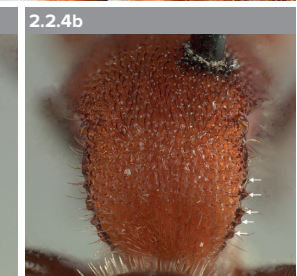
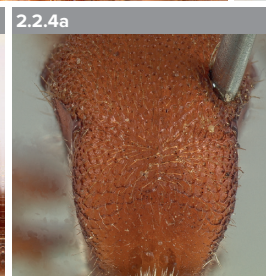
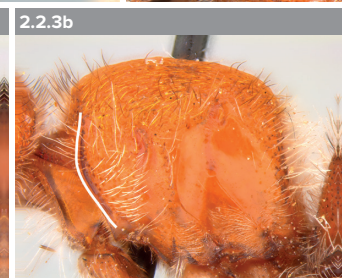
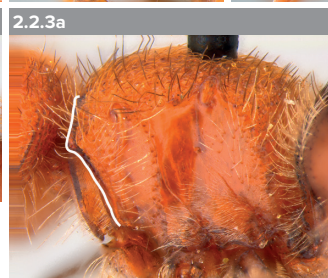


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2.2.1b	<i>Myrmilloides grandiceps</i>	Habitus: lateral view
2.2.1c	<i>Pseudomethoca paludata</i>	Habitus: lateral view
2.2.2a	<i>Myrmilloides grandiceps</i>	Head: posterior genal and anterior postgenal teeth
2.2.2b	<i>Pseudomethoca frigida</i>	Head: small genal tooth
2.2.2c	<i>Pseudomethoca nephele</i>	Head: genal and postgenal tooth
2.2.2d	<i>Pseudomethoca dentigula</i>	Head: hypostomal tooth only
2.2.2e	<i>Pseudomethoca sanbornii</i>	Head: unarmed
2.2.3a	<i>Pseudomethoca oceola</i>	Humeral carina: distinct, sharp
2.2.3b	<i>Pseudomethoca meritoria</i>	Humeral carina: distinct, blunt
2.2.3c	<i>Pseudomethoca sanbornii</i>	Humeral carina: weak, rounded
2.2.4a	<i>Pseudomethoca sanbornii</i>	Propodeum: lateral margin simple
2.2.4b	<i>Pseudomethoca simillima</i>	Propodeum: lateral margin dentate



(tribe character), and the T1 shape sessile (tribe character). This genus has only one species, *M. grandiceps*, and can be recognized by the remarkably large and sharply angled head with a posterior tooth on the gena and a large tooth anteriorly on the postgena. **DISTRIBUTION AND DIVERSITY:** Just one species, found mainly in the central USA. **NOTES** This species is variable in color and somewhat poorly approximates three different color syndromes. See the species pages (3.3.6.1, 3.5.2.1, 3.6.7.1) for more information.

Pseudomethoca

ETYMOLOGY From the Ancient Greek *pseudes* “false” and the genus name *Methocha* (a thynnid wasp that eats tiger beetle larvae). **IDENTIFICATION** These females have the mesosoma entire (subfamily character) and fiddle-shaped (tribe character), and the T1 shape sessile (tribe character). This is the most diverse and variable genus of the Pseudomethocini. Any Pseudomethocini without a genal tooth belong to *Pseudomethoca*, and any small-bodied (less than 6 mm) Pseudomethocini with a genal tooth belong to *Pseudomethoca*. **DISTRIBUTION AND DIVERSITY** There are 40 species in the USA, about 55 Mesoamerican species, and about 40 South American species. **NOTES** Females are often abundant, though not as common as *Dasymutilla*. They are mainly known to attack ground-nesting bees. The large head is theoretically useful to provide a strong bite for removing guard bees from nest entrances. **KEYS AND CHARACTERS** Mickel (1935a) wrote a good key, but this book treats all those species and also includes the more recently discovered ones. Other than body size and coloration, head armature is a useful feature, especially among the small-bodied species. The genal carina is often armed with a tooth, while the postgenal area more rarely has a tooth. Most of the larger-bodied species have the gena simply carinate and the pygidial sculpture helps to differentiate species; these pygidial features are similar to those of *Dasymutillini* (see section 2.1). These larger species, especially those in the Eastern Females Color Syndrome, are also separated by differences in the humeral carina, which was especially hard to interpret without figures and still takes a bit of practice to recognize. The two most common species in the eastern USA (*Ps. simillima* and *Ps. sanbornii*) are separated by the lateral propodeal margins.

2.3 SPHAEROPHTHALMINAE: SPHAEROPHTHALMINI: SPHAEROPHTHALMA AND KIN

This tribe is dominated by nocturnal forms, and only five of the 11 North American genera of Sphaerophthalmini are treated in this chapter. Three of these genera, *Morsyma*, *Protophopsis*, and *Stethophopsis*, are represented by a single diurnal species in the USA. *Photomorphus* and *Sphaerophthalma* are large diverse genera with most of their species active at night, but a moderately diverse minority of species in these genera are diurnal, especially in the humid eastern USA. Nocturnal forms of those two genera, and six additional genera, are treated in more detail in chapter 6.

Morsyma

ETYMOLOGY This is a “remix” of the genus name *Myrmosa*. *Myrmosa* was recognized by having a divided mesosoma in the females. The type of this genus and species was a wingless male; the author thought it was a female with a divided mesosoma like that of *Myrmosa*. **IDENTIFICATION** These females have the mesosoma entire (subfamily character) and pear-shaped (tribe character), and the T2 fringe with dense plumose setae (tribe character). The only species in this genus, *M. ashmeadi*, can be recognized by the strong arcuate carina separating the pronotum and mesonotum. Distribution and color are also useful: this coastal California species has orange head and mesosoma, contrasting with black metasoma with a distinct white setal fringe on T2. **DISTRIBUTION AND DIVERSITY** Just one species: *M. ashmeadi*. **NOTES** See the species page (3.5.4.1, 5.7.8.1) for more information.

Photomorphus

ETYMOLOGY Named for being similar to *Photopsis*, an older name for western nocturnal members of *Sphaerophthalma*. **IDENTIFICATION** These females have a unique mesosomal shape that is somewhat intermediate between *Timulla*, *Pseudomethoca*, and other Sphaerophthalmini. The mesosoma is elongate and subrectangular, with the sides pinched at the propodeal spiracle and the propodeum narrower than the mesonotum. They are dull brown in color and generally small-bodied, the gena never has a tooth, the head is never angulate, the mesosoma is always longer than wide, and T2 sometimes has a plumose fringe. **DISTRIBUTION AND DIVERSITY** There are about 10 diurnal species in the central and eastern USA and many more nocturnal ones farther west (6.1.6). **NOTES** These are pretty drab for diurnal mutillids; some eastern species with large eyes seem to be crepuscular or nocturnal. **KEYS AND CHARACTERS** Generally, the diurnal forms occur only in the eastern USA. These species are separated mainly by coloration, mandible structure, and pygidial sculpture. It is currently impossible to differentiate all the nocturnal forms from the central and western USA.

Protophopsis

ETYMOLOGY The genus name means “early photopsis,” reflecting Schuster’s (1949) belief that it was loosely related to the nocturnal velvet ants. **IDENTIFICATION** These females have the mesosoma entire (subfamily character) and pear-shaped (tribe character), and the T1 shape broad and sessile (tribe characters). The only species in the USA, *Pr. venenaria*, has a silver or golden head and two pale yellow patches on T3. **DISTRIBUTION AND DIVERSITY** One species lives in the USA (*Protophopsis venenaria*), one lives in Central America, and two occur in South America. **NOTES** Schuster thought this was related to nocturnal Sphaerophthalmini when he described the genus in 1949. More recently, Brothers & Lelej (2017) recovered it within Dasymutillini in their phylogeny. The lack of axillar armature on the males and presence of a felt line on S2 suggest that it truly belongs with the Sphaerophthalmini, and it is treated as such in this book. To some degree, this also comports with a recent unpublished molecular phylogeny by Waldren (2021) and Waldren et al. (forthcoming). **KEYS AND CHARACTERS** Because there are so few species, distribution is usually diagnostic in *Protophopsis*.

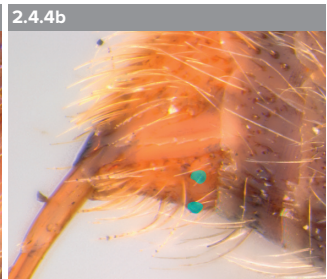
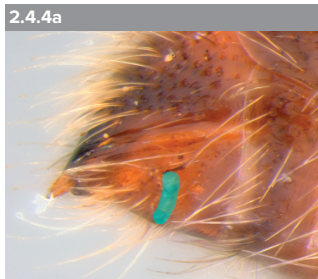
Sphaerophthalma

ETYMOLOGY From the Ancient Greek *sphaero* “ball” and *ophthalmos* “eye,” in reference to the rounded eye shape. Interestingly, there are two *h*’s in *ophthalmos*, but the name was misspelled in the original publication and we are stuck with the single letter *h*-*ophthalma* suffix. **IDENTIFICATION** These females have the mesosoma entire (subfamily character) and pear-shaped (tribe character), and the tergal fringes densely plumose (tribe character). This is the most diverse and variable genus of the Sphaerophthalmini, and more detailed information about recognizing the genus is found in section 4. Ruling out the unique coloration and mesosoma shape of other diurnal Sphaerophthalmini in this section can diagnose the diurnal members of this genus treated in this chapter. **DISTRIBUTION AND DIVERSITY** There are two eastern and central diurnal females and about 10 western species, which seem to be mostly nocturnal, but they are brightly colored and sometimes found in daylight. Most species (~95) are dull colored and nocturnal. **NOTES** Eastern and central diurnal species attack mud-nesting wasps and are common inside houses. Western day-active forms are usually found on cool days late in evening and persist in their activity into the night. In some cases, *S. unicolor* individuals were hand collected during the late afternoon and then further individuals were collected in light traps on the same night. **KEYS AND CHARACTERS** The color pattern and T1 shape alone can often work for separating diurnal species. It is important, however, to compare these species with those in the nocturnal chapter since most species in this genus are nocturnal and treated in chapter 6.

Figure	Taxon	Description
2.3.1a	<i>Morsyma ashmeadi</i>	Habitus: lateral view
2.3.1b	<i>Photomorphus impar</i>	Habitus: lateral view
2.3.1c	<i>Protophopsis venenaria</i>	Habitus: lateral view
2.3.1d	<i>Sphaeroptalma unicolor</i>	Habitus: lateral view
2.3.1e	<i>Sphaeroptalma pensylvanica</i>	Habitus: lateral view
2.3.1f	<i>Stethophopsis maculata</i>	Habitus: lateral view
2.3.2a	<i>Protophopsis venenaria</i>	Metasoma: T1 shape broad sessile
2.3.2b	<i>Sphaeroptalma unicolor</i>	Metasoma: T1 shape short sessile
2.3.2c	<i>Sphaeroptalma pensylvanica</i>	Metasoma: T1 shape subsessile
2.3.2d	<i>Sphaeroptalma marpesia</i>	Metasoma: T1 shape petiolate



Figure	Taxon	Description
2.4.1a	<i>Ephuta margueritae</i>	Habitus: lateral view
2.4.2a	<i>Ephuta margueritae</i>	Frons: large eyes, dense setae
2.4.2b	<i>Ephuta spinifera</i>	Frons: small eyes, sparse setae
2.4.3a	<i>Ephuta scrupea</i>	Gena: postgenal carina complete
2.4.3b	<i>Ephuta slossonae</i>	Gena: postgenal carina incomplete
2.4.4a	<i>Ephuta floridana</i>	Hypopygium: basal transverse ridge
2.4.4b	<i>Ephuta scrupea</i>	Hypopygium: two basal tubercles
2.4.5a	<i>Ephuta margueritae</i>	Pygidium: entirely setose, no plate
2.4.5b	<i>Ephuta minuta</i>	Pygidium: plate slender, microreticulate
2.4.5c	<i>Ephuta slossonae</i>	Pygidium: plate broad, smooth



Stethophotopsis

ETYMOLOGY From the Ancient Greek *stetho* “chest” and the formerly recognized genus *Photopsis*. The name refers to the unique mesosternal armature of the male. **IDENTIFICATION** These females have the mesosoma entire (subfamily character) and pear-shaped (tribe character), and T2 with a plumose fringe (tribe characters). The only species, *S. maculata*, can be recognized by color and the body is entirely orange except for two black patches at the base of T2. **DISTRIBUTION AND DIVERSITY** Just one species, *Stethophotopsis maculata*, which lives in the Madrean Archipelago of Arizona and northern Mexico. **NOTES** See the species page (3.4.16.1) for more information.

2.4 SPHAEROPHTHALMINAE: EPHUTINI: *EPHUTA*

Ephuta

ETYMOLOGY The genus name was apparently a newly invented word. **IDENTIFICATION** These females have the mesosoma entire (subfamily character) and ovate (tribe character), the eye vertically ovate (tribe character), and the T1 shape narrow cylindrical (tribe and genus character). Additionally, they lack felt lines, unlike the other Sphaerophthalminae. **DISTRIBUTION AND DIVERSITY** There are 30 species in the USA and many more in Central and South America. **NOTES** Females are rarely encountered. Many examined specimens are from pitfall traps. In the USA, they have similar distribution to *Timulla*, with multiple eastern, central, and Arizonan species, but very few in California. Due to the eye shape, this tribe was included in the Mutillinae until a recent phylogenetic study revealed that they belonged in the Sphaerophthalminae. **KEYS AND CHARACTERS** Schuster (1951) published the most effective key, which works all right but is missing a few species and can be especially difficult to interpret without reference material. The presence or absence of dense, small, colorful setae on the head is useful. Species can have the eye large or small; this can most easily be recognized in a frontal view, by dividing the interocular distance by the eye height. Ratios of 1.2 or lower indicate a large eye, while ratios greater than 1.3 indicate a small eye. One important feature is the postgenal carina, which is found on the underside of the head. *Ephuta* females can therefore be especially annoying to identify because they curl their head downward when they die. It then becomes necessary to rehydrate the specimen and gently pull the head forward to reveal this feature. Many specimens in collections have their heads removed entirely due to accidents during this procedure. Figures are provided for additional characters used by Schuster (1951) and in the species accounts of the next section. The pygidial shape terminology for *Ephuta* is somewhat confusing, since a pygidium that would be considered wide for an *Ephuta* is much narrower than that seen in any species of *Dasymutilla* (see section 2.1) or *Timulla* (see section 2.5).

2.5 MUTILLINAE: TROGASPIDIINI: *TIMULLA*

Timulla

ETYMOLOGY This name is a “remix” of the type genus for velvet ants: *Mutilla*.

This has happened a lot within the family for other velvet ant genera: *Timulla*, *Atillum*, and *Tallium*. All rearrangements of *Mutilla*. Strangely, *Tumalli* has not been used yet—a shame if you ask us. I've seen the same thing with a handful of genera in the spiny lobster family Palinuridae. The name *Palinurus* was rearranged for the genera *Linuparus*, *Nupalirus*, and *Panulirus*.—AARON

IDENTIFICATION These females have the mesosoma entire (subfamily character) and rectangular (tribe character), the eye vertically ovate (subfamily character), and the T1 shape sessile (tribe and

genus character). **DISTRIBUTION AND DIVERSITY** There are nearly 30 species in the USA, and many more in Central and South America. **NOTES** This is one of the few genera in the USA wherein males typically carry the females during courtship. For this reason, many mating pairs have been collected and the ratio of species known from both sexes is higher than that seen in many other genera. **KEYS AND CHARACTERS** Coloration and mesosoma shape are important for separating females of *Timulla*. Microscopic differences in the scutellar scale, pygidium, and sculpture in various body regions are also useful for identification. Mickel (1937) has a useful key, but many of the characters, especially regarding the mesosoma shape, are difficult to interpret. The first, and often easiest, step is measuring the propodeal width: two species have the propodeum widest, two have the propodeum narrowest, and the remainder have the propodeum and pronotum similar in width. Secondly, the general shape of the humerus (shoulder) must be interpreted. The humerus is considered “angular” when the lateral margins of the pronotum are relatively straight and parallel and form a perpendicular or obtuse angle with the anterior propodeal margin. The humerus is considered “rounded” when the lateral margins of the pronotum are more curved and convergent anteriorly, more evenly rounding into the anterior pronotal margin. Third, the lateral margins of the mesonotum can be constricted or not. When the mesonotum is considered “constricted,” it is clearly narrower than the pronotum and propodeum and usually has a distinct in-step posterior to the pronotal spiracle and/or a lateral notch anterior to the propodeal spiracle; Mickel (1937) referred to this state as “sides of dorsum of thorax distinctly emarginate medially.” When the mesonotum is “not constricted,” it is only scarcely narrower than the pronotum and propodeum and has relatively straight lateral margins without a distinct notch anterior to the propodeal spiracle (“sides of dorsum of thorax not emarginate medially” in Mickel’s key). These features are still somewhat subjective and difficult to interpret without practice, but hopefully this phrasing is clearer, especially when accompanied by the figures presented here.

2.6 MYRMOSINAE: MYRMOSA AND KIN

Myrmosa

ETYMOLOGY The genus name was apparently a newly invented word based around the Ancient Greek *myrme* “ant.” **IDENTIFICATION** These females have the mesosoma divided (subfamily character), the clypeus with a basal longitudinal carina, S1 with a raised longitudinal process, and T2 without yellow spots (genus characters). Species in this genus have simple antennal tubercles without an interantennal prominence and the mandible tridentate. **DISTRIBUTION AND DIVERSITY** Four females are recognized in the USA, of which two are associated with males. This genus also occurs in the Palearctic Region. **NOTES** This genus and its relatives were sometimes treated as members of the family Tiphidae or placed into their own family because they have many features that are not found in other velvet ants. Females have a divided mesosoma and usually have ocelli; males have a jugal lobe in the hindwing and lack felt lines. This is the only velvet ant genus to occur in both the New and Old World. **KEYS AND CHARACTERS** Krombein’s (1940) key works pretty well, but it is complicated by the inclusion of Old World species. Differences in head shape and microscopic ridges or tubercles on the head and mesosoma are the most useful characters.

Myrmosula

ETYMOLOGY This genus was named for its similarity to *Myrmosa*. **IDENTIFICATION** These females have the mesosoma divided (subfamily character), the clypeus without a basal longitudinal carina, S1 without a raised longitudinal process, and T2 usually with pale yellow spots (genus characters). Species in this genus usually have either an interantennal prominence or the antennal tubercles armed with a tooth or tubercle and the mandible bidentate. **DISTRIBUTION AND DIVERSITY:** There are about 10 species, with most of the diversity in the western USA. **NOTES** Brothers (1978) wrote a good paper on the life cycle and host interactions of *Myrmosula parvula* with halictid bee species

Figure	Taxon	Description
2.5.1a	<i>Timulla oajaca</i>	Habitus: dorsal view
2.5.2a	<i>Timulla ferrugata</i>	Mesosoma: propodeum widest, humerus rounded, mesonotum weakly constricted, moderate scale
2.5.2b	<i>Timulla dubitatiformis</i>	Mesosoma: equally wide, humerus rounded, mesonotum weakly constricted, no scale
2.5.2c	<i>Timulla dubitata</i>	Mesosoma: equally wide, humerus rounded, mesonotum constricted, small scale
2.5.2d	<i>Timulla vagans</i>	Mesosoma: equally wide, humerus angular, mesonotum constricted, large scale
2.5.2e	<i>Timulla leona</i>	Mesosoma: equally wide, humerus angular, mesonotum not constricted, small scale
2.5.2f	<i>Timulla n. navasota</i>	Mesosoma: propodeum narrowest, humerus rounded, mesonotum not constricted, no scale
2.5.3a	<i>Timulla leona</i>	Pygidium: striate
2.5.3b	<i>Timulla suspensa</i>	Pygidium: rugose basally, microreticulate apically

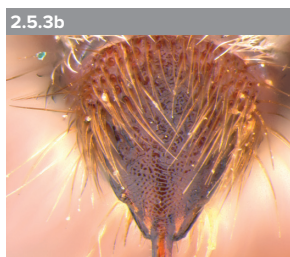
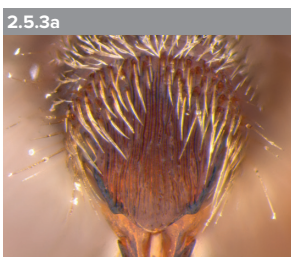
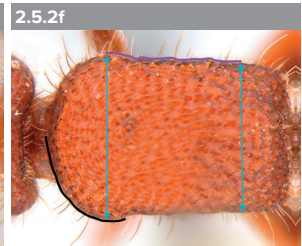
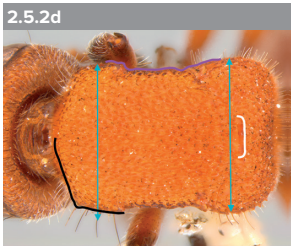
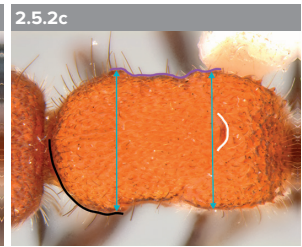
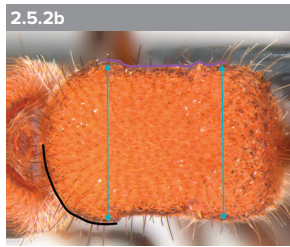
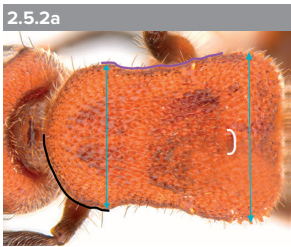
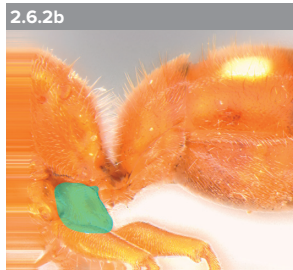


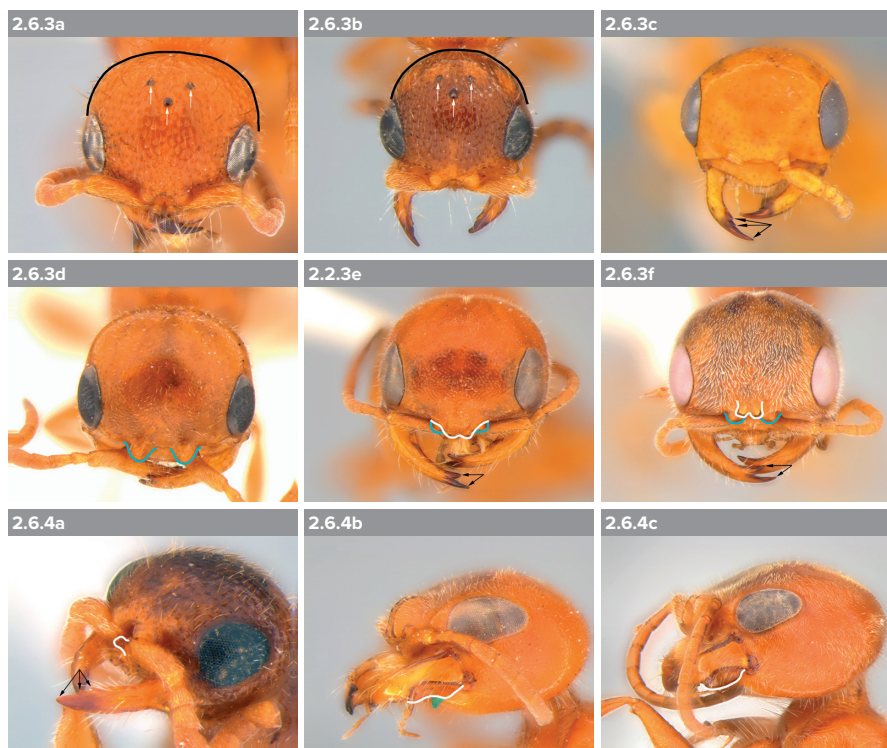
Figure	Taxon	Description
2.6.1a	<i>Myrmosa bradleyi</i>	Habitus: lateral view
2.6.1b	<i>Myrmosula pacifica</i>	Habitus: lateral view
2.6.1c	<i>Leiomyrmosa spilota</i>	Habitus: lateral view
2.6.2a	<i>Myrmosa unicolor</i>	S1: large ridge; Metacoxa: large tooth
2.6.2b	<i>Myrmosula exaggerata</i>	S1: unarmed; etacoxa: small tooth
2.6.3a	<i>Myrmosa bradleyi</i>	Frons: ocelli present, vertex quadrate, antennal tubercle unarmed, no interantennal prominence
2.6.3b	<i>Myrmosa unicolor</i>	Frons: ocelli present, vertex rounded, antennal tubercle unarmed, no interantennal prominence
2.6.3c	<i>Leiomyrmosa spilota</i>	Frons: ocelli absent, mandible tridentate, antennal tubercle unarmed, no interantennal prominence
2.6.3d	<i>Myrmosula parvula</i>	Frons: ocelli absent, mandible bidentate, antennal tubercle raised, no interantennal prominence
2.6.3e	<i>Myrmosula pacifica</i>	Frons: ocelli absent, mandible bidentate, weak antennal tubercle, interantennal prominence blunt
2.6.3f	<i>Myrmosula boharti</i>	Frons: ocelli absent, mandible bidentate, weak antennal tubercle, interantennal prominence sharp
2.6.4a	<i>Myrmosa unicolor</i>	Head: clypeus dentate, mandible tridentate
2.6.4b	<i>Myrmosula pacifica</i>	Head: mandible with straight lamella, postgena unarmed
2.6.3i	<i>Myrmosula rutilans</i>	Head: mandible with concave lamella, postgena dentate



Lasioglossum zephyrum, in Kansas. Many of the western specimens examined by Wasbauer were collected on desert mats of *Euphorbia* flowers by R. M. Bohart. At first glance, these wasps can most easily be confused with various *Pseudomethoca* species, often sharing similar coloration with them in a given region. **KEYS AND CHARACTERS** Wasbauer (1973) wrote a good key to separate the females of this genus. They can sometimes be recognized by slight color differences and distribution, but microscopic armature of various structures on the head is usually necessary to confirm a species identification. These particularly include differences in the antennal tubercles and interantennal prominence.

Leiomyrmosa

ETYMOLOGY From the Ancient Greek *leios* “smooth” with the related genus *Myrmosa* as a suffix. The name refers to the overall smooth body with few setae. **IDENTIFICATION** These females have the mesosoma divided (subfamily character), the clypeus without a basal longitudinal carina, S1 without a raised longitudinal process, and T2 usually with pale yellow spots (genus characters). Species in this genus have simple antennal tubercles without an interantennal prominence and the mandible tridentate. **DISTRIBUTION AND DIVERSITY** There is only one species recognized, *Leiomyrmosa spilota*, which occurs in the Sonoran Desert in California (and probably Arizona, see below). **NOTES** This genus was known only from nine specimens of a single species collected from sand dunes near Blythe, California. One dark-bodied individual was recently collected by Bill Warner in Arizona directly opposite of Blythe on the Arizona side of the Colorado River. We cannot be sure yet whether this represents a second species of *Leiomyrmosa* or a color variant of *L. spilota*. The type series and all subsequent specimens were collected only in pitfall traps; it is unlikely that anyone has observed live specimens of these rare wasps in their natural activities.



DAY WALKERS—DIURNAL FEMALE VELVET ANTS—COLOR SYNDROMES AND SPECIES

3.0 INTRODUCTION AND OVERVIEW

All female velvet ants are completely wingless. Some males, however, are completely wingless, too, (like *Stethophotopsis maculata*, 3.4.16.1) and others always have tiny wings (like *Myrmilloides grandiceps*, 3.3.6.1). These are treated here in chapter 3 with their females. Some other males, especially *Dasymutilla asopus* and their relatives (see 5.2.5.4), have the wings shortened in some individuals. Since these species also have fully winged populations and because their short wings are dark and obvious, they are included in chapter 5 with the other fully winged males. In rare instances, fully winged males can have their wings mangled by predators or, very rarely, apparently chewed off by themselves on purpose. Those insects are treated in chapter 5, as well.

The key below will help you recognize the Females Color Syndrome (FCS) of a winged velvet ant and get you closer to the target of a species identification.

1. Head and mesosoma cuticle blackened, dorsally with mostly uniformly colored, long, dense setae
 - a. Head, mesosoma, and metasoma dorsal color mostly white **3.1 Desert FCS** (p. 51)
 - b. Head, mesosoma, and metasoma dorsal color mostly yellow to red **3.2 Western FCS** (p. 62)
 - c. Head and mesosoma color mostly black, metasoma usually reddish **3.3 Texan FCS** (p. 82)
2. Mesosoma background color different from metasoma color, or head and/or mesosoma with contrasting pattern
 - a. Head and mesosoma with contrasting patterns; metasoma background color usually reddish or concolorous with mesosoma **3.4 Madrean FCS** (p. 91)
 - b. Head and mesosoma reddish-orange with sparse setae (rarely with head blackish); metasoma background color blackish, contrasting with always uniformly reddish-orange mesosoma **3.5 Timulla-like FCS** (p. 114)
3. Head, mesosomal, and metasomal (at least T2) background cuticle concolorous orange-red or brown, head and mesosoma without distinct setal pattern
 - a. Body color usually reddish-orange, legs usually blackened, metasoma often with distinct black, silvery, and reddish-orange pattern **3.6 Eastern FCS** (p. 122)
 - b. Body color dull brown, legs usually light brown, metasoma with faint pattern **3.7 Cryptic FCS** (p. 147)

3.1 DESERT FEMALES COLOR SYNDROME

Velvet ants in the Desert Females Color Syndrome (FCS) possess white to pale yellow dorsal setae, which are typically longer than those seen in other color syndromes. Their legs and bodies are generally black, but some species have a reddish underlying cuticle (ex. *Dasymutilla gloriosa* and *D. thetis*). Members of the Desert FCS are concentrated in the hot desert ecoregions of North America, including the Chihuahuan, Sonoran, Mojave, and Baja California Deserts. Members of this syndrome, however, extend into some other regions, particularly the Mediterranean-climate regions of California's Central Valley and some mountainous areas of Arizona and Mexico. In the USA, there are 18 females in three genera with this color syndrome, mainly in the genus *Dasymutilla*.

Many forms could be confused with pale yellow taxa in the Western FCS, but those species are usually included in both sections. None of the species treated here occurs in the Great Plains, so pale yellow individuals from the Great Plains should always be checked with the Western FCS section. There are some Madrean species that could initially seem like they belong here, especially *D. pulchra* (3.4.7.1) and some populations of *D. monticola* (3.4.4.2), but none of the species in the Desert FCS has black setal patches on the mesosoma or pale yellow or orange cuticular spots on T2.

Why are members of this color syndrome clothed in white or very pale setae? One initial popular hypothesis involved purported camouflage—because some species superficially look similar to the hairy fruit of the creosote bush. A recent study, however, indicated that this white coloration evolved in these wasps prior to the arrival of creosote in North America. Instead, the coloration assists in dissipating heat from the female's body. This confers an advantage by extending the activity period during which a female can search for suitable hosts. In the hot deserts, Western FCS species are disadvantaged by necessarily shorter activity periods. It has not yet been established that the non-thistledown desert species also have an advantage in dealing with high temperatures, but their abundance in specifically hot regions superficially supports that hypothesis. If white coloration is specifically particularly adaptive to deal with arid, warm environments in southwestern North America, then this likely developed during the Neogene, particularly in the Miocene and/or Pliocene epochs 4–6 million years ago, when widespread desertification occurred in North America.

Even if climatic variables are the main factor driving white color in these wasps, participation in Müllerian mimicry systems also seems to occur. All these insects resemble one another in superficial color, but in numerous cases, minor color features are shared by species within specific regions (and some of these features seem to detract from the thermoregulatory function). For example, there is usually a distinct yellowish tint to the metasomal setae in the *Dasymutilla magna* cluster; if heat management was the sole driving factor in their coloration, why would not the setae be entirely whitish? Furthermore, many species treated here have contrasting black setae, often on the metasoma, which would seem to detract a bit from thermoregulation. Although thermoregulation obviously seems to be an important factor pushing the color pattern of these wasps, it is unlikely to be the sole driver; mimicry, and maybe even camouflage in some cases, may still be at least a secondary factor.

All 18 of these Desert FCS species are known from both sexes. Most of the males (~61%) belong to the analogous Desert Males Color Syndrome (MCS) (5.1), which has a body cuticle that is generally black and the dorsal body setae mostly white to pale yellow, just like these females. dual sex-limited mimicry is common in this color syndrome, and males of some of these species have darker coloration than the females.

This color syndrome extends south into arid regions of Mexico (p. 322). In other arid regions of the world, including North Africa and the deserts of Central Asia (see 8.3.11), and even arid South America, velvet ants also have predominantly whitish setal coloration. In the North American species pictured in this chapter, however, the extent of white setal coverage and the length of these setae, are unmatched, except perhaps by the unusual Australian species, *Ephutomorpha fulvocrinita*.

Why is this lone species from Down Under clothed so similarly to our North American desert friends? Perhaps this species, through a retained mutation or a series of mutations, has come upon the same advantage of dissipating heat in the interior deserts of Australia and being able to become active earlier in the day than other mutillid species.



TOP LEFT: *Dasylabris gussakovski* from Uzbekistan.
 TOP RIGHT: *Reedomutilla gayi* from Chile.
 LEFT: *Ephutomorpha fulvocrinita* from Australia.

The key below is useful for figuring out which page to visit next.

Genus *Dasymutilla*—T1 shape petiolate, T2 fringe with simple setae

- 3.1.1 Entire body, including legs, covered with, white setae, widespread *D. gloriosa, D. pseudopappus, D. thetis*
- 3.1.2 Dorsal setae gray to pale yellow, legs often partly gray, Sonoran Desert *D. magna, D. connectens, D. eminentia, D. satanas*
- 3.1.3 Tip of metasoma black or metasoma with black pattern *D. nocturna, D. atricauda, D. foxi*
- 3.1.4 Dorsal setae whitish-gray, legs black, Pacific/Sierra region in California *D. sackenii, D. californica, D. coccineohirta, D. aureola*
- 3.1.5 Dorsal setae whitish, legs mostly black, hot deserts in California *D. albiceris, D. imperialis*

Genus *Pseudomethoca*—T1 shape sessile, T2 fringe with simple setae

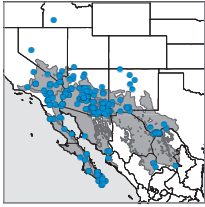
- 3.1.6 Dorsal setae uniformly pale grayish yellow *Ps. anthracina*

Genus *Sphaerophthalma*—T1 shape petiolate, T2 fringe plumose

- 3.1.7 Dorsal setae uniformly pale grayish yellow *S. edwardsii*

3.1.1—*Dasymutilla gloriosa* Desert females cluster

Species in this cluster (sometimes referred to as thistledown velvet ants) have the whole body, including the legs and underside, covered with long white setae. Some species with gray legs, like *D. foxi* (3.1.3.3) or *D. eminentia* (3.1.2.3), could be confused with those. They are common and widespread in the southwestern USA, especially in hot arid regions.



3.1.1.1—*Dasymutilla gloriosa*

DAH-ZEE-MEW-TILL-UH GLOW-REE-OWE-SUH

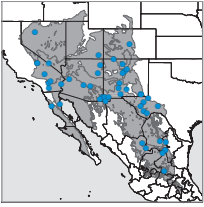


ETYMOLOGY From the Latin *gloriosa* “glorious,” likely referring to the fluffy angel-like appearance of this wasp.

FIELD IDENTIFICATION Often difficult. The dorsal setae are longer and shaggier than *D. thetis*. Unlike *D. pseudopappus*, the body cuticle is usually reddish and the setae are less regularly oriented; the mesosoma has a partly flattened patch and T2 has a dense patch of especially long setae subbasally. This is the most commonly encountered and most widely distributed Desert FCS species, so, even money, it is likely this one.

LAB IDENTIFICATION The antennal scrobe has a dorsal carina; the mesosoma has a wide flat scutellar scale with thick carinae anteriorly; the pygidium is flat with the sculpture uniformly rugose or longitudinally rugose. **MALE** (5.2.7.1, 5.3.3.4). Very different from the female; body covered with black and yellow or orange setae. **NOTES** This species was previously thought to be camouflaged with the fruits of creosote bush. Recent studies have found that their white coloration more likely evolved to protect them from high temperatures. The white color allows them to maintain a lower body temperature than orange-colored female congeners, enabling them to forage for longer periods of time in hot deserts than their relatives. Therefore, this is the most commonly seen species in hot deserts during hot parts of the day or season. This species is most common in North America’s hot deserts, but isolated populations were recently discovered in the Great Basin of Nevada and Idaho, too. The male and female of *D. gloriosa* are very different in coloration and are a textbook example of dual sex-limited mimicry. They were not associated until a gynandromorph specimen was discovered (p. 13).





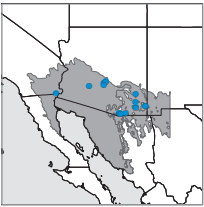
3.1.1.2—*Dasymutilla pseudopappus*

DAH-ZEE-MEW-TILL-UH SOO-DOE-PAPP-USS



ETYMOLOGY From the Ancient Greek words *pseudo* “false” and *pappus* “woolly seed”; the name is a reference to the resemblance of these wasps to creosote fruit. **FIELD IDENTIFICATION** Often difficult. The dorsal setae are longer and shaggier than *D. thetis*. Unlike

D. gloriosa, the body cuticle is usually blackish; and the setae are more regularly oriented: the mesosoma has erect setae throughout, and T2 has the long setae more uniformly distributed. **LAB IDENTIFICATION** The antennal scrobe has a dorsal carina; the mesosoma has a narrow erect scutellar scale without carinae anteriorly; and the pygidium is somewhat convex with distinct raised striae basally. **MALE** (5.2.7.5, 5.3.3.5). Very different from the female; body covered with black and yellow, orange, or red setae. **NOTES** While superficially nearly identical to *D. gloriosa*, genetic studies show that these species are only distantly related. *D. pseudopappus* is often found at higher elevations and earlier in the year than *D. gloriosa*.



3.1.1.3—*Dasymutilla thetis*

DAH-ZEE-MEW-TILL-UH THAY-TISS

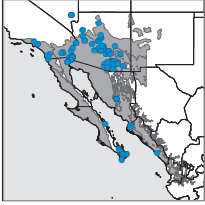


ETYMOLOGY In Greek mythology, Thetis was a goddess of the seas and the mother of Achilles. **FIELD IDENTIFICATION** Relatively easy: this species has shorter and sparser dorsal setae. **LAB IDENTIFICATION** The antennal scrobe lacks a dorsal carina, and the mesosoma lacks a scutellar scale. The mandible is also unique in the genus *Dasymutilla*, having a strong sharp dorsal mandibular carina. **MALE** (5.1.3.3). Similar to female, except with darker cuticle and extensive black setae. **NOTES** *Dasymutilla thetis* is usually smaller than the other this-tled-down velvet ants and has a narrower distribution, being found in southern Arizona only.



3.1.2—*Dasymutilla magna* Desert females cluster

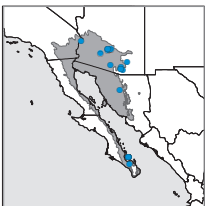
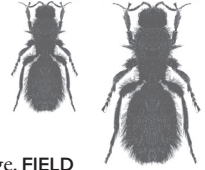
These species occur mainly in the Sonoran Desert. The dorsal body setae are generally gray or pale yellow, or gray anteriorly and pale yellow apically. Some populations of *D. foxi* (3.1.3.3), treated in the next cluster, have the tergal setae uniformly gray, but they have a wider head than any of the species in this cluster.



3.1.2.1—*Dasymutilla magna*

DAH-ZEE-MEW-TILL-UH MAGG-NUH

ETYMOLOGY From the Latin *magnus* “big.” This species is larger than any of the other desert form species in North America, though some specimens of *D. sackenii* or *D. satanas* can be nearly as large. **FIELD IDENTIFICATION** Usually easy. This large-bodied species has black legs with gray “elbows” and the propodeal setae mostly black. It is larger, more common, and more widespread than the superficially similar *D. connectens*. **LAB IDENTIFICATION** The antennal scrobe has a dorsal carina; the genal carina is sharp and distinct; the mesosoma is longer than wide and has a scutellar scale; the mid and hind femoral apices are rounded; and the S2 sculpture is simply punctate. **MALE** (5.1.1.1). Similar to female. **NOTES** Structurally, this species is similar to *D. magnifica* from the Texan FCS (3.3.1.1).

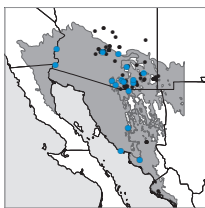


3.1.2.2—*Dasymutilla connectens*

DAH-ZEE-MEW-TILL-UH CUH-NECK-TENS

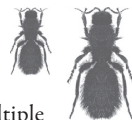
ETYMOLOGY Derived from the Latin word *connecto* “linked together.” It is not clear why that name was chosen for this species. **FIELD IDENTIFICATION** Often easy. This species is similar to *D. magna* but is smaller-bodied. **LAB IDENTIFICATION** The antennal scrobe has a dorsal carina; the genal carina is absent; the mesosoma is longer than wide and has a scutellar scale; the mid and hind femoral apices are truncate; and the S2 sculpture is simply punctate. **MALE** (5.1.1.2). Similar to female. **NOTES** This species is less common and smaller-bodied than *D. magna*. The femora have truncate apices, revealing that *D. connectens* is closely related to *D. nogalensis* from the Texan FCS (3.3.4.5).





3.1.2.3—*Dasymutilla eminentia*

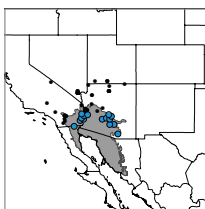
DAH-ZEE-MEW-TILL-UH EMM-INN-ENN-CHUH



ETYMOLOGY Derived from the Latin word *eminentia* “prominence” or “protuberance,” likely referencing the multiple bumps on S2. **FIELD IDENTIFICATION** Often easy. This moderate-sized, compact-bodied species has the leg setae entirely gray. **LAB IDENTIFICATION** The antennal scrobe has a dorsal carina; the genal carina is usually absent; the mesosoma is as wide as long and lacks a scutellar scale; the mid and hind femoral apices are rounded; and the S2 sculpture is scabrous laterally. **MALE** (5.1.1.3). Similar to female. **NOTES** *Dasymutilla*

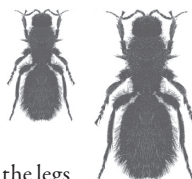


eminentia is smaller than *D magna* or *D.satanas*. The dorsal setae vary from gray to dark orange, with some populations fitting the Western FCS (3.2.2.2). Based on the wide mesosoma, some populations of *D. foxi* (3.1.3.3) could be confused with this species, but they have a wider head and simply punctate S2 sculpture.



3.1.2.4—*Dasymutilla satanas*

DAH-ZEE-MEW-TILL-UH SAY-TAN-USS



ETYMOLOGY This species was named after Satan, likely in reference to the distribution of this species in the hellish southwestern hot deserts. **FIELD IDENTIFICATION** Usually easy. This large species has the legs entirely black and the propodeal dorsum with setae mostly



pale yellow. **LAB IDENTIFICATION** The antennal scrobe has a dorsal carina; there is no genal carina; the mesosoma is longer than wide and has a scutellar scale; the mid and hind femoral apices are rounded; and the S2 sculpture is simply punctate. **MALE** (5.3.3.3). Much darker coloration than female. **NOTES** In northern and western populations, the dorsal setae are bright orange (see Western FCS, 3.2.5.1). The dorsal setae are shaggier and generally uniformly pale yellow compared with the other species in this cluster.

3.1.3—*Dasymutilla nocturna* Desert females cluster

Unlike the other Desert FCS clusters, the tergites have extensive patches of black setae. The *D. pulchra* cluster (3.4.7.1) from the Madrean FCS could be confused with these species, but they have the mesosoma with a black setal patch. Two of these species are apparently restricted to the Algodones sand dunes in California, but *D. foxi* is relatively widespread in arid regions of Arizona and California.



3.1.3.1—*Dasymutilla nocturna*

DAH-ZEE-MEW-TILL-UH KNOCK-TURN-UH

ETYMOLOGY From the Latin *nocturnus* “night active,” in reference to the nocturnal behavior in some individuals.

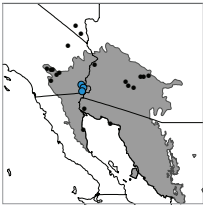
FIELD IDENTIFICATION Easy. This species is often nocturnal;

T3–6 have the setae entirely black; the head is narrower than the mesosoma.

LAB IDENTIFICATION The antennal scrobe has a dorsal carina; the head is narrower than the mesosoma; the mesosoma is about as wide as long

and has a scutellar scale; and the legs have the setae entirely black. **MALE** (5.1.3.1). Similar to female, with white setae on the apical tergites.

NOTES This species is most commonly seen in the Algodones sand dunes in California. Like its closest relative, *D. arenivaga* (Western FCS, 3.2.6.1), this species is active both in daylight and after dark.



3.1.3.2—*Dasymutilla atricauda*

DAH-ZEE-MEW-TILL-UH AY-TRICK-AWE-DUH

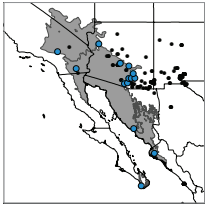
ETYMOLOGY From the Latin words *ater* “black” and *cauda* “tail,” in reference to the black tip of the metasoma in females. **FIELD**

IDENTIFICATION Usually easy. This species is diurnal; T4–6 have the setae entirely black; the head is as wide as the mesosoma. **LAB**

IDENTIFICATION The antennal scrobe lacks a dorsal carina; the head is as wide as the mesosoma; the mesosoma is longer than wide and lacks a scutellar scale; and the legs have the setae entirely black. **MALE** (5.1.3.2).

Similar to female, with white setae on the apical tergites. **NOTES** Most populations of *D. atricauda* have orange dorsal setae and are treated in the Western FCS (3.2.6.2). This is a somewhat rare variant of this species; this white desert form occurs only on the Algodones sand dunes in California.





3.1.3.3—*Dasymutilla foxi*

DAH-ZEE-MEW-TILL-UH FOX-EYE



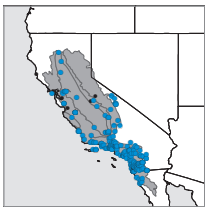
ETYMOLOGY This species was named for the entomologist William J. Fox, who described many velvet ant species in the 1890s. This white variant, found mainly in the Sonoran Desert, used to be named *D. phoenix*, after the city in Arizona. **FIELD IDENTIFICATION** Usually easy. This species is diurnal; there is a mesal patch of black setae on

T2–3; and the head is as wide as the mesosoma. **LAB IDENTIFICATION** The antennal scrobe lacks a dorsal carina; the head is as wide as the mesosoma; the mesosoma is as wide as long and lacks a scutellar scale; and the legs have the setae mostly gray. **MALE** (5.5.2.2). Usually with reddish metasomal color. **NOTES** This is one of the most variably colored species in the western USA, being treated in both the Madrean (3.4.6.3) and Western (3.2.7.1) FCS. Unlike most of the other variable species, differently colored individuals are often found together in the same locality. Rarely, this species lacks the black patch on T2–3 and could be confused with *D. eminentia* (3.1.2.3) in the previous cluster, except that species has the head skinnier and the S2 sculpture scabrous laterally.



3.1.4—*Dasymutilla sackenii* Desert females cluster

These species have white or pale yellow dorsal setae and entirely black legs. These are temperate Pacific or mountain species in California, rarely seen in the true hot deserts. Each of these species varies in color from white to bright red. In all but *D. sackenii*, the Western FCS forms (3.2.4) of these species are more common than their desert forms.



3.1.4.1—*Dasymutilla sackenii*

DAH-ZEE-MEW-TILL-UH SACKEN-EE-EYE



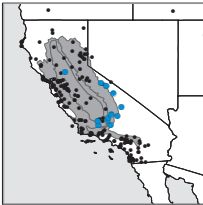
ETYMOLOGY This species was named for the Russian diplomat and entomologist Carl Robert Osten-Sacken, who worked mainly on flies. **FIELD IDENTIFICATION** Often difficult. This species is widespread and has the dorsal setae longer and shaggier than the others in this cluster. Like *D. californica*, the head is slender, but *D.*

sackenii individuals are almost always larger in size. **LAB IDENTIFICATION** The antennal scrobe has a dorsal carina; the head is narrower than the mesosoma and is unarmed posteriorly; the mesosoma is longer than wide and has a scutellar scale. **MALE** (5.1.2.1). Similar to female. **NOTES** Some northern populations have orange dorsal setae and fit the Western FCS (3.2.4.4), but unlike the other species in this cluster, this white desert form is more common. This species is recognized as a parasite of the sand wasp *Bembix occidentalis*.



Dasymutilla sackenii

Dasymutilla californica

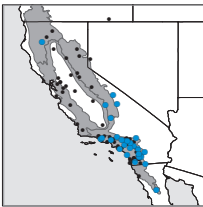


3.1.4.2—*Dasymutilla californica*

DAH-ZEE-MEW-TILL-UH CAL-IF-OR-NICK-UH

ETYMOLOGY This species was named after the state of California. **FIELD IDENTIFICATION** Often difficult. This species has a slender head like *D. sackenii*, but this desert form of *D. californica* is less common and almost always smaller in

size. **LAB IDENTIFICATION** The antennal scrobe usually lacks a dorsal carina; the head is narrower than the mesosoma and is armed with a posterolateral tubercle; the mesosoma is longer than wide and has a scutellar scale. **MALE** (5.1.2.3). Similar to female. **NOTES** This is a widespread Pacific species, but this white color form is apparently restricted to mountain areas in the southeastern Sierra Nevada, although some pale Central Valley populations fit here. The Western FCS (3.2.4.1) form is more common and widespread.



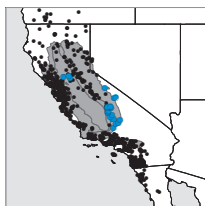
3.1.4.3—*Dasymutilla coccineohirta*

DAH-ZEE-MEW-TILL-UH COX-IN-EE-OH-HURT-UH

ETYMOLOGY From the Latin *coccineus* “red” or “scarlet” and *hirtus* “shaggy” or “hairy,” in reference to the shaggy red dorsal setae of many populations. This white desert form used to be named *D. clytemnestra* after the sister of Helen of Troy and wife of Agamemnon from Greek mythology. **FIELD IDENTIFICATION** Often difficult.

This species has the mesosoma longer than wide and the head nearly as wide as the mesosoma. **LAB IDENTIFICATION** The antennal scrobe lacks a dorsal carina; the head is about as wide as the mesosoma and is unarmed posteriorly; the mesosoma is longer than wide and has a scutellar scale. **MALE** (5.1.2.4, 5.2.4.2). Similar to female. **NOTES** This white color form is widespread in southern California. Males of *D. coccineohirta* are almost always orange or reddish, even in populations with white females. The Western FCS (3.2.4.2) form is more common and widespread.





3.1.4.4—*Dasytutilla aureola*

DAH-ZEE-MEW-TILL-UH OUR-EE-OLL-UH

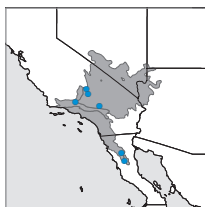
ETYMOLOGY Apparently derived from the Latin word *aureus* “golden,” in reference to the golden-yellow dorsal setae of many

populations. **FIELD IDENTIFICATION** Often easy. This species has the head much wider than the mesosoma and the mesosoma as wide as long. **LAB IDENTIFICATION** The antennal scrobe usually has a dorsal carina; head is clearly wider than the mesosoma and unarmed posteriorly; mesosoma is as wide as long and lacks a scutellar scale. **MALE** (5.1.2.5). Similar to female. **NOTES** This is a widespread Pacific species, but this Desert FCS form is apparently restricted to the southeastern Sierra Nevada. Some specimens from hot portions of the Central Valley are a pale enough yellow that they could match the desert form. The Western FCS (3.2.1.1) form is more common and widespread.



3.1.5—*Dasytutilla albiceris* Desert females cluster

Dasytutilla albiceris and *D. imperialis* are similar to the *D. sackenii* cluster, with whitish dorsal setae and black legs, but they are generally found in hotter desert habitats. Unlike the species in the *D. sackenii* cluster above, the two species in this cluster each have the head slender and the mesosoma as wide as long.



3.1.5.1—*Dasytutilla albiceris*

DAH-ZEE-MEW-TILL-UH AHL-BIH-SEHR-ISS

ETYMOLOGY From the Latin words *albus* “white” and *cerinus* “wax-colored” or “yellowish.” **FIELD IDENTIFICATION** Often difficult. This species is superficially similar

to *D. sackenii* but has the mesosoma as wide as long and has a narrower geographic distribution. **LAB IDENTIFICATION** Unlike *D. imperialis*, this species lacks a scutellar scale. **MALE** (5.1.2.2). Similar to female. **NOTES** Structurally, this species is similar to *D. vestita* in the Western FCS (3.2.2.1). *Dasytutilla albiceris* is known from a few localities in transition areas between hot deserts and mountain habitats in southern California.





3.1.5.2—*Dasyutilla imperialis*

DAH-ZEE-MEW-TILL-UH IMM-PEER-EE-AHL-ISS

ETYMOLOGY Named for Imperial County, California.

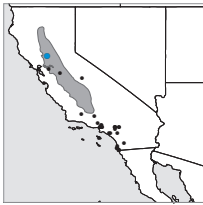
FIELD IDENTIFICATION Easy. This is the only *Dasyutilla* in the Algodones dunes with white setae on T3–6 and black setae on the legs. **LAB IDENTIFICATION** Unlike *D. albiceris*, this species has a

scutellar scale. **MALE** (5.4.2.2). Different from female; covered entirely with black setae. **NOTES** The male was discovered and named pretty recently (2005); the female was recognized even later (2020). This species is known from very few specimens, all from the Algodones sand dunes in California. It seems to be most active late in the year; most specimens were collected in September or October.



3.1.6.1—*Pseudomethoca anthracina*

SOO-DOE-METH-OWE-KUH ANN-THRUH-SEE-NUH



ETYMOLOGY From the Ancient Greek *anthrakinos* “coal-black,”

in reference to the male coloration. **FIELD IDENTIFICATION** Often difficult. Different from all other *Pseudomethoca*, but this species can easily be confused with *D. aureola* (3.1.4.4) except for its sessile T1 shape. **LAB IDENTIFICATION** The head is wider than the mesosoma; the mesosoma is as

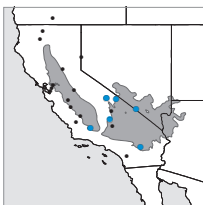
wide as long; and the T1 shape is sessile. **MALE** (5.4.5.1). Different from female; covered entirely with black setae. **NOTES** This white, desert form of *Ps. anthracina* is much rarer than most of the Desert FCS species and can be easily confused with *D. aureola* because of the short mesosoma and wide head. The white color form treated here is only rarely found in the Central Valley of California; most individuals have orange or red dorsal setae and fit the Western FCS (3.2.1.1). There is one undescribed *Pseudomethoca* species from Baja California Sur, Mexico, with similar coloration except that it has a black patch of setae on T2.



ABOVE: New species of *Pseudomethoca* from Baja California.

3.1.7.1—*Sphaerophthalma edwardsii*

S-FAIR-OPP-THAL-MUH EDWARDS-EE-EYE



ETYMOLOGY This species was named after its collector, Henry Edwards, an English stage actor, writer, and entomologist in the late 19th century. **FIELD IDENTIFICATION** Often difficult. This species overlaps in distribution with the *D. sackenii* cluster (3.1.4), but it has the leg setae mostly whitish-gray and the tergal fringes plumose. It generally has denser, more erect dorsal setae and darker body cuticle than other nocturnal





species (p. 283). **LAB IDENTIFICATION** The mandible lacks a dorsal or ventral tooth basally; the mesonotal setae are simple or brachyplumose; the T1 shape is petiolate; the tergal fringes are plumose; and T6 has a defined microreticulate pygidial plate. **MALE** (5.7.12.4). Different from this female form, with the dorsal setae mostly orange. **NOTES** This species is usually nocturnal but is sometimes seen in

daylight. Similarly colored nocturnal genera (6.1) usually have the body cuticle pale brown and the dorsal body setae sparser. This color form of *S. edwardsii* overlaps with Desert FCS forms of *D. aureola*, *D. californica*, and *D. coccineohirta* on the eastern slopes of the Sierra Nevada.

3.2 WESTERN FEMALES COLOR SYNDROME

This is the most common color syndrome that all three of us encounter (Kevin in California, Aaron in Texas, and Joe in Utah). The Western Females Color Syndrome (FCS) is almost entirely found west of the Mississippi River valley and extends throughout much of northern and central Mexico (p. 322), but it is not present in Central America. Members are covered in short to long hair that ranges from yellow to orange to cardinal red in coloration. The underlying cuticle and legs are typically black in color. Currently, the Western FCS includes 34 species in four genera.

When the dorsal setae are very pale yellow, these species could be confused with the Desert FCS. A few species treated here are difficult to separate from the Eastern, Madrean, or *Timulla*-like FCS in the central and northwestern USA, especially when the dorsal setae are sparse and the tergites have black, silvery, and orange color patterns. If the head and mesosomal setae lack black or silvery patches, this rules out the Madrean FCS. If the T2 disc has a large yellow-orange cuticular patch mesally, this rules out the *Timulla*-like FCS. In the central USA, if the head and mesosoma setae are moderately dense and erect and T2 has the cuticle largely black anteriorly and laterally, this rules out the Eastern FCS.

Of the 33 species in this FCS, 26 (~79%) are known from both sexes. Most of the males (~88%) belong to the analogous Western Males Color Syndrome (MCS) (5.1), which has the body cuticle mainly black or dark reddish and the dorsal body setae, at least on the mesonotum and T2 disc and/or T3–5, mostly yellow, orange, or red, just like these females. Only a small handful of species in the Western FCS have males with different coloration from the females.

Although this color syndrome is abundant and famous in North America, it is rarely seen on other continents. A few isolated, interesting taxa, like *Dasylabris schultzei* in southwestern Africa (Namibia) and *Quwitilla blattoserica* in Chile, do a pretty good impression of our western Nearctic friends. Additionally, the bizarre Thai species *Cockerellidia sobmi* (8.2.9.1) has long reddish setae and is unlike any other velvet ants in the region.



Quwitilla blattoserica from Peru.



Ephutomorpha lutaria from Australia.

The key below is useful for figuring out which page to visit next.

—Genus *Dasymutilla*—T1 shape petiolate; T2 fringe with simple setae

- 3.2.1 T3–5 setae uniformly yellow, orange, or red, like T2; mesosoma as wide as long; head much wider than mesosoma; Pacific states *D. aureola*
- 3.2.2 T3–5 setae uniformly yellow, orange, or red, like T2; mesosoma as wide as long; head not wider than mesosoma *D. vestita*, *D. eminentia*, *D. erythrina*
- 3.2.3 T3–5 setae uniformly yellow, orange, or red, like T2; mesosoma longer than wide; Great Plains and eastern Arizona to Texas ... *D. calorata*, *D. leda*, *D. stevensi*, *D. bioculata*, *D. nogalensis*
- 3.2.4 T3–5 setae uniformly yellow, orange, or red, like T2; mesosoma longer than wide; Pacific and northwestern states *D. californica*, *D. coccineohirta*, *D. sackenii*, *D. flammifera*
- 3.2.5 T3–5 setae uniformly yellow, orange, or red, like T2; mesosoma longer than wide; species with especially long and shaggy setae; Mojave and Sonoran Deserts *D. satanas*, *D. arenivaga*
- 3.2.6 T3–6 or T4–6 setae entirely black; dorsal setae long, dense, and shaggy; Mojave, Sonoran, and Great Basin Deserts *D. arenivaga*, *D. scitula*, *D. atricauda*
- 3.2.7 T3–6 with extensive pattern of black or silvery setae; mesosoma as wide as long *D. foxi*, *D. furina*, *D. vestita*, *D. montivagoides*
- 3.2.8 T3–6 with extensive pattern of yellow, orange, black or silvery setae; mesosoma longer than wide *D. bioculata*, *D. occidentalis*, *D. radkei*, *D. campanula*, *D. californica*

—Genus *Invreieilla*—T1 shape sessile, head with genal tooth ventrally, T2 fringe with setae simple

- 3.2.9 Head massive, armed with large genal tooth *I. manleyi*

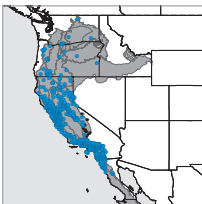
—Genus *Pseudomethoca*—T1 shape sessile, head unarmed ventrally, T2 fringe with setae simple

- 3.2.10 Head and mesosoma with dense, mostly erect dorsal setae *Ps. anthracina*, *Ps. flammigera*, *Ps. aureovestita*
- 3.2.11 Head and mesosoma with sparse mostly flat dorsal setae *Ps. propinqua*

—Genus *Sphaerophthalma*—T1 shape sessile or petiolate, T2 fringe with setae plumose

- 3.2.12 Dorsal setae uniformly yellow, orange, or red; leg setae usually gray *S. unicolor*, *S. edwardsii*

3.2.1.1—*Dasymutilla aureola*



DAH-ZEE-MEW-TILL-UH OUR-EE-OLL-UH



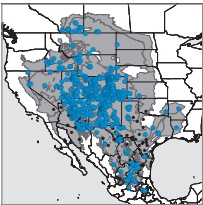
ETYMOLOGY Apparently derived from the Latin word *aureus* “golden,” in reference to the golden-yellow dorsal setae of many populations. **FIELD IDENTIFICATION** Often easy. This species has the head much wider than the mesosoma and the mesosoma as wide as long. **LAB IDENTIFICATION** The antennal scrobe usually has a dorsal carina; the head is clearly wider than the mesosoma and unarmed posteriorly; the mesosoma is as wide as long and lacks a scutellar scale. **MALE** (5.2.4.3). Similar to female. **NOTES** This is a widespread Pacific species, which has the dorsal setal color varying from nearly white (see Desert FCS, 3.1.4.4) to bright scarlet red. The brighter red specimens are more commonly seen in southern California, often at somewhat higher elevations, but specimen



age can affect the brightness of the dorsal setae. Based on records from inaturalist.com, this is the second most commonly observed velvet ant species in the world, behind only *D. occidentalis* (3.2.8.2, 3.6.1.1). Males (5.2.4.3), however, are more rarely seen than females and, surprisingly, are encountered less often than males of other Pacific species. This species has been associated with host bees in the genera *Anthophora* and *Melissodes*.

3.2.2—*Dasymutilla vestita* Western females cluster

Dasymutilla vestita is widespread throughout the central and western USA, while the other two are southwestern species. The tergal setae (at least from T2's posterior half to T5) are uniformly yellow, orange, or red; the mesosoma is as wide as long (and always lacks a scutellar scale); and the head is not wider than the mesosoma. The mesosomal shape can be difficult to interpret in the field (and sometimes in the lab), so these should be compared with many species in the following clusters.



3.2.2.1—*Dasymutilla vestita*

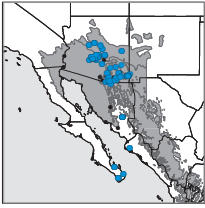
DAH-ZEE-MEW-TILL-UH VESS-TEE-TUH



ETYMOLOGY Apparently from the Latin *vestis* “garment,” in reference to the colorful dorsal setae. **FIELD IDENTIFICATION** Often easy. This species is more widespread than the others in this cluster and has the leg setae entirely black.

LAB IDENTIFICATION The body cuticle is usually entirely black; the antennal scrobe has a dorsal carina; the genal sculpture is less coarse than the vertex sculpture; the vertex is unarmed posteriorly; the mesosoma is as wide as long and lacks a scutellar scale; the hind trochanter is unarmed; S2 has the sculpture simply punctate; and the pygidial sculpture is rugose. **MALE** (5.2.6.1). Similar to female. **NOTES** This is one of the most common species in the western USA, especially in the Intermountain West, and expands east to Arkansas and Louisiana, north into Alberta, Canada, and as far south as Oaxaca, Mexico. In some regions of western Texas and New Mexico, the apical tergites are largely blackened (3.2.7.3), and in southern Texas (and sporadically throughout the southwestern deserts), this species fits the Texan FCS (3.3.2.2).





3.2.2.2—*Dasymutilla eminentia*

DAH-ZEE-MEW-TILL-UH EMM-INN-ENN-CHUH

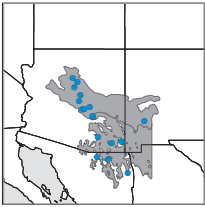


ETYMOLOGY Derived from the Latin word *eminentia* “prominence” or “protuberance,” likely referencing the multiple bumps on

S2. **FIELD IDENTIFICATION** Often easy. The leg setae are mostly gray and the dorsal setae are usually orange or yellow. **LAB IDENTIFI-**



CATION The body cuticle is variably black to reddish-brown; the antennal scrobe has a dorsal carina; the genal sculpture is nearly as coarse as the vertex sculpture; the vertex is unarmed posteriorly; the mesosoma is as wide as long and lacks a scutellar scale; the hind trochanter has a small tooth; S2 has the sculpture scabrous laterally; and the pygidial sculpture is rugose. **MALE** (5.2.3.2). Similar to female. **NOTES** This color form is more commonly seen at moderately high elevations in Arizona and New Mexico, while specimens from lower elevations in hot deserts more often fit the Desert FCS (3.1.2.3).



3.2.2.3—*Dasymutilla erythrina*

DAH-ZEE-MEW-TILL-UH AIR-EETH-RYE-NUH



ETYMOLOGY From the Ancient Greek *erythros* “red,” in reference to the dorsal setal color. **FIELD IDENTIFICATION** Sometimes easy. The distribution is more restricted, and the dorsal setae are brighter red than other species in this cluster. There are often scattered gray setae on the legs. **LAB IDENTIFICATION** The body cuticle is black laterally and ventrally but mostly pale orange dorsally beneath the red setae; the antennal scrobe has a dorsal carina;

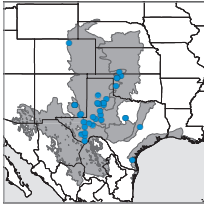
the genal sculpture is as coarse as the vertex sculpture; the vertex is unarmed posteriorly; the mesosoma is as wide as long and lacks a scutellar scale; the hind trochanter is unarmed; S2 has the sculpture simply punctate; and the pygidial sculpture is rugose. **MALE** (5.2.5.3). Similar to female. **NOTES** This species is rare in Arizona, but it is apparently the most common species in mountainous areas of Mexico (p. 322). Most of the Mexican populations have gray setae on the legs and a variably large



black patch on the metasoma, but many specimens in Arizona have the leg setae black and at most a tiny black patch on the T2 fringe. Where this species overlaps with *D. vestita* in Arizona, the latter species often has brighter red dorsal setae than other populations (Fig. 3.2.2.1a). *Dasymutilla erythrina*, however, has the dorsal setae even more brilliant and shining, emphasized by the pale orange cuticle beneath these setae.

3.2.3—*Dasymutilla calorata* Western females cluster

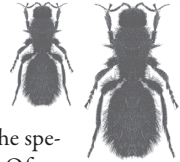
These species are mainly restricted to New Mexico, Texas, and the Great Plains, but *D. stevensi* extends west into Arizona, and a rare variant of *D. nogalensis*, known only from Arizona, is treated here. The tergal setae (at least from T2's posterior half to T5) are uniformly yellow or orange and the mesosoma is longer than wide. The mesosomal shape can be difficult to interpret in the field (and sometimes in the lab), so these should also be compared with other western *Dasymutilla* clusters.



3.2.3.1—*Dasymutilla calorata*

DAH-ZEE-MEW-TILL-UH CAL-OWE-RATT-UH

ETYMOLOGY From the Latin *caloratus* “heated,” perhaps in reference to its occurrence in Texas, which has hotter weather than Minnesota, where the author of the species, Clarence Mickel, lived. **FIELD IDENTIFICATION** Often easy. In addition to the large size, there are usually more black setae on the propodeal dorsum and anterior portion of T2 than other species in the cluster. **LAB IDENTIFICATION** The head is narrower than the mesosoma; the antennal scrobe has a distinct dorsal carina; the gena has a weak carina; the mesosoma is longer than wide and has a scutellar scale; the dorsal propodeal setae are usually black; and the pygidial sculpture is striate. **MALE** (5.2.6.2). Similar to female. **NOTES** Along with *D. klugii* (3.3.1.2) and *D. occidentalis* (3.2.8.2), this is one of the largest species in Texas and the Great Plains. Additionally, the color pattern is somewhat intermediate between those of other large species, and some specimens have the mesosoma more extensively black than normal, making them difficult to separate from *D. klugii* (3.3.1.2). The previously recognized species *D. hispidaria* was recently determined to be an aberrant form of *D. calorata* with the typically black setae turned yellow-orange, likely due to specimen age or some kind of mutation.

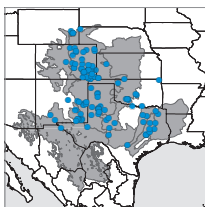


Dasymutilla calorata



D. hispidaria

D. klugii



3.2.3.2—*Dasymutilla leda*

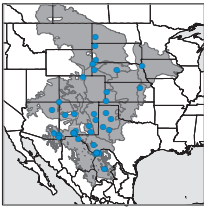
DAH-ZEE-MEW-TILL-UH LAY-DUH

ETYMOLOGY In Greek mythology, Leda was an Aetolian princess who became a Spartan queen. **FIELD IDENTIFICATION** Difficult. The head is wider than any other species in this cluster. **LAB IDENTIFICATION** The head is wider than the mesosoma; the antennal scrobe lacks a dorsal carina; the gena lacks a carina; the mesosoma is longer than wide and has a scutellar scale; the dorsal propodeal setae are usually yellow or orange; and the pygidial sculpture is striate. **MALE** Unknown. **NOTES** This species has a massive head, almost like *Pseudomethoca*, but has a distinct scutellar scale and petiolate T1 shape. Structurally, this species





is basically identical to *D. gorgon* from the Texan FCS (3.3.3.1) and it may eventually be recognized as a conspecific variant of that species.



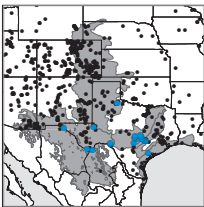
3.2.3.3—*Dasymutilla stevensi*

DAH-ZEE-MEW-TILL-UH STEVENS-EYE

ETYMOLOGY This species was named after O. A. Stevens, who collected the type specimen in 1923. **FIELD IDENTIFICATION** Very difficult. The head is wider than most species in this cluster, but not as wide as *D. leda*, and the body size is usually smaller than *D. leda*. The dorsal body setae are usually duller yellow or orange than *D. nogalensis* and the leg setae are usually entirely black. **LAB IDENTIFICATION** The head is scarcely wider than the mesosoma; the antennal scrobe usually lacks a dorsal carina; the gena lacks a carina; the mesosoma is longer than wide and lacks a scutellar scale; the dorsal propodeal setae are usually yellow or orange; and the pygidial sculpture is striate. **MALE** (5.2.6.4). Similar to female. **NOTES** This is the only species of this cluster that lacks a scutellar scale. Structurally this species is similar to *D. nupera* from the Texan FCS (3.2.4.1) and can be difficult to separate from that species in some individuals with interspersed black and yellow setae on the mesosomal dorsum.



difficult to separate from that species in some individuals with interspersed black and yellow setae on the mesosomal dorsum.



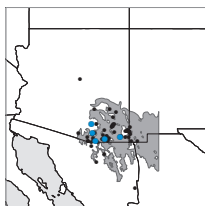
3.2.3.4—*Dasymutilla bioculata*

DAH-ZEE-MEW-TILL-UH BYE-OCK-EW-LAW-TUH

ETYMOLOGY From the Latin *bi* “two” and *oculus* “eye,” in reference to the two orange spots on T2 in many males.

FIELD IDENTIFICATION Very difficult. The head is narrower than in most species in the cluster, and T2 has an orange cuticular patch beneath the orange setae. **LAB IDENTIFICATION** The head is narrower than the mesosoma; the antennal scrobe has the dorsal carina weak or absent; the gena lacks a carina; the mesosoma is longer than wide and has a scutellar scale; the dorsal propodeal setae are usually yellow or orange; and the pygidial sculpture is striate. **MALE** (5.2.2.2, 5.2.5.1). Often similar to female. **NOTES** This variant of *D. bioculata* is not commonly encountered. Most *D. bioculata* specimens in the Western FCS have black and/or silvery setae on the apical tergites (3.2.8.1). Various other *D. bioculata* populations fit in the Eastern FCS (3.6.5.3) or Texan FCS (3.3.4.3).





3.2.3.5—*Dasymutilla nogalensis*

DAH-ZEE-MEW-TILL-UH NO-GALL-ENN-SISS



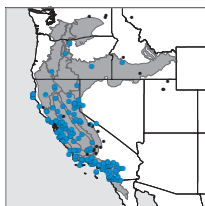
ETYMOLOGY This species was named after the city of Nogales, Arizona. **FIELD IDENTIFICATION** Often difficult. This is a rare variant known from mountainous areas of Arizona, the color pattern and body shape are similar to *D. stevensi*, but the setae are generally shinier.

LAB IDENTIFICATION Unlike the other species in this cluster, the mid and hind femoral apices are truncate. The head is about as wide as the mesosoma; the antennal scrobe has a dorsal carina; the gena lacks a carina; the mesosoma is longer than wide and has a distinct scutellar scale with a some transverse carinae anterior and lateral to the scale; the dorsal propodeal setae are usually yellow or orange; and the pygidial sculpture is longitudinally striate. **MALE** (5.2.5.2, 5.3.3.2). Similar to female. **NOTES** This species typically fits in the Texan FCS (3.3.4.5), but this rare variant has the head and mesosoma with coppery-reddish dorsal setae.



3.2.4—*Dasymutilla californica* Western females cluster

These species are predominantly found in the Pacific states, and more sporadically in the northwestern USA. The tergal setae (at least from T2's posterior half to T5) are uniformly yellow, orange, or red and the mesosoma is longer than wide. The mesosomal shape can be difficult to interpret in the field (and sometimes in the lab), so these should be compared with *D. aureola* (3.2.1.1) and *D. vestita* (3.2.2.1).



3.2.4.1—*Dasymutilla californica*

DAH-ZEE-MEW-TILL-UH CAL-IF-OR-NICK-UH



ETYMOLOGY This species was named after the state of California. **FIELD IDENTIFICATION** Difficult. This species has a slender head like *D. sackenii* and *D. flammifera*, but it is more common, widespread, and usually smaller in size than those species. Additionally, the propodeum often has the setae black dorsally. **LAB IDENTIFICATION** The body cuticle is



variably black to dark reddish brown; the antennal scrobe has the dorsal carina weak or absent; the head is clearly narrower than the mesosoma and is armed with a posterolateral tubercle; the mesosoma is longer than wide and has a scutellar scale; and the pygidial sculpture is generally rugose. **MALE** (5.2.4.1). Similar to female. **NOTES** This is a widespread Pacific species, which was recently found as far east as Idaho and Utah. The Desert FCS (3.1.4.2) form is rarer and has a more restricted distribution. An additional variant has a distinct black setal patch on the metasoma (3.2.8.6). In many museum collections, this species is more abundant than *D. aureola* (3.2.1.1), but on websites such as inaturalist.com there are fewer records of *D. californica*, perhaps because of the smaller body size.



3.2.4.2—*Dasymutilla coccineohirta*

DAH-ZEE-MEW-TILL-UH COX-IN-EE-OH-HURT-UH



ETYMOLOGY From the Latin *coccineus* “red” or “scarlet” and *hirtus* “shaggy” or “hairy,” in reference to the shaggy red dorsal setae of many populations. **FIELD IDENTIFICATION** Often difficult. This species has a wider head than other species in this cluster; unlike *D. aureola* (3.2.1.1), which has an even wider head, the mesosoma of *D. coccineohirta* is longer

than wide. **LAB IDENTIFICATION** The body cuticle is variably black to dark reddish-brown; the antennal scrobe lacks a dorsal carina; the head is about as wide as the mesosoma and is unarmed posteriorly; the mesosoma is longer than wide and has a scutellar scale; and the pygidial sculpture is generally rugose. **MALE** (5.2.4.2). Similar to female.

NOTES This variant is more common than the Desert FCS form (3.1.4.3). The distribution of this species overlaps almost perfectly with that of *D. californica* above and *D. aureola* (3.2.1.1), and each of these species can be abundant in the same habitat. All three species range in color from white to yellow to bright red.



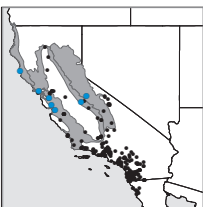
3.2.4.3—*Dasymutilla flammifera*

DAH-ZEE-MEW-TILL-UH FLAMM-IH-FAIR-UH



ETYMOLOGY Derived from the Latin *flamma* “blaze” or “fire,” in reference to the long, bright red dorsal setae. **FIELD IDENTIFICATION** Difficult. The head is slender, like *D. californica*, but *D. flammifera* is usually larger-bodied, with the setae denser and more erect, and the propodeum always has the dorsal setae orange or reddish. Where this species overlaps with *D. sackenii*, the dorsal setae are usually bright red, rather than dull orange. **LAB IDENTIFICATION** The body cuticle is dark reddish-brown, especially beneath the orange or red dorsal setae; the antennal scrobe has a dorsal carina that is often weak; the head is narrower than the mesosoma and is unarmed posteriorly; the mesosoma is longer than wide and has a scutellar scale; and the pygidial sculpture is basally rugose and apically microreticulate. **MALE** (5.2.4.5). Similar to female.

NOTES This species is rarer and usually larger-bodied than *D. coccineohirta* or *D. californica* and has a somewhat disjunct distribution in the Pacific region. Populations in the southern Coastal Range usually have bright red dorsal setae, while populations from the Great Basin usually have duller orange dorsal setae. Structurally, this species is similar to *D. pseudopappus* from the Desert FCS (3.1.1.2).



3.2.4.4—*Dasymutilla sackenii*

DAH-ZEE-MEW-TILL-UH SACKEN-EE-EYE



ETYMOLOGY This species was named for the Russian diplomat and entomologist Carl Robert Osten-Sacken, who worked mainly on flies. **FIELD IDENTIFICATION** Difficult. Like *D. californica* and *D. flammifera*, the head is slender, but *D. sackenii* is almost always larger in size, never has bright red dorsal setae, and is not known to

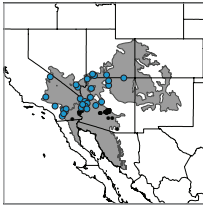


occur east of the Sierra Nevada (at least with this coloration). **LAB IDENTIFICATION** The body cuticle is entirely black; the antennal scrobe has a distinct dorsal carina; the head is narrower than the mesosoma and is unarmed posteriorly; the mesosoma is longer than wide and has a scutellar scale; and the pygidial sculpture is uniformly rugose. **MALE** (5.2.4.6). Similar to female. **NOTES** This color form is less abundant than the Desert FCS form (3.1.4.1) and is usually found at higher elevations near the northern extent of the range for this species.



3.2.5—*Dasymutilla satanas* Western females cluster

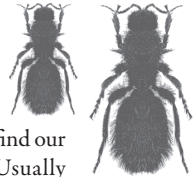
These species occur in dry habitats of the western USA, particularly in the Mojave and Sonoran Deserts. The tergal setae (at least from T2's posterior half to T5) are uniformly yellow or orange and the mesosoma is longer than wide. The dorsal body setae are usually longer and shaggier than those of most other Western FCS clusters.



3.2.5.1—*Dasymutilla satanas*

DAH-ZEE-MEW-TILL-UH SAY-TAN-USS

ETYMOLOGY This species was named after Satan, likely in reference to the distribution of this species in the hellish southwestern hot deserts (although we find our arid communities lovely). **FIELD IDENTIFICATION** Usually easy. This large diurnal species has the dorsal setae orange



and the S2–5 fringe setae yellow or orange. **LAB IDENTIFICATION** The eye is moderate in size, its diameter generally shorter than F1 + 2 combined; the antennal scrobe has a distinct dorsal carina; there is no genal carina; the head is narrower than the mesosoma; the mesosoma is longer than wide and has a scutellar scale; the sternal fringes are entirely yellow; and the pygidium sculpture is densely rugose, verging on microreticulate. **MALE** (5.3.3.3). Much darker coloration than female. **NOTES** This Western FCS form, with its bright orange dorsal setae, is most prevalent in the Mojave Desert and is more commonly seen than the paler yellow Desert FCS form (3.1.2.4) in the Sonoran Desert. Superficially, some variants of *D. calornata* (3.2.3.1) from the central USA look similar to this species.



(continued...)

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