green [fig. 14]; males with yellow bands on metasoma, legs, mandibles and clypeus; propodeum encircled by a carina [fig. 15]...*Agapostemon* (pg. 57)

Body black, brown, or dully metallic, sometimes with red metasoma; if more brightly metallic, then smaller, and without above features...7



Fig. 14: Integument bright metallic green



Fig. 15: Carina encircling propodeum

7(6). Metasoma red; females without scopae [fig. 16]; if metasoma black, then integument is coarsely sculptured; small bees <8mm...*Sphecodes* (pg. 63)

Variously colored; if metasoma red (rare) then females with scopae on hind legs [fig. 17] and males with outer wing veins weakened [fig. 18]...8



Fig. 16: Female lacking scopae



Fig. 17: Female with scopae present



Fig. 18: Outer wing veins slightly weakened

8(7). Metasoma with distinct and complete pale hairbands apically on terga [fig. 19] (these may be abraded in worn specimens); integument usually black to brown, but sometimes dully metallic ...*Halictus* (pg. 59)

Often lacking distinct hair bands on terga, but if present, then located basally [fig. 20]; outer wing veins weakened, especially in females [fig. 18] (this character not always evident); integument variously colored, frequently somewhat metallic in smaller specimens ...*Lasioglossum* (pg. 61)



Fig. 19: Hair bands present apically on terga



Fig. 20: Hair bands present basally on terga

9(5). Axilla produced ventrally into a spine, not continuing outline of scutellum [fig. 21]; females lacking scopae...10

Axilla not produced, continuing outline of scutellum [fig. 22]...11



Fig. 21: Axilla produced as spines



Fig. 22: Axilla not produced

10(9). Pseudopygidial area on T5 of female at least half as long as wide; pygidial plate of male sinuous and widened anteriorly...*Triepeolus* (not covered in guide)

Pseudopygidial area on T5 of female usually less than half as long as wide; pygidial plate of male not sinuous; less common...*Epeolus* (not covered in guide)

11(9). One subantennal suture under each antenna (this character difficult to see in many cases) [fig. 23]; facial fovea absent in both sexes [fig. 24]...12

Two subantennal sutures under each antenna [fig. 25]; facial fovea present at least in females, and covered densely in short hairs [fig. 26]...*Andrena* (pg. 48)



Fig. 23: One subantennal suture



Fig. 24: Facial fovea absent



Fig. 25: Two subantennal sutures



Fig. 26: Facial fovea present

12(11). Integument marked at least with spots of yellow and/or orange and/or red [fig. 27]; distinct hair bands absent on metasoma; females lacking scopa...*Nomada* (pg. 44)

Integument with pale markings at most present on face, though in some species spots of pale, appressed hair may appear as pale markings [fig. 28]...13



Fig. 27: Integument marked widely with red



Fig. 28: Integument with spots of pale, appressed hair

13(12). Stigma absent on forewing; marginal cell extremely long and narrow [fig. 29]; metasoma without pale hairs extending beyond first tergum; large, *Bombus*-like bees...*Xylocopa* (pg. 46)

Stigma present, marginal cell not as above [fig. 30]; metasomal vestiture widely variable...14

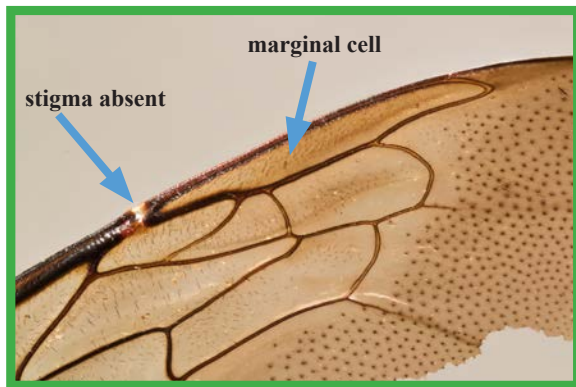


Fig. 29: Stigma absent, marginal cell long & narrow

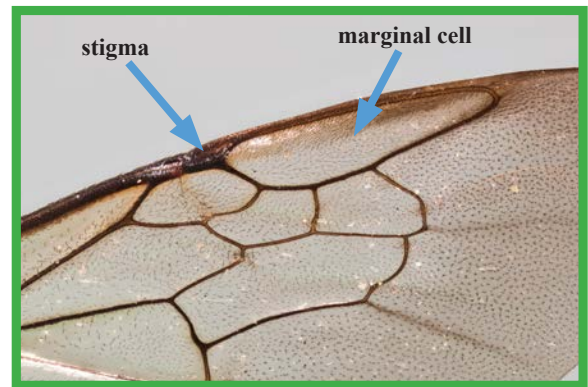


Fig. 30: Stigma present, marginal cell shorter

14(13). Forewings with closed cells mostly without hair [fig. 31]...15

Forewings with hair clearly present in closed cells [fig. 32]...16



Fig. 31: Closed cells mostly hairless



Fig. 32: Closed cells with hair

15(14). Scutellum with two processes [fig. 33], sometimes hidden by hair; females lacking scopae; if pale hairs extend past T2, then forming patches rather than bands...*Melecta* (pg. 43)

Scutellum rounded, without processes [fig. 34]; females with scopae on hind legs...*Anthophora* (pg. 29) **Note:** *Habropoda* will also resolve here, but the genus is likely not found in the Valley.



Fig. 33: Scutellum with two processes



Fig. 34: Scutellum lacking processes

16(14). Integument blue-green and shiny metallic [fig. 35]; sparsely-haired; males at least with some pale markings on clypeus...*Ceratina* (pg. 35)

Integument never metallic; densely-haired at least on mesosoma [fig. 36]...17



Fig. 35: Integument shiny metallic & sparsely-haired



Fig. 36: Integument not metallic & hairier

17(16). Vertex of head evenly convex throughout [fig. 37]; second abscissa of vein M+Cu on hind wing less than $\frac{2}{3}$ as long as M and less than 1.6x as long as cu-v [fig. 38]; females densely hairy overall..*Diadasia* (pg. 37)

If vertex of head convex, then only between lateral ocellus and compound eye and not evenly rounded throughout [fig. 39]; second abscissa of M+Cu on hindwing more than $\frac{2}{3}$ as long as M and more than 1.6x as long as cu-v [fig. 40]...18



Fig. 37: Vertex of head evenly convex



Fig. 38: Lengths of veins on hind wing



Fig. 39: Vertex of head more linear

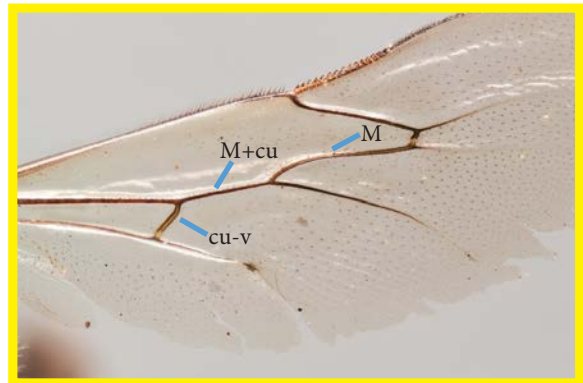


Fig. 40: Lengths of veins on hind wing

18(17). Tegula narrowed anteriorly, and with lateral concave margin [fig. 41]; males with elongate antennae, paler below; summer bees, not likely to be found before June...*Melissodes* (pg. 41)

Tegula not narrowed anteriorly, and rounded throughout [fig. 42]; males with elongate antennae, black above and below; spring bees, not likely to be found after July...*Eucera* (pg. 39)



Fig. 41: Tegula narrowed anteriorly



Fig. 42: Tegula rounded, not narrowed anteriorly

19(1). Portion of marginal cell along edge of forewing not much longer than stigma [fig. 43], and second submarginal cell less than $\frac{2}{3}$ as long as first; very small bees...*Perdita* (not covered in guide)

Forewing characteristics not as above...**20**

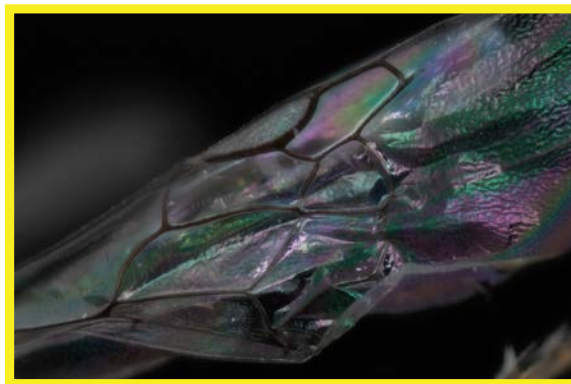


Fig. 43: Edge of forewing nearly equal to stigma

20(19). Axilla produced ventrally into a spine, not continuing outline of scutellum [fig. 44]; females lacking scopae...**21**

Axilla not produced, continuing outline of scutellum [fig. 45]...**22**



Fig. 44: Axilla produced as spines



Fig. 45: Axilla not produced

21(20). Eyes not hairy; mesosoma with medial tubercle [fig. 46], metasoma rounded posteriorly [fig. 47]; male metasoma lacking apical spines...*Dioxys* (pg. 70)

Eyes conspicuously hairy [fig. 48]; metanotum without medial tubercle; female metasoma acutely tapered [fig. 49]; male metasoma with apical spines...*Coelioxys* (pg. 72)

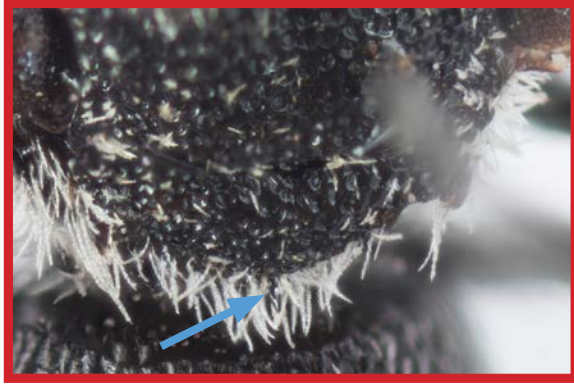


Fig. 46: Mesosoma with medial tubercle



Fig. 47: Metasoma rounded



Fig. 48: Eyes conspicuously hairy



Fig. 49: Metasoma tapered

22(20). Forewing with second submarginal cell much shorter than first [fig. 50]; females lacking scopa; small black bees, usually with pale integumental markings at least on face, but not on metasoma...*Hylaeus* (pg. 55)

Forewing with second submarginal cell at least $\frac{2}{3}$ as long as first and usually receiving first recurrent vein [fig. 51]...23



Fig. 50: 2nd submarginal cell much shorter than first



Fig. 51: 2nd submarginal cell at least $\frac{2}{3}$ as long as first

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Fig. 52: One subantennal suture



Fig. 53: Facial fovea absent

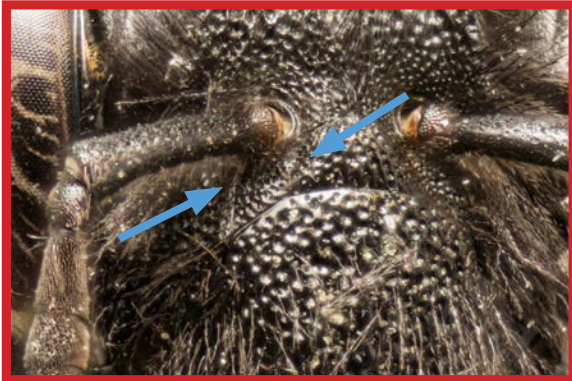


Fig. 54: Two subantennal sutures



Fig. 55: Facial fovea present

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Fig. 62: Arolia present on feet

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Fig. 65: Arolia absent on feet



Fig. 66: Arolia present on feet

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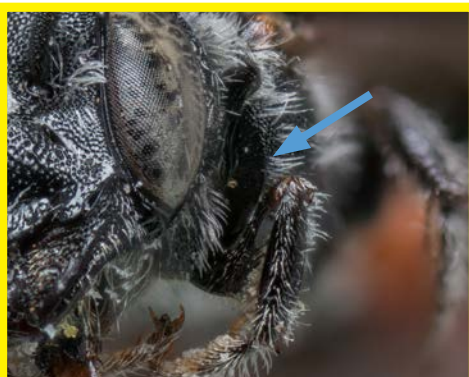


Fig. 67: Mesepisternum divided by carina



Fig. 68: Metasoma with four apical teeth



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Fig. 71: Parapsidal lines nearly as broad as long



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Not as above...*Hoplitis* (pg. 79)

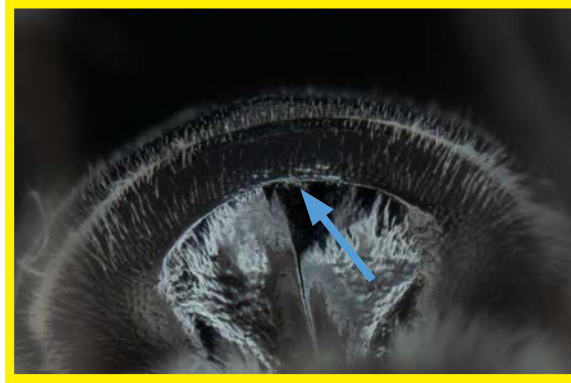


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7. Genus Accounts

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Anthophora

Family: Apidae

Tribe: Anthophorini

At a glance: *Anthophora* are medium to moderately large bees, generally robust and fairly hairy, sometimes with pale hairbands on the metasoma. Females with dense scopal hairs on hind legs. Common in spring through early summer, sometimes in urban environments. Most similar to *Eucera*, *Melissodes*, *Diadasia*.

Identification: Forewings with three submarginal cells. The closed cells on the forewings are mostly hairless, in contrast with those in Eucerine bees. The first recurrent vein intersects the second submarginal cell near its middle. Males lack the greatly elongated antennae of

Eucerine bees. Male generally have extensive pale markings on the clypeus, which often extend elsewhere onto the face and mandibles.

Notes: *Anthophora* construct individual nests in soil or in earthen banks, sometimes in large aggregations. This genus is common in the Valley and can be found from March-July. Males may often be found patrolling circuits for females around preferred floral hosts.



An *Anthophora* female. This species is more densely-haired on the metasoma than many others in the genus.



Anthophora urbana male showing the metasomal hair bands that are common in the genus, and the pale markings on the face which are present in males.



Anthophora female showing the moderate size and robust form typical of the genus.

Apis mellifera

Family: Apidae

Tribe: Apini

At a glance: *Apis* are moderately-large bees, usually with honey-colored hair on the face and mesosoma, extending onto the metasoma in loose and shaggy hair bands. Darker forms are present in the Valley, but are much less common. Most similar to *Bombus*.

Identification: *Apis mellifera* is the only representative of *Apis*--a largely Eurasian genus--in our area. They are morphologically and behaviorally distinct from all native bees on the continent north of Mexico. They can be readily distinguished by the combination of three submarginal cells on the forewing, hairy eyes, and hind tibia with spurs lacking. Females carry a wetted mass

of pollen in a corbicula on the hind tibia, a feature shared only with non-parasitic *Bombus* in our region. Though very dark color forms can be encountered, the frequent honey-gold coloration on the abdomen is also quite distinctive. Males are rarely encountered, but are notable for being holoptic, or having eyes which meet at the top of the head.

Notes: Introduced from Europe in 1622, *Apis mellifera* is the only highly social bee species in our region. In contrast to *Bombus* species with short-lived annual hives, *Apis* forms “permanent” hives which can ostensibly last indefinitely, and queens never take part in foraging duties. I’ve observed a hive persisting in a barn wall for longer than five years. *Apis mellifera* can be found throughout the region, and can be extremely abundant locally, especially in proximity to managed hives.



Apis mellifera female showing the combination of hairy eyes and tibial corbicula which set it apart from other genera.

Bombus

Family: Apidae

Tribe: Bombini

At a glance: *Bombus* are medium to very large, robust bees, generally densely-haired throughout, with a mix of black and paler hair colors, sometimes including bright yellows and oranges. The integument is a somewhat shiny black. Most similar to *Xylocopa*, *Apis*.

Identification: Forewings with three submarginal cells. Females carry pollen in corbicula on the hind tibia, except for cleptoparasitic species in the subgenus *Psithyrus*. *Bombus* can be differentiated from superficially similar *Xylocopa* by the lack of a jugal lobe on the hind wing, and the presence of a stigma on the forewing. Vestiture is a mix of darker and lighter

hairs, with either banding or more extensive areas of orange, yellow, or white hairs on the metasoma.

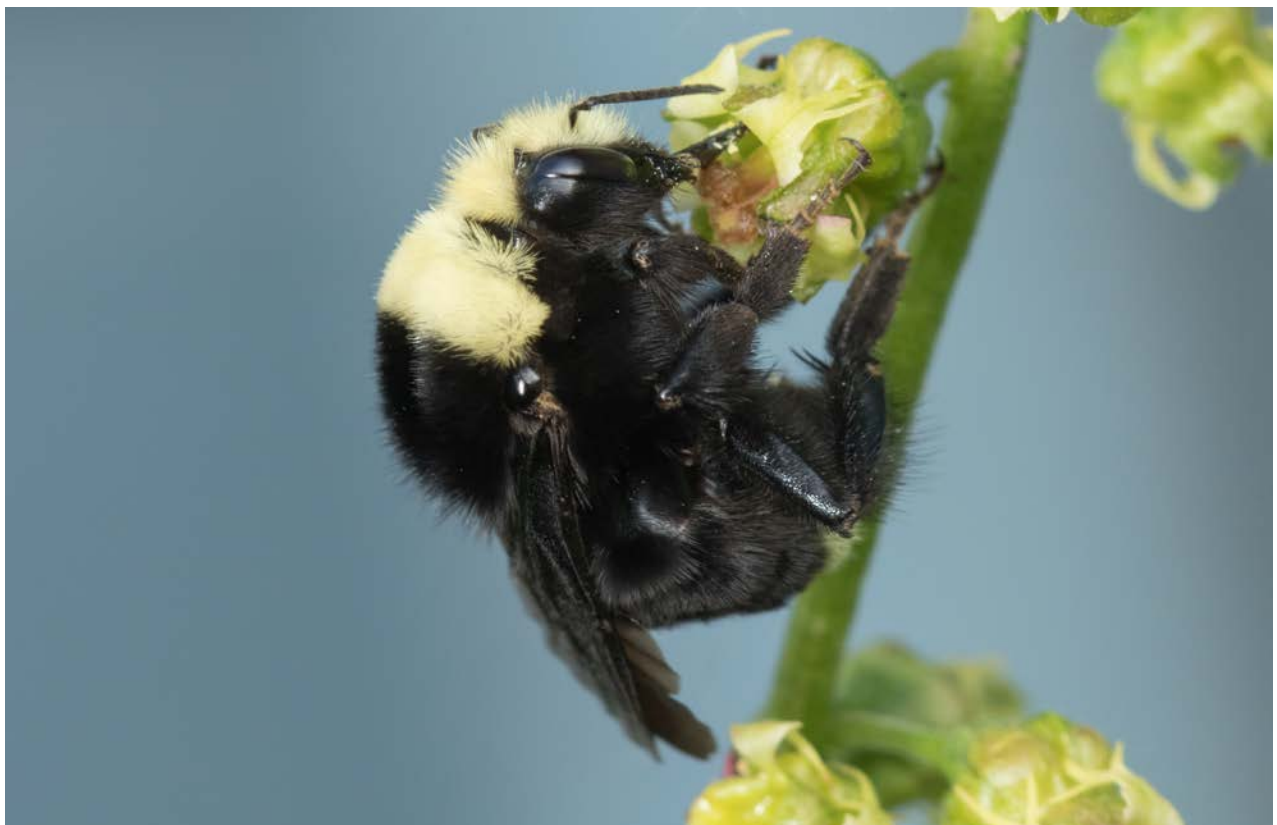
Notes: All *Bombus* are primitively eusocial except for those in the subgenus *Psithyrus*, which are cleptoparasitic and subvert existing nests of non-parasitic *Bombus*, dominating or killing the queen and forcing the workers to provide for the invader's offspring. Queens of some species (eg. *Bombus vosnesinskii*) may be found on warm days in mid-late winter. Queens of some other species (eg. *Bombus fervidus*) are rarely found before late April. Workers of each species are generally found once queens are no longer active, assuming the foraging duties. These are followed by males and new, prospective queens (gynes), which will establish their own annual colonies in the following year. *Bombus* diversity is high in our region, and as many as fifteen species may be found in the Valley and surrounding foothills.



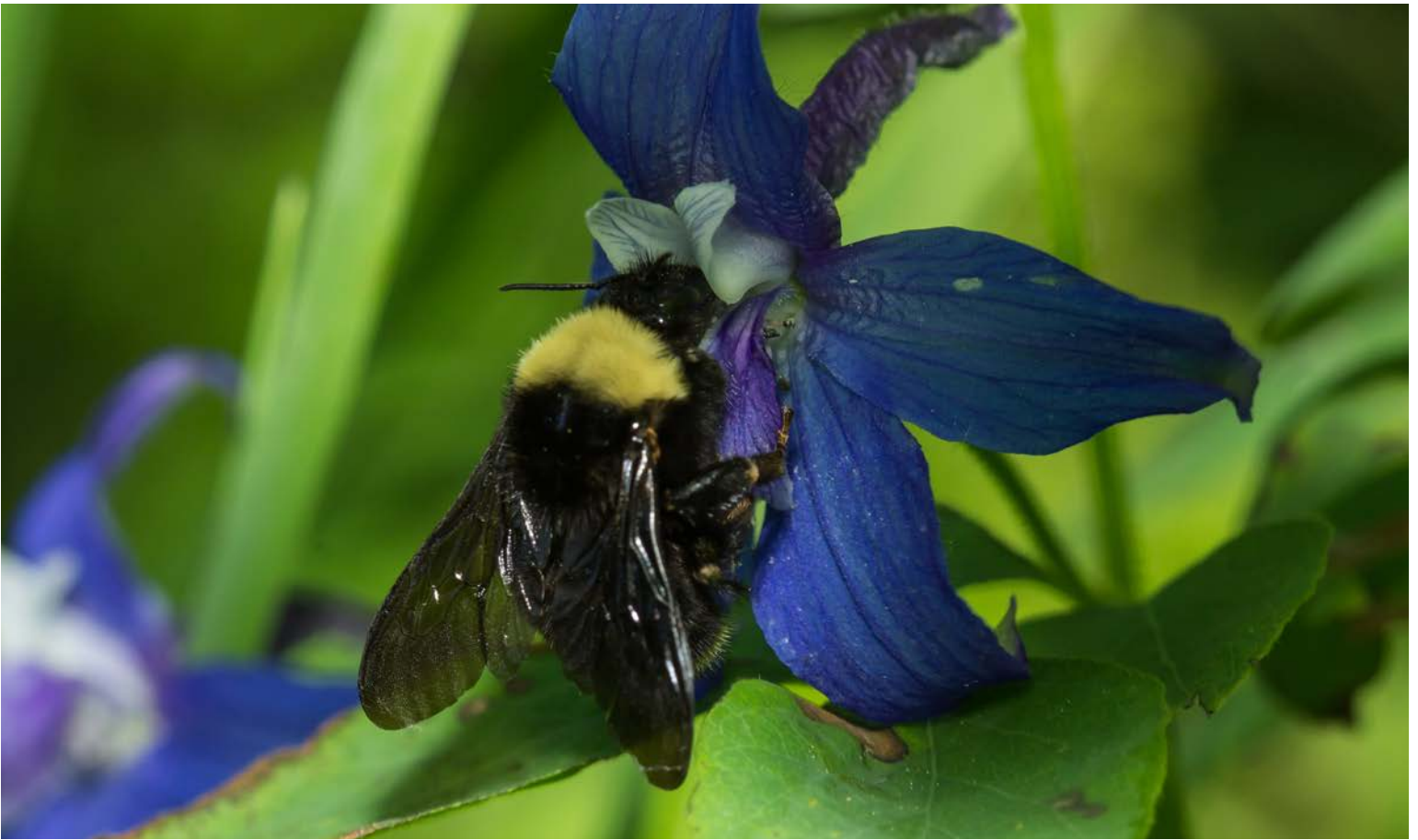
Bombus appositus queen showing the corbicula on the hind tibia, extensive pale hairs, and robust body form.



Bombus insularis, a cleptoparasitic female in the subgenus *Psithyrus*, showing the lack of corbicula on the hind tibia.



Bombus vosnesinskii, a very common species throughout Western Oregon.



Bombus fervidus, a later-emerging species with queens flying April-May.



Bombus mixtus, one of the smaller and more variably-colored species in the Valley.

Ceratina

Family: Apidae

Tribe: Ceratinini

At a glance: *Ceratina* are small, metallic blue-green to nearly black, sparsely-haired bees, frequently with pale markings on the clypeus. Terga are constricted at the margins, lending a ribbed or wavy appearance to the metasoma. Most similar to *Lasioglossum*.

Identification: Forewings with three submarginal cells. Pale markings on the clypeus present in most females and all males, but always lacking in paraocular areas in females. Both sexes appearing nearly hairless and shiny. Females with sparse scopa on hind legs. Males with angular projections on the underside of the hind femur.

Notes: *Ceratina* nest in pithy stems, and lay eggs in unlined cells which are separated by re-combined pithy material. Nesting is generally solitary, but nests in some occasions may be occupied by multiple females. *Ceratina* can be found from early-spring to early-fall in the Valley, and appear particularly abundant during the month of August.



A *Ceratina* female showing the sparse hair, pale markings on the clypeus, and metallic integument.



A *Ceratina acantha* female showing the small relative size of the genus. Note that this female is lacking any pale markings.



A *Ceratina* female showing a small, vertical pale marking on the clypeus, which is unique to some females in the genus.

Diadasia

Family: Apidae

Tribe: Emphorini

At a glance: *Diadasia* are small to medium bees, robust and exceptionally hairy, often with pale hairbands on the metasoma. Females with long, filamentous scopal hairs on hind legs. Found in conjunction with host plants. Fairly uncommon in our area. Most similar to *Anthophora*, *Eucera*, *Melissodes*.

Identification: Forewings with three submarginal cells. *Diadasia* are readily distinguished in our area from superficially similar-looking bees by a uniformly rounded vertex of the head, whereas in the Eucerini, the vertex of the head is at most rounded only medially. Males lack the greatly elongated antennae found in

Eucerine males. On the hindwing, the vein cu-v is little if any shorter than the second abscissa of vein M+Cu, which is significantly shorter than vein M.

Notes: *Diadasia* nest in soil and generally construct raised turrets at the nest entrance. This genus is composed of floral specialists. In the Valley, the Convolvulaceae specialist *Diadasia bituberculata* can be found during the bloom period of its hosts, which includes non-native bindweed (*Convolvulus*) species. *Diadasia* which specialize on checkermallows in the genus *Sidalcea* are likely present in the valley as well.



A female *Diadasia diminuta* (a species likely not found in the Valley). The robust body shape and overall hairiness with filamentous scopae are characteristic.



Diadasia diminuta showing the rounded vertex of the head.



Diadasia nigrifrons. A number of species are pollen specialists of flowers in the Mallow family (Malvaceae).

Eucera

Family: Apidae

Tribe: Eucerini

At a glance: *Eucera* are medium bees, generally robust and fairly hairy, sometimes with pale hairbands on the metasoma. Females with long, dense scopal hairs on hind legs. Males with extremely long antennae which are uniformly black. Common in spring, but found in urban environments with less frequency than *Melissodes*. Most similar to *Anthophora*, *Melissodes*, *Diadasia*.

Identification: Forewings with three submarginal cells. Tegulae are rounded throughout, in contrast to the tegulae of *Melissodes*, which are narrowed anteriorly. Hair is present throughout the closed cells on the forewings,

in contrast with *Anthophora*, which have closed cells mostly hairless. Males with elongate antennae which are uniformly black. Males with pale markings on the face, but usually less extensive than in *Anthophora*. Females with dense scopa on hind legs. *Eucera* are found from March-June, while *Melissodes* are found from June-September.

Notes: *Eucera* construct individual nests in soil. This genus is common in the Valley and can be found from March-June. The genus can be found in association with a wide variety of flowers. I very commonly find male *Eucera* “sleeping” in the flowers of cat’s ears (*Calochortus tolmiei*) in evenings or on cooler days.



A female *Eucera* showing the robust body form of the genus.



A male *Eucera* showing the extremely elongate antennae which are black both above and below.

Melissodes

Family: Apidae

Tribe: Eucerini

At a glance: *Melissodes* are medium bees, generally robust and fairly hairy, sometimes with pale hairbands on the metasoma. Females with long, dense scopal hairs on hind legs. Males with extremely long antennae which are usually paler below than above. Very common in summer, especially among plants in the family Asteraceae. Most similar to *Anthophora*, *Eucera*, *Diadasia*.

Identification: Forewings with three submarginal cells. Tegula are narrowed anteriorly, in contrast to the tegula of *Eucera*, which are rounded throughout. Hair is present throughout the closed cells on the forewings,

in contrast with *Anthophora*, which have closed cells mostly hairless. Males with elongate antennae which are paler below than above. Males with pale markings on the face, but usually less extensive than in *Anthophora*. Females with dense scopa on hind legs. *Melissodes* are found from June-September, while *Eucera* are found from March-June.

Notes: *Melissodes* construct individual nests in soil. This genus is very common in the Valley, including in urban environments, and can be found into early fall. They are particularly fond of plants in the family Asteraceae, and a species found in the Eugene area specializes on Willamette Valley gumweed (*Grindelia integrifolia*). A *Clarkia* specialist is also likely present in the Valley.



A *Melissodes* female showing the robust body form and dense scopa, as well as the protuberant clypeus.



A *Melissodes* male with the characteristic long antennae which are paler in color below than above.



A *Melissodes* female showing the extensive, dense scopal hairs on the hind legs.

Melecta

Family: Apidae

Tribe: Melectini

At a glance: *Melecta* are moderately-sized bees with black integument and dense hairs at least on the mesosoma, with hairs similar in color and form extending onto the first tergum. Most similar to *Anthophora*.

Identification: Forewings with three submarginal cells. Hair is variously colored, and may include patches of short, appressed white hair on the metasoma as in *Melecta separata*. Hair on the first tergum is of similar color and length as the hair on the mesosoma. Hairs are lacking in the interior cells of the forewing as in *Anthophora*. Two processes are present on the

scutellum. Antennal segments are short and thickened. Females are cleptoparasitic and lack scopa.

Notes: *Melecta* are cleptoparasites of *Anthophora*. One or two species may be present in the Willamette Valley. While not in the Valley proper, I have found *Melecta separata* at Horse Rock Ridge in the foothills just north and east of Eugene.



A *Melecta separata* female showing the pale metasomal hair patches, modified antennae, and lack of scopa.

Nomada

Family: Apidae

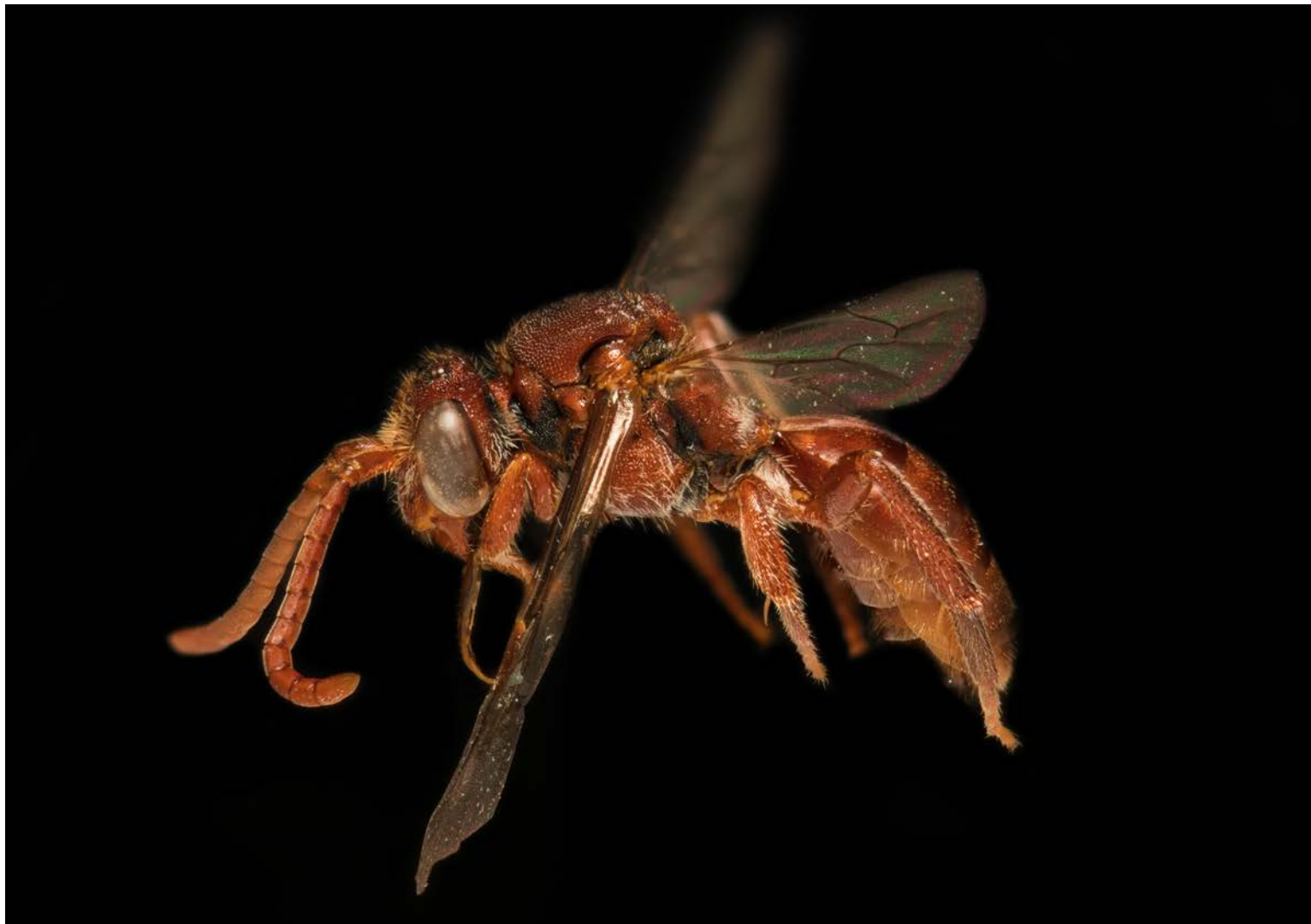
Tribe: Nomadini

At a glance: Bees in the genus *Nomada* are slender and wasp-like, and small to medium in size. *Nomada* are sparsely-haired and always have at least some yellow, red, or orange markings on the integument if they are not more thoroughly marked in these colors. Most similar to *Anthidium*, *Stelis*.

Identification: Forewings usually with three submarginal cells, but occasionally with only two in some species. The cleptoparasitic females lack scopa and both sexes are sparsely-haired, especially on the metasoma. The integument is often black with yellow, orange, or red markings, though species with

a predominantly red or orange integument are not uncommon in our area. These are distinctive bees which can be easily recognized in the field with a little practice.

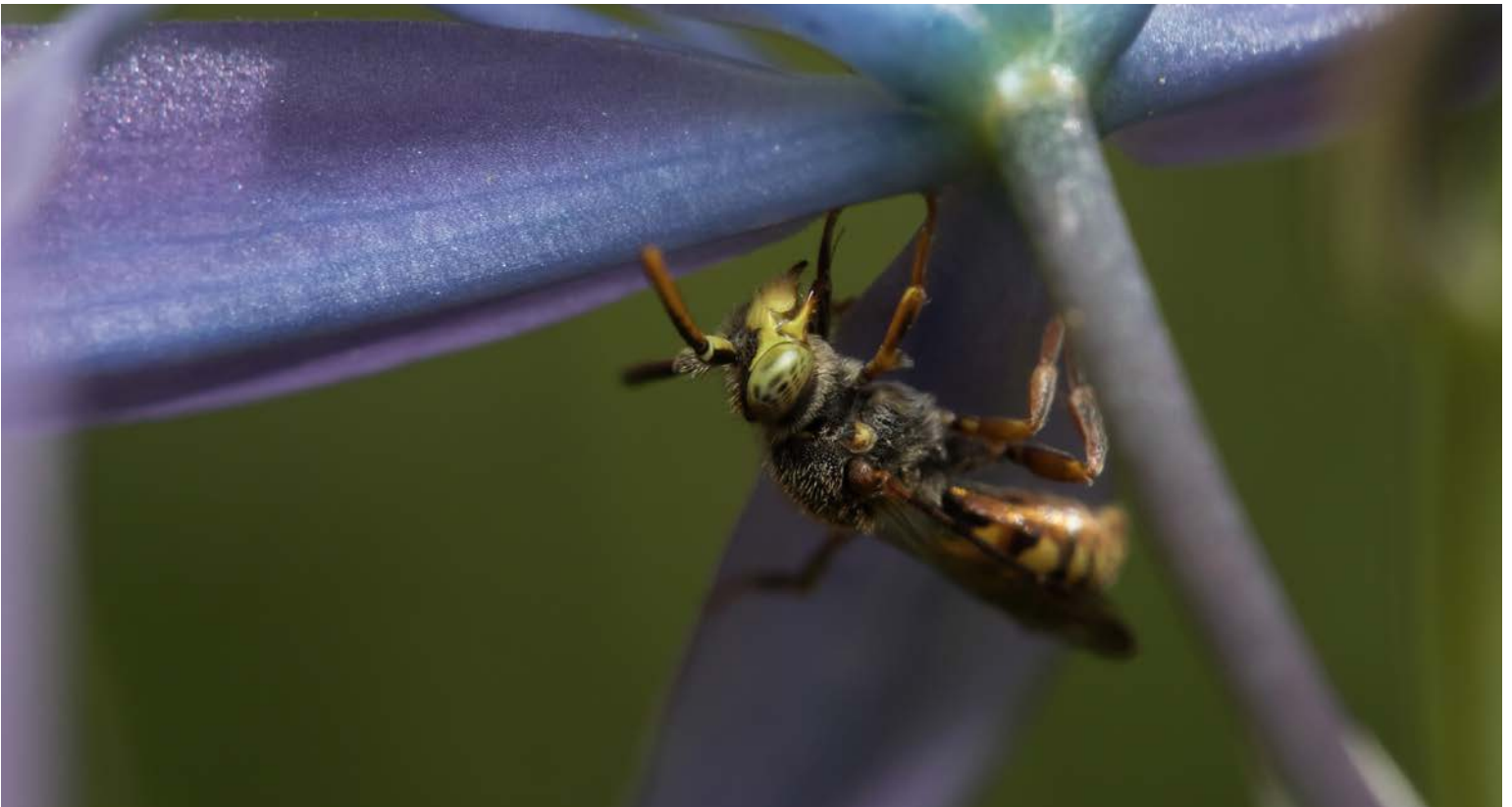
Notes: *Nomada* are cleptoparasites, usually of bees in the genus *Andrena*, and are thus found predominantly during the *Andrena* flight period of February-June. Females can often be seen flying low over open ground in search of nests, especially lending to a wasp-like appearance. *Nomada* are found on a wide variety of simple, radially symmetrical flowers including those in the Asteraceae and Apiaceae.



A *Nomada* female showing the extensive red coloration that is found in some species, and the overall wasp-like appearance.



A *Nomada* species with more extensive black markings. Additionally, note the *Meloe* blister beetle larvae tucked underneath the wings and behind the mid-leg.



A *Nomada* species with extensive yellow markings.

Xylocopa

Family: Apidae

Tribe: Xylocopini

At a glance: Bees in the genus *Xylocopa* are extremely robust, and in our area, largely black or darkly metallic bees. Superficially resembling *Bombus*, they lack the contrasting hair bands on the metasoma. Most similar to *Bombus*.

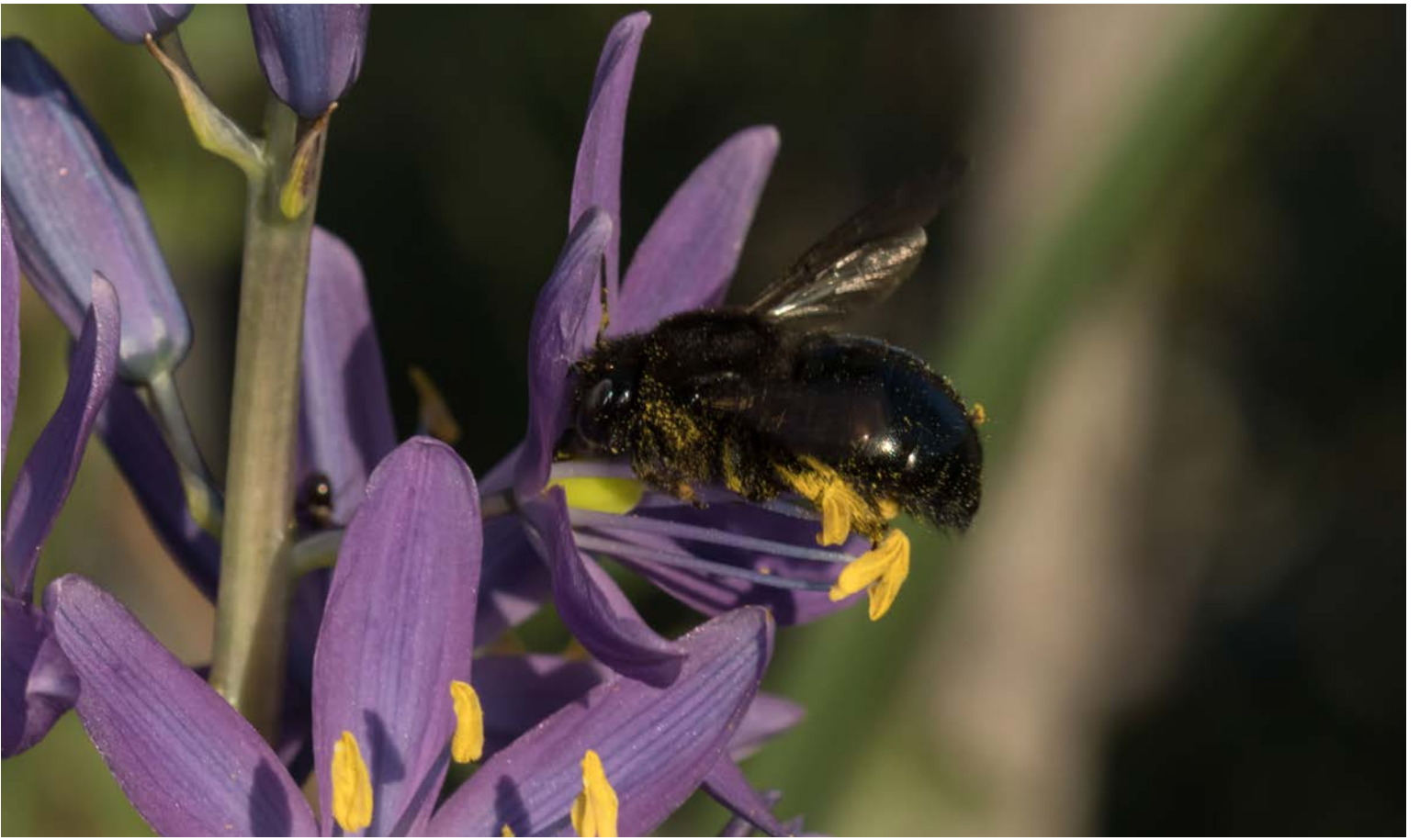
Identification: Forewing with three submarginal cells. *Xylocopa* are quickly differentiated from *Bombus* by the presence of a jugal lobe on the hindwing, the lack of stigma on the forewing, and tibial scopa rather than corbicula in females. *Xylocopa* have posterior basitarsus longer than tibia, and forewing with the second submarginal cell narrowed toward a very slender

marginal cell. Both sexes have antennae with greatly elongated second flagellar segments. Males typically have pale markings on the face.

Notes: For now, *Xylocopa tabaniformis* is the only representative of its genus found in the Willamette Valley, but *Xylocopa californica* can be found not much further south and the species appears to be expanding its range. *X. tabaniformis* nests in aggregations, constructing tunnels often several inches deep in wood. They can be somewhat destructive to man-made structures, especially in large aggregations. Males can be found patrolling circuits for females. The species epithet *tabaniformis* means in the form of a horse-fly, and the shiny black males especially may be mistaken for a very large horse-fly on first sight. The loud buzz of *Xylocopa* in flight is unlike that produced by any other genus in our area.



A *Xylocopa californica* female showing the extremely robust body form.



A *Xylocopa* female showing the scopa on the hind legs.

Andrena

Family: Andrenidae

Subfamily: Andreninae

At a glance: *Andrena* are small to medium, slender bees, usually with black or brown integument, but occasionally metallic blue-green, and with or without metasomal hair bands. Hairs are often shaggy and of different lengths, in contrast to many Halictine species. Most similar to *Halictus*, *Lasioglossum*, metallic forms may resemble *Osmia*.

Identification: Forewing with three submarginal cells, rarely only two. The presence of broad facial fovea filled with short, velvety hairs is enough to distinguish females from other genera, and this character can often be seen in the field. Females have scopae on hind legs,

and generally with well-developed propodeal corbicula as well. Males lack facial fovea, but the combination of three submarginal cells and two subantennal sutures (sometimes difficult to see) is enough to separate them from other genera. Additionally, males are often fairly distinctive in the field with a slender profile, abundant shaggy hairs, a “mustache” of straight, pale hairs, and long antennae.

Notes: This is a highly diverse genus in our area, due in part to the floral specialization of a number of species. Largely spring bees, *Andrena* can be found as early as February, coinciding with the bloom of osoberry (*Oemleria cerasiformis*), but are not often found past June. *Andrena* nest in soil, and are host to parasites including *Nomada* and *Meloe* blister beetles. Males of a few species in our area have extremely enlarged mandibles for grasping females during mating.



An *Andrena* female showing the slender body form, propodeal corbicula, and scopae on hind legs.



A female *Andrena auricoma* nectaring at candy flower (*Claytonia sibirica*).



A female *Andrena prunorum* with facial fovea clearly visible.



A female *Andrena nigrocaerulea*--one of a handful of *Andrena* with metallic integument.



A male *Andrena anisochlora* showing the greatly enlarged mandibles found in some males of the genus.

Panurginus

Family: Andrenidae

Tribe: Panurgini

At a glance: *Panurginus* are small, sparsely-haired black bees, often with yellow on the clypeus, and sometimes on the legs in males. Most similar to *Hylaeus*, *Andrena*, *Lasioglossum*.

Identification: Forewings with two submarginal cells. Marginal cell truncate. Females carry pollen in sparse scopae on hind legs. Both sexes with two subantennal sutures, and narrow, hairless facial fovea along the inner margin of the eyes.

Notes: *Panurginus* construct individual nests in soil. The genus is not often recorded in the Willamette

Valley, but multiple species are likely present. I have encountered *Panurginus* in association with western buttercup (*Ranunculus occidentalis*) in late April at Mount Pisgah Arboretum in Eugene. *Panurginus* can likely be found in association with cinquefoils (*Drymocallis* spp.) throughout the Valley.



A *Panurginus* female showing the black integument and sparse scopae characteristic of the genus.



A male and female *Panurginus* mating pair.

Colletes

Family: Colletidae

Subfamily: Colletinae

At a glance: *Colletes* are small to medium bees, often with pale hair bands on the metasoma. The eyes are strongly convergent below, lending a heart shape to the face. In profile, the metasoma is more distinctly arched toward the apex than in similar genera. Most similar to *Andrena*, *Halictus*, *Lasioglossum*.

Identification: Forewings with three submarginal cells. The second recurrent vein on the forewing is outwardly arcuate in the basal portion, forming an s-shape. Females have small facial fovea along the inner margin of the eyes, though these are less discrete than in *Andrena*. If the mouthparts are visible, the glossa (end

of the tongue) is characteristically short and bi-lobed. Females carry pollen in scopa on hind legs.

Notes: *Colletes* construct individual nests in soil or in earthen banks, sometimes in large aggregations. Nest cells are lined with a cellophane-like secretion. This genus is somewhat common in the Valley in late spring and early summer. I regularly find *Colletes* with oceanspray (*Holodiscus discolor*) in June.



A *Colletes* female showing the arched metasoma with distinct, pale hair bands, and scopa on the hind legs.



A male *Colletes kincaidii*.

Hylaeus

Family: Colletidae

Subfamily: Hylaeinae

At a glance: *Hylaeus* are small, sparsely-haired black bees, with pale markings usually present on the face, and often more extensively on the mesosoma and legs, especially in males. Most similar to *Panurginus*, *Lasioglossum*, *Ceratina*.

Identification: Forewings with two submarginal cells. The second submarginal cell is significantly shorter in length than the first. Females carry pollen internally and lack scopa. The first flagellar segment on the antennae is always much shorter than the scape, which is often somewhat modified and thickened.

Notes: *Hylaeus* generally nest in small, pre-existing cavities such as pithy plant stems, with cells constructed of a cellophane-like secretion. In our area, *Hylaeus* are generally late-spring and summer bees, found from May-August on simple, radially symmetrical flowers such as those in the Asteraceae and Apiaceae.



A *Hylaeus* male showing sparsely-haired integument and pale markings.



A *Hylaeus* male showing strong pale markings on the face.



A female *Hylaeus* showing the sparsely-haired integument and small relative size characteristic of the genus.

Agapostemon

Family: Halictidae

Tribe: Halictini

At a glance: *Agapostemon* are moderately-sized bees, somewhat sparsely haired, and with bright metallic green integument at least on the head and mesosoma, sometimes also on the metasoma. Males have extensive yellow banding on the metasoma, as well as yellow markings on the legs and face. Most similar to *Lasioglossum*, *Osmia*.

Identification: Forewings with three submarginal cells. Basal vein strongly arched basally. Females with pseudopygidial area on fifth tergum. Both sexes with propodeum encircled by a strong carina. The bright metallic green integument distinguishes the genus from

all other Halictid bees in our area. However, the similar *Augochlora* is present further south.

Notes: *Agapostemon* nest in soil, with lateral cells extending from deep, vertical burrows. Species in our region establish communal nests, with multiple females occupying the same burrow. *Agapostemon* can be found from April-September in the Valley.



An *Agapostemon femoratus* female showing the brightly metallic green integument that characterizes the genus.



An *Agapostemon texanus* female with metallic green integument extending onto the metasoma.



An *Agapostemon virescens* male showing the strong yellow markings characteristic of males in the genus.

Halictus

Family: Halictidae

Tribe: Halictini

At a glance: *Halictus* are small to medium bees with black, brown, or greenish metallic integument as in the subgenus *Seladonia*. These are social bees, and size differences exist among castes within species. All *Halictus* have distinct hairbands on the metasoma, though these are often reduced in males. Most similar to *Lasioglossum*, *Andrena*.

Identification: Forewings with three submarginal cells. Basal vein strongly arched basally. Females with pseudopygidial area on fifth tergum. Pale metasomal hair bands are present apically on the terga, though these may be worn, especially medially, in older

specimens, and are often not as apparent in males. Males usually with some yellow at least on clypeus and mandibles.

Notes: Sociality is the norm but not the rule among *Halictus*. In social species, mated females overwinter and establish new nests in spring. These foundress queens produce a worker caste which primarily raise the queen's offspring, but are also fertile themselves and may produce limited numbers of their own offspring. Males and gynes (prospective queens) are produced near the end of the season. With multiple generations annually, *Halictus* can be found from February-September. Nests are in soil, and communal nesting aggregations are common. *Halictus* are often abundant in urban areas, and seem particularly attracted to flowers in the family Asteraceae later in the season.



A *Halictus farinosus* female showing the strong metasomal hairbands characteristic of the genus.



A *Halictus ligatus* female--a very common species in the Valley.



A *Halictus* male showing yellow markings on the legs and clypeus.

Lasioglossum

Family: Halictidae

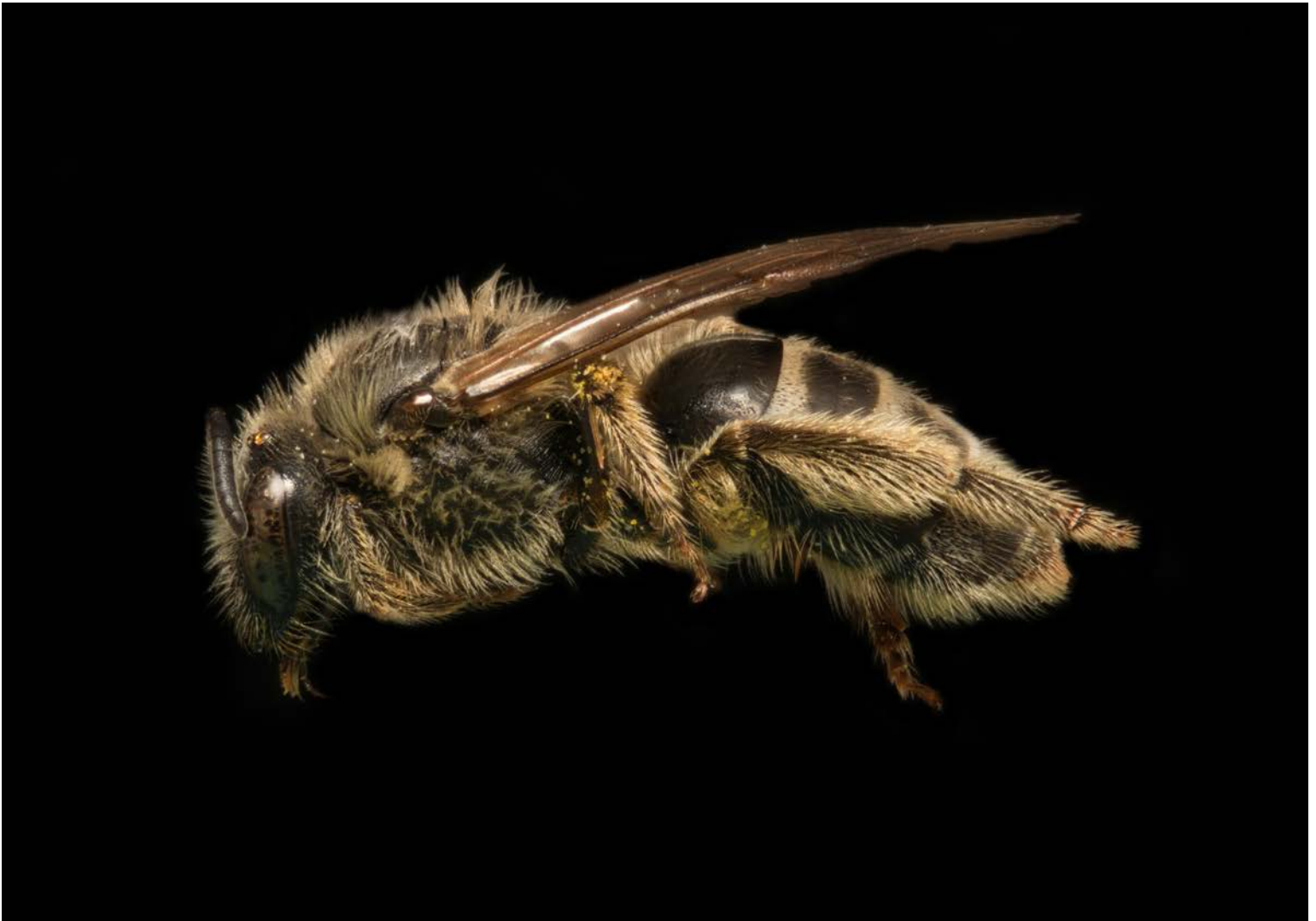
Tribe: Halictini

At a glance: *Lasioglossum* are small to moderately large bees, with black or brown to somewhat brightly metallic blue-green or gold integument, especially in the subgenus *Dialictus*. Strong metasomal hairbands are present in some species, but lacking in others and especially those which are small and metallic. Most similar to *Halictus* and *Andrena*.

Identification: Forewings usually with three submarginal cells, but occasionally two in some species. Basal vein strongly arched basally. Females with pseudopygidial area on fifth tergum. Metasomal hairbands are sometimes present, especially in

Lasioglossum sensu stricto, but these are always in a basal rather than apical position on the terga (contrast with *Halictus*). Females have scopa located primarily on the tibia, but some species have secondary scopa on the underside of the metasoma. Both sexes, but particularly females, have weakened outer wing veins, though this is not always readily apparent. In our area, *Lasioglossum ovaliceps* has a shiny red metasoma similar to that found in *Sphecodes*.

Notes: Nests are in soil. Like other Halictinae, the *Lasioglossum* exhibit varying degrees of sociality. Solitary nesting behavior is more common than among bees in the genus *Halictus*, and especially among *Lasioglossum* sensu stricto. Some species are common in the Valley, including in urban settings. Diversity is highest in mid-spring, but species may be found into late summer. *Lasioglossum* can be found on a wide variety of simple flowers.



A *Lasioglossum* female showing scopae on the hind legs and secondarily on the underside of the metasoma.



A *Lasioglossum* female showing strong, pale hair bands basally on the metasomal terga.



A *Lasioglossum* female in the subgenus *Dialictus* showing the small size and metallic integument that is characteristic of the group.

Sphecodes

Family: Halictidae

Tribe: Halictini

At a glance: *Sphecodes* are small, sparsely-haired bees, coarsely sculptured and generally with red on the metasoma. Most similar to *Lasioglossum*, *Nomada*.

Identification: Forewings with three submarginal cells, rarely two. The basal vein on the forewing is strongly arched in the basal portion. Females are cleptoparasitic and lack scopa. The integument is coarsely sculptured, with coarse punctures at least on the thorax. The mesosoma is black, and the metasoma is generally red, though all-black species may exist in the Valley.

Notes: *Sphecodes* are cleptoparasites of other bees,

generally in the subfamily Halictinae, including both social and solitary species. In the Willamette Valley, they can be found in conjunction with their hosts from late February into mid-summer. *Sphecodes* can be found nectaring at simple flowers, but are just as often seen flying inches from the ground in search of their hosts' nests.



A *Sphecodes* female showing the coarse punctation on the mesosoma, and the red metasoma typical of the genus.



A Sphecodes female.



A Sphecodes male.

Dufourea

Family: Halictidae

Subfamily: Rophitinae

At a glance: *Dufourea* are small to moderately-sized black bees, somewhat sparsely-haired at least on the metasoma. The antennae sit extremely low on the face. *Dufourea* are more robust than other Halictid bees. Most similar to *Lasioglossum*.

Description: Bees in the genus *Dufourea* are small to medium black and lightly-haired bees. Two submarginal cells distinguish the genus from all other Halictidae in our region, save for a handful of *Lasioglossum* and *Sphecodes* species. The antennae are set extremely low on the face, below the midline of the eyes. These are uncommon bees, but may be locally common in

association with their floral hosts.

Notes: *Dufourea* construct nests in soil consisting of a single tunnel with lateral burrows. All *Dufourea* in our area are pollen specialists, thus their flight period will be well-timed with the flowering of their floral hosts. *Dufourea campanulae* (specializing on flowers in the genus *Campanula*) has been recorded in the Valley. I have found *Dufourea dilatipes* in association with cat's ears (*Calochortus tolmiei*) in southern Oregon and the species is potentially present in the Valley as well.



A *Dufourea* female showing the robust form, black integument, and scopa on hind legs.

Anthidium

Family: Megachilidae

Tribe: Anthidiini

At a glance: *Anthidium* are small to moderately-large, robust bees with a black, non-metallic integument which is adorned with numerous pale markings. *Anthidium* are fairly wasp-like in appearance, but substantially more compact and robust. Most similar to *Stelis*, *Anthidiellum*, *Dianthidium*.

Identification: Forewings with two submarginal cells. *Anthidium* are the only Anthidiine bees to lack arolia, making them easy to distinguish from other closely related genera. Females have scopa present on the underside of the metasoma. Males have projections on apical terga, and those on the seventh tergum are

particularly useful in species identification. Females always have at least five distinct mandibular teeth.

Notes: *Anthidium* construct nests lined with cut plant hairs in pre-existing cavities, usually in wood, but also in soil or rock. In contrast to most bees, males may be larger than females and defend territories around preferred flowers. Males can be found patrolling territories for both intruders and females. Native species appear to exist at low abundance in the Valley, but the introduced *Anthidium manicatum* has become extremely common.



A male *Anthidium utahense* showing the characteristic and wasp-like pale markings. This is one of a handful of species present in the Valley.



An *Anthidium* female with extensive yellow markings.



Anthidium atrifrons male and female mating pair.

Stelis

Family: Megachilidae

Tribe: Anthidiini

At a glance: *Stelis* consists of small to medium cleptoparasitic bees with black to metallic blue-green integument, and usually with pale markings at least on the metasoma. Species in the subgenus *Dolichostelis*, represented in our area by *Stelis laticincta*, are particularly wasp-like, with yellow-orange markings throughout. Most similar to *Anthidium*, *Osmia*.

Identification: Forewings with two submarginal cells. Females are cleptoparasitic and lack scopa. The presence of two spurs at the apex of the middle tibia distinguishes the genus from other Megachilid genera. Males lack projections apically on the metasoma, which

characterize other Anthidiine bees.

Notes: Female *Stelis* lay eggs in the unfinished nests of other bees in the subfamily Megachilinae. Species in subgenus *Dolichostelis* may remove resin plugs from finished nests before laying eggs, and reseal nests upon departure. High concentrations of Megachilid bees, whether by the placement of artificial nest cavities or high quality habitat will likely foster populations of *Stelis*. Both females and males can be found nectaring at locally-abundant flowers. In my yard, *Stelis laticincta* shows a proclivity for goldenrod (*Solidago lepida*). Species composition in our area is poorly known, and it is difficult to estimate flight period.



With yellow integumental markings throughout, *Stelis laticincta* has a strong resemblance to other Anthidiine bees. Other *Stelis* in the Willamette Valley will not have such extensive markings. Note the lack of scopa on this female.



A brightly metallic *Stelis* species with pale markings restricted to the metasoma.



Stelis are highly variable in both the color of the integument and the color of the markings.

Dioxys

Family: Megachilidae
Tribe: Dioxyini

At a glance: *Dioxys* are small, dark bees, coarsely-sculptured, with thin, pale hairbands on the metasoma. Most similar to *Coelioxys*, *Megachile*.

Identification: Forewings with two submarginal cells. Axilla are strongly produced in spines, and a small tubercle is present medially on the metanotum (this is often hidden by hairs and can be very difficult to see). Females are cleptoparasitic and lack scopa. Females with simple, bidentate mandibles. The female metasoma is rounded apically, in contrast to that in *Coelioxys* which is sharply tapered. Males lack spines at the apex of the metasoma in contrast to males of *Coelioxys*.

Notes: *Dioxys* are cleptoparasites of other bees in the family Megachilidae, and do not appear particularly host-specific. These are largely summer bees. While this genus may or may not be present in the Willamette Valley, I have included *Dioxys* in the guide as I think its presence is somewhat likely.



Dioxys female showing the coarse integument and thin pale hair bands typical of the genus.



A *Dioxys* female showing the coarse integumental sculpturing.

Coelioxys

Family: Megachilidae
Tribe: Megachilini

At a glance: *Coelioxys* are small to medium bees, coarsely-sculptured, with thin hairbands on the metasoma. Females in the genus *Coelioxys* are unique in having a sharply tapered metasoma which terminates in an acute point, making them recognizable from a distance. Most similar to *Dioxys*, *Megachile*.

Identification: Forewings with two submarginal cells. Females are cleptoparasitic and lack scopa. The female metasoma is sharply tapered, ending in an acute point, in contrast with the metasoma in *Dioxys* which is rounded apically. Males have two pairs of spines on the metasoma near its apex. Both sexes with conspicuously

hairy eyes and a mesosoma with axilla produced in spines. Generally black with short, pale hairs and thin hairbands on the metasoma, though red markings (especially on the legs) are not uncommon.

Notes: *Coelioxys* are cleptoparasites of bees in the genus *Megachile*, to which they are closely related, though there are records of parasitism of other Megachilid genera and some Apid genera. The tapered abdomen in females is used to insert eggs into the cut-leaf wall partitions between brood cells in *Megachile* nests. These are among the more common parasitic bees, and can be found in urban areas where hosts are abundant. Generally seen June-September.



A *Coelioxys* female showing the heavily tapered metasoma and lack of scopa.



A *Coelioxys* male showing the paired spines at the apex of the metasoma.



A *Coelioxys* female showing the red markings which can be found on the legs of some species.

Megachile

Family: Megachilidae
Tribe: Megachilini

At a glance: Bees in the genus *Megachile* are medium to large, robust bees, with black, non-metallic integument, generally with pale hairs on the mesosoma, and often with pale hair bands on the metasoma. A deep concavity is usually present on the anterior surface of the first tergum.

Identification: Forewings with two submarginal cells. The lack of arolia on the feet separates the genus from all Osmiine bees, and the lack of pale markings on the integument distinguishes the genus from Anthidiine bees. Females have large, multi-toothed mandibles, often with cutting edges in the spaces between the teeth.

Females with scopae on the underside of the metasoma. In males, the metasoma ends somewhat abruptly, giving a rounded appearance. Males sometimes have heavily modified and flattened tarsi on their forelegs which are used to cover a female's eyes during mating.

Notes: This is an exceptionally diverse genus, though not particularly so in our area. While some *Megachile* species nest in the ground, most nest in pre-existing cavities--generally in wood but sometimes in rock or other materials. Females generally line nest cells with cut petals and leaves from broad-leaved forbs and shrubs, but may also use plant resins. In my yard, leaves from Rosaceae are commonly used by larger species, and smaller species often use leaf clippings from American willowherb (*Epilobium ciliatum*). Males of some species are territorial and will fiercely defend chosen flower patches. *Megachile* are largely summer bees, generally found from June-September.



A large *Megachile inermis* female showing the robust body form, large mandibles, and scopae on the underside of the metasoma.



A *Megachile* male showing modified tarsi on the foreleg--a character which can be found among some males of this genus.



A small *Megachile* male. Members of this genus range widely in size.

Ashmeadiella

Family: Megachilidae

Tribe: Osmiini

At a glance: *Ashmeadiella* are small, robust bees, with all black integument or with some red on the metasoma and legs. Hair is pale, and thin apical hair bands are usually present on the metasoma. Most similar to *Osmia*, *Hoplitis*.

Description: Forewings with two submarginal cells. The anterior, vertical surface of the first tergum is concave medially, with the concavity delimited by a carina. The mesepisternum (lateral portion of the mesosoma) is distinctly divided into two separate planes--a mostly hairless, mostly impunctate anterior surface, and a hairy, punctate lateral surface. Females

have scopa on the underside of the metasoma. Males have four small teeth present apically on the sixth tergum.

Life History: *Ashmeadiella* construct nests lined with leaf pulp in cavities in wood, in the ground, or under rocks. Many species are associated with specific floral hosts. *Ashmeadiella* likely exist in the valley at low densities and in relatively unfragmented habitats.



A female *Ashmeadiella* showing the robust form, large head, and pale hair bands on the metasoma which are typical of the genus.



A female *Ashmeadiella* showing the metasomal scopa, and the red metasomal markings which are common in this genus.

Heriades

Family: Megachilidae

Tribe: Osmiini

At a glance: *Heriades* are small, sparsely-haired black bees with a very coarsely punctured integument and thin, pale hair bands on the metasoma. Most similar to *Hoplitis*, *Ashmeadiella*.

Identification: Forewing with two submarginal cells. Arolia present as in all Osmiini. The integument is very coarsely and deeply punctate. The dorsal portion of the propodeum has a row of deep, nearly rectangular pits which are separated from the posterior surface by a strong carina. The anterior face of the first tergum is strongly concave. The male metasoma is curved under so that the apex of the metasoma is almost touching the

first or second sterna. The seventh tergum of the male is completely hidden by the sixth.

Notes: *Heriades* can generally be found from late May to early August in the Valley. *Heriades* nest in pre-existing cavities in wood. Nest cells are usually lined with plant resins. *Heriades carinata* appears to be a fairly common species throughout the Valley, especially in association with simple flowers in the Rosaceae and Asteraceae.



Heriades carinata male showing the curved metasoma and the coarsely punctate integument.

Hoplitis

Family: Megachilidae

Tribe: Osmiini

At a glance: Bees in the genus *Hoplitis* are small to medium in size, with dull-colored integument, but occasionally with red on the metasoma as in some *Ashmeadiella*. Three species in western North America are brightly metallic, but are almost certainly not present in the Willamette Valley. *Hoplitis* are more elongate than *Osmia* and lack some of the coarse integumental sculpturings that define other members of the Osmiini. Most similar to *Osmia*, *Ashmeadiella*.

Identification: Forewings with two submarginal cells. Arolia present on feet as in other Osmiini. Parapsidal lines on the mesosoma are linear and elongate, whereas

those in *Osmia* are nearly punctiform. The anterior face of the first tergum is rounded, without a strong median depression, and at most delimited by a weak carina and only medially. Males have a pair of translucent, membranous flaps on the sixth sternum. Females carry pollen in scopa on the underside of the metasoma.

Notes: Nesting behavior in *Hoplitis* is diverse, ranging from nests in soil, to pithy stems and wood cavities. In some instances partitions are made from masticated leaf material, while many species tend to use some combination of pebbles, resin, sand, and mud. The tiny *Hoplitis producta* is very common in the Valley in late spring and early summer.



A female *Hoplitis fulgida* showing the more elongate body form (in comparison with *Osmia*). Metallic *Hoplitis* species such as this one are very unlikely to be found in the Valley.



A *Hoplitis producta* female--a very common species in early summer in the Valley.



A male *Hoplitis producta* with modified, thickened antennae, which are common among males in this genus.

Osmia

Family: Megachilidae

Tribe: Osmiini

At a glance: Bees in the genus *Osmia* are small to moderately-large robust bees with weakly metallic to brightly metallic integument as in the subgenus *Melanosmia*. Many species, especially those which are brightly metallic, are sparsely-haired, while many others are densely covered with pale hairs on the dorsum of the mesosoma, which often extend onto the first tergal segments. Most similar to *Hoplitis*.

Identification: Forewings with two submarginal cells. Arolia are present on the feet as in all Osmiine bees. Females with scopa present on the underside of the metasoma. Males have an enlarged second sternum,

covering large portions of the third. Males tend to have elongated antennae and a “mustache” of pale hairs on the clypeus. Punctiform parapsidal lines not much longer than wide differentiate the genus from others in the tribe.

Notes: *Osmia* tend to nest in pre-existing cavities in wood lined with mud or masticated leaf material. Other appropriately-sized crevices are frequently used for nesting, and I have found an *Osmia* nest in the barrel of a propane torch. Some species nest in soil. Preferred mud-gathering locations often attract numerous female *Osmia*. *Osmia* are spring to early-summer bees, generally not found much beyond July in the Willamette Valley. These are mostly polylectic bees, visiting a wide range of flowers including some agriculturally important crop species. They are particularly effective pollinators of fruits in the Rose Family.



A female *Osmia* showing the metallic integument, robust form, and scopa on the underside of the metasoma.



A nearly-black *Osmia* female. Most members of the genus have significantly lighter integument.



A male *Osmia* showing the long antennae and mustache of pale hairs on the clypeus which are typical of males in this genus.

Protosmia

Family: Megachilidae

Tribe: Osmiini

At a glance: *Protosmia rubifloris* is the only representative of the genus *Protosmia* in our region. *Protosmia rubifloris* is a small to moderately-sized dark bee with pale hair bands on the metasoma. Females have notably long mandibles, and cheeks (gena) wider than eyes. Most similar to *Hoplitis*, *Ashmeadiella*, *Megachile*.

Identification: Forewings with two submarginal cells. Arolia present as in all Osmiini. Females with scopa on the underside of the metasoma. Females with a medial, nearly spatulate projection on the clypeus, and long, slender mandibles. Males with a produced, medial lobe

and rounded lateral projections on the sixth tergum.

Notes: *Protosmia rubifloris* is the only representative of its genus in North America, with the rest found in the Mediterranean. The species nests in pre-existing cavities in wood or less commonly in pine cones. *P. rubifloris* can be found from mid-April to early June. It is not well known from the Valley, but is likely to be found more broadly, especially in relatively undisturbed natural areas. The species is somewhat common at Mount Pisgah Arboretum in Eugene, and I know of its presence in several other areas.



Protosmia rubifloris female showing the medial projection on the clypeus and the elongate, modified mandibles.



A *Protosmia rubifloris* female showing the broad gena (cheek area).



A *Protosmia rubifloris* male.

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