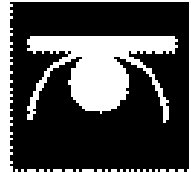


ILLINOIS
NATURAL
HISTORY
SURVEY

A Revision of the Bees of the
Genus *Andrena* of the Western
Hemisphere



Part XIV

Subgenus *Onagrandrena*

Wallace E. LaBerge and Robbin W. Thorp

Part XV

Subgenus *Hesperandrena*

Robbin W. Thorp and Wallace E. LaBerge

Illinois Natural History Survey Bulletin
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A Revision of the Bees of the Genus
Andrena of the Western Hemisphere
Part XIV. Subgenus *Onagrandrena*

Wallace E. LaBerge and Robbin W. Thorp

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INTRODUCTION

The subgenus *Onagrandrena* was first recognized and described by Linsley and MacSwain (1956) to include those black *Andrena* that are oligolectic on plants of the family Onagraceae and have pollen-collecting hairs modified to collect the specialized pollen from those plants. The males are more difficult to recognize than the females and most males are very similar to those of *Melandrena*. Since first described, two species of *Onagrandrena* have been recognized that have pale vestiture in both sexes. However, the pollen collecting hairs of both of these are of the *Onagrandrena* type, both sexes have well-formed pronotal angles and lateral ridges, and the males have relatively narrow, long mandibles with reduced or absent subapical teeth.

The species of *Onagrandrena* are very similar and are difficult to tell apart. Populations seem to be relatively isolated in desert locations with habitats amenable to the host plants. This, we believe, has led to a proliferation of species and we can detect slight average differences between populations from different geographic locations within some species. A few of these microgeographic races have been recognized in the literature as subspecies, but the present authors prefer not to formally recognize these races with names.

The reader is referred to earlier sections of this revision (LaBerge 1967, 1969, 1971, 1973, 1977, 1980, 1986, 1989; LaBerge and Bouseman 1970, 1987; LaBerge and Ribble 1972, 1975; Bouseman and LaBerge 1979; Thorp, 1969; Donovan, 1977) for details of morphology and for a more complete bibliography of the literature on *Andrena*. No new morphological terms have been introduced in the present work and the bibliography presented includes only references cited in the text or not listed in earlier parts of the revision. Published locality and floral records are included in the appropriate sections near the end of each species account. Maps showing the known distributions of species (Figs. 2-6) do not have all listed localities spotted on them. Localities that could be located only in a general way, such as county, or could not be found on maps or in gazetteers are omitted.

Considerable detailed information is available concerning the floral activity of several species of *Onagrandrena* in papers by Linsley, MacSwain, Raven and Thorp (1963a and b, 1964) and MacSwain, Raven, and Thorp (1973). These papers also provide brief notes on nesting burrows and an earlier paper by Linsley, MacSwain and Smith (1955) gives details on the nesting biology of a few species of *Onagrandrena*.

Institutions in which type material is deposited are listed with contractions as follows:
AMNH—American Museum of Natural History, New York City
CAS—California Academy of Science, San Francisco
INHS—Illinois Natural History Survey, Champaign
LACM—Los Angeles County Museum (of Natural History), Los Angeles
PANS—Philadelphia Academy of Natural Sciences
USNM—United States National Museum (of Natural History), Washington, D.C.
UCB—University of California at Berkeley (Entomology Collection)
UCD—University of California at Davis (Entomology Collection)
UCR—University of California at Riverside (Entomology Collection)
UKL—University of Kansas, Lawrence
USU—Utah State University, Logan

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Terry L. Griswold, Utah State University, Logan; Lynn S. Kimsey, University of California, Davis; John Chemsak, University of California, Berkeley; R.R. Snelling, Los Angeles County Museum, Los Angeles; J.G. Rozen, Jr., American Museum Natural History, New York City; Robert W. Brooks, University of Kansas, Lawrence; Ronald J. McGinley, National Museum (now at the Illinois Natural History Survey in Champaign), Washington, D. C.; U.N. Lanham, University of Colorado Museum, Boulder; Daniel Otte, Academy of Natural Sciences of Philadelphia; Floyd G. Werner, University of Arizona, Tucson; J.E.H. Martin, Canadian National Collection, Ottawa; the late George Eickwort, Cornell University, Ithaca, N.Y. Other specimens were borrowed from small holdings and returned at various times. The authors extend their appreciation to all of the people involved in these transactions.

For the special expertise and patience required to obtain quality SEM photos of noncoated specimens, we thank Mary Ann Tenorio, Entomology, California Academy of Sciences, San Francisco, CA for most of the photos and Daryl Ubick of the same department who ably completed the project. Mr. John J. Sherrod is thanked for preparing the male terminalia drawings for publication.

Subgenus *ONAGRANDRENA* Linsley and MacSwain

Onagrarendra Linsley and MacSwain, 1956, Pan-Pacific Ent., 32: 111-112; Lanham, 1949, California Univ. Publ. Ent., 8:183-238; Mitchell, 1960, North Carolina Agr. Exp. Sta. Tech. Bul. 141:86-257; LaBerge, 1964, Univ. Nebraska St. Mus. Bul. 4:315; 1986, Trans. American Ent. Soc., 111:441-458.

Onagrarendra are moderately large to large bees with short malar spaces, short to moderately tall vertices (rarely taller than half an ocellar diameter above lateral ocellus), and genal areas of moderate width (broad in males with long mandibles). Both sexes usually have the propodeum outside of the dorsal enclosure punctatorugose and the enclosure moderately rugulose. The females have the propodeal corbiculum not at all developed. The hairs along the upper and posterior margin of the propodeum are long and plumose but do not form a long overhanging margin to a basket and these long hairs grade into the shorter internal plumose hairs. The scopal hairs are long, relatively sparse to extremely sparse and simple. Both sexes lack tergal pale fasciae and most males lack sternal subapical pale fimbriae.

Common Characters. Medium-sized to large bees; facial quadrangle quadrate to slightly elongate; eyes with inner margins parallel or converging slightly towards mandibles; clypeus black, punctate; vertex above lateral ocellus usually equals one ocellar diameter or less; genal area usually broader than eye in profile; galea usually broad with apicolateral margin concave, a few species with small straight-sided galeae, usually galea exceeded by last two maxillary palpal segments; labral process entire to bidentate, usually recurved. Pronotum usually without humeral angle or lateral ridges but present in four species. Posterior hind tibial spur not broadened basally or twisted in outer third. Pterostigma not especially narrow usually slightly wider than from inner margin prestigma to anterior wing margin; three submarginal cells usually present; vein 1st m-cu usually meets second submarginal cell near middle of cell or beyond middle; vannal lobe hind wing broad, excision deep. Propodeal enclosure usually irregularly rugulose, smooth or nearly so in a few species; surfaces outside of enclosure with distinct to coarse punctures, often separated only by narrow, sharp ridges, smooth in several species. Vestiture variable but often black in large part, without pale apical tergal fasciae.

Female. Facial foveae shallow, large, separated from lateral ocellus by half to one ocellar diameter, usually extending down to below a line at lower margins of antennal fossae; subgenal coronet present. Propodeal corbicula absent or poorly expressed; without long plumose hairs anteriorly, dorsally with long plumose straight hairs, internally with abundant plumose hairs short below and grading into upper long hairs; trochanteral flocculus complete but weak; tibial scopal hairs long to extremely long, moderately abundant to sparse, simple.

Male. Mandible short to elongate, apposite to decussate; antenna moderately long, first flagellar segment slightly shorter than second segment to slightly but distinctly longer. Sterna usually without subapical fimbriae; with apical lobe distinctly bidentate; sternum 8 usually with apex capitate and distinctly separated from neck region; neck region and often apical lobe more or less hairy.

PHYLOGENY

The *Onagrandra* probably arose from a common ancestor with the subgenus *Andrena*. Only a few morphological changes (shortened malar space, loss of propodeal corbiculum, and shortened vertex) are needed to separate the generalized *Onagrandra* from generalized *Andrena*. Few additional changes (color of the vestiture, simplified trochanteral flocculus, and coarse sculpturing of the propodeum) are needed to account for the majority of species of *Onagrandra*. The Eurasian fauna does not have any species belonging in this subgenus or approaching this combination of characteristics, so we assume it to have evolved in western North America where it exists at present.

The accompanying phylogenetic diagram (Fig. 1) showing the hypothetical relationships among the known species of *Onagrandra* is based on 22 attributes listed below in both apomorphic and plesiomorphic states (Table 1). The tree is rooted by a hypothetical ancestor based on comparing situations in the subgenus *Andrena s. str.* and in more generalized bees (Halictidae and Colletidae) and coded "0" for all states. A parsimony analysis of the data set (Appendix 1) using David Swofford's PAUP* 4.0b8 program (2002 Sinauer Associates, Sunderland, MA), yielded 200 minimum-length trees, of which the strict consensus is shown in Figure 1. This tree indicates that the four species with distinct pronotal humeral angles and lateral ridges in both sexes could possibly be considered as a separate subgenus. This tree indicates that the four species with distinct pronotal humeral angles and lateral ridges in both sexes could possibly be considered as a separate subgenus. These four,

however, do not show any apomorphic characteristics that are not present in some or all of the remaining *Onagrarendra* species and the present authors prefer to recognize them as the most generalized species of the *Onagrarendra*.

Table 1. A list of the plesiomorphic and apomorphic alternatives of the characters upon which our phylogenetic study was based.

Plesiomorphic	Apomorphic
1. Pronotum with humeral angles and lateral ridges	without angles or ridges.
2. Propodeal enclosure weakly sculptured	coarsely sculptured.
3. Female vestiture entirely pale	largely or entirely black.
4. Propodeum with distinct dorsal surface	declivous from base.
5. Dorsal thoracic hairs long	short.
6. Wing membranes hyaline or weakly infumate	deeply infumate.
7. Labral process with apical portion broad, sides straight or shape triangular	narrow, sides concave.
8. Metasomal terga black without metallic blue or violaceous reflections	terga with metallic blue or violaceous reflections.
9. Propodeum outside of enclosure finely rugulate and/or tessellate, not punctatorugose but punctate	finely to coarsely punctatorugose.
10. Female clypeal punctures dense	punctures sparse.
11. Galeae normal, dulled by fine dense tessellation	small, shiny.
12. Scutellar punctures separated by half a puncture width or more	punctures dense.
13. Female terga 2 and 3 with apical areas punctate at least basally	apical areas impunctate.
14. Female hind tibial scopal hairs dense, obscuring surface	long, sparse, not hiding surface.
15. Ocelli not enlarged	ocelli more or less enlarged.
16. Vertex above lateral ocellus equals one ocellar diameter	equals less than one ocellar diameter.
17. Lower mesepisternum punctate	punctatorugose.
18. Male mandible with subapical tooth	without subapical tooth.
19. Male tergal vestiture entirely pale	dark on terga 6 and 7 or mostly dark.
20. Male thoracic hairs entirely to partly pale	entirely dark.
21. Male flagellar segment one equal to or only slightly longer than segment 2	distinctly longer than segment 2 and often longer than segment 3.
22. Male genal area broad, about one and one-half times as broad as eye	genal area not much broader than eye in profile.

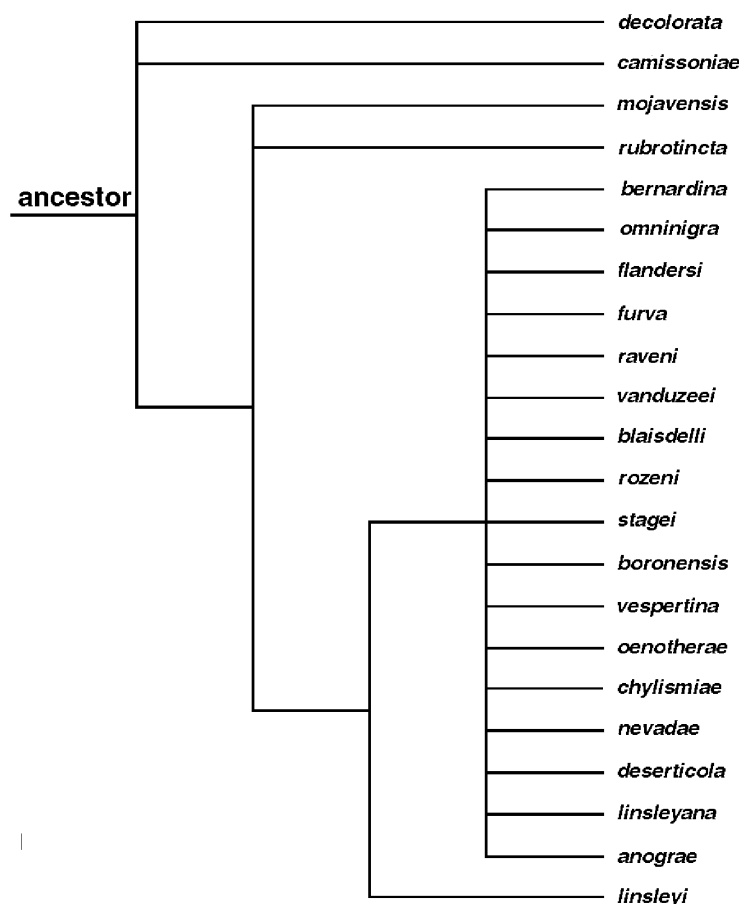


Fig. 1. Phylogenetic diagram of the species of the subgenus *Onagrandra*. This is a strict consensus tree of 200 most parsimonious trees all of length 45 with consistency index + 0.489 and retention index = 0.720. Diagram derived by use of PAUP* 4.0b8 of D. L. Swofford (2002). Note that the majority of the tree is unresolved due to the small number of characters available. The authors thank Phil Ward of the University of California-Davis for running the program to produce this diagram.

BIOLOGY

The subgenus *Onagrandra* is defined in large measure by a suite of behavioral, morphological, and physiological traits associated with collection of pollen by the female bees from a few closely related, usually congeneric, species of the the plant family Onagraceae. This behavior, referred to as oligolecty (Linsley 1958), is accompanied by morphological adaptations of the female pollen transport apparatus. The females have sparse unbranched (simple) scopal hairs, they lack propodeal corbiculae, and they have poorly formed trochanteral flocculi on the hind legs (trochanters). These three structural modifications make the pollen transport apparatus well adapted to handle and store large triangular pollen grains that are tied together in webby masses by viscin threads (Linsley 1958, Thorp 1979, Skvarla *et al.* 1978). P.H. Timberlake was one of the first to recognize the correlation between the long simple hairs of the scopa in *Andrena* and the collection of pollen from Onagraceae according to Cockerell (1937). Females of this subgenus also have predominantly black integument and black, dark brown or ochraceous vestiture that enhances absorption of radiant energy. This is advantageous for foraging flights during low light, cool matinal or crepuscular periods when many of the host plants present pollen. In addition to coincidental daily rhythms, these annual spring-flying bees exhibit seasonal synchrony with bloom of

their pollen host plants. In some species this appears to include abilities to refrain from emerging in unfavorable years and to emerge early (e.g., in late autumn) when their host plants are stimulated to germinate early by aseasonal heavy summer rains. Thus, loss of pollen host plants and/or habitat due to urbanization and agriculture diminishes populations of bees.

Distribution and Abundance. Bees of the subgenus *Onagrاندrena* are limited to the western United States and northwestern Mexico west of the 105th meridian and between the 42nd and 35th parallels. All but four species (*anograe*, *linsleyana*, *nevadae*, and *stagei*) occur in California. Nine are restricted to California and four of these (*camissoniae*, *omninigra*, *vanduzeei*, and *vespertina*) occur exclusively in cismontane California, the other five (*bernardina*, *deserticola*, *flandersi*, *furva*, and *mojavensis*) are transmontane or occur in the southern deserts. Four additional species (*blaisdelli*, *boronensis*, *decolorata*, and *oenotherae*) occur primarily in California, but also extend their ranges into Baja California del Norte, Mexico. Several species are severely limited in distribution and/or are known from a very few specimens. Only females are known for *A. nevadae* (2) and *A. stagei* (3). *Andrena camissoniae* and *A. decolorata* are each known from less than 20 specimens and from three to four localities respectively. *Andrena vespertina* is known from nearly 170 specimens, but only from two disjunct localities separated by about 220 air miles.

Bees of the subgenus *Onagrاندrena* tend to occur entirely within the distribution of their pollen host plant taxa. Peripheral populations of Onagraceae tend to be pollinated by generalist bees or other pollinators or have shifted their reproduction to self-compatibility or autogamy. *Andrena linsleyi* occupies only the southern portion (less than half) of the range of *Oenothera deltoides* (Linsley *et al.* 1963a: Fig. 2). *Andrena rozeni* occupies much of the distribution of *Camissonia claviformis*, but does not extend north into Oregon and Idaho with its pollen host, nor as far east as its host in Nevada and Arizona (Linsley *et al.* 1963a: Fig. 1, as *O. clavaeformis*).

Few remnants of presumably more widespread populations of *Onagrاندrena* remain, especially in the Central Valley and coastal areas of California and these are threatened by encroachment of human populations. While they can forage for nectar at flowers of many plants, these bees are restricted to plants of the family Onagraceae for pollen resources necessary to rear their young. Many habitats no longer exist where populations of these bees were found when the studies by E.G. Linsley and J.W. MacSwain were initiated in the mid-1950s. Locations and descriptions of the major habitats where most of the biological studies on bees of the subgenus *Onagrاندrena* have been conducted are provided by E.G. Linsley and his colleagues (Linsley *et al.* 1963a, b, 1964, 1973; MacSwain, *et al.* 1973). Relevant features of the Onagraceae host plants are provided by P.H. Raven in the same series of publications as well as in Raven 1962, 1964, 1969. Information on *Clarkia* is available in the monograph by Lewis and Lewis (1953) and on *Gayophytum* by Lewis and Sweykowski (1964).

Overwintering, Emergence, and Seasonal Flight. Adults of most California species fly in spring, primarily in March and April. However, species oligolectic on *Clarkia* (*A. bernardina*, *omninigra*) and *Gayophytum*, and *A. vanduzeei* are active principally in late spring (May and June) and early summer (June and July) respectively. Species that occur primarily in the Colorado Desert (*A. linsleyi*, *rozeni*, *rubrotincta*) emerge as early as February (Linsley *et al.* 1963a). Those that live in the Great Basin (*A. anograe*, *chylismae*, *linsleyana*, *nevadae*, *raveni*, *stagei*) fly primarily from May into July (Linsley *et al.* 1963b, Thorp 1987).

Linsley *et al.* (1963a) list apparently anomolous early records for three species that occur in the Colorado Desert of California (*rozeni*, *linsleyi*, and *rubrotincta*). These species usually first appear in February, but males of each were collected between 27 November and 17 December 1921 at Needles, California. The authors suggested that the most likely reason for these early records was an unusual season. Precipitation records (US Weather Bureau 1921) for July through December 1921 show that the Needles, California station received above normal rainfall for the months of August, September, October, and December in 1921. Rainfall in just August and September was 4.66 inches above normal and nearly an inch higher than the normal for the entire year at Needles that year. We have no information about whether the pollen host plants of these bees bloomed in response to these unusually high, aseasonal rains, but the following example of a southeastern California desert oligolege and its host plant is strongly suggestive.

Hurd (1957) reported collecting specimens of the normally spring flying melittid bee, *Hesperapis fulvipes* Crawford, in October 1951 in the eastern Mojave and Colorado deserts of California. This occurred after unusual heavy summer rains that caused the pollen host plant of the bee, *Geraea canescens*, to bloom several months ahead of time. Precipitation records (US Weather Bureau 1951) for July through December 1951 at three stations in southeastern California (Needles, Blythe, and Parker Reservoir) confirm that they all received heavy rains in August 1951 (3.47 to 5.52 inches above normal). This case combined with weather data for 1951, demonstrates that heavy August rain was sufficient to stimulate aseasonally early emergence of the oligolectic bee and bloom of its pollen host plants. The similar aseasonal heavy rainfall pattern in 1921 thus offers an explanation for the early appearance on *Onagrandra* at Needles that year.

Seasonal flight patterns of the bees are closely tied to the bloom seasons of their pollen host plants. It is well known that many plants have the ability to hold over inclement years as seed investment in the soil. This is particularly striking in desert plants and gives rise to spectacular bloom years when preceding fall rains have been adequate to cause germination of much of the seed bank at one time. There is evidence to suggest that at least some *Onagrandra* survive inclement years and emerge a year or more later, "... although ... this adaptation may not be a perfect one ..." (Linsley *et al.* 1963a). *Andrena mojavensis* appears to be adapted to remain more than one year in its brood cells when conditions are unfavorable and to emerge when conditions become favorable. In the poor flower year of 1959, small numbers of females were concentrated on the few flowers available. In 1960, both flowers and bees were extremely abundant. The high population of bees in 1960 was not likely to have been produced by the previous generation alone (Linsley *et al.* 1964).

Linsley and MacSwain (1963) report that adults of *A. (O.) oenotherae* (as *oraria*) were excavated from nest cells in early October and early February, indicating that this species and presumably other spring flying *Onagrandra* overwinter as adults in their brood cells (Linsley *et al.* 1963a). Some *Onagrandra* appear to be protandrous: *A. rozeni*, *linsleyi* (Linsley *et al.* 1963a).

Male Behavior. Males of *A. rozeni* characteristically and consistently over various localities in the Colorado Desert of California appeared about two hours before sunset in the vicinity of the female pollen host plant, *Camissonia claviformis* (Linsley *et al.* 1963a). This was about 30 minutes before females began foraging for pollen. Males flew rapidly at the height of the flowers, approaching, but not contacting pollen collecting females. Copulation was only observed with females that were freshly emerged and had not yet begun to collect pollen. Males are rarely seen at other times of day.

Males of *A. linsleyi* visit Asteraceae: *Geraea canescens* and *Palafoxia linearis* in the AM for nectar and seeking females in some years. When the female pollen host, *Oenothera*

deltoides, is the major source of nectar, male activity is concentrated on it. Most copulation records involve other flowers, however. Male flight among flowers appears erratic when compared to the more regular flight of *A. rozeni* males.

Nests-Sites, Architecture, and Construction. Nests of only a few species of *Onagrarendra* have been excavated and described including: *A. rozeni* and *A. linsleyi* (Linsley *et al.* 1963a); *A. raveni* (Linsley *et al.* 1963b); and *A. mojavensis*, *A. deserticola*, and *A. boronensis* (Linsley *et al.* 1964). Nests were also excavated for *A. oenotherae* (as *oraria*) (Linsley and MacSwain 1963), but no information on nest architecture was provided.

Females of these bees most frequently nest in sandy soil. Nests are often initiated in shallow depressions and tend to be scattered, but small aggregations were noted for *A. deserticola*. They range in depth from about 36 cm to over 1 m. The entrance shaft is often vertical (*A. linsleyi*, *raveni*, *mojavensis*, and *deserticola*) but may angle downwards at 45 degrees for the first 5–14 cm as in *A. rozeni* and *boronensis*.

Flower Relationships. Female *Onagrarendra* all exhibit host-specificity for pollen (oligolecty) with members of the Onagraceae (Table 2). Females of 15 of 22 species of *Onagrarendra* collect pollen from species of *Camissonia*. Females of four species collect pollen from *Oenothera*. Females of two species collect pollen from *Clarkia* and the remaining one collects pollen from *Gayophytum*. Based on seasonal and diurnal synchrony, fidelity of female bees foraging for pollen host plants, numbers of individual bee foragers, and their size and fit with their host floral structures, these bees are probably the principal pollinators of their host species of Onagraceae except for *Oenothera*.

The long viscin threads in *Oenothera* tie many pollen grains together in long strands and are an adaptation to pollination by hawkmoths. These long loose strands of pollen hang from the venters of the moths and become draped over the lobes of the stigma as the pollinators hover in front of the flowers probing for nectar. This presents a handling problem to most female bees that attempt to pack pollen in their pollen transport structures (Thorp 1979). Females of *Onagrarendra* have solved this problem by simplifying their pollen transport structures. Females of most generalist bees are unable to effectively cope with the largest and webbiest pollen grains of the Onagraceae. The pollen transport apparatus of the honey bee, *Apis mellifera* L., is particularly ill-suited for packing pollen of *Oenothera* (Linsley *et al.* 1963a). These flowers are usually nocturnal blooming, adapted for hawkmoth pollination, and possess the largest and webbiest grains (Greggory 1963–64, Raven 1979, Skvarla *et al.* 1978, Linsley *et al.* 1963a). Females of four species of *Onagrarendra* (*anograe*, *linsleyana*, *linsleyi*, and *stagei*) that collect pollen from *Oenothera* have the most sparse scopal hairs. These bees usually collect residual pollen the following morning before the flowers close for the day, for example, *Andrena linsleyi* (Linsley *et al.* 1963a).

Flowers of many of the genera of Onagraceae are well adapted for pollination by bees, especially oligolectic *Andrena* (Linsley *et al.* 1963a, b, Thorp 1969, Linsley *et al.* 1973, MacSwain *et al.* 1973, Estes and Thorp 1974, Raven 1979). In contrast to hawkmoth and hummingbird pollinated Onagraceae, these frequently have viscin threads reduced in length and number, for example *Camissonia*, *Clarkia*, and *Gayophytum* (Linsley *et al.* 1963a, b, Thorp 1969). Skvarla *et al.* (1978) note that structures of the viscin threads are often different between moth and bee pollinated species of the tribe Onagreae.

Most *Camissonia* are matinal flowering and bright yellow, a few are white and crepuscular or nocturnal flowering. Their oligolectic bees therefore forage primarily early in the morning (at or before sunrise) and/or late in the afternoon until sunset. Flowers of *Clarkia* and of *Gayophytum* present pollen most of the day. The female *Onagrarendra* on *Clarkia* forage in the middle of the day. Since *Clarkia* anthers dehisce gradually, pollen foraging

female bees vibrate the anthers to release additional pollen. *Gayophytum* occurs at high elevations and has late summer flowering. Its small flowers are pollinated primarily by small bees and throughout the day, but also by one species of *Onagrandra*. *Onagrandra* females gather nectar from a variety of other floral sources, especially when the pollen host is not suitable, for example, *Oenothera* with the nectar at the base of its long hypanthium.

Pollen Competition. More than one species of *Onagrandra* occur together at some localities and some even share the same pollen host plant resources sympatrically (Linsley *et al.* 1963 a, b, 1964, 1973). They also share host plants with some oligolectic species of the subgenus *Diandrena* (Thorp 1969, Linsley *et al.* 1973). How do they manage to coexist in sympatry? Many of the ways have been discussed by Thorp (1969) in relation to coexistence among members of the subgenus *Diandrena*. These include: 1) some do not share the same floral resource where they co-occur; 2) sharing of the same floral resource is not among most closely related species within the subgenus; 3) some seasonal resource division occurs; 4) some diurnal resource division with species with larger and darker females foraging earlier occurs; 5) not all populations of any one species occur in sympatry with the same guilds of other species; 6) species dominance may shift among areas of sympatry.

Table 2. Principal pollen flowers for species of *Onagrandra*.

<i>anograe</i>	<i>Oenothera caespitosa, albicaulis, scapoidea</i>
<i>linsleyana</i>	<i>Oenothera pallida</i>
<i>omninigra</i>	<i>Clarkia dudleyana, unguiculata, cylindrica, speciosa</i>
<i>bernardina</i>	<i>Clarkia</i> (?)
<i>flandersi</i>	<i>Camissonia campestris, claviformis</i>
<i>furva</i>	<i>Camissonia campestris</i>
<i>oenotherae</i>	<i>Camissonia campestris, cheiranthifolia</i>
<i>vespertina</i>	<i>Camissonia boothii</i>
<i>boronensis</i>	<i>Camissonia crassifolia</i>
<i>stagei</i>	<i>Oenothera</i> (?)
<i>chylismiae</i>	<i>Camissonia claviformis</i>
<i>rozeni</i>	<i>Camissonia claviformia, boothii</i>
<i>linsleyi</i>	<i>Oenothera deltoidea</i>
<i>blaisdelli</i>	<i>Camissonia campestris, bistorta</i>
<i>deserticola</i>	<i>Camissonia campestris</i>
<i>nevadae</i>	<i>Camissonia</i> (?)
<i>raveni</i>	<i>Camissonia claviformis, tanacetifolia</i>
<i>vanduzeei</i>	<i>Gayophytum diffusum</i>
<i>rubrotincta</i>	<i>Camissonia brevipes, claviformis</i>
<i>mojavensis</i>	<i>Camissonia kernensis</i>
<i>camissoniae</i>	<i>Camissonia campestris</i>

Examples of co-occurrence include: West of Blythe, CA—*A. rozeni, linsleyi, rubrotincta* (Linsley *et al.* 1963a); West of Austin, NV—*A. rozeni, raveni, chylismiae* (Linsley *et al.* 1963b); Short Canyon, CA—*A. mojavensis, boronensis, deserticola, flandersi* plus two *Diandrena* (Linsley *et al.* 1964); East of Bakersfield, CA—*A. oenotherae* (as *convallaria*), *deserticola, vespertina* (Linsley *et al.* 1973); Hungry Valley, CA—*A. blaisdelli, deserticola* (Linsley *et al.* 1973); Northeast of Santa Margarita, CA—*A. blaisdelli, furva, oenotherae* (as *convallaria*), *omninigra*, (Linsley *et al.* 1973). At most of these localities, potential competition for pollen resource is minimized through availability of more than one species

of pollen host plant, and differences in seasonal and diurnal abundance of species foraging on that host.

Parasites, Predators, and Associates. Strepsiptera: Stylopidae: The presence of adult *Stylops* between the metasomal tergites has been noted for: *Andrena boronensis* (Linsley *et al.* 1964); *A. chylismae* (including one female as *thorpi*) (Linsley and MacSwain 1962, Linsley *et al.* 1963); *A. linsleyi* (Linsley and MacSwain 1955, Linsley *et al.* 1963); *A. oenotherae* (as *convallaria subhyalina*) (Linsley and MacSwain 1963, Linsley *et al.* 1964); *A. raveni* (Linsley *et al.* 1963); *A. rozeni* (Linsley and MacSwain 1955, Linsley *et al.* 1963); and *A. vespertina* (Linsley and MacSwain 1961). We have found *Stylops* in specimens we have examined of *A. deserticola*, *A. linsleyana*, and *A. raveni*. Up to 67% of one sample of *A. oenotherae* at one site were found to contain *Stylops* (Linsley and MacSwain 1963). Female bees from many sites had up to three *Stylops* and one female *A. oenotherae* from near Ensenada, Baja California del Norte, Mexico, contained four. **Hymenoptera: Anthophoridae:** Females of a species of *Nomada* were noted as being active near burrows of *A. chylismae*, *A. linsleyi*, *A. raveni*, and *A. rozeni* (Linsley *et al.* 1963), and of *A. boronensis* and *A. deserticola* (Linsley *et al.* 1964). **Diptera: Asilidae:** Robber flies, *Callinicus calcaneus* (Loew), were recorded as predators on *A. omninigra* by Linsley (1972).

Key to the Females of
Onagrandrena

1. Pronotum with humeral angle and blunt vertical ridge laterally (Fig. 18); propodeal dorsal enclosure weakly sculpture 2.
Pronotum without humeral angle and ridge (Fig. 15); propodeal enclosure coarsely rugulate or coarsely punctate 5.
- 2(1). Vestiture entirely pale, yellow to ochraceous 3.
Vestiture all or mostly black, at most dorsum of thorax and vertex with pale hairs and these usually dark ochraceous or fulvous 4.
- 3(2). Propodeum declivous, without distinct dorsal surface, areas outside of enclosure evenly tessellate with scattered puncture
..... *Andrena decolorata* LaBerge and Thorp.
Propodeum with dorsal surface, area outside of enclosure with weak irregular rugulae as well as punctures and tessellation (Fig. 21)
..... *Andrena camissoniae* Linsley and MacSwain.
- 4(2). Mesoscutum at least posteromedially and scutellum shiny, at least in part unshagreened
..... *Andrena mojavensis* Linsley and MacSwain.
Mesoscutum dulled by fine shagreening throughout or shiny only in very small posteromedial area; scutellum dull, finely shagreened throughout *Andrena rubrotincta* Linsley.
- 5(1). Most dorsal thoracic hairs shorter than width of scape (a few to several longer hairs may be present), velvetlike in appearance 6.
Most dorsal thoracic hairs at least as long as scape width and usually longer, not at all velvetlike 9.
- 6(5). Wing membranes infumate, brown to almost black 7.
Wing membranes scarcely, if at all, infumate, hyaline 8.

- 7(6). Labral process with apical portion about as broad as base of scape;
vertex above lateral lateral ocellus equals about one ocellar
diameter *Andrena bernardina* Linsley.
Labral process with apical portion long, narrower than base of scape;
vertex above lateral ocellus equals more than one ocellar diameter
..... *Andrena omninigra* Viereck.
- 8(6). Terga 2 and 3 with apical area impunctate medially; mesoscutum
with punctures large, deep, surface shiny at least posteromedially
..... *Andrena flandersi* Timberlake.
Terga 2 and 3 with apical areas punctate at least in basal half across
entire tergum; mesoscutal punctures small, crowded, surface dull,
shagreened *Andrena furva* Linsley and MacSwain.
- 9(5). Dorsal thoracic hairs dark brown to black 10.
Dorsal thoracic hairs pale, ochraceous to fox-red 23.
- 10(9). Metasomal terga black with distinct violaceous to blue reflections
..... *Andrena raveni* Linsley and MacSwain.
Metasomal terga black, violaceous reflections absent or faint 11.
- 11(10). Mesoscutum dulled by fine dense shagreening 12.
Mesoscutum shiny, unshagreened except at extreme periphery..... 21.
- 12(11). Propodeum outside of enclosure finely, irregularly rugulate and/or
tessellate, not punctatorugose or only finely so; mesepisternum
with distinct punctures, not punctatorugose 13.
Propodeum outside of enclosure and mesepisternum moderately to
coarsely punctatorugose 15.
- 13(12). Clypeal punctures relatively sparse, separated mostly by half to one
puncture width, median impunctate line usually complete; labral
process usually triangular with straight sides and rounded tip
..... *Andrena linsleyi* Timberlake.
Clypeal punctures dense, separated by half a puncture width or less,
impunctate line usually incomplete or absent, rarely complete and
extremely narrow; labral process with apical part narrowed, sides
concave, or broad and bidentate apically 14.
- 14(13). Lateral ocellus separated from facial fovea by one ocellar diameter or
Lateral ocellus separated from facial fovea by about half an ocellar
diameter; terga 3 and 4 without metallic reflections 22.
- 15(12). Galeae small, shiny, unshagreened or only slightly shagreened near
tips; tergum 1 with basal area shiny, unshagreened
..... *Andrena blaisdelli* Cockerell.
Galeae longer, dulled by fine dense shagreening; tergum 1 with basal
area at least lightly shagreened 16.
- 16(15). Scutellar punctures relatively sparse (especially in anterior third), spaces
tessellate..... *Andrena rozeni* Linsley and MacSwain (in part).

- Scutellar punctures dense, separated by half a puncture width or less, often with interpunctural spaces lacking, punctatorugose 17.
- 17(16). Terga 2 and 3 with apical areas with punctures separated mostly by 3 to 5 puncture widths..... 18.
Terga 2 and 3 with apical areas with punctures separated mostly by 1 to 3 puncture widths 19.
- 18(17). Hind tibial scopal hairs long, sparse, scarcely hiding surface *Andrena stagei* Linsley and MacSwain.
Hind tibial scopal hairs shorter, dense, partially obscuring surface *Andrena boronensis* Linsley and MacSwain.
- 19(17). Tergum 2 with median third of basal area with punctures separated mostly by half a puncture width or less *Andrena vespertina* Linsley and MacSwain.
Tergum 2 with median third of basal area with punctures slightly sparser, separated largely by half to one puncture width 20.
- 20(19). Hind tibial scopa with moderately abundant, long, simple hairs, surface of tibia somewhat obscured by hairs..... *Andrena oenotherae* Timberlake.
Hind tibial scopa with sparse, long, simple hairs not at all obscuring surface of tibia (slightly larger bee, slightly sparser scopal hairs, slightly darker wings) *Andrena chylismiae* Linsley and MacSwain.
- 21(11). Scopal hairs long, sparse; propodeal enclosure coarsely reticulorugose (Fig. 16); terga 2-4 with basal area punctures coarse, deep, abundant..... *Andrena nevadae* Linsley and MacSwain.
Scopal hairs moderately long and dense; propodeal enclosure usually shallow, relatively sparse..... *Andrena deserticola* Timberlake.
- 22(14). Large bees with ocelli distinctly enlarged; lateral ocellus about as broad as vertex above it; mesosomal vestiture black; scutellum dull, not shiny anteriorly..... *Andrena linsleyana* Thorp.
Usually smaller bees with ocelli not enlarged; lateral ocellus width narrower than vertex above it; mesosoma usually with some vestiture pale dorsally, scutellum moderately shiny *Andrena anograe* Cockerell (in part).
- 23(9). Lower mesepisternum punctate, interpunctural spaces tessellate; scutellum with anterior punctate area shiny, not tessellate; clypeal punctures small, dense..... *Andrena anograe* Cockerell (in part).
Mesepisternum largely coarsely punctatorugose, lower-posterior area punctate, but obscured by dense tessellation; scutellum with anterior punctate area dulled by fine tessellation; clypeal punctures larger, slightly sparse..... *Andrena rozeni* Linsley and MacSwain (in part).

Key to the Males of
Onagrandrena

1. Pronotum with humeral angle and verticle ridge laterally (Fig. 14) 2.
Pronotum without humeral angle or verticle ridge laterally..... 5.
- 2(1). Mandible without subapical tooth, represented by slight angle not a
distinct tooth (Fig. 13) *Andrena rubrotincta* Linsley.
Mandible with distinct subapical tooth (Fig. 22) 3.
- 3(2). Scutellum and mesoscutum dull, shagreened 4.
Scutellum shiny, mesoscutum shiny at least posteromedially.....
..... *Andrena mojavensis* Linsley and MacSwain.
- 4(3). Propodeum outside of enclosure punctatorugose or with distinct fine
rugulae, dorsal enclosure finely to coarsely rugulose throughout
..... *Andrena camissoniae* Linsley and MacSwain.
Propodeum outside of enclosure tessellate with sparse punctures,
without rugulae, dorsal enclosure tessellate often with short, fine
rugulae near base (Fig. 25) ... *Andrena decolorata* LaBerge and Thorp.
- 5(1). Mesoscutum and scutellum shiny, interpunctural spaces not shagreened
except lightly, especially peripherally 18.
Mesoscutum and scutellum dull, spaces shagreened 6.
- 6(5). Tergal vestiture entirely pale in color or almost so 7.
Tergal vestiture with dark hairs at least on terga 6 and 7, usually mostly
entirely black 8.
- 7(6). Mesepisternum and propodeum punctatorugose 19.
Mesepisternum and propodeum with discrete punctures and small but
distinct interpunctural spaces..... *Andrena linsleyi* Timberlake.
- 8(5). Thoracic hairs entirely black or dark brown 9.
Thoracic hairs not entirely dark, mesoscutum with pale hairs at least
peripherally, usually entirely or mostly pale 10.
- 9(8). Propodeum outside of dorsal enclosure and scutellum punctatorugose;
propodeal enclosure strongly rugose; ocelli of normal size
..... *Andrena chylismiae* Linsley and MacSwain.
Propodeum outside of dorsal enclosure not punctatorugose, finely
sculptured; scutellum with distinct punctures separated by more
than half a puncture width; propodeal enclosure rugulose; ocelli
enlarged *Andrena linsleyana* Thorp.
- 10(8). Metasomal terga black with relatively strong metallic blue or purple
reflections on terga 2 to 5; mesoscutal vestiture entirely pale
..... *Andrena raveni* Linsley and MacSwain.
Metasomal terga black without metallic reflections or extremely weakly
violaceous on terga 3- or 4-5; mesoscutal vestiture dark postero-
medially 11.

- 11(10). Mesoscutum and scutellum with black or dark brown hairs mixed with pale hairs posteromedially or forming a distinct dark patch..... 12.
Mesoscutum and scutellum with hairs pale, white to ochraceous 13.
- 12(11). Vertex above lateral ocellus equals slightly more than one ocellar diameter; wings deeply infumate *Andrena omninigra* Viereck.
Vertex above lateral ocellus equals one ocellar diameter or less; wings variable, clear to moderately infumate 16.
- 13(11). Clypeal hairs all or mostly pale, ochraceous or white 14.
Clypeal hairs entirely black or pale apically only 15.
- 14(13). Scutellum with distinct punctures; facial hairs entirely white or almost so, a few dark hairs may be present near inner eye margin or just below vertex *Andrena rozeni* Linsley and MacSwain.
Scutellum punctatorugose; facial hairs between clypeus and vertex black or dark brown at least in large part 17.
- 15(13). Propodeum outside of dorsal enclosure and mesepisternal surface coarsely punctatorugose (Fig. 10); lower mesepisternal surface punctatorugose..... *Andrena oenotherae* Timberlake.
Propodeum outside of dorsal enclosure and mesepisternum finely sculptured, not punctatorugose, usually with distinct punctures (Fig. 7); lower mesepisternal surface punctate with punctures separated by one to two puncture widths, interpunctural surfaces shagreened
..... *Andrena anograe* Cockerell.
- 16(12). Terga 3–5 or 4–6 with weak metallic reflections; mesepisternum posteromedially and scutellum shiny *Andrena vanduzeei* Linsley.
Terga without metallic reflections; mesepisternum and scutellum dull, shagreened or tessellate *Andrena bernardina* Linsley.
- 17(14). Tergum 2 with basal area sparsely punctate, punctures separated mostly by 3 to 5 puncture widths or more; pleura usually with some white hairs
..... *Andrena boronensis* Linsley and MacSwain (in part).
Tergum 2 with basal area more densely punctate, punctures usually separated by 1 to 2 puncture widths or less; pleural hairs black
..... *Andrena vespertina* Linsley and MacSwain.
- 18(5). Metasomal terga 2 and 3 with apical areas impunctate
..... *Andrena flandersi* Timberlake.
Metasomal terga 2 and 3 with apical areas minutely punctate at least in basal half *Andrena deserticola* Timberlake.
- 19(7). Metasomal tergum 2 sparsely punctate, punctures separated by 3 to 5 diameters; galea of normal size, shagreened at least basally; face with black hairs along inner eye margins
..... *Andrena boronensis* Linsley and MacSwain (in part).
Metasomal tergum 2 densely punctate, punctures separated by less than one diameter; galea small, shiny, unshagreened; face without black hairs along inner eye margins 20.

- 20(19). Vertex above lateral ocellus usually equals slightly less than two ocellar diameters, never more, surfaces shiny; flagellar segment long, distinctly longer than segment 2 and usually longer than 3; sterna 2–5 with weak subapical fimbriae of long plumose hairs
 *Andrena blaisdelli* Cockerell.
- Vertex above lateral ocellus equals more than one ocellar diameter, never less; flagellar segment 1 about as long as segment 2 and never as long as segment 3; sterna 2–5 with narrow subapical fimbriae of short plumose hairs
 *Andrena furva* Linsley and MacSwain.

SPECIES ACCOUNTS

Andrena (Onagrandra) anograe Cockerell

- Andrena anograe* Cockerell, 1901, Canadian Ent., 33:154; 1934, American Mus. Nov., No. 697, p. 2.
- Andrena (Melandrena) anograe*: Lanham, 1949, Univ. California Publ. Ent., 8:221; Linsley and MacSwain, 1955, Pan-Pacific Ent., 31:164,165,166; Linsley, MacSwain, and Smith, 1955, Pan-Pacific Ent., 31:175.
- Andrena (Onagrandra) anograe knowltoni* Linsley and MacSwain, 1961, Pan-Pacific Ent., 37:126-127; Linsley, MacSwain, and Raven, 1963, Univ. California Publ. Ent., 33:30, 39. **New synonymy.**
- Andrena (Onagrandra) anograe*: Linsley and MacSwain, 1956, Pan-Pacific Ent., 32:112; Tepedino, 1982, The Southwest Ent., 7:17.
- Andrena micranthophila* Cockerell, 1906, Bul. American Mus. Nat. Hist., 22:432; Frison, 1927, Bul. Illinois St. Nat. Hist. Surv., 16:231 (type list).
- Andrena (Melandrena) micranthophila*: Lanham, 1949, Univ. California Publ. Ent., 8:221; Linsley and MacSwain, 1955, Pan-Pacific Ent., 31:166 synonymy).

Andrena anograe is one of only two species with females having largely black vestiture except pale on the thoracic dorsum and can be readily recognized by this character. The males of *anograe* are similar to those of *A. oenotherae* but have the propodeum outside of the dorsal enclosure and the lower lateral mesepisternal areas more finely sculptured.

FEMALE: Measurements and Ratios. N = 20; length, 12-15 mm; width, 3-4 mm; WL, M = 4.38±0.284 mm; FL/FW, M = 1.06±0.007; FOVL/FOVW, M = 2.88±0.053.

Diagnosis. Vestiture black except thoracic dorsum with hairs ochraceous to fox-red with few black hairs intermixed; vertex usually with some pale hairs, wing membranes hyaline, veins dark reddish brown to black; metasomal terga black without violaceous reflections. Galeae moderately long, dulled by fine dense shagreening; labral process slightly longer than half length of labrum, apex broad, thickened, usually bidentate, lateral margins concave. Clypeus with small, round, dense punctures, surface shiny, usually without median impunctate line; vertex above lateral ocellus equals one ocellar diameter or slightly less. Pronotum without humeral angle or vertical ridge laterally. Mesoscutum punctate, interpunctural surfaces dulled by fine shagreening. Scutellum with anterior punctate area moderately shiny. Propodeum with dorsal surface; enclosure (Fig. 7) coarsely rugulate, rugulae mostly transverse apically, irregular basally; dorsal surface outside of enclosure moderately punctatorugose; surfaces finely tessellate or shagreened. Mesepisternum with lower surface punctate, interpunctural spaces tessellate. Metasomal terga 2–4 with apical areas punctate in basal three-fifths or more, punctures separated mostly by 1 to 2 puncture

widths, basal area punctures separated largely by 1 to 3 puncture widths, surfaces shiny. Thoracic dorsum with hairs moderately long, longer than width of antennal scape; propodeum without corbicula laterally, hairs all long and plumose; scopal hairs long, simple, moderately abundant.

MALE: Measurements and Ratios. N = 20; length, 10–12 mm; width, 2.5–3.0 mm; WL, M = 3.85 ± 0.270 mm; FL/FW, M = 1.10 ± 0.008 ; FS1/FS2, M = 1.41 ± 0.034 .

Diagnosis. Vestiture color as in female but mesepipleura occasionally with pale hairs intermixed with black and metasomal tergum 1 often with at least a few pale hairs basally; wing membranes hyaline, yellowish, veins red to reddish brown; metasomal terga black. Galeae as in female; labral process broad, strongly bidentate, reflexed; clypeus as in female; vertex above lateral ocellus equals about one ocellar diameter; flagellar segment 1 with minimum length equal to segment 3 and slightly longer than or equal to segment 2. Pronotum as in female; mesoscutum and scutellum posteriorly dulled, sculptured as in female but punctures slightly finer; mesepisternum (especially lower half) and propodeum outside of dorsal enclosure finely sculptured, with distinct punctures, not punctatorugose; dorsal enclosure reticulorugose (Fig. 12). Metasomal terga 2–5 with apical areas shiny, with small sparse punctures in basal half to two-thirds; basal areas slightly more coarsely punctate, shiny. Metasomal tergum 2 with basal area hairs long, at least half as long as those of tergum 1; hind tibiae with outer surface hairs long, sparse, almost as long along anterior margin as dorsal femoral hairs. Sternum 7 distinctly bidentate apically; sternum 8 not distinctly lobed apically but distinctly emarginate apically (Figs. 27 and 28).

Type Material. The holotype female of *Andrena anograe* Cockerell was taken at Colorado Springs, Colorado, middle of July, at flowers of white *Oenothera* (Ckll. No. 3,567) (USNM No. 5,808). The holotype female of *Andrena micranthophila* Cockerell was collected by W.P. Cockerell from east of Lake George, Park Co., Colorado, June 18, at flowers of *Chamaerhodos erecta* and is in the collection of the California Academy of Sciences (CAS No. 15,355). The holotype female of *Andrena knowltoni* was taken 5 miles S. of Green River, Emery Co., Utah, May 24, 1960, on *Stanleya pinnata* by G.F. Knowlton and is in the collection of the California Academy of Sciences (CAS No. 6,698).

Distribution. *Andrena anograe* is known to occur from central Wyoming, south to Colorado, and west to central Utah (Fig. 2). A single male labeled Tucson, Arizona, April 8, 1935, A.L. Melander in the INHS collection is here regarded as a mislabeled specimen. It may be one of the many specimens purchased by T.H. Frison and reputedly collected in Arizona by Oslar (Thorp, 1970). This species has been taken from May 5 through July 31, but chiefly in June and early July. A total of 96 females and 92 males were examined from the localities listed below (records from the literature are included).

COLORADO. CHAFEE CO.: Mt. Princeton Hot Springs (1 mi. E.); Salida (1.5 mi. W). COSTILLO CO.: Sage Flats, Ute Creek. DENVER CO.: Denver. EL PASO CO.: Colorado Springs. GUNNISON CO.: Gunnison (7.6 and 8.4 mi. W). LARIMER CO.: Mishawauka. MONTROSE CO.: Cimarron (1.2 mi. W). PARK CO.: Lake George (E of); Wilkerson Pass. TELLER CO.: Florissant. NEW MEXICO. SAN JUAN CO.: Waterflow (2.5 mi. N). UTAH. EMERY CO.: Green River (2.5 mi. W, 6, 7 and 10 mi. N and 5 mi. S); Red Plateau (E foot); Woodside, (4.5 mi. N). GARFIELD CO.: Boulder. GRAND CO.: Crescent Junction; Johnson; Thompson. SAN JUAN CO.: Monticello. WYOMING. ALBANY CO.: Laramie (S. of). LARAMIE CO.: Cheyenne. SWEETWATER CO.

Floral Records. *Andrena anograe*, as its name suggests, collects pollen exclusively from species of Onagraceae, including the genus *Oenothera* subgenera *Anogra* and *Pachylophis*. It has been collected from flowers of the following plants.

Chamaerhodos erecta, *Cryptantha* sp., *Gaura* sp., *G. coccinea*, *Geranium fremontii*, *Oenothera* sp., *O. albicaulis*, *O. caespitosa*, *O. c.* var. *montana*, *O. coronopifolia*, *O. pallida trichocalyx*, *O. s. scapoidea*, *Oxytropis deflexa* var. *sericea*, *Penstemon* sp., *Senecio* sp., *Stanleya pinnata*.

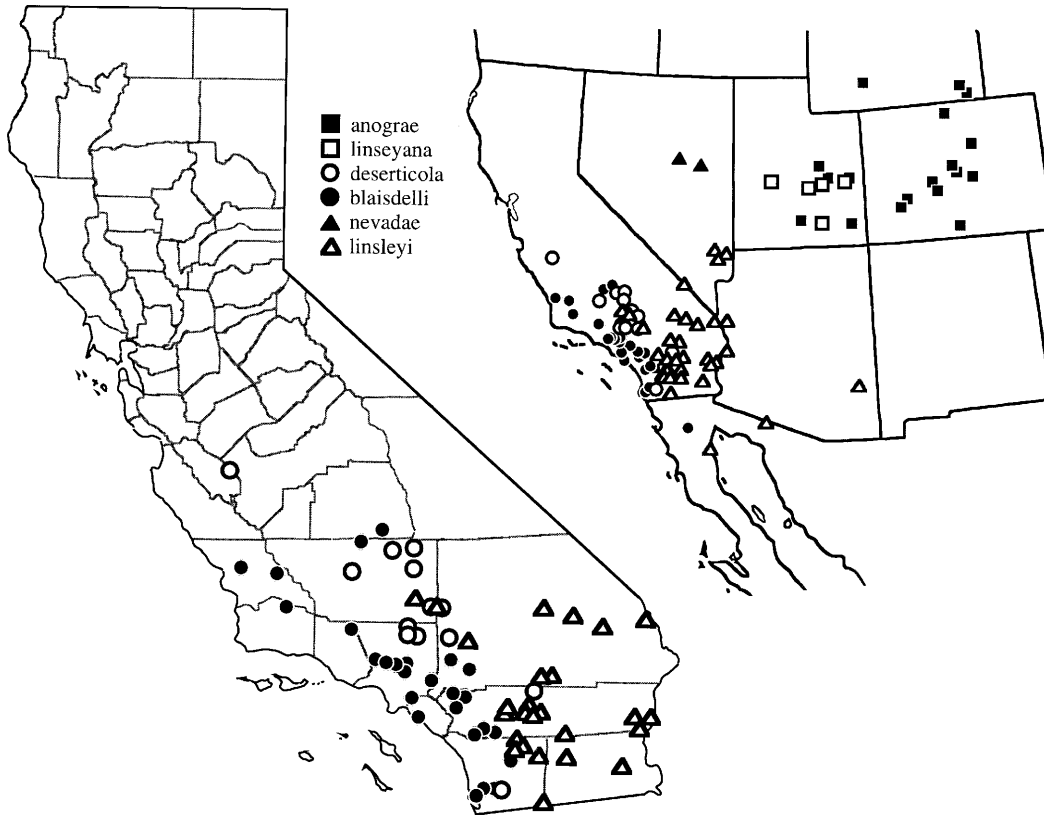


Fig. 2. Maps showing the known distributions of *A. anograe*, *A. linsleyana*, *A. deserticola*, *A. blaisdelli*, *A. nevadae*, and *A. linsleyi*. A separate map of the state of California is included to clarify location of localities.

Andrena (Onagrandra) linsleyana Thorp

Andrena (Onagrandra) linsleyana Thorp, 1987, Pan-Pacific Ent., 63:194-198.

Andrena linsleyana is a large species related to *Andrena anograe*. The female of *linsleyana* is like the black specimens of *anograe* from Utah but has the ocelli enlarged and the scutellum entirely dull. The male of *linsleyana* has the vestiture entirely black, as does the male of *Andrena chylismiae*, but can be recognized by the slightly enlarged ocelli, the more finely sculptured propodeum outside of the enclosure, and the more densely punctate metasomal terga.

FEMALE: Measurements and Ratios. N = 5; length, 14–15 mm; width about 4.5 mm; WL, M = 4.99 ± 0.322 mm; FL/FW, M = 1.10 ± 0.002 ; FOVL/FOVW, M = 2.97 ± 0.149 .

Diagnosis. Vestiture entirely black; wing membranes hyaline, slightly infumate, yellowish, veins dark reddish-brown to black; metasomal terga black without metallic reflections. Galeae as in *anograe*; labral process subtriangular or with thick apical part and concave sides (as in *anograe*), in two specimens with three angles apically, shiny. Clypeus with distinct, round, dense punctures, surface shiny, usually without complete median impunctate line or thin, if present; vertex above lateral ocellus equals distinctly less than one ocellar diameter, ocelli distinctly enlarged. Pronotum as in *anograe*. Mesoscutum sculptured as in *anograe*; scutellum densely punctate as in *anograe* and dulled by shagreening (not shiny in anterior fourth). Propodeum distinctly sculptured, as in *anograe*; mesepisterna with distinct punctures (not punctatorugose) and dulled by fine dense shagreening. Metasomal terga 2–4 densely punctate basally, punctures separated by half to one puncture width; apical areas punctate except narrow apical rim, surfaces shiny. Thoracic dorsum

with hairs long to moderately long, much longer than width of flagellum; propodeum without developed corbicula laterally, hairs long and plumose, grading from short below to longest dorsally; scopal hairs long, simple, moderately abundant.

MALE: Measurement and Ratios. N = 18; length, 11–13 mm; width, 2.5–3.5 mm; WL, M = 4.30±0.340 mm; FL/FW, M = 1.16±0.016; FS1/FS2, M = 1.16±0.019

Diagnosis. Vestiture entirely black as in female. Wing membranes hyaline, slightly infumate, veins reddish brown to dark brown; metasomal terga black, without metallic reflections. Galeae as in female; labral process broad, reflexed, bidentate. Clypeus as in female but without median line in any specimens; vertex above lateral ocellus equals slightly less than one ocellar diameter, ocelli enlarged; flagellar segment 1 longer than segment 2 and longer or equal to segment 3. Pronotum and mesoscutum as in *anograe* female. Scutellum as in female but usually shiny along anterior margin (basal fourth or less); propodeum and mesepisterna sculptured as in *anograe* male. Metasomal terga 2–5 sculptured as in female terga 2–4 but punctures slightly sparser. Metasomal tergum 2 with basal area hairs moderately long, almost half as long as those of tergum 1; hind tibiae with outer surface hairs long, sparse, along anterior margin almost as long as dorsal femoral hairs. Genital capsule illustrated by Thorp (1987, p. 197). Sternum 7 flattened apically with minute medial indentation, hairs sparse; sternum 8 as in *anograe* but without apical emargination (Figs. 29 and 30).

Type Material. The holotype female (USNM) of *linsleyana* was collected at Bullfrog Campground, Kane County (about 72 mi S of Hanksville, Wayne Co.), Utah, April 21, 1983 by F.D. and J.H. Parker.

Distribution. *Andrena linsleyana* is known only from Utah (Fig. 2). Males and females were collected on April 21 with females flying through July 10. A total of 27 females and 58 males were examined from the localities listed below.

UTAH: EMERY CO.: Gilson Butte (4 airline miles N); Wildhorse Creek N of Goblin Valley. GRAND CO.: Cisco; Elgin (E of). KANE CO.: Bullfrog Campground at Lake Powell (ca. 72 mi. S of Hanksville. Wayne Co.); Green River (7 mi. S). MILLARD Co.: Hatton.

Floral Records. *Andrena linsleyana* has been collected from *Oenothera pallida*, *Hymenopappus filifolius*, and *Stanleya pinnata* and is presumably an oligolege of flowers of the genus *Oenothera*.

Remarks. Thorp (1987) placed this species in a species complex including *Andrena chylismiae*, *nevadae*, *thorpi*, and *stagei*. However, we now consider this bee to be related to *Andrena anograe*, as evidenced by the sculpturing of the dorsum of the thorax, the mesepisterna, and the propodeum, as well as the shape of the labral process. It resembles *chylismiae* and keys out with it in our key because of the entirely black male vestiture.

Andrena (Onagrاندrena) omninigra Viereck

Andrena omninigra Viereck, 1917, Trans. American Ent. Soc., 43:385–386; Linsley, 1938, Proc. California Acad. Sci., Ser. 4, 23:265, 277.

Andrena grundeli Linsley, 1938, Proc. California Acad. Sci., Ser. 4, 23:265, 267, 274–275.

Andrena (Melandrena) grundeli grundeli: Linsley and MacSwain, 1955, Pan-Pacific Ent., 31:164, 165; Linsley, MacSwain and Smith, 1955, Pan-Pacific Ent., 31:176; Linsley and MacSwain, 1955, Pan-Pacific Ent., 31:166; Linsley and MacSwain, 1961, Pan-Pacific Ent., 37:127 (synonymy).

Andrena (Melandrena) omninigra: Lanham, 1949, Univ. California Publ. Ent., 8:221.

Andrena (Onagrاندrena) omninigra: Linsley and MacSwain, 1956, Pan-Pacific Ent., 32:112, Linsley and MacSwain, 1961, Pan-Pacific Ent., 37:127, 128 (synonymy); Linsley, 1972, Pan-Pacific Ent., 48:94–96; MacSwain, Raven and Thorp. 1973, Univ.

California Publ. Ent., 70:14, 41, 43, Tables 1, 2, 5–11. 13. 18. (synonymy).
Andrena (*Onagrandra*) *omninigra clarkiae* Linsley and MacSwain, 1961, Pan-Pacific Ent., 37:127–128; MacSwain, Raven and Thorp, 1973, Univ. California Publ. Ent., 70:15–16. **New synonymy.**

Andrena omninigra females are distinctive in the extremely short dorsal thoracic vestiture and the deeply infumate, blackened wing membranes. The male of *omninigra* can be recognized by having black or dark brown hairs mixed with the pale on the thoracic dorsum and by having a tall vertex (above lateral ocellus vertex equals more than one ocellar diameter).

FEMALE: Measurements and Ratios. N = 20; length, 11–13 mm; width, 3–4 mm; WL, M = 4.45±0.496 mm; FL/FW, M = 1.07±0.009; FOVL/FOVW, M = 3.15±0.058.

Diagnosis. Vestiture black; wing membranes deeply infumate, dark brown, veins black; metasomal terga black without violaceous reflections. Galeae moderately long, moderately shiny, dulled by fine shagreening. Labral process longer than half length of labrum, narrowed apically, lateral edges strongly concave, apical part narrower than scape base. Clypeus with round punctures crowded except in narrow medial impunctate line, surface shiny; vertex above lateral ocellus equals slightly more than one ocellar diameter. Pronotum without humeral angle or vertical ridge. Mesoscutum and scutellum punctate, punctures crowded, interpunctural surfaces moderately dulled by fine shagreening. Propodeum with distinct dorsal surface; dorsal enclosure coarsely rugulate, rugulae mostly longitudinal except irregular basally; surface outside of enclosure punctatorugose, surfaces shagreened or finely tessellate. Mesepisternum distinctly punctate, interpunctural spaces moderately shiny, shagreened. Metasomal terga with abundant round punctures separated mostly by half to one puncture width or slightly more, apices of terga narrowly impunctate; surfaces shiny, unshagreened. Thoracic dorsum with hairs extremely short, almost scalelike, shorter than width of antennal scape; propodeum with lateral surface with abundant, moderately short, simple, erect hairs, dorsal margin with moderately long plumose hairs no longer than twice length of internal hairs and often less; scopal hairs long, simple, moderately abundant.

MALE: Measurements and Ratios. N = 20; length, 9–12 mm; width, 2–3 mm; WL, M = 3.92±0.385 mm; FL/FW, M = 1.11±0.008; FS1/FS2, M = 1.44±0.026.

Diagnosis. Vestiture color black except as follows: head with vestiture white except face above antennal fossae, along inner margins eyes, at least upper three-fourths of genal area with black hairs or white and black mixed. Thoracic hairs white to pale ochraceous except as follows: pronotum with some dark hairs especially above; mesoscutum with large patch of dark hairs or mixed white and black; scutellum usually with small medial patch of dark hairs or mixed; mesepipleuron and propodeum usually with black hairs mixed with white; tegulae with dark hairs. Tergal hairs black except basally on tergum 1 to 4 white (often terga 2, 3, and 4 with various amounts of black or brown and white hairs mixed), terga 5, 6, and 7 entirely black; sternal hairs from mostly white to mostly black; leg hairs on tibiae and tarsae black, basal segments black or mixed white and black. Wings distinctly infumate, but less than in female. Metasomal terga with coarse, round punctures separated mostly by one to two puncture widths; apical rims narrowly impunctate; surfaces unshagreened, shiny. Galeae as in female; labral process strongly reflexed, deeply emarginate apically, broad; clypeus as in female but usually without median impunctate line; vertex above lateral ocellus equals distinctly more than one ocellar diameter; flagellar segment 1 distinctly longer than segment 2, antennae relatively short. Pronotum as in female; mesoscutum as in female but punctures finer; propodeum sculptured as in female but dorsal enclosure with rugulae slightly finer. Metasomal terga 2–5 with apical areas shiny, with deep round punctures in basal three-fifths to two-thirds; basal areas slightly more sparsely punctate, shiny. Metasomal tergum 2 with basal area hairs at least half as long as those of

tergum 1. Hind tibiae with outer surface hairs moderately long, distinctly shorter than dorsal femoral hairs. Sternum 7 as in *linsleyana* but hairs abundant, short; sternum 8 distinctly capitate apically, not at all emarginate (Figs. 23 and 24).

Type Material. The holotype female of *A. (O.) omninigra* (CAS No. 4,046) was collected in California by E. Norton. The holotype female of *A. (O.) grundeli* (CAS No. 4,233) was collected from Nippinawasse (near Midway), Madera Co., California, May 22, 1931, by E.S. Ross. The holotype female of *A. (O.) clarkiae* (CAS No. 6,706) was collected from Arroyo Seco, Monterey Co., California, May 21, 1955, by P. Torchio.

Distribution. *Andrena omninigra* is known (Fig. 3) only from California (MacSwain, Raven, and Thorp, 1993, p. 13). The flight period for *omninigra* is late May to early July, males primarily in May, females primarily in early June. One record of a female in early March may be in error. A total of 293 females and 123 males were examined from localities listed below.

CALIFORNIA. BUTTE CO.: Arch Rock Tunnel (Highway 70, Feather River Canyon); Highway 70 (5 mi. W Butte-Plumas county line). CALAVERAS CO.: Mokelumne Hill; Railroad Flat (1.5 mi. E and 4 mi. S). CONTRA COSTA CO.: Antioch. EL DORADO CO.: Camino; Pollock Pines; Riverton; Snowline Camp. FRESNO CO.: Bass Lake (and 2 mi. E.); Kings Canyon (Ten-mile Creek); Sequoia National Forest (T13S, R26E, 7.8 mi. N Highway 180); Tollhouse (1.5 mi. W). KERN CO.: Bodfish (2 mi. S); Glenville (6.2 mi. E). LOS ANGELES CO.: Angeles Canyon; San Antonio Canyon. MADERA CO.: Nippinawasse (near Midway); North Fork (2.7 and 4.8 mi. N); Oakhurst. MARIPOSA CO.: El Portal; Mariposa (and 6 mi. S); Mormon Bar (2.8 mi. S and 6.5 mi. SW); Wawona; Yosemite Valley. MONTEREY CO.: Arroyo Seco; Arroyo Seco Camp. PLUMAS CO.: Elephant Butte (1 mi. N); Elephant Butte Tunnel (2.3 mi. E); Rock Creek (Jct. Highway 70, Feather River Canyon). SACRAMENTO CO.: Folsom. SAN BENITO CO.: Hollister. SAN DIEGO CO.: Mt. Laguna. SAN LUIS OBSIPO CO.: Santa Margarita (5 mi. NE). SANTA CRUZ CO.: Felton. SOLANO/YOLO CO.: Putah Canyon. TULARE CO.: California Hot Springs; Kaweah; Pine Flat (3.7 mi. SE); Sequoia National Park. TUOLUMNE CO.: 3,500 feet alt.; Buck Meadows-Mather; Strawberry; Twain Harte (4 mi. W).

Biology. Linsley (1972) records robber flies, *Callinicus calcaneus* (Loew), as predators on *A. omninigra* in early June 1970 near Railroad Flat, Calaveras County, California, while female bees were nectaring at flowers of mountain misery, *Chaemaebatia foliolosa* Benth. Although *A. omninigra* is an oligolege of *Clarkia*, none of its pollen host plants were in bloom in the vicinity. Linsley suggests that the bees were foraging in the shade to minimize absorption of radiant heat through their black integument. He further suggests that the flies developed an early search image for these black bees foraging in patches of flowers in the shade and continued to prey on them while ignoring other brightly colored *Osmia* and other *Andrena* species foraging in sunny patches of the flowers.

Floral Records. *Andrena omninigra* is an oligolege of *Clarkia* spp. (MacSwain, *et al.* 1973). It has been collected from flowers of the plants listed below.

Brassica sp., *Calochortus venustus*, *Cercocarpus betuloides* (as *douglasii*), *Chamaebatia foliolosa*, *Clarkia* sp., *C. amoena huntiana*, *C. biloba*, *C. cylindrica*, *C. dudleyana*, *C. mildrediae*, *C. purpurea*, *C. quadravulnera*, *C. rhomboidea*, *C. speciosa*, *C. s. polyantha*, *C. unguiculata*, *C. williamsoni*, *C. xantiana*, *Cryptantha* sp., *C. flaccida*, *Eriodictyon californicum*, *Eriogonum* sp., *Gilia capitata*, *Rhamnus californica*, *Sidalcea malvaeflora*.

Andrena (Onagnadrena) bernardina Linsley

Andrena bernardina Linsley, 1938, Proc. California Acad. Sci., Ser. 4, 23:265, 267, 275–276.

Andrena (Melandrena) bernardina: Lanham, 1949, Univ. California Publ. Ent., 8:221.

Andrena (Melandrena) grundeli bernardina: Linsley and MacSwain, 1955, Pan-Pacific Ent., 31:164, 165, 166–167; Linsley, MacSwain and Smith, 1955, Pan-Pacific Ent., 31:176.

Andrena (Onagrandrena) bernardina: Linsley and MacSwain, 1961, Pan-Pacific Ent., 37:128; MacSwain, Raven and Thorp, 1973, Univ. California Publ. Ent., 70:13, 16, 67.

Andrena bernardina Linsley is a small species from southern California that is similar and related to *Andrena omninigra* Provancher. The female of *bernardina* is like that of *omninigra* in having short hairs on the thoracic dorsum and very much blackened, deeply infumate wing membranes. This female, however, has the dorsal thoracic hairs somewhat longer than in *omninigra*, being about as long as the flagellar width. In addition the female of *bernardina* has the vertex above the lateral ocellus equal to about one ocellar diameter. The male of *bernardina*, like that of *omninigra*, has black hairs mixed with the pale on the mesoscutum and the scutellum, but has the vertex above the lateral ocellus equals no more than one ocellar diameter.

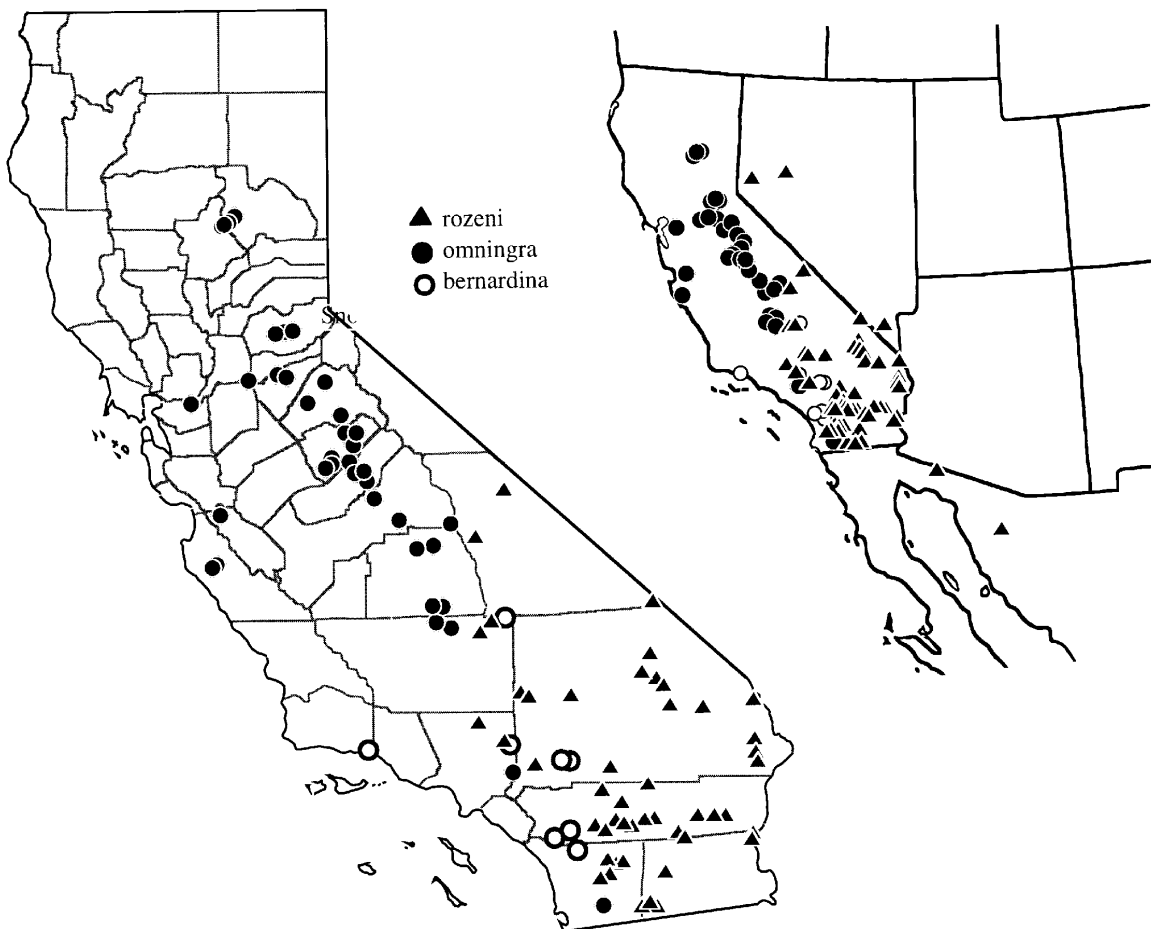


Fig. 3. Maps showing the known distributions of *A. rozeni*, *A. omninigra*, and *A. bernardina*.

FEMALE: Measurements and Ratios. N = 9; length, 11–12 mm; width, 3.0–3.5 mm; WL, 4.09 ± 0.232 mm; FL/FW, 1.02 ± 0.004 ; FOVL/FOVW, 2.84 ± 0.049 .

Diagnosis. Vestiture black; wing membranes deeply infumate, dark brown, veins black; metasomal terga black without violaceous reflections. Galeae narrow, moderately shiny basally. Labral process as in *omninigra* but apical part broader, about as broad as base of scape or slightly broader. Clypeus as in *omninigra*; vertex above lateral ocellus equals about one ocellar diameter. Pronotum as in *omninigra*. Mesoscutum, scutellum and propodeum sculptured as in *omninigra*. Mesepisternum sculptured as in *omninigra* but punctures separated by half a puncture width or less. Metasomal terga with coarse round punctures separated mostly by half to two puncture widths, apical margins narrowly impunctate; surfaces shiny, shagreening extremely weak if present. Thoracic dorsum with hairs short but longer than in *omninigra*, at most as long as width of flagellum, somewhat irregular; propodeum with weakly developed corbicula laterally, inner surface with short, relatively simple hairs, anterior margin without long hairs, dorsal margin with long plumose hairs but these sparse; scopal hairs long simple, sparse, not hiding surface of tibia.

MALE: Measurements and Ratios. N = 4; length, 9–11 mm; width, 2.5–3.0 mm; WL, M = 3.36 ± 0.317 mm; FL/FW, M = 1.05 ± 0.013 ; FS1/FS2, M = 1.16 ± 0.085 .

Diagnosis. Vestiture black except mesoscutum, scutellum and metanotum with hairs largely pale, white to grayish, with long black hairs intermixed posteromedially on mesoscutum and medially on scutellum. Wings hyaline, only slightly infumate. Galeae as in female; labral process strongly reflexed, emarginate apically, broad; clypeus shiny with crowded punctures, median impunctate line absent or incomplete and extremely narrow; flagellar segment 1 longer than either segment 2 or 3, segment 2 about equal to 3 or slightly shorter, antennae short; vertex as in female. Pronotum as in *omninigra*; mesoscutum, scutellum and propodeum sculptured as in *omninigra*. Metasomal terga 2–5 with apical and basal areas shiny, unshagreened, densely punctate with punctures separated largely by half to one or two puncture widths. Metasomal tergum with basal area hairs short; hind tibial hairs relatively short, about as long as greatest width of tibia or shorter. Sternum 7 with small, distinct, apical toothlike lobes with v-shaped median emargination, each lobe with several hairs; sternum 8 with apex distinctly broadened but not capitate, barely or not at all emarginate apicomediaally (Figs. 33 and 34).

Remarks. A male from Boron, Kern County, California, is probably *A. bernardina* although it is considerably paler than most males of this species. It has intermixed dark hairs on the mesosoma, lacks the white hairs on metasomal terga 1 and 2, and the propodeal enclosure is not as rugose. We think that this male is probably correctly placed under *bernardina*, but should be considered only as a questionable record.

Type Material. The holotype female of *A. (O.) bernardina* (CAS No. 4,542) was collected in Tetley Park, San Bernardino Mts., California, May 23, 1936, at flowers of *Potentilla glandulosa* by E.G. Linsley.

Distribution. *Andrena bernardina* is known to occur only in southern California (Fig. 3). It has been collected from mid-May until early July. In addition to the type material 19 female and 8 male specimens from localities listed below were examined.

CALIFORNIA. KERN CO.: Sand Canyon (3 mi W of Brown). Los Angeles Co.: San Antonio Canyon; Tanbark Flat. RIVERSIDE CO.: Sage (5 mi S); Temecula (9 mi E). SAN BERNARDINO CO.: Seeley Flat and Tetley Park, San Bernardino Mts. SAN DIEGO CO.: Mt. Palomar. SANTA BARBARA CO.: Carpenteria.

Floral Records. *Andrena bernardina* has been collected only from flowers of the plants listed below. It is presumably an oligolege of *Clarkia*, based on pollen from specimens reported by MacSwain et al. (1973). However, too few records exist to be able to designate whether this is, indeed, an oligolege or not. It has been taken from flowers of the plants listed below.

Baccharis sp., *Cryptantha* sp., *C. intermedia*, *Potentilla glandulosa*.

Andrena (Onagrandra) flandersi Timberlake

- Andrena flandersi* Timberlake, 1937, Pan-Pacific Ent., 13:72; Cockerell, 1937, American Mus. Nov. No. 948, p. 14; Linsley, 1938, Proc. California Acad. Sci., Ser. 4, 23:266; 278.
- Andrena (Melandrena) flandersi*, Lanham, 1949, Univ. California Publ. Ent., 8:221; Linsley and MacSwain, 1955, Pan-Pacific Ent., 31:164, 166, 167; Linsley, MacSwain and Smith, 1955, Pan-Pacific Ent., 31:176, 183.
- Andrena (Onagrandra) flandersi*: Linsley and MacSwain, 1956, Pan-Pacific Ent., 32:111, 113, 118–120; Linsley, MacSwain, and Raven, 1964, Univ. California Publ. Ent., 33:63, 64, 65, 72, 79, 80, 82, 88, 90, 91.

This moderate-sized, dark species from southern California can be recognized in the female sex by the short plumose hairs of the thoracic dorsum and the impunctate tergal apical areas. The male of *flandersi* also has the tergal apical areas impunctate.

FEMALE: Measurements and Ratios. N = 20; length, 10–11 mm; width, 3.0–3.5 mm; WL, M = 3.42±0.102 mm; FL/FW, M = 1.06±0.006; FOVL/FOVW, M = 3.09±0.037.

Diagnosis. Vestiture black; wing membranes hyaline, scarcely or not infumate, veins dark brown; metasomal terga black without violaceous reflections. Galeae long, moderately dulled by fine shagreening. Labral process as in *omninigra* but apical part thick, at least as thick as base of scape, emarginate apically. Clypeus sculptured as in *omninigra*; vertex above lateral ocellus equals about one ocellar diameter. Pronotum without humeral angles or lateral ridge. Mesoscutum and scutellum punctate, punctures large, deep, separated mostly by half a puncture width or less, interpunctural surface shiny, unshagreened or only delicately so; metanotum with dense, extremely fine punctures dulling surface. Propodeum sculptured as in *omninigra* but surface outside of dorsal enclosure finely punctatorugose. Mesepisterna with distinct punctures in lower half, interpunctural surface dulled by coarse shagreening. Metasomal terga 2–4 with apical areas impunctate, shiny. Thoracic dorsum with hairs short, about as long as width of scape or shorter, erect, plumose, not scalelike, velvetlike; propodeal corbicula with internal hairs short, simple; long dorsal hairs sparse, long hairs absent along anterior margin; scopal hairs simple, long, moderately abundant.

MALE: Measurements and Ratios. N = 20; length, 9–11 mm; width, 2–3 mm; WL, M = 3.26±0.159; FL/FW, M = 1.11±0.007; FS1/FS2, M = 1.13±0.024.

Diagnosis. Vestiture white except as follows: metasomal terga 3–5 often with brown hairs mixed with pale hairs basally. Wing membranes hyaline, not at all infumate. Galeae as in female; labral process strongly reflexed, large, bidentate; clypeus as in female; vertex above lateral ocellus equals one ocellar diameter; flagellar segment 1 equal to or slightly longer than segment 2 and equal to segment 3, antennae relatively short. Pronotum as in female; mesoscutum and scutellum shiny as in female but punctures slightly sparser. Propodeum and mesepisterna sculptured much as in female but propodeal dorsal enclosure with rugulae denser and less coarse. Metasomal terga 2–5 with apical areas impunctate, shiny; basal areas shiny with sparse punctures (Fig. 8). Metasomal tergum 2 with basal area hairs less than half as long as those of tergum 1. Hind tibiae with outer surface hairs moderately long, with at least a few extremely long hairs along anterior margin. Sterna 7 and 8 (Figs. 35 and 36) much as in *anograe*.

Type Material. The holotype female (CAS No. 14,359) of *Andrena (A.) flandersi* was collected about 11 miles SW of Victorville, San Bernardino County, California, May 5, 1936, at flowers of *Ericameria cooperi* by E.G. Linsley and P.H. Timberlake.

Distribution. *Andrena flandersi* is known to occur only in southern California in the Mojave Desert (Fig. 4). It has been collected from March 19 through June 14 from locali-

ties listed below. In addition to the holotype a total of 215 females and 32 males were examined.

CALIFORNIA. KERN CO.: Boron; Dove Well (5 mi. NW); Freeman Jct.; Mojave; Red Rock Canyon; Salt Wells (7 mi. W); Sand Canyon (3 mi. W of Brown); Short Canyon (6 mi. NW of Inyokern); Walker Pass (and 3 mi. SE). LOS ANGELES CO.: Acton; Little Rock (and 1 mi. W); Pallett Creek; Palmdale; Pearblossom (4 mi. S); Squaw Canyon (7 mi. S). SAN BERNARDINO CO.: Adelanto (20 mi. N); Big Panoche Creek; Desert Spring (5 mi. W); Kramer Hills; Kramer Junction (and 3 mi. S); Landers; Lucerne Valley; Morongo Valley; Phelan (2 mi. S); Red Mountain; Victorville (11 mi. SW). SAN DIEGO CO.: Borrego Springs. VENTURA CO.: Saticoy.

Floral Records. Although *Andrena flandersi* has not been collected frequently on Onagraceae, it has been taken on *Camissonia* (as *Oenothera*) (Linsley, MacSwain, and Raven, 1964) and is presumably an oligolege of flowers of that genus. Most females examined by the authors have at least a few *Camissonia* pollen grains in their scopae. This species has been collected from flowers of the plants listed below.

Baccharis sp., *Camissonia campestris*, *C. claviformis claviformis*, *C. contorta*, *C. kernensis*, *Chaenactis* sp., *Coreopsis* sp., *C. bigelovii*, *C. californica*, *Cryptantha* sp., *Ericameria cooperi*, *Lasthenia californica*, *Layia* sp., *L. glandulosa*, *Malacothrix* sp., *Oenothera* (= *Camissonia* ?) sp., *Salix* sp.

Andrena (Onagrandrena) furva Linsley and MacSwain

Andrena (Onagrandrena) furva Linsley and MacSwain, 1961, Pan-Pacific Ent., 37:117–118; Linsley, MacSwain, and Raven, 1964, Univ. California Publ. Ent., 33:64, 73, 79; Linsley, MacSwain, Raven, and Thorp, 1973, Univ. California Publ. Ent., 71:26, 27, 32–33, 47, 51, 56; MacSwain, Raven and Thorp, 1973, Univ. California Publ. Ent., 70:46.

The female of *Andrena furva* is similar to that of *omninigra* and related species but has entirely black vestiture and short dorsal thoracic hairs. The male of *furva* was unknown and a complete description is supplied below. This male is one of those species with entirely white vestiture and has the galeae small and shiny as in *Andrena blaisdelli*, but differs from that species by the longer vertex, shorter first flagellar segment, and shorter, more distinct sternal fimbriae as described below.

FEMALE: Measurements and Ratios. N = 20; length, 10–11 mm; width, about 3 mm; WL, M = 3.20±0.120 mm; FL/FW, M = 0.97±0.004; FOVL/FOVW, M = 3.01±0.044.

Diagnosis. Vestiture black; wing membranes hyaline, not infumate or only slightly so, veins dark brown; metasomal terga black without metallic reflections. Galeae short, narrow, shiny, slightly shagreened in apical halves or less or unshagreened. Labral process with apical part narrow, sides strongly concave, apex usually deeply emarginate; clypeus with round crowded punctures, without impunctate midline or this incomplete and narrow; vertex above lateral ocellus equals one ocellar diameter or rarely slightly more. Pronotum without dorsal angle or lateral ridge. Mesoscutum and scutellum with small dense punctures separated mostly by half a puncture width, interpunctural spaces dulled by fine shagreening (Fig. 9). Propodeum with distinct dorsal surface; dorsal enclosure coarsely, irregularly rugulate; surface outside of enclosure moderately coarsely punctatorugose. Mesepisterna coarsely punctatorugose. Metasomal terga 2 and 3 with basal areas with punctures round, deep, crowded, separated mostly by half a puncture width, slightly sparser near apical area, apical areas with apical half impunctate, basal half punctured similar to basal areas; surfaces shiny, unshagreened. Thoracic dorsum with hairs short, mosslike,

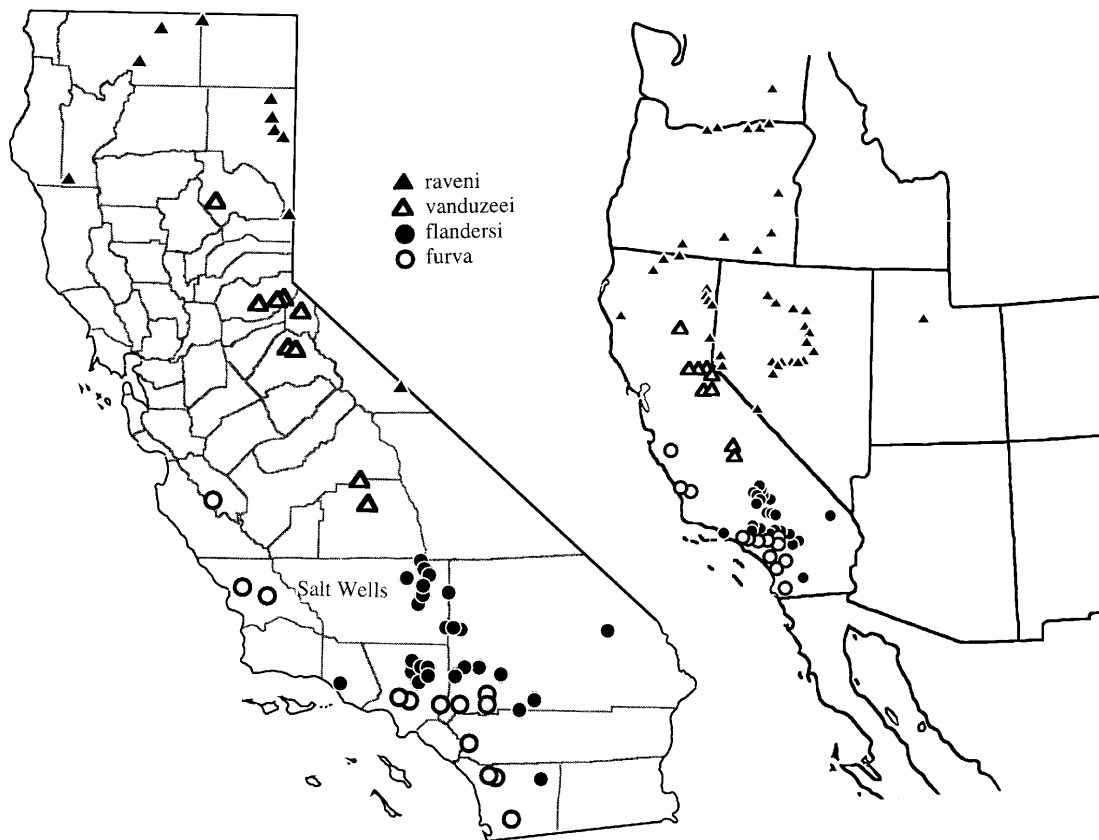


Fig. 4. Maps showing the known distributions of *A. flandersi*, *A. raveni*, *A. vanduzeei*, and *A. furva*.

shorter than width of antennal scape; propodeum with corbicula as in *flandersi*; scopal hairs simple, abundant.

MALE: Measurements and Ratios. N = 20; length, 8–11 mm; width, 2.5–3.0 mm; WL, M = 3.17 ± 0.172 mm; FL/FW, M = 1.07 ± 0.007 ; FS1/FS2, M = 1.04 ± 0.013 .

Integumental Color. Black except as follows: mandible with apical fourth rufescent, terga with apical areas piceous, wing membranes hyaline, not or only slightly infumate.

Structure. Antennae relatively short, in repose not reaching scutellum; scape length equals first two and one-half flagellar segments; flagellar segment 1 about as long as segment 2 or slightly longer, usually shorter than segment 3; segments beyond 3 all slightly longer than broad. Eyes each almost three times as long as broad, inner margins diverging towards vertex. Mandibles not decussate. Galeae as in female. Maxillary palpus short, with segmental ratio about as 1.0:1.0:0.8:0.8:0.6:0.8. Labial palpus with ratio about as 1.0:0.3:0.3:0.5. Labral process large, deeply emarginate, strongly reflexed; labrum apical to process without sulcus or cristae. Clypeus moderately long, median length equals about half or slightly less of interocular width; densely punctate, interpunctural surfaces shiny, without median impunctate line. Supraclypeal area dulled by minute punctures and shagreening. Face above antennal fossae with longitudinal rugulae, diverging medially towards ocelli; vertex above lateral ocellus equals slightly more than one ocellar diameter, never less than one. Genal area slightly broader than eye in profile. shiny, punctate except in narrow zone near eye margin.

Pronotum without humeral angles or lateral ridge. Mesoscutum and scutellum with crowded punctures, surface dulled by shagreening except scutellum occasionally moderately shiny. Propodeum sculptured as in female but dorsal enclosure with rugulae fine; mesepisterna punctatorugose as in female.

Metasomal terga 2–5 with basal areas punctate, punctures separated by half to one or two puncture widths, surfaces shiny, shagreening slight, if present; apical areas with punctures at least in basal halves, shiny. Tergum 7 with distinct, narrow, triangular pseudopygidial areas, lateral edges often turned slightly up. Sterna 2–5 with basal areas distinctly punctate, punctures separated mostly by 2 to 3 puncture widths, surfaces moderately shiny; apical areas impunctate. Sternum 7 with apical lobe elongate, weakly emarginate, with sparse, fine hairs; Sternum 8 strongly capitate apically, neck region with abundant hairs but not covering apical margin (Figs. 37 and 38).

Vestiture. White except vertex occasionally with a few yellowish brown hairs and hind basitarsi with inner surfaces with pale yellow hairs. Clypeus with dense beard; hind basitarsus with hairs along anterior margin moderately long; sterna 2–5 with dense subapical fimbriae of relatively short hairs.

Type Material. The holotype female of *Andrena (O.) furva* (CAL No. 6,703) was collected 4.5 miles NE of Santa Margarita, San Luis Obispo County, California, April 28, 1959, by J. W. MacSwain.

Distribution. This species is known only from southern California (Linsley, MacSwain, Raven, and Thorp, 1973, p. 33) (Fig. 4). It has been collected from April 14 through May 1. In addition to the holotype, a total of 22 females and 23 males were examined from localities listed below.

CALIFORNIA. LOS ANGELES CO.: Altadena; Claremont; La Crescenta. RIVERSIDE CO.: Elsinore (4 mi. E in Railroad Canyon). SAN BENITO CO.: Pinnacles Nat. Monument. SAN BERNARDINO CO.: Deep Creek; Fontana (4 mi. N). SAN DIEGO CO.: Descanso-Alpine transect; Frey Creek, Pauma Valley. SAN LUIS OBISPO CO.: La Panza Camp (12 mi. NE of Pozo); Santa Margarita (4.5 mi. N and 5 mi. NE).

Floral Records. *Andrena furva* has been collected from flowers of the following plants.

Camissonia campestris, *C. contorta*, *Clarkia cylindrica*, *Cryptantha* sp. and *C. intermedia*.

Andrena (Onagrاندrena) oenotherae Timberlake

Andrena oenotherae: Bohart, 1937, Pan-Pacific Ent., 13:54 (**Nomen nudum**).

Andrena oenotherae Timberlake, 1937, Pan-Pacific Ent., 13:6971; Linsley, 1938, Proc. California Acad. Sci., Ser. 4, 23:266, 267; Rust, Menke, and Miller, 1985, in Menke and Miller, Entomology of the California Channel Islands, San Diego, California, p. 42.

Andrena (Melandrena) oenotherae: Lanham, 1949, Univ. California Pub. Ent., 8:221; MacSwain and Smith, 1955, Pan-Pacific Ent., 31:173, 175, 176, 178, 180, 181–182, 183.

Andrena (Onagrاندrena) oenotherae: Linsley and MacSwain, 1956, Pan-Pacific Ent., 32:111, 112–113, 116–118, 119, 120; Linsley and MacSwain, 1961, Pan-Pacific Ent., 37:125, 128; Linsley and MacSwain, 1963, Pan-Pacific Ent., 39:189, 190, 192, 196; Linsley, MacSwain, Raven, and Thorp, 1973, Univ. California Publ. Ent., 71:33–34; Davis and LaBerge, 1975, Nat. Hist. Surv., Biol. Notes No. 95, p. 10.

Andrena (Onagrاندrena) convallaria convallaria Linsley and MacSwain, 1963, Pan-Pacific Ent., 39:190–193. **New synonymy.**

Andrena (Onagrاندrena) convallaria subhyalina Linsley and MacSwain, 1963, Pan-Pacific Ent., 39:193–194; Linsley, MacSwain, and Raven, 1963, Univ. California Publ. Ent., 33:71–72. **New synonymy.**

Andrena (Onagrاندrena) oraria oraria Linsley and MacSwain, 1963, Pan-Pacific Ent., 39:194–196; Linsley, MacSwain, Raven, and Thorp, 1973, Univ. California Publ. Ent., 71:34–35. **New synonymy.**

Andrena (*Onagrandra*) *oraria actitis* Linsley and MacSwain, 1963, Pan-Pacific Ent., 39:196; Linsley, MacSwain, Raven, and Thorp, 1971, Univ. California Publ. Ent., 71:35. **New synonymy.**

Andrena oenotherae is one of our most common *Onagrandra*. The female can be recognized by being entirely black with relatively long dorsal thoracic vestiture, relatively dense scopal hairs, and relatively densely punctate clypeus and metasomal terga. The male of *oenotherae* has the dorsal thoracic hairs white without black hairs, clypeal hairs all or mostly pale, and the mesepisternum and propodeal surface outside of the dorsal enclosure coarsely sculptured, punctatorugose.

FEMALE: Measurements and Ratios. N = 20; length, 11–14 mm; width, 3–4 mm; WL, M = 3.90 ± 0.196 mm; FL/FW, M = 1.06 ± 0.010 ; FOVL/FOVW, M = 3.06 ± 0.050 .

Diagnosis. Vestiture black; wing membranes hyaline, slightly infumate, veins dark brown to black; metasomal terga black without metallic reflections. Galeae moderately long, dulled by fine shagreening; labral process (Fig. 11) longer than half length of labrum, sides strongly concave, apical part narrower than base of first flagellar segment, usually entire, rarely somewhat knobbed and slightly emarginate at apex (apex appears heart shaped). Clypeus with punctures large, deep, crowded, separated mostly by half a puncture diameter, larger apicomediaally, surface shiny, unshagreened except occasionally shagreened near base, without median impunctate line; vertex above lateral ocellus equals one ocellar diameter or slightly less; ocelli not enlarged or only slightly so. Pronotum without humeral angle or vertical ridge laterally. Mesoscutum with abundant small punctures separated mostly by half a puncture width, surface dulled by fine dense shagreening; scutellum punctatorugose, shagreened. Propodeum with distinct dorsal surface; dorsal enclosure with coarse irregular rugulae (Fig. 12), often with median longitudinal ruga; dorsal surface outside of enclosure and posterior surface moderately coarsely punctatorugose; surfaces moderately dulled by shagreening. Mesepisternum punctatorugose, dull. Terga 2–4 apical areas with punctures separated mostly by 1 to 3 puncture widths, basal areas with punctures separated mostly by half to one puncture widths, surfaces shiny. Thoracic dorsum with hairs much longer than width of scape; propodeum without distinct corbicula laterally, hairs long and plumose; scopal hairs long simple, moderately abundant, hiding surface to some degree.

MALE: Measurements and Ratios. N = 20; length, 9–11 mm; width, 2–3 mm; WL, M = 3.49 ± 0.201 mm; FL/FW, M = 1.07 ± 0.005 ; FS1/FS2, M = 1.24 ± 0.025 .

Diagnosis. Vestiture black except as follows: mesonotum, scutellum and metanotum with dorsal surfaces with long white hairs; vertex with some long white hairs mixed with black; metasomal tergum 1 with pale hairs basally (may be mixed with long black hairs), tergum 2 occasionally with basal area with several pale hairs especially basomedially. Wing membranes hyaline, slightly infumate apically, veins dark reddish brown to black. Metasomal terga black, apical areas dark brown, slightly translucent. Galeae as in female; labral process bidentate; clypeus densely punctate, without median impunctate line; surface shiny, unshagreened; vertex above lateral ocellus equals about one ocellar diameter; flagellar segment 1 with minimum length equal to segment 3, usually slightly longer than segment 2. Pronotum as in female; mesoscutum and scutellum as in female but punctures smaller; propodeum as in female but dorsal enclosure with rugulae almost always irregular (Fig. 10), rarely with median ruga; mesepisterna punctatorugose, dull. Metasomal terga 2–5 with apical area punctures separated by one to three puncture widths, often restricted to basal half of apical area, surfaces shiny, lightly shagreened if at all. Metasomal tergum 2 with basal area hairs long, mediobasally half as long as those of tergum 1 or longer; hind tibiae with outer surface hairs long, sparse, along anterior margin some almost as long as dorsal femoral hairs. Genital capsule as in Figs. 13 and 14. Sternum 7 with apical margin in two rounded lobes and median emargination; sternum 8 weakly capitate, not at all or barely emarginate apicomediaally (Figs. 41 and 42).

Type Material. The holotype female of *Andrena (O.) oenotherae* (CAS No. 14368) was collected at Gavilan, Riverside County, California, March 20, 1932 by C.M. Dammers from flowers of *Oenothera* (perhaps *Camissonia*) sp. The holotype female (CAS No. 11,275) of *A. (O.) convallaria* was collected from 2.5 miles S of Livingston, Merced County, California, March 20, 1960 by G.I. Stage from flowers of *Camissonia* (as *Oenothera*) *campestris*. The holotype female of *A. (O.) subhyalina* (CAS No. 11,276) was collected at Boron, Kern County, California, April 3, 1959, by J.W. MacSwain from *Camissonia* (as *Oenothera*) *campestris*. The holotype female of *A. (O.) oraria* (CAS No. 11,278) was collected from beach one mile NE of Point Reyes light-house, Marin County, California, April 19, 1959, by J. W. MacSwain from flowers of *Camissonia* (as *Oenothera*) *cheiranthifolia cheiranthifolia*. The holotype female of *A. (O.) actitis* (CAS No. 11,279) was collected at Fleishhacker Zoo (SW corner of), San Francisco, California, May 21, 1959 by J.W. MacSwain from flowers of *Camissonia* (as *Oenothera*) *cheiranthifolia cheiranthifolia*.

Distribution. *Andrena oenotherae* is known to occur from central cismontane California south into Baja California del Norte (Linsley, MacSwain, Raven, and Thorp, 1973, p. 30) (Fig. 5). Timberlake (1937) lists this species from Arizona (Cave Creek, Chiricahua Mts.), but this has not been verified. It has been collected from January 16 through July 9 but mostly from March through early June. A total of 1,119 females and 499 males were examined from localities listed below.

CALIFORNIA. CONTRA COSTA CO.: Antioch. FRESNO CO.: Coalinga (5 mi. W); Jacolitos Canyon; Kerman (9 mi. W). IMPERIAL CO.: Coyote Wells (6 mi. W); Sunrise Butte. KERN CO.: Bakersfield (18 and 20 mi. E, 7.3 mi. N); Bealville; Blackwell's Corner (and 9.6 mi. N); Boron; Edison (5 and 6 mi. E); Frazier Park; Frazier River (6 air mi. E of Tupman); Lebec; Short Canyon (6.5 mi. NW Inyokern); Tejon Canyon; Weldon (and 10 mi. S). LOS ANGELES CO.: Alamos Bay; Altadena; Azusa (3 mi. N); Camp Baldy; Claremont; Devil's Punchbowl; Elizabeth Lake Canyon; El Segundo Sand Dunes; Glendale; Irwindale; La Crescenta; Lancaster (and 18 mi. W); Little Rock; Manhattan Beach; Mescal Wildlife Sanctuary; Palmdale; Pasadena; Point Dume; Redondo Beach; San Gabriel Canyon; San Gabriel Mts.; San Gabriel Wash; Whittier. MADERA CO.: Oakhurst (Cemetery and 3.7 mi. W). MARIN CO.: Dillon Beach; Point Reyes Lighthouse (1 mi. NE); Point Reyes National Seashore (North Beach). MERCED CO.: Livingston (2 mi. SW and 2.5 mi. S). MONTEREY CO.: Bradley (1.5 mi. W). ORANGE CO.: Balboa Island; Laguna Beach; Newport; Newport (upper) Bay; Newport Beach. RIVERSIDE CO.: Elsinore (and 4 mi. E); Gavilan; Hemet (and 6 mi. S); Homeland; Palm Springs; Mira Loma; Perris; Riverside; Sage (5 mi. S); Santa Ana River; Soboda Hot Springs; Sunnymead; Temecula (7 and 9 mi. E); Wineville. SACRAMENTO CO.: Brannon Island State Park. SAN BERNARDINO CO.: Adelanto; Alta Loma; Desert Springs; Kramer Junction (4 mi. S); Phelan (2 mi. S); Redlands; San Bernardino (10 mi. W); Verdmont; Victorville (11 mi. S). SAN DIEGO CO.: Border Field State Beach; Borrego; Carlsbad (and 2 mi. S); Coastal Sage area; Coronado; Del Mar; Dulzura; Jacumba; Lakeside; Newton; Oceanside; Pauma; Pine Valley (1 mile N); San Diego and Mission Bay; San Pasqual (4 mi. E); Solana Beach. SAN FRANCISCO CO.: Fleishaker Zoo; Sand Dunes; San Francisco. SAN LUIS OBISPO COUNTY: Bee Rock (1.8 mi. W); Creston (2.5 mi. S); Santa Margarita (4.5 and 5 mi. NE); Shandon (6.8 mi SW); Simmler (10 mi. W). SANTA BARBARA CO.: Cuyama; Goleta; New Cuyama (and 28 mi. NW); Pine Canyon Guard Station (1.6 mi. W and 2.6 mi. E); Santa Cruz Island (Christy Beach and Fraser Point); Santa Rosa Island (Carrington Point and Skunk Point); Ventucopa (Santa Barbara Canyon). STANISLAUS CO.: Turlock. TULARE CO.: Fairview (1 mi. S); Johnsondale; Tipton (2.4 mi. S); Tulare (airpark and 4 mi. S). VENTURA CO.: Chuchupate Ranger Station (base of Frazier Mt.); Fillmore; Gorman (5 mi. S in Hungry Valley); Mugu Lagoon (Point Mugu); Point Mugu Naval Air Station (Area 1 and 2); Quatal Canyon (NW corner of county); San Buenaventura State Park (S end); Saticoy; Upper

Cuyama Canyon; Ventura. MEXICO. BAJA CALIFORNIA DEL NORTE: Descanso Bay; Ensenada (3 mi. S); La Zapopita, Valle de Trinidad; Santo Tomas (7 mi. N).

Floral Records. *Andrena oenotherae* is an oligolege of matinal blooming flowers of the genus *Camissonia* (Linsley *et al.*, 1973) and has been collected from flowers of the plants listed below.

Acacia greggii, *Agoseris heterophylla*, *Allysum maritimum*, *Anisocoma acaulis*, *Brassica* sp., *Cakilie edentulata*, *Calandrinia* sp., *Camissonia* sp., *C. bistorta*, *C. californica*, *C. campestris*, *C. c. obispoensis*, *C. cheiranthifolia cheiranthifolia*, *C. c. suffruticosa*, *C. claviformis claviformis*, *C. contorta*, *C. kernensis*, *C. micrantha*, *C. ovata*, *C. pallida*, *C. sierrae*, *Capsella bursa-pastori*, *Chaenactis* sp., *Chrysanthemum coronarium*, *Coreopsis* sp., *C. bigelovii*, *C. californica*, *Croton californicus*, *Cryptantha* sp., *C. clevelandii*, *C. intermedia*, *Encelia actoni*, *Ericameria* sp., *E. cooperi*, *Eriogonum fasciculatum*, *Erodium* sp., *Gilia* sp., *Hemizonia kelloggii*, *Isomeris arborea*, *Lantana* sp., *Lasthenia* sp., *Layia glandulosa*, *L. platyglossa*, *Lupinus* sp., *Malacothrix* sp., *Melilotus alba*, *Mirabilis californica*, *Oenothera* (= *Camissonia*) sp., *Phacelia* sp., *Potentilla* sp., *Rhaphanus sativus*, *Salix* sp., *S. laevigata*, *S. lasiolepis*, *Sisymbrium* sp., *Vicia americana*, *Viguiera* sp.

Andrena (*Onagrandra*) *vespertina* Linsley and MacSwain

Andrena (*Onagrandra*) *vespertina* Linsley and MacSwain, 1961, Pan-Pacific Ent., 37:123-125; Linsley and MacSwain, 1963, Pan-Pacific Ent., 39:193; Linsley, MacSwain, Raven and Thorp, 1973, Univ. California Publ. Ent., 71:27, 35-36, fig. 15, table 10.

Andrena vespertina is a large black bee active in the late afternoon and evening, as well as in the early morning. The female of *vespertina* is similar to that of *oenotherae* but has more densely punctate metasomal terga and the mesoscutal punctures are smaller and denser. The male of *vespertina* is like that of *boronensis* in having white clypeal hairs and white dorsal thoracic hairs without an intermixture of black hairs but has no white hairs on the pleural areas of the thorax and has the metasomal terga much more densely punctate.

FEMALE: Measurements and Ratios. N = 20; length, 13.0-13.5 mm; width, 3.0-3.5 mm; WL, M = 4.06±0.185 mm; FL/FW, M = 1.04±0.004; FOVL/FOVW, M = 2.82±0.037.

Diagnosis. Vestiture black; wing membranes moderately infumate, yellowish brown, veins dark brown to black; metasomal terga without metallic reflections. Galeae as in *oenotherae*; labral process with apical portion narrow as in *oenotherae*. Clypeus sculptured as in *oenotherae*. Vertex and ocellus as in *oenotherae*. Pronotum without humeral angle or lateral ridges (Fig. 15); mesoscutum and scutellum sculptured as in *oenotherae* but punctures slightly smaller and denser, separated entirely by half a puncture width or less, surface dull, shagreened; propodeum sculptured as in *oenothera*; mesepisternum finely punctatorugose, dull, shagreened. Metasomal terga 2 and 3 with apical area punctures separated mostly by 1 to 3 puncture widths, basal area (especially in median third) with punctures dense, separated mostly by half a puncture width or less, contrasting somewhat with slightly more sparsely punctate apical area; surfaces shiny. Thoracic dorsum with hairs long, dense; propodeum without distinct corbicula, hairs long and plumose; scopal hairs long, simple, moderately abundant, hiding surface to some degree.

MALE: Measurements and Ratios. N = 20; length, 11-12 mm; width, 2.5-3.0 mm; WL, M = 3.73±0.289 mm; FL/FW, M = 1.13±0.004; FS1/FS2, M = 1.19±0.015.

Diagnosis. Vestiture black except as follows: clypeal hairs entirely white, facial hairs white except along inner margins compound eyes, vertex with white hairs, thorax with dorsal hairs white, without dark hairs, pleural hairs black without white hairs in upper part, metasomal tergum 1 usually entirely or partly white. Wing membranes hyaline, slightly

infumate apically, veins dark brown to black; metasomal terga black, apical areas not or only slightly translucent. Galeae as in female; labral process and clypeal sculpturing as in *oenotherae*; vertex above lateral ocellus equals about one ocellar diameter; flagellar segments as in *oenotherae*. Pronotum as in *oenotherae* female; mesoscutum and scutellum sculptured as in *oenotherae* female but mesoscutal punctures slightly denser and pleural punctures distinct (not punctatorugose); propodeum with dorsal enclosure coarse, irregularly rugose; surface outside of enclosure, dull, finely sculptured, tessellate with indistinct punctures slightly roughening surface. Metasomal terga 2–5 (especially 2 and 3) with apical area punctures separated by 1 to 3 puncture widths, often restricted to basal half or slightly more; basal area punctures dense, separated mostly by half to one or two puncture widths and contrasting with more sparsely punctate apical areas. Metasomal tergal hairs and hind tibial hairs as in *oenotherae*. Sternum 7 with broad apical lobes and small apicomedian emargination, hairs weak but abundant; sternum 8 capitate with weak apicomedian emargination, hairs slender relatively sparse (Figs. 47–48).

Type Material. The holotype female of *Andrena (Onagrاندrena) vespertina* (CAS No. 6,710) was collected 18 miles E of Bakersfield, Kern County, California, April 19, 1958, at flowers of *Camissonia boothii* (as *Oenothera decorticans*) by E.G. Linsley.

Distribution. *Andrena vespertina* is known from the type locality and Del Puerto Canyon, 21 mi. W Patterson, Stanislaus Co. (Fig. 5). It was collected several times from March 9 through June 12 (Linsley *et al.* 1973). We have examined 74 females and 95 males.

CALIFORNIA. KERN CO.: Bakersfield (18 mi. E). STANISLAUS CO.: Del Puerto Canyon (21 mi. W of Patterson).

Floral Records. *Andrena vespertina* is considered to be an oligolege of *Camissonia boothii* and is known to forage during late evenings. It has been collected from flowers of the plants listed below.

Camissonia boothii (as *decorticans*), *C. campestris*, *Isomeris arborea*.

Andrena (Onagrاندrena) boronensis Linsley and MacSwain

Andrena (Onagrاندrena) boronensis Linsley and MacSwain, 1962, Pan-Pacific Ent.

38:49–51; Linsley, MacSwain, and Raven, 1963, Univ. California Pub. Ent., 33:69–71.

Andrena (Onagrاندrena) eulobi Linsley and MacSwain, 1963, Pan-Pacific Ent.,

39:197; Linsley, MacSwain, Raven, and Thorp, 1973, Univ. California Publ.

Ent., 71:31–32. **New synonymy.**

Andrena boronensis is closely related to *A. oenotherae* from which it can be separated in both sexes by the more sparse metatergal punctation. In the female, terga 2 and 3 have the apical area punctures separated largely by three to five puncture widths and the punctures are minute in size.

FEMALE: Measurements and Ratios. N=20; length, 12–14 mm; width, 3–4 mm; WL, M = 3.88±0.193 mm; FL/FW, M = 1.09±0.007; FOVL/FOVW, M = 3.15±0.058.

Diagnosis. Vestiture black; wing membranes hyaline, slightly infumate apically, veins dark brown to black; metasomal terga black without metallic reflections. Galeae as in *oenotherae*; labral process with narrowed apical portion occasionally narrow as in *oenotherae*, usually about as broad as base of scape or almost so, occasionally weakly emarginate apically. Clypeus sculptured as in *oenotherae*. Vertex and ocelli as in *oenotherae*. Pronotum without humeral angle or vertical ridge laterally; mesoscutum, scutellum, mesepisternum and propodeum sculptured as in *oenotherae*. Terga 2 and 3 with apical areas with punctures separated mostly by 3 to 5 puncture widths, punctures minute, basal areas with punctures separated by 1 to 3 or more puncture widths, sparse especially in median third, surfaces shiny. Thoracic dorsum with hairs long; propodeum without distinct corbicula laterally, hairs long and plumose; scopal hairs long, simple, moderately abundant, hiding surface to some degree.

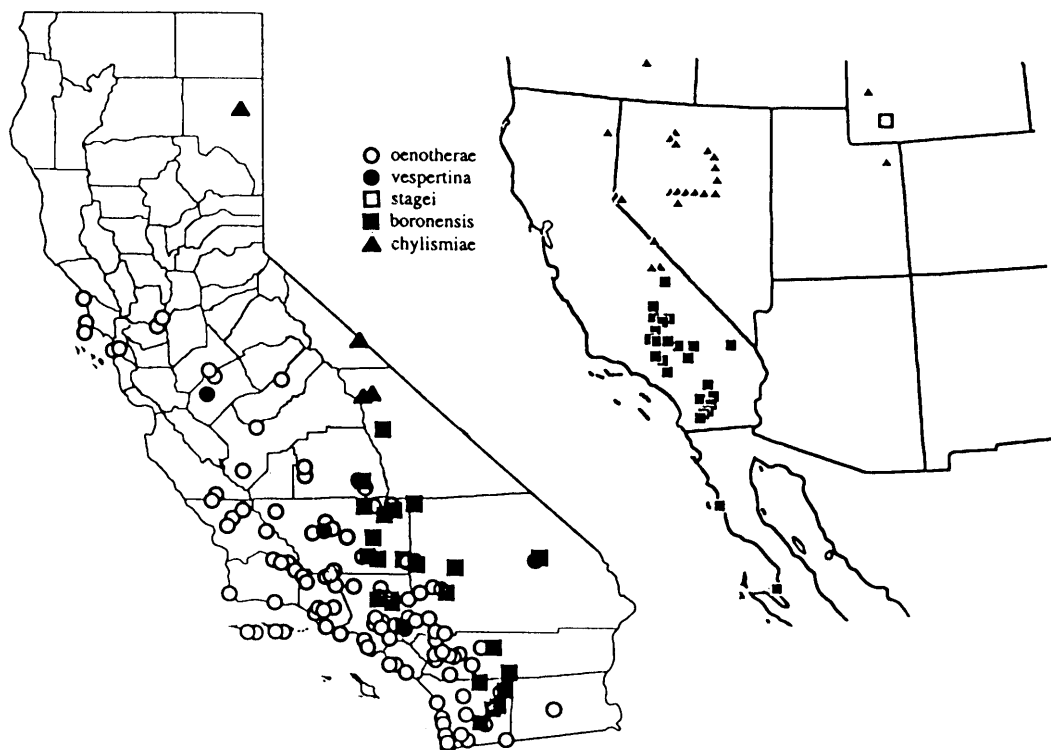


Fig. 5. Maps showing the known distributions of *A. oenotherae*, *A. vespertina*, *A. chylismiae*, *A. stagei*, and *A. boronensis*.

MALE: Measurements and Ratios. N = 20; length, 9–10 mm; width, 2–3 mm; WL, M = 3.51 ± 0.143 mm; FL/FW, M = 1.14 ± 0.009 ; FS1/FS2, M = 1.25 ± 0.019 .

Diagnosis. Head with vestiture white except as follows: long black hairs mixed with white on vertex, on face along inner margins of compound eyes and occasionally mixed with black on face above clypeus, on labrum, and on genal area (some white usually present on lower genal area below level of mandible). Thorax white dorsally, usually including a few to many long white hairs on dorsal surface of propodeum; pleural hairs black with white at least dorsally near wings. Leg hairs black but some white hairs often present on femora. Metasomal hairs black with long white hairs dorsally on tergum 1 and a few mediobasally on tergum 2. Wing membranes hyaline, slightly infumate apically at most, veins dark reddish brown to black; metasomal terga black, without metallic reflections. Galeae as in female; labral process bidentate; clypeus densely, finely punctate, surface shiny; vertex above lateral ocellus equals about one ocellar diameter; flagellar segment 1 with minimum length usually slightly longer than segment 2, about equal to segment 3. Pronotum and thoracic sculpturing, including propodeum, as in *oenotherae* female. Metasomal terga sculptured much as in female but punctures usually sparser; tergum 2 with basal area hairs and tibial hairs as in *oenotherae*. Sternum 7 with apical teeth small, crowded together, median emargination weak with fine hairs; sternum 8 much as in *oenotherae* but apical hairy lobe somewhat narrower (Figs. 43 and 44).

Type Material. The holotype female of *Andrena* (*O.*) *boronensis* (CAS No. 11,274) was collected at Boron, Kern County, California, April 3, 1959 at flowers of *Camissonia campestris* (as *dentata*) by J.W. MacSwain. The holotype female of *A.* (*O.*) *eulobi* (CAS No. 11,277) was collected 14 miles south of San Quintin, Baja California del Norte, Mexico, March 30, 1962, at flowers of *Camissonia* (as *Oenothera*) *crassifolia* by P.H. Raven. Linsley and MacSwain, 1963, cite this locality as 14 miles north of San Quintin, but the label on the holotype clearly has the locality as 14 miles south of San Quintin.

Distribution. *Andrena boronensis* occurs in southern California and in Baja California del Norte (Fig. 5). It has been collected from March 2 to August 5 but chiefly from the end of March to early June. In addition to the type material, a total of 422 females and 106 males were examined from localities listed below.

CALIFORNIA. IMPERIAL CO.: Travertine Rock. INYO CO.: Goodale Creek (N of Lone Pine). KERN CO.: Boron; Mojave (and 6 mi. E); Red Rock Canyon; Short Canyon (6.5 mi. NW of Inyokern); Walker Pass Summit (0.7 and 7.2 mi. NW); Weldon (0.5 mi. S). LOS ANGELES CO.: Claremont; Little Rock (and 1 mi. W); Pearlblossom (5 mi. S); Palmdale; Valyermo. RIVERSIDE CO.: Thousand Palms. SAN BERNARDINO CO.: Apple Valley; Barstow (2 mi. W); Desert Springs; Kramer Hills; Salt Wells (7 mi. W). San Diego Co.: Anza-Borrego State Park; Descanso-Alpine; Oak Grove; Pegleg Smith Monument; Shelter Valley. TULARE CO.: Johnsondale. MEXICO. BAJA CALIFORNIA DEL NORTE: Guerro Negro; San Quintin (14 miles N).

Nest Biology. Linsley et al. (1964) give the following account of the nesting of this species. "Most burrows of *A. boronensis* were found in or near the borders of hard-packed, unpaved roadbeds. Several were excavated at Little Rock. They were 7 mm in diameter and slanted down from the ground surface at an angle of about 45 degrees to a depth of 11 to 14 cm; from this point they progressed vertically to a depth of 36 to 47 cm and then laterally for 12 to 20 cm where a horizontal cell was placed."

Floral Records. *Andrena boronensis* is an oligolege of the genus *Camissonia* (Linsley et al. 1973). It has been collected from flowers of the plants listed below.

Baccharis viminea, *Camissonia bistorta*, *C. brevipes*, *C. campestris*, *C. claviformis aurantiaca*, *C. c. claviformis*, *C. crassifolia*, *C. kernensis*, *Coreopsis bigelovii*, *C. californica*, *Cryptantha intermedia*, *Encelia farinosa*, *Ericameria linearifolia*, *Eriophyllum confertiflorum*, *Layia glandulosa*, *Potentilla* sp., *Salix exigua*, *S. lasiolepis*.

Andrena (Onagrandrena) stagei Linsley and MacSwain.

Andrena (Onagrandrena) stagei Linsley and MacSwain, 1962, Pan-Pacific Ent., 38: 52; Linsley, MacSwain, and Raven, 1963, Univ. California Publ. Ent., 33:31, 38.

Andrena stagei is known only from the type material and only in the female sex. These females are very similar to those of *boronensis* with sparse punctures on terga 2–4, but have the scopal hairs of the hind tibiae slightly longer and sparser.

FEMALE: Measurements and Ratios. N = 1; length, 11.0 mm; width, 3.5 mm; WL, 4.05 mm; FL/FW, 1.04; FOVL/FOVW, 2.81.

Diagnosis. Color of vestiture and integument as in *oenotherae* but wings slightly more infumate. Galeae, labral process, clypeal sculpture and pronotum as in *oenotherae*. Vertex above lateral ocellus shorter than one ocellar diameter, ocelli slightly enlarged. Mesoscutum, scutellum, and propodeum sculptured as in *oenotherae*. Metasomal terga 2 and 3 with apical areas with punctures separated mostly by 3 to 5 puncture widths, punctures small to minute, basal areas with punctures separated by 1 to 3 or more puncture widths, surfaces shiny. Thoracic dorsum with long hairs as in *oenotherae*; scopal hairs long, simple, sparse, not hiding surface of tibia at least medially.

Type Material. The holotype female and two female paratypes of *Andrena (O.) stagei* (CAS No. 11,280) were collected at Little America (22 miles W of Green River), Sweetwater County, Wyoming, June 20, 1960, at flowers of *Oenothera pallida trichocalyx* by G.I. Stage (Fig. 5). Since this species is known only from the type specimens, no further distribution or floral data are cited.

***Andrena (Onagrandrena) chylismiae* Linsley and MacSwain**

Andrena chylismiae Linsley and MacSwain, 1961, Pan-Pacific Ent., 37:121–123;

Linsley, MacSwain, and Raven, 1963, Univ. California Publ. Ent., 33:31, 37–38.

Andrena thorpi Linsley and MacSwain, 1962, Pan-Pacific Ent., 38:51; Linsley,

MacSwain, and Raven, 1963, Univ. California Publ. Ent., 33:31, 38–39. **New**

synonymy.

Andrena chylismiae is closely related to *A. oenotherae* which it resembles by the densely punctate metasomal terga but differs by the long sparse tibial scopal hairs of the females and the entirely black vestiture of the males. This species differs from either *stagei* or *boronensis* by the denser metasomal punctation as described below.

FEMALE: Measurements and Ratios. N = 20; length, 12–15 mm; width, 3.0–4.5 mm; WL, M = 4.34±0.293 mm; FL/FW, M = 1.04±0.004; FOVL/FOVW, M = 2.96±0.042.

Diagnosis. Vestiture black; wing membranes hyaline, slightly infumate, veins dark brown to black; metasomal terga without metallic reflections. Galeae and labral process as in *oenotherae*. Clypeus sculptured as in *oenotherae*. Pronotum without humeral angle or ridge laterally; mesoscutum, scutellum, mesepisternum and propodeum sculptured as in *oenotherae*. Terga 2 and 3 with punctures dense as in as in *oenotherae*. Thoracic dorsum with hairs long as in *oenotherae*; propodeum without corbicula laterally, hairs long and plumose; scopal hairs long, simple sparse, not hiding surface.

MALE: Measurements and Ratios. N = 14; length, 11–12 mm; width, 3.0–3.5 mm; WL, M = 4.15±299 mm; FL/FW, M = 1.09±0.07; FS1/FS2, M = 1.19±022.

Diagnosis. Vestiture entirely black; wing membranes hyaline, only slightly infumate, veins dark brown to black; metasomal terga without metallic reflections. Galeae as in female; labral process bidentate; clypeus densely punctate, surface shiny; vertex above lateral ocellus equals about one ocellar diameter; flagellar segment 1 with minimum length about equal to segment 3, slightly longer than segment 2. Pronotum as in *oenotherae* female; mesoscutum and scutellum sculptured as in *oenotherae* female but punctures slightly smaller; propodeum and mesepisternum sculptured as in *oenotherae* female. Metasomal terga 2–5 with apical area punctures separated by one to three puncture widths, lightly shagreened if at all; basal area punctures separated usually by 1 to 2 puncture widths. Metasomal tergum 2 with basal area hairs long as in *oenotherae*; hind tibiae with long sparse hairs along anterior margin as in *oenotherae*. Sternum 7 similar to that of *oenotherae* but with apical lobes slightly narrower and less distinctly hairy; sternum 8 capitate with weak apicomedian emargination, somewhat angular laterally, neck region short, broad (Figs. 45 and 46).

Type Material. The holotype female of *Andrena (O.) chylismiae* (CAS No. 6,700) was collected 10 miles S of Reno, Washoe County, Nevada, May 29, 1959, at flowers of *Camissonia* (as *Oenotherae*) *claviformis cruciformis* by P.H. Raven. The holotype female of *A. (O.) thorpi* (CAS No. 11,281) was collected 11 miles N of Winnemucca, Humboldt County, Nevada, June 8, 1961, from flowers of *Oenothera deltooides piperi* by J.W. MacSwain.

Distribution. *Andrena chylismiae* is known from California west of the Sierra Nevada Mts., and southern Oregon east to western Wyoming and eastern Utah (Linsley, MacSwain, and Raven, 1963, p. 37) (Fig. 5). It has been collected from May 19 through June 18. A single female supposedly collected in the Santa Catalina Mts. in Pima Co. Arizona by Oslar is probably mislabeled (Thorp, 1970) and is not included in the localities listed below. In addition to the types and paratypes, 242 females and 23 males were examined from localities listed below.

CALIFORNIA. INYO CO.: Big Pine; Big Pine Creek (8000 ft. alt.). LASSEN CO.: Ravendale (19 mi. SE). MONO CO.: Benton. NEVADA. EUREKA CO.: Emigrant Pass (4 mi. E); Eureka (2 and 28.5 mi. W. and 7.6, 17.1, 50.2 and 73.3 mi. N). HUMBOLDT CO.: Winnemucca (and 11 mi. N and 10 mi. S). LANDER CO.: Austin (2.5 and 12 mi. E,

9.5 mi. W); Reese River Valley (9.7 and 14.7 mi. W. of Austin; Railroad Pass (3 mi. E). WASHOE CO.: Reno (10 mi. S); Steamboat Springs (10 mi. S of Reno). OREGON. HARNEY CO.: Frenchglen (20 mi. S). UTAH. UINTAH CO.: Brush Creek. WYOMING. LINCOLN CO.: LaBarge (6 mi. S).

Floral Records. This species is an oligolege of species of *Camissonia* (Linsley *et al.* 1973). It has been collected at flowers of the plants listed below.

Camissonia claviformis claviformis, *C. c. cruciformis*, *C. c. integrrior*, *Melilotus officinalis*, *Oenotherae* sp., *O. deltoides piperi*, *Sisymbrium altissimum*, *Stanleya pinnata*, *Stenotus* (as *Haplopappus*) *acaulis*, *Taraxacum officinale*.

Andrena (*Onagrاندrena*) *rozeni* Linsley and MacSwain

Andrena (*Melandrena*) *rozeni* Linsley and MacSwain, 1955, Pan-Pacific Ent., 31:164, 166, 168–170; Linsley, MacSwain, and Smith, 1955, Pan-Pacific Ent., 31:176, 179.

Andrena (*Onagrاندrena*) *rozeni*: Linsley and MacSwain, 1956, Pan-Pacific Ent., 32:112; Linsley, MacSwain, and Raven, 1963, Univ. California Publ. Ent., 33:11, 36–37; Linsley, MacSwain, and Raven, 1964, Univ. California Publ. Ent., 33:72–73.

Andrena rozeni is a distinctive species related to the *deserticola* group of species, but resembling members of the large *oenotherae* group of species. It can be separated from *oenotherae* in either sex by the scutellum having distinct punctures separated by half or more puncture widths especially in the anterior fourth, the interpunctural spaces being dulled by fine tessellation. The tibial scopal hairs are relatively sparse, as in *chylismiae*, but the females of *rozeni* have terga 2–4 more closely punctate basally and the scutellar punctures of *chylismiae* are close set as in *oenotherae*. Rarely the females of *rozeni* have hairs along the posterior margin of the scutellum reddish brown to red, as in some females of *anograe*, but can be separated from the latter by the scutellar sculpturing as described below and the coarser propodeal sculpturing. The male of *rozeni* can be separated from other members of the *oenotherae* group by the pale facial and thoracic hairs together with the sparse scutellar punctures.

FEMALE: Measurements and Ratios. N = 20; length, 10–13 mm; width, 3–4 mm; WL, M = 4.05±0.175 mm; FL/FW, M = 1.10±0.004; FOVL/FOVW, M = 3.24±0.053.

Diagnosis. Vestiture black except occasionally ochraceous to reddish brown hairs present along posterior border of scutellum; wing membranes hyaline, slightly if at all infumate, veins dark reddish brown to dark brown; metasomal terga without metallic reflections. Galeae, vertex and ocelli as in *oenotherae*. Labral process narrowed apically, with sides concave, apical part about as broad as long and about as broad as base of scape. Clypeus sculptured as in *oenotherae*; vertex above lateral ocellus equals ocellar diameter or slightly less. Pronotum without humeral angle or vertical ridge laterally. Mesoscutum with crowded small punctures separated mostly by half a puncture width or less, surface dulled by fine tessellation. Scutellum punctate, near anterior margin punctures distinctly separated by half to one puncture width, surface finely tessellate. Propodeum sculptured as in *oenotherae*; mesepisternum coarsely punctatorugose except posteromedially where punctures small, obscured by dense tessellation. Terga 2–4 with basal area punctures separated by half to one puncture width or slightly more, surface shiny; apical areas punctate below: basally (basal half to three-fourths), punctures separated mostly by half to two or three puncture widths or more, surfaces shiny. Thoracic dorsum with hairs much longer than width of scape; propodeum without distinct corbicula laterally, hairs long and plumose; scopal hairs long, simple, sparse, not at all hiding surface of tibia.

MALE: Measurements and Ratios. N = 20; length, 9–11 mm; width, 2.5–3.0 mm; WL, M = 3.59±0.236 mm; FL/FW, M = 1.17±0.010; FS1/FS2, M = 1.20±0.020.

Diagnosis. Vestiture black except as follows: head hairs white except vertex with short to long black hairs, face in narrow zone near eye margin usually with dark hairs, genal area often with dark hairs mixed with the white; thoracic hairs white except pleurae with some dark brown to black hairs ventrally and on lower lateral surfaces; metasomal tergum 1 often with white hairs basally. Wing membranes hyaline, veins dark reddish brown; metasomal terga black, apical areas not translucent. Galeae as in female; labral process bidentate; clypeus densely punctate; vertex above lateral ocellus equals one ocellar diameter or slightly less; flagellar segment 1 as in *oenotherae*; labral process large, bidentate, reflexed. Pronotum as in female; mesoscutum and scutellum as in female but punctures slightly smaller; mesepisternal sculpture as in female; propodeum as in *oenotherae*. Metasomal terga 2–5 sculptured as in female terga 2–4 but punctures slightly sparser. Metasomal tergum 2 with basal area hairs shorter than half length of hairs of tergum 1; hind tibiae with hairs sparse and long as in *oenotherae*. Sternum 7 similar to that of *chylismiae* in shape but with abundant short hairs on apicomedian lobes and apicolaterally; sternum 7 distinctly capitate, apex rounded, neck region narrow, vestiture coarse, long, dense (Figs. 49–50).

Type Material. The holotype female of *Andrena* (*O.*) *rozeni* (CAS No. 6,708) was collected from near Needles, San Bernardino County, California, March 6, 1930, by E. G. Linsley.

Distribution. *Andrena rozeni* is known from southern California, Nevada, Arizona, and Sonora in Mexico (Linsley, MacSwain, and Raven, 1963, pp. 7, 36) (Fig. 3). It has been taken from December 4 through June 23 but chiefly from late February to the end of April. In addition to the holotype, a total of 962 females and 237 males were examined from localities listed below.

ARIZONA. LA PAZ CO.: Vicksburg. MARICOPA CO.: Gila Bend (13 and 32 mi. E). PIMA CO.: Cortaro; Sells (32.8 mi. NE). YUMA CO.: Hope (7 mi. W); Mohawk (9.5 mi. W); Yuma. CALIFORNIA. IMPERIAL CO.: Coyote Wells (3 and 6 mi. W); Kane Springs; Ocotillo; Palo Verde (and 3 mi. S); Yuma Desert. INYO CO.: Eureka Dune (35 mi. ESE of Bigpine); Lone Pine (N of Goodale Creek); Shoshone (5.5 mi. N). KERN CO.: Sand Canyon (3 mi. W of Brown); Walker Pass (1 mi. W). LOS ANGELES CO. Co.: Edwards Airforce Base (SW boundary and 1 mi. S); Llano (2 mi. SW). RIVERSIDE CO.: Andreas Canyon; Berdoo Canyon; Blythe (18 mi. W); Boyd Desert Research Center (4 mi. S of Palm Desert); Coachella Valley; Desert Center (4 mi. E); Desert Hot Springs (Whitehouse Canyon); Hopkins Well (2 mi. W); Indio; Joshua Tree Natl. Mon. (Bell Picnic area); La Quinta; Palm Canyon; Palm Desert; Pinyon Crest (12 road mi. SW Palm Desert); Thousand Palms. SAN BERNARDINO CO.: Baker (2 mi. N); Baker Sand Dunes (9 air mi. S, Zzyzx Springs); Cajon Pass; Calico; Essex; Kelso (7 mi. S in Providence Mts.); Kramer Hills; Kramer Junction; Mojave Desert; Needles (and near and 30 mi. S); Salton Sea; Vidal Junction (7 mi. N); Vidal (5 mi. N); Vulcan Mines; Yucca Valley. SAN DIEGO CO.: Borrego (9 mi. E at Coyote Creek); Borrego Palm Canyon, Borrego State Park; Borrego Springs; Borrego Valley (and dunes); Jacumba (5 mi. E); Julian (near Salton Sea); Sentenac Canyon; Tub Canyon (Borrego). NEVADA. CLARK CO.: Searchlight. WASHOE CO.: Sparks (4.5 mi. N); Wadsworth (28 mi. W). MEXICO. SONORA: Sonoyta (50 mi. W and 134 km S).

Nest Biology. Females of *A. rozeni* nest in sandy soil (Linsley *et al.* 1963a). They prefer shallow depressions and the base of shaded road cuts as sites to initiate nest construction. Their burrows angle about 45 degrees downward for the first 5 cm or more, descend vertically for about 1 meter and turn horizontally for about 20 cm where a brood cell is constructed. Burrows were commonly started in the afternoon with excavation continuing through the night. Females seem to require more than one night of nest preparation before initiating pollen foraging.

Floral Records. *Andrena rozeni* is an oligolege of plants of crepuscular blooming species of the genus *Camissonia* and has been collected from plants listed below.

Agoseris glauca, *Baccharis* sp., *Baileya* sp., *B. multiradiata*, *Brassica* sp., *Camissonia boothii decorticans*, *C. claviformis aurantiaca*, *C. c. claviformis*, *C. c. integrrior*, *C. c. peirsonii*, *C. tanaacetifolia*, *Cryptantha clevelandii*, *C. intermedia*, *Encelia* sp., *E. farinosa*, *Geraea canescens*, *Hyptis emoryi*, *Isomeris arborea*, *Madia rammii*, *Medicago sativa*, *Mirabilis* sp., *Oenothera* sp., *O. deltooides pinnata*, *O. pallida*, (as *latifolia*), *O. piperi*, *O. trichocalyx*, *Sisymbrium altissimum*, *Stanleya* sp., *Taraxacum officinale*.

***Andrena (Onagrandrena) linsleyi* Timberlake**

Andrena linsleyi Timberlake, 1937, Pan-Pacific Ent., 13:71–72; Linsley, 1938, Proc. California Acad. Sci., Ser. 4, 23:266, 278.

Andrena (Melandrena) linsleyi: Lanham, 1949, Univ. California Publ. Ent., 8:221; Linsley and MacSwain, 1955, Pan-Pacific Ent., 31:165, 166, 170–171; Linsley, MacSwain, and Smith, 1955, Pan-Pacific Ent., 31:176, 179.

Andrena (Onagrandrena) linsleyi: Linsley and MacSwain, 1956, Pan-Pacific Ent., 32:112; Linsley, MacSwain, and Raven, 1963, Univ. California Publ. Ent., 33(1):11–16; Linsley, MacSwain, and Raven, 1964, Univ. California Publ. Ent., 33(2):73.

Andrena enceliarum Cockerell, 1937, American Mus. Novs. No. 948, p. 13. **New synonymy.**

Andrena linsleyi is a relatively large *Oenothera* bee with sparse, long scopal hairs, a triangular labral process with rounded tip, and relatively weakly sculptured propodeum and mesepisterna. The male of *linsleyi* has the vestiture entirely white. Both sexes are marked by relatively sparsely punctate clypeus, scutellum and mesoscutum as described below.

FEMALE: Measurements and Ratios. N = 20; length, 11–14 mm; width, 3.5–4.0 mm; WL, M = 4.10±0.145 mm; FL/FW, M = 1.12±0.004; FOVL/FOVW, M = 3.12±0.032

Diagnosis. Vestiture black; wing membranes hyaline, not infumate, veins reddish brown to dark brown; metasomal terga black without metallic reflections. Galeae moderately long, dulled by fine shagreening; labral process large, triangular with apex rounded, shiny, sides straight, entire. Clypeus with punctures separated by half to one puncture width or slightly more (especially near apex), with distinct, complete, median, impunctate line, shiny, unshagreened; vertex above lateral ocellus equals distinctly less than one ocellar diameter, never more; ocelli moderately enlarged. Pronotum as in *oenotherae*. Mesoscutum and scutellum with distinct punctures separated by half a puncture width or slightly more, surface dulled by fine shagreening. Propodeum with distinct dorsal surface; dorsal enclosure with relatively fine, irregular rugulae; surfaces outside of enclosure punctate, dulled by tessellation, rugulae extremely fine, if present. Mesepisterna with distinct punctures, especially in lower half, obscured by coarse tessellation. Terga 2–4 with punctures small, separated mostly by half to one puncture width or slightly more, surface shiny; apical areas finely punctate in basal half to two-thirds, punctures separated by half to two puncture widths, surfaces shiny. Thoracic dorsum with hairs longer than width of scape; propodeum without distinct corbicula laterally, hairs long and plumose; scopal hairs extremely long, simple and extremely sparse, not at all hiding surface of tibia.

MALE: Measurements and Ratios. N = 20; length, 9–11 mm; width, 2.5–3.0 mm; WL, M = 3.67±0.188 mm; FL/FW, M = 1.16±0.009; FS1/FS2, M = 1.33±0.020.

Diagnosis. Vestiture white except hind tibiae with inner surfaces yellow. Wing membranes hyaline, veins dark brown to black; metasomal terga black, without metallic reflections. Galeae as in female; labral process large, emarginate apically, slightly reflexed; vertex above lateral ocellus equals less than one ocellar diameter; flagellar segment 1 longer than segment 2 and usually slightly longer than segment 3. Pronotum as in *oenotherae*

female; mesoscutum with punctures separated mostly by half a puncture width, surface dulled by fine, regular shagreening; scutellum similar but punctures separated by slightly more than half a puncture width, especially anteriorly and surface often somewhat shiny in apical half; propodeum and mesepisterna sculptured as in female. Metasomal terga 2–5 sculptured as in female terga 2–4 but punctures usually slightly more crowded, shiny. Metasomal tergum 2 with basal area hairs short, erect; hind tibiae with outer surface hairs long as in *oenotherae*. Sterna 7 and 8 closely resemble those of *blaisdelli*. Sternum 7 with somewhat blunted apical lobes and relatively weak emargination; sternum 8 distinctly capitate with moderately dense hairs (Figs. 51 and 52).

Type Material. The holotype female (CAS No. 14,363) of *Andrena (O.) linsleyi* was collected 2 miles N of Palm Springs, Riverside County, California, on flowers of *Hyptis emoryi* (not collecting pollen) March 7, 1936, by P.H. Timberlake. The holotype male (AMNH) of *A. (O.) enceliarum* was collected at Dublin, Arizona, March 7, 1937, from flowers of *Encelia* sp. by T.D.A. Cockerell

Distribution. *Andrena linsleyi* is known to occur in southern California, southern Nevada, western Arizona and Sonora, and Baja California del Norte in Mexico (Linsley, MacSwain, and Raven, 1963, p. 12) (Fig. 2). It has been collected from February 15 through April 26. In addition to the type material, a total of 1,077 females and 205 males were examined from localities listed below (including localities reported in the literature).

ARIZONA. GRAHAM CO.: Dublin. MOHAVE CO.: Topok (3.5 mi. S). YUMA CO.: Quartzite (12 mi. E). CALIFORNIA. KERN CO.: Boron; California City. IMPERIAL Co.: Glamis (2 mi. N); Kane Springs; Paloverde (3 mi. S). RIVERSIDE CO.: Blythe (18 and 19.4 mi. W); Hopkins Well; Indio; La Quinta; Palm Canyon; Palm Desert; Palm Springs (2 mi. N); Salton Sea; Thousand Palms. SAN BERNARDINO CO.: Apple Valley; Baker (9 mi. S, Zzyzx Springs); Essex (and 2 and 3 mi. S and 10 mi. S), Kelso Dunes; Needles (near); Twenty-Nine Palms (and 29 mi. E). SAN DIEGO CO.: Anza (Coyote Canyon); Borrego, Borrego-Springs; Borrego State Park (Coyote Creek); Borrego Valley (Palm Canyon); Costillo-Borrego; Jacumba (15 mi. E); Ocotillo-Borrego. NEVADA. CLARK CO.: Glendale; Mesquite (8 mi. W); Mormon Mesa; Sandy. MEXICO. SONORA: Sonoyta (81 mi. S). BAJA CALIFORNIA DEL NORTE. Osoyoos (Richter Pass Road).

Nest Biology. Nests of *A. linsleyi* are initiated in declivities (Linsley *et al.* 1963a). Their burrows descend vertically from a concentric tumulus.

Floral Records. An excellent summary of the floral activities of *Andrena linsleyi* is detailed in Linsley, MacSwain, and Raven (1963, pp. 11–16). This species is an oligolege of *Oenothera*, having been collected most frequently from flowers of *O. deltoides*. It has been collected from flowers of the plants listed below.

Baileya sp., *B. pleniradiata*, *Camissonia claviformis aurantiaca*, *C. c. clavaeformis*, *Dithyrea californica*, *Encelia* sp., *C. boothii desertorum*, *Dithyrea californica*, *Encelia* sp., *E. farinosa*, *Geraea canescens*, *Hyptis emoryi*, *Oenothera* sp., *O. deltoides deltoides*, *Palaefoxia arida* (as *linearis*).

Andrena (Onagrandrena) blaisdelli Cockerell

Andrena blaisdelli Cockerell, 1924, Pan-Pacific Ent., 1:59; Bohart, 1937, Pan-Pacific Ent., 13:54; Linsley, 1938, Proc. California Acad. Sci., Ser. 4, 23:266, 267, 277.

Andrena (Melandrena) blaisdelli: Lanham, 1949, Univ. California Publ. Ent., 8:221; Linsley and MacSwain, 1955, Pan-Pacific Ent., 31:164, 166, 167; Linsley, MacSwain, and Smith, 1955, Pan-Pacific Ent., 31:176, 183.

Andrena (Onagrandrena) blaisdelli: Linsley and MacSwain, 1956, Pan-Pacific Ent., 32:112; Linsley and MacSwain, 1961, Pan-Pacific Ent., 37:118.

Andrena blaisdelli is a small species from southern California closely related and similar to *Andrena furva*. The female of *blaisdelli* can be told from that of *furva* by the longer hairs of the mesosomal dorsum, the broader apical part of the labral process, the shorter vertex, the more finely sculptured mesepisterna and propodeum, and the slightly sparser scopal hairs. The male of *blaisdelli* is one of the species of *Onagrandrena* with the vestiture entirely white. It differs from the male of *furva* by the shorter vertex, the more finely sculptured mesepisterna, and the longer first flagellar segment. Both *furva* and *blaisdelli* have small shiny galeae and can be told by these from all other species of *Onagrandrena*.

FEMALE: Measurements and Ratios. N = 20; length 10–12 mm; width, 3.0–3.5 mm; WL, M = 3.35±0.135 mm; FL/FW, M = 0.98±0.003; FOVL/FOVW, M = 3.34±0.039.

Diagnosis. Vestiture black; wing membranes hyaline, only slightly infumate, veins dark brown; metasomal terga black without metallic reflections. Galeae short, narrow, shiny, not or only finely shagreened; labral process longer than half length of labrum, sides strongly concave, apical part thick, as broad as base of first flagellar segment or broader, usually distinctly emarginate apically. Clypeus with dense small punctures, without medial impunctate line (or with incomplete line), shiny; vertex above lateral ocellus usually equals slightly less than one ocellar diameter, never more. Pronotum without humeral angle or vertical ridge laterally. Mesoscutum and scutellum densely punctate, punctures small, round, surface dulled by fine tessellation; mesepisternum moderately punctatorugose, dulled by shagreening. Propodeum with distinct dorsal surface, dorsal enclosure irregularly rugulose; surface outside of enclosure moderately coarsely punctatorugose, dull. Tergum 1 with basal area shiny, punctate; terga 2–4 with basal areas with punctures separated mostly by half to one puncture width; apical areas slightly upturned, with basal one-third to one-half with small punctures as dense as in basal area, apical third or half impunctate and often slightly upturned; surfaces shiny. Thoracic dorsum with hairs much longer than width of scape; propodeum without distinct corbicula, internal hairs long, plumose; scopal hairs long, sparse, simple, not fully hiding surface.

MALE: Measurements and Ratios. N = 16; length, 8–11 mm; width, 2–3 mm; WL, M = 3.05±0.200 mm; FL/FW, M = 1.02±0.004; FS1/FS2, M = 1.46±0.029.

Diagnosis. Vestiture white except some short brown hairs occasionally present on vertex. Wing membranes hyaline, not infumate or only slightly so, veins dark reddish brown. Terga black to dark reddish brown, apical areas often somewhat hyaline. Galeae as in female; vertex above lateral ocellus as in female; flagellar segment 1 with minimum length distinctly longer than segment 2 (about as 1.2 to 1.5:1.0), usually longer than segment 3. Pronotum as in female; mesoscutum and scutellum sculptured as in female; propodeum as in female but dorsal enclosure with irregular rugulae somewhat finer; mesepisterna sculptured as in female. Metasomal terga 2–5 sculptured similar to female terga 2–4 but basal area punctures somewhat sparser, usually separated by half to two puncture widths and apical areas with impunctate rims shorter (usually one-third or less of length of apical area). Metasomal tergum 2 with basal area hairs very short, erect, mediobasally much less than half as long as those of tergum 1; hind tibiae with outer surface hairs moderately long, along anterior margin a few almost as long as dorsal femoral hairs. Sternum 7 somewhat flattened apically with a small apicomedian emargination similar to *omninigra*, but less hairy. Sternum 8 strongly capitate, without apical emargination (Figs. 39 and 40).

Type Material. The holotype female (CAS No. 1,708) of *Andrena (O.) blaisdelli* was collected in San Diego, San Diego Co., California, May 30, 1890, by F.E. Blaisdell.

Distribution. *Andrena blaisdelli* is known only from southern California and Baja California del Norte (Linsley, MacSwain, Raven, and Thorp, 1973, p. 28) (Fig. 2). It has been collected from March 10 through August 2, but chiefly from late March through early May. A total of 143 females and 21 males were examined from the localities listed below.

CALIFORNIA. KERN CO.: Woody. LOS ANGELES CO.: Altadena; Claremont; La

Crescenta; La Mirada; Pasadena; Pico Canyon (W of Hwy. 5 and W of Newhall); Tujunga. ORANGE CO.: Costa Mesa. RIVERSIDE CO.: Anza (5 mi. E); Gavilan; Moreno (3 mi. NE); Riverside; Sage (5 mi. S); Temecula (7 mi. E). SAN BERNARDINO CO.: Cajon Pass; Mohave Desert (near Deep Creek). SAN DIEGO CO.: Descanso-Alpine; Lakeside (2 mi. NE); Plum Canyon; San Diego; Sentenac Canyon. SAN LUIS OBISPO CO.: Santa Margarita (5 mi. NE); Simmler (10 mi. W). SANTA BARBARA CO.: New Cuyama (28 mi. NW). TULARE CO.: Fairview (1 mi. S). VENTURA CO.: Gorman (5 mi. S in Hungry Valley). MEXICO. BAJA CALIFORNIA DEL NORTE: La Zapopita, Valle de Trinidad.

Floral Records. Although doubtlessly an oligolege of *Camissonia*, this species has been collected from that plant only a few times. However, several females without floral data have at least a few *Camissonia* pollen grains in their scopae. *Andrena blaisdelli* has been collected from flowers of the plants listed below.

Camissonia bistorta, *C. californica*, *C. campestris* (as *dentata*), *Cryptantha* sp., *C. intermedia*, *Eriophyllum* sp., *E. confertiflorum*, *Salix lasiolepis*, *Yucca whipplei*.

Andrena (*Onagrandra*) *deserticola* Timberlake

Andrena deserticola Timberlake, 1937, Pan-Pacific Ent., 13:73–74; Linsley, 1938, Proc. California Acad. Sci., Ser. 4, 23:266, 278.

Andrena (*Melandrena*) *deserticola*: Lanham, 1949, Univ. California Publ. Ent., 8:221; Linsley and MacSwain, 1955, Pan-Pacific Ent., 31:165, 172; Linsley, MacSwain, and Smith, 1955, Pan-Pacific Ent., 31:173, 176, 178, 180, 181, 182–183.

Andrena (*Onagrandra*) *deserticola*: Linsley and MacSwain, 1956, Pan-Pacific Ent., 32:112; Linsley, MacSwain, and Raven, 1964, Univ. California Publ. Ent., 33: 68–69; Davis and LaBerge, 1974, Illinois St. Nat. Hist. Surv. Biol. Notes, No. 95, p. 10.

This small species can be recognized in either sex by the shiny mesoscutum and scutellum. The female is a relatively small bee with entirely black vestiture and relatively dense scopal hairs. The male is a small bee with the vestiture entirely white, without sternal subapical fimbriae and with a well-formed pseudopygidial plate on tergum 6.

FEMALE: Measurements and Ratios. N = 20; length, 11–13 mm; width, 3.0–3.5 mm; WL, M = 3.81±0.141 mm; FL/FW, M = 1.00±0.004; FOVL/FOVW, M = 3.33±0.056.

Diagnosis. Vestiture entirely black; wing membranes hyaline, slightly infumate apically, veins dark reddish brown to black; metasomal terga black without metallic reflections. Galeae moderately long, shagreened; labral process as in *anograe*. Clypeus densely punctate, without median impunctate line or line incomplete, punctures occasionally slightly sparser near apical margin; vertex above lateral ocellus equals about one ocellar diameter. Pronotum without humeral angle or vertical ridge laterally. Mesoscutum and scutellum with abundant small round punctures separated largely by about one puncture width, surfaces shiny, shagreening sparse and delicate or absent. Propodeum with dorsal enclosure irregularly rugulate; dorsal surface outside of enclosure moderately coarsely punctatorugose, surfaces dulled by fine tessellation or shagreening. Mesepisternum weakly to moderately punctatorugose, dulled by fine tessellation. Terga 2–4 with apical areas punctate in basal half or more, impunctate apically, punctures separated mostly by 1 to 2 puncture widths; basal areas with punctures separated by 1 to 2 puncture widths; surface shiny, shagreening absent or light; pygidial plate blunt, apex broad, rounded. Thoracic hairs long, much longer than width of antennal scape; propodeum without corbicula laterally, hairs all long and plumose; scopal hairs moderately long, simple, moderately abundant and dense, hiding surface of tibia at least partially.

MALE: Measurement and Ratios. N = 5; length, about 10 mm; width, about 2.5 mm; WL, M = 3.43±0.250 mm; FL/FW, M = 1.08±0.014; FS1/FS2, M = 1.25±0.033.

Diagnosis. Vestiture entirely white; wing membranes hyaline, veins red to dark reddish brown; metasomal terga black without metallic reflections, apical areas somewhat translucent, reddened. Galeae as in female; labral process broad, bidentate, reflexed. Clypeus as in female; vertex above lateral ocellus equals about one ocellar diameter; flagellar segment 1 distinctly longer than segment 2, equal to or longer than segment 3. Pronotum as in female; mesoscutum and scutellum shiny, sculptured as in female, punctures slightly finer; propodeum as in female but dorsal area somewhat more coarsely sculptured; mesepisterna as in female. Metasomal terga 2–5 with apical areas sparsely punctate in basal half or more, punctures separated by 2 to 3 puncture widths or more, basal areas with punctures relatively sparse, separated by 2 to 5 puncture widths, surfaces shiny. Metasomal tergum 2 with basal area hairs relatively long, at least half as long as those of tergum 1; hind tibiae with outer surface hairs long, sparse, almost as long along anterior margin as dorsal femoral hairs. Sterna 7 and 8 similar to those of *linsleyi* but sternum 7 with apical lobes narrower and sternum 8 with neck region shorter (Figs. 53 and 54).

Type Material. The holotype female (CAS No. 14,353) of *Andrena (O.) deserticola* was collected at Adelanto (1 mi. S), San Bernardino County, California, May 28, 1932, from flowers of *Baileya multiradiata* by P.H. Timberlake.

Distribution. This species is known only from California (Linsley, MacSwain, Raven, and Thorp, 1973, p. 32) (Fig. 2). It has been collected from March 4 through July 28, but chiefly from mid-March through mid-May. In addition to the holotype, a total of 230 females and 12 males were examined from localities listed below.

CALIFORNIA. KERN CO.: Bakersfield (20 mi. E); Boron; Last Chance Canyon, El Paso Mts.; Short Canyon (6.5 mi. NW of Inyokern); Weldon (10 mi. S). LOS ANGELES CO.: Edwards Airforce Base (SW boundary); Little Rock (1 mi. W); Palmdale (and 2 mi. N); Pearblossom (5 mi. N at Lovejoy Buttes). RIVERSIDE CO.: Joshua Tree Natl. Mon.; Kramer Junction (on county line). SAN BENITO-FRESNO CO.: Big Panoche Creek. SAN BERNARDINO CO.: Adelanto (1 mi. S). SAN DIEGO CO.: Descanso-Alpine.

Nest Biology. Burrows of *A. deserticola* at two sites in Short Canyon consisted of aggregations of about a dozen nests on alluvial fans at the upper end of the canyon and near the lower wash. Burrows had vertical entrances, diameters of 6–7 mm, and were about 60 cm deep.

Floral Records. *Andrena deserticola* is an oligolege of plants of the genus *Camissonia*. Linsley, MacSwain, and Raven (1964, pp. 68–69) should be consulted for details on floral preferences, as well as other biological notes. This species has been collected from flowers of the plants listed below.

Baileya multiradiata, *C. pallida*, *Camissonia* sp., *C. boothii decorticans*, *C. campestris*, *C. claviformis*, *C. kernensis*, *Coreopsis* sp., *C. bigelovii*, *C. californica*, *Cryptantha intermedia*, *Oenothera* (= *Camissonia*?) sp.

Andrena (Onagrarendra) nevadae Linsley and MacSwain

Andrena (Onagrarendra) nevadae Linsley and MacSwain, 1961, Pan-Pacific Ent., 37:125–126; Linsley, MacSwain, and Raven, 196, Univ. California Publ. Ent., 33:31, 39.

Andrena nevadae is a large black bee known from only the female holotype and one female paratype collected in Nevada. These bees have long, simple, sparse scopal hairs similar to those of *Andrena linsleyi* Timberlake. However, *nevadae* can be separated from *linsleyi* by the shiny mesoscutum and scutellum and by the more coarsely sculptured propodeum. The female of *nevadae* is readily separated from the female of *deserticola* by the sparse scopal hairs and coarsely sculptured propodeum.

FEMALE: Measurements and Ratios. N = 1; length, about 13 mm; width, about 4 mm; WL, 4.94 mm; FL/FW, 1.04; FOVL/FOVW, 3.00.

Diagnosis. Vestiture entirely black; wing membranes hyaline, slightly infumate apically, veins dark reddish brown to black; metasomal terga black without metallic reflections. Galeae as in *anograe*; labral process triangular, with straight sides, apex thickened to form small knob. Clypeus and vertex as in *deserticola*. Pronotum without humeral angle or vertical ridge laterally. Mesoscutum and scutellum sculptured as in *deserticola*, shiny. Propodeum (Fig. 16) with dorsal enclosure coarsely rugulate, surface outside of enclosure (Fig. 16) moderately coarsely punctatorugose, dulled by fine shagreening. Mesepisterna punctatorugose, surface dulled by shagreening. Metasomal terga 2–4 with apical areas punctate in basal two-thirds, punctures separated by half to one puncture width or slightly more; basal areas with punctures separated mostly by one to two puncture widths; surfaces shiny, shagreening sparse and delicate or absent. Thoracic dorsum with hairs long, much longer than width of antennal scape; propodeum without corbicula laterally, hairs all long and plumose; scopal hairs very long, simple, extremely sparse, not at all hiding surface of tibia.

Type Material. The holotype female (CAS No. 6,705) of *nevadae* was collected 1.8 miles west of Pancake Summit, White Pine County, Nevada, June 24, 1959, at flowers of *Camissonia* (as *Oenothera*) *claviformis integrrior* by J.W. MacSwain. A female paratype was collected from 28.5 miles west of Eureka, Eureka County, Nevada, June 8, 1960, at flowers of *Stanleya pinnata* by J.W. MacSwain (Fig. 2).

Andrena (Onagrاندrena) raveni Linsley and MacSwain

Andrena (Onagrاندrena) raveni Linsley and MacSwain, 1961, Pan-Pacific

Ent., 37:118–121; Linsley, MacSwain, and Raven, 1963, Univ. California Publ.

Ent., 33:31–36.

Andrena raveni is very distinctive in both sexes because metasomal terga 1–5 have relatively strong, metallic, bluish or violaceous reflections. The only other species of this subgenus with such reflections is *Andrena vanduzeei* in which the metallic reflections are very much subdued and are strongest on terga 4 and 5 (and 6 in the male sex).

FEMALE: Measurements and Ratios. N = 20; length, 11–13 mm; width, 3.0–3.5 mm; WL, M = 4.04±0.170 mm; FL/FW, M = 1.05±0.008; FOVL/FOVW, M = 3.07±0.066.

Diagnosis. Vestiture black; wing membranes hyaline, yellowish, slightly infumate; veins dark reddish brown to black; metasomal terga black with dark blue metallic reflections, apical areas, especially on terga 5 and 6, often with violaceous reflections. Galeae as in *oenotherae* but dulled by fine dense tessellation; labral process as in *oenotherae* but apical part slightly thicker, equals width of base of scape or slightly broader, apex usually slightly emarginate. Clypeus with punctures small, round, dense, separated by half a puncture or less, without median impunctate line, shiny; vertex above lateral ocellus equals about one ocellar diameter or slightly less. Pronotum as in *oenotherae*. Mesoscutum densely punctate, punctures separated by half a puncture width or less, interpunctural surface moderately shiny posteriorly or dull, reticular shagreening fine; scutellum similar but punctures denser and moderately shiny only near anterior margin. Propodeum sculptured as in *oenotherae*; mesepisterna distinctly punctured below, punctures crowded, surface dulled by fine tessellation. Terga 2–4 with apical areas punctate except in narrow apical margin, punctures separated mostly by one to three puncture widths, basal area punctures separated mostly by half to one puncture width, surfaces shiny. Thoracic dorsum with hairs much longer than width of scape; propodeum without distinct corbicula laterally, hairs long, plumose; scopal hairs long, simple, sparse.

MALE: Measurements and Ratios. N = 20; length, 10–12 mm; width, 2–3 mm; WL, M = 3.59 ± 0.249 mm; FL/FW, M = 1.10 ± 0.006 ; FS1/FS2, M = 1.39 ± 0.017 .

Diagnosis. Vestiture black except as follows: vertex with long white hairs, rarely face below ocelli with a few to several pale hairs; mesoscutum and scutellum with white hairs; propodeum without white or with a few on each side anteriorly; mesepisterna entirely black or with a few pale hairs intermixed; metasomal tergum 1 often and tergum 2 occasionally with basal area hairs white in part or nearly entirely. Wing membranes hyaline, slightly infumate, yellowish, veins dark reddish brown; metasomal terga with metallic, bluish or violaceous reflections. Galeae and vertex as in female; labral process large, bidentate; flagellar segment 2 longer than either segment 1 or segment 2. Pronotum as in *oenotherae*; mesoscutum and scutellum sculptured as in female; propodeum as in female; mesepisternum dull, punctatorugulose and finely tessellate. Metasomal terga 2–5 sculptured as in female terga 2–4 but basal area punctures sparser, separated mostly by one to two puncture widths or slightly more, apical areas with apical impunctate rim broader than in female, surfaces shiny. Metasomal tergum 2 with basal area hairs long, mediobasally half as long as those of tergum 1 or longer; hind tibiae with outer surface hairs long, sparse, as in *oenotherae*. Sternum 7 with apicomedian lobes flattened apically as in *blaisdelli* but apicomedian emargination much deeper; sternum 8 with apex weakly capitate, shallowly emarginate apicomediaally, with neck region broad and hairs dense (Figs. 55 and 56).

Type Material. The holotype female (CAS No. 6,707) of *Andrena (O.) raveni* was collected from 9.5 mi. W of Austin, Lander Co., Nevada, June 7, 1959, visiting *Camissonia* (as *Oenotherae*) *claviformis integrrior* flowers by J.W. MacSwain.

Distribution. *Andrena raveni* is known from California, Idaho, Nevada, Oregon, Utah, and Washington (Fig. 4). It has been collected from May 3 through July 16 but mainly in May and June. In addition to the holotype, a total of 772 females and 79 males were examined from localities listed below.

CALIFORNIA. LASSEN CO.: Hallelujah Junction; Madeline (0.5 mi. N); Ravendale (2 mi. N, 2.4 mi. NW, 3.5 mi. S and 19 mi. SE); Termo (5.5 and 6.5 mi. N). MONO CO.: Benton Inspection Sta. SISKIYOU CO.: Lake Shastina (1 mi. NE); Macdoel; Tulelake (5 mi. S). TRINITY CO.: Long Ridge. (South of Zenia). NEVADA. EUREKA CO.: Emigrant Pass (4 mi. E and 22 mi. W); Eureka (28.5, 33.8, 36.2 and 37 mi. W; 7.6, 17.1, 50.2, 70.8 and 73.3 mi. N). HUMBOLDT CO.: Golconda; Winnemucca (11 mi. N). LANDER CO.: Austin (9.5, 9.7, 11, 14.5 and 14.7 mi. W); Austin Summit (2.5 and 12 mi. E); Railroad Pass (3 mi. E). WASHOE CO.: Reno (10 mi. S); Steamboat Springs (10 mi. S of Reno). OREGON. HARNEY CO.: Fields (10.7 mi. S); Narrows (9 mi. S). KLAMATH CO.: Bonanza (NE of Round Prairie). LAKE CO.: Hart's Moutnain (1.2 mi. W of Antelope Refuge HQ). MALHEUR CO.: Harper (3 mi. SW). MORROW CO.: Boardman Bomb Range; Irrigon. SHERMAN CO.: Meryhill Ferry (3 mi. E of Briggs). UMATILLA CO.: Umatilla. WASCO CO.: The Dalles (7 mi. E). UTAH. TOOELE CO.: Tooele (3.6 mi. S). WASHINGTON. ADAMS CO.: Ritzville (4 mi. N).

Nest Biology. Linsley *et al.* give the following short account of the nest of *A. raveni*. "Burrows of *A. raveni* are excavated in loose sandy soil and the entrances are commonly located in surface irregularities. The burrow entrance is vertical and surrounded by a large tumulus."

Floral Records. *Andrena (O.) raveni* is an oligolege of the genus *Camissonia* and has been collected from the following plants.

Agoseris glauca, *Camissonia claviformis citrina*, *C. c. claviformis*, *C. c. cruciformis*, *C. c. integrrior*, *C. tanacetifolia*, *Euphorbia* sp., *Heterotheca* (as *Chrysopsis*) *villosa*, *Madia ramii*, *Oenotherae alyssoides*, *O. deltoides piperi*, *O. pallida* (and as *latifolia*), *Sisymbrium altissimum*, *S. officinale*, *Stanleya pinnata*, *Taraxacum officinale*, *Thelypodium laciniatum*.

Andrena (Onagrandra) vanduzeei Linsley

Andrena vanduzeei Linsley, 1938, Proc. California Acad. Sci., ser. 4, 23:266, 267, 280–281.

Andrena (Melandrena) vanduzeei: Lanham, 1949, Univ. California Publ. Ent., 8:221; Linsley and MacSwain, 1955, Pan-Pacific Ent., 31:172; Linsley, MacSwain and Smith, 1955, Pan-Pacific Ent., 31:176.

Andrena (Onagrandra) vanduzeei: Linsley and MacSwain, 1956, Pan-Pacific Ent., 32:112.

Andrena vanduzeei is a small species in which the metasomal terga often show weak metallic reflections (especially terga 4 and 5 of the female and terga 4–6 of the male). The female is marked also by moderately shiny mesoscutum, moderately dense scopal hairs, and an impunctate, narrow, median, clypeal line. The male has dark hairs mixed with the white on the mesoscutum, the first two metasomal terga usually with pale hairs and few pale hairs on the head.

FEMALE: Measurements and Ratios. N = 10; length, 10–11 mm; width, about 3 mm; WL, M = 3.86±0.158 mm; FL/FW, M = 1.05±0.004; FOVL/FOVW, M = 3.26±0.084.

Diagnosis. Vestiture entirely black; wing membranes hyaline, yellow, moderately infumate, veins dark reddish brown to dark brown; metasomal terga black with extremely weak metallic reflections especially on apical areas of terga 4 and 5, reflections usually violaceous. Galeae as in *oenotherae*; labral process with sides concave as in *oenotherae* but apical part short and broad, at least as broad as base of scape. Clypeus with punctures dense except medially near apical margin and usually with complete, narrow, impunctate midline; vertex above lateral ocellus equals about one ocellar diameter or slightly less. Pronotum as in *oenotherae*. Mesoscutum as in *oenotherae* but interpunctural shagreening light, moderately shiny at least posteromedially; scutellum often shiny along anterior margin. Propodeum finely or moderately finely punctatorugose, surface dulled; mesepisterna with shallow but distinct punctures, not punctatorugose, interpunctural space dulled by fine tessellation. Terga 2–4 with apical area punctures minute, separated mostly by two to four puncture widths, apical rim impunctate, basal areas with punctures separated by half to one or two puncture widths, surfaces shiny; pygidial plate V-shaped with narrowly rounded or pointed apex. Thoracic dorsum with hairs much longer than width of scape; propodeum without distinct corbicula laterally, hairs long and plumose; scopal hairs long, simple, moderately abundant.

MALE: Measurements and Ratios. N = 17; length 9–10 mm; width, 2.0–2.5 mm; WL, M = 3.36±0.218 mm; FL/FW, M = 1.10±0.004; FS1/FS2, M = 1.29±0.015.

Diagnosis. Vestiture black except as follows: clypeus with hairs in apicomедial band white, occasionally white hairs extend to base along midline but always less than 50% of clypeal hairs pale; vertex with pale hairs; genae occasionally with several pale hairs especially below; mesoscutum and scutellum with pale hairs but black hairs present posteromedially on mesoscutum and medially on scutellum; propodeum often with pale hairs dorsally; pleural areas rarely with pale hairs; terga 1 and 2 with basal area hairs pale or largely so. Wing membranes hyaline, only slightly infumate; metasomal terga (especially terga 4–6 often with weak metallic reflections, especially apically. Galeae as in female; labral process bidentate, reflexed; clypeus with dense round punctures, with weak median impunctate line, especially in apical half, surface shiny; vertex above lateral ocellus equals about one ocellar diameter; flagellar segment 1 longer than segment 2 but about equal in length to segment 3. Pronotum as in *oenotherae* female; mesoscutum and scutellum as in female, but punctures smaller and slightly sparser; propodeum and mesepisternum sculptured relatively weakly, much as in female. Metasomal terga 2–5 sculptured as in female

terga 2–4 but punctures somewhat sparser and apical area punctures often restricted to basal half of apical area. Metasomal tergum 2 with basal area hairs long, mediobasally half as long as those of tergum 1 or longer; hind tibiae with outer surface hairs long, sparse, along anterior margin some hairs almost as long as dorsal femoral hairs. Sternum 7 with apicomedian lobes similar to those of *deserticola*, not flattened apically as in *raveni*, hairs sparse, weak; sternum 8 with apex flattened, not markedly capitate, moderately densely hairy (Figs. 57 and 58).

Type Material. The holotype female (CAS No. 4,543) of *Andrena (O.) vanduzeei* was collected from Huntington Lake, Fresno Co., California, July 4, 1919, by E.P. Van Duzee.

Distribution. *Andrena vanduzeei* is known to occur only in the high Sierra region of California (Fig. 4). It has been taken from April 10 through August 11, but mainly in June and July. In addition to the holotype, a total of 22 females and 22 males were examined from localities listed below.

CALIFORNIA. AILPINE CO. EL DORADO CO.: Echo Lake; Ice House Road (5 mi. N); Phillips. FRESNO CO.: Cherry Gap Summit; Huntington Lake; Shaver Lake; Sulphur Meadow. PLUMAS CO.: Buck. TULARE CO.: General Grant Grove and Giant Forest Grove, Sequoia Natl. Park. TUOLUMNE CO.: Mill Creek Camp; Strawberry.

Floral Records. *Andrena vanduzeei* was collected from only a few species of plants; therefore, little is known concerning its flower preferences. Pollen in its pollen collecting hairs indicate that it probably is an oligolege of *Onagraceae*, presumably *Gayophytum*, based on its late flight period, distribution, and limited flower records. It has been collected from flowers of *Gayophytum diffusum*, *G. d. parviflorum*, *Potentilla* sp., and *Rhamnus* sp.

Andrena (Onagrandrena) rubrotincta Linsley

Andrena rubrotincta Linsley, 1938, Proc. California Acad. Sci., ser. 4, 23:266, 278–279.

Andrena (Melandrena) rubrotincta: Lanham, 1949, Univ. California Publ. Ent., 8:321; Linsley and MacSwain, 1955, Pan-Pacific Ent., 31:165, 170; Linsley, MacSwain, and Smith, 1955, Pan-Pacific Ent., 31:176.

Andrena (Onagrandrena) rubrotincta: Linsley and MacSwain, 1956, Pan-Pacific Ent., 32:112; Linsley and MacSwain, 1961, Pan-Pacific Ent., 37:128; Linsley, MacSwain, and Raven, 1963, Univ. California Publ. Ent., 33:16–18.

Andrena rubrotincta is the first of four species described below that are marked in both sexes by having a well-formed pronotal humeral angle and lateral ridge. The lateral ridge, especially in the females, is not sharply formed but somewhat rounded and the humeral angle is not strongly ear-shaped or triangular as in other subgenera of *Andrena* but are distinct nonetheless. The female of *rubrotincta* can be told from the other species with pronotal humeral angles by the black vestiture and the mesoscutum being dulled by shagreening. The male of *rubrotincta* differs from other members of this group by the lack of a subapical mandibular tooth and the mesoscutum being shagreened.

FEMALE: Measurements and Ratios. N = 20; length, 11–13 mm; wing length, 3–4 mm; WL, M = 4.48±0.166 mm; FL/FW, M = 1.04±0.006; FOVL/FOVW, M = 3.04±0.052.

Diagnosis. Vestiture dark reddish brown to dark brown; wing membranes hyaline, not at all infumate, veins dark red to dark reddish brown; metasomal terga piceous, without metallic reflections. Galeae as in *oenotherae*; labral process large, triangular with blunt tip, often slightly emarginate apically, sides usually straight, rarely concave (Fig. 20); vertex above lateral ocellus short, equals about half an ocellar diameter. Clypeus with small round punctures separated mostly by half a puncture width or slightly more, with narrow median impunctate line. Vertex above lateral ocellus equals about half an ocellar diameter; ocelli not enlarged. Pronotum with distinct humeral angle and dorsoventral ridge laterally (Fig.

18). Mesoscutum with small round punctures separated mostly by half a puncture width or more, surface dulled by fine reticular shagreening; scutellum similar but punctures slightly denser. Propodeum with dorsal surface distinct, dorsal enclosure weakly sculptured, finely tessellate; surface outside of enclosure not punctatorugose, with scattered obscure punctures and fine reticular shagreening dulling surface; 2–4 with apical areas punctate except narrow rim, punctures separated mostly by one to three puncture widths, basal areas with punctures separated mostly by one to two puncture widths, surfaces shiny. Thoracic dorsum with hairs longer than width of scape; propodeum without distinct corbicula laterally, hairs long and plumose; tibial scopal hairs long, simple, sparse, scarcely hiding surface.

MALE: Measurements and Ratios. N = 20; length, 9–11 mm; width, 2.0–2.5 mm; WL, M = 3.74±0.173 mm; FL/FW, M = 1.06±0.005; FS1/FS2, M = 1.32±0.022

Diagnosis. Vestiture pale, white to pale ochraceous, except on vertex and along inner margins of eyes usually brown; wings hyaline, slightly infumate apically, veins dark reddish brown to black; metasomal terga black or piceous, without metallic reflections. Galeae as in *oenotherae*; labral process large, trapezoidal with median emargination (not strongly bidentate), curved but not strongly reflexed; mandibles decussate, without subapical tooth (Fig. 17). Clypeus with punctures small, irregularly separated by half to one puncture width, usually with median impunctate line, shiny; vertex above lateral ocellus equals less than one ocellar diameter and usually slightly more than half an ocellar diameter; genal area twice as broad as eye in profile; flagellar segment 1 equal to or slightly longer than segment 3, distinctly longer than 2. Pronotum as in female (Fig. 19). Mesoscutum and scutellum as in female but punctures slightly sparser and surface often slightly shiny, shagreening delicate but present; propodeum and mesepisternum sculptured as in female but propodeum with dorsal enclosure slightly more coarsely rugulate. Terga 2–5 with apical areas as in female terga 2–4 but punctures smaller and slightly sparser; basal areas similar to female. Metasomal tergum 2 with basal area hairs short, mediobasally less than half as long as those of tergum 1; hind tibiae with outer surface hairs long, sparse, along anterior margin some almost as long as dorsal femoral hairs. Sternum 7 similar to that of *vanduzeei*, vestiture sparse, weak; sternum 8 with apex broad, gently emarginate, neck region strongly hairy (Figs. 59 and 60).

Type Material. The holotype female (CAS No. 4,235) of *Andrena* (*O.*) *rubrotincta* was collected from the Colorado Desert near Needles, San Bernardino Co., California, March 6, 1930, by E.G. Linsley.

Distribution. *Andrena rubrotincta* is known from southern California, Nevada, and western Arizona (Linsley, MacSwain, and Raven, 1963, p. 17) (Fig. 6). We also have seen a specimen from Utah. It has been collected from February 1 through May 9 but chiefly in March and April. In addition to the holotype, a total of 78 females and 26 males were examined from localities listed below.

ARIZONA. MOJAVE CO.: Cane Springs; Havasu City; Kingman (8 mi. N and 32 mi. NW); Topock. CALIFORNIA. IMPERIAL CO.: Coyote Wells (6 mi. W); Painted Canyon (4.6 mi. NE Mecca). KERN CO.: Short Canyon (6 and 6.5 mi. NW Inyokern); Walker Pass (1 mi. W). RIVERSIDE CO.: Boyd Desert Research Center (4 mi. S. Palm Desert); Coyote Creek; Deep Canyon Recreation Area; Desert Center (4 mi. E); Desert Hot Springs (4.5 mi. NW); Elsinore (4 mi. E); Indio; Joshua Tree Natl. Mon.; La Quinta; Palm Desert; Thousand Palms. SAN BERNARDINO CO.: Kelso (7 mi. S in Providence Mountains); Needles (near, 9 mi. S and 15 mi. SE). SAN DIEGO CO.: Borrego; Jacumba (5 mi. E). NEVADA. CLARK CO.: Glendale (and 1.6 mi. E and 6 mi. NE); Mesquite (4 mi. W); Mormon Mesa; Overton. UTAH. WASHINGTON CO.: Virgin (3 mi. W).

Floral Records. *Andrena* (*A.*) *rubrotincta* is an oligocele of plants of the genus *Camissonia* (as *Oenothera* in earlier publications) and has been collected from flowers of the plants listed below.

Baileya sp., *Camissonia* sp., *Camissonia b. brevipes*, *C. b. pallidula*, *C. claviformis*, *C. aurantiaca*, *C.* (as *Oenothera*) *parryi*, *Hyptis emoryi*, *Lesquerella* sp., *Oenothera* sp., *Phoradendron californicum*, *Salix* sp., *Tamarix gallica*.

***Andrena (Onagrarendra) mojavensis* Linsley and MacSwain**

Andrena (Melandrena) mojavensis Linsley and MacSwain, 1955, Pan-Pacific Ent., 31:165, 171–172; Linsley, MacSwain, and Smith, 1955, Pan-Pacific Ent., 31:173, 174, 176, 178, 179–181, 182, 183.

Andrena (Onagrarendra) mojavensis: Linsley and MacSwain, 1956, Pan-Pacific Ent., 32:112; Linsley, MacSwain, and Raven, 1964, Univ. California Publ. Ent., 33:65–67; Davis and LaBerge, 1975, Illinois Nat. Hist. Survey, Biol. Notes, No. 95, p. 10.

Andrena mojavensis is a large bee closely related to *rubrotincta*. The female of *mojavensis* has the mesoscutum and scutellum shiny. The male of *mojavensis* also has a shiny mesoscutum and scutellum and has a distinct subapical mandibular tooth.

FEMALE: Measurements and Ratios. N = 20; length, 13–14 mm; width, 3–4 mm; WL, M = 4.50±0.081 mm; FL/FW, M = 1.01±0.005; FOVL/FOVW, M = 2.96± 0.041.

Diagnosis. Vestiture dark brown to black; wing membranes hyaline, veins dark reddish brown to dark brown; metasomal terga piceous, not metallic.galeae as in *oenotherae*; labral process and vertex as in *rubrotincta*. Clypeus sculptured as in *rubrotincta*. Vertex and ocelli as in *rubrotincta*. Pronotum with humeral angle and lateral ridge. Mesoscutum and scutellum punctate as in *rubrotincta* but surfaces shiny, shagreening delicate and largely peripheral, if present. Propodeum and mesepisterna sculptured as in *rubrotincta*. Terga 2–4 with apical areas sculptured as in *rubrotincta* but apical impunctate rim broader, often equal to half of apical area and punctures smaller and sparser; basal areas with punctures sparse and minute, separated mostly by three to five puncture widths; surfaces shiny. Thoracic hairs and pollen-collecting hairs as in *rubrotincta*.

MALE: Measurements and Ratios. N = 20; length, 9–11 mm; width, 2–3 mm; WL, M = 3.85±0.279 mm; FL/FW, M = 1.00±0.004; FS1/FS2, M = 1.24±0.016.

Diagnosis. Vestiture pale, yellowish or ochraceous, darker on face and thoracic dorsum, usually brown on vertex and along inner margins of eyes, occasionally some brown hairs on gena near outer margin of eye; wing membranes hyaline, veins reddish brown to dark brown; metasomal terga brown to black but apical areas hyaline, yellow to reddish brown. Galea as in *oenotherae*; labral process as in *rubrotincta*; mandibles decussate, with more or less distinct subapical tooth; clypeus, vertex, genal area and flagellar segments as in male of *rubrotincta*. Pronotum as in female. Mesoscutum and scutellum sculptured much as in female, surfaces shiny; propodeum and mesepisterna sculptured as in female. Terga 2–5 sculptured as in female terga 2–4 but apical areas with punctures minute and often barely visible. Metasomal tergum 2 with basal area hairs short, as in *rubrotincta* male; hind tibiae with hairs as in *rubrotincta*. Sterna 7 and 8 similar to those of *rubrotincta* but sternum 7 with denser hairs and sternum 8 with smaller apical lobes and dense vestiture (Figs. 61 and 62).

Type Material. The holotype female (CAS No. 6,704) of *Andrena (O.) mojavensis* was collected from Short Canyon, 6.5 mi. NW of Inyokern, Kern Co., California, April 13, 1954 from flowers of *Camissonia campestris* (as *Oenothera dentata* var. *johnstonii*) by James M. Linsley.

Distribution. *Andrena mojavensis* is known to occur only in northeastern Kern County in California (Fig. 6). It has been collected from March 19 through April 26. In addition to the type material, a total of 470 females and 43 males were examined from localities listed below.

CALIFORNIA. KERN CO.: Brown (3 mi. W in Sand Canyon); Jawbone Canyon; Short Canyon (6.5 mi. NW of Inyokern); Walker Pass (1 mi. W).

Nest Biology. The following notes are from Linsley *et al.* (1964). "Burrows of *A. mojavensis* are constructed in the coarse granitic sand of the upper slopes of Short Canyon and in the finer sand of the upper washes near these slopes. Those on the upper slopes penetrated to an underlying layer of decomposing granite at depths of 60 to 75 cm; in the finer sand of the washes and alluvial fans the only one found was 60 cm deep. They had vertical entrances and diameters averaging almost 8 mm. All were scattered over a wide area with no tendency toward aggregations."

Floral Records. This species is an oligolege of species of *Camissonia* (primarily *C. kernensis*) and has been collected from flowers of plants listed below (including records from the literature).

Camissonia campestris, *C. claviformis claviformis*, *C. kernensis*, *Coreopsis bigelovii*, *Cryptantha* sp., *Dithyrea californica*.

Andrena (Onagrandra) camissoniae Linsley and MacSwain

Andrena (Onagrandra) camissoniae Linsley and MacSwain, 1968, Pan-Pacific Ent., 44:144–145; Linsley, MacSwain, Raven, and Thorp, 1973, Univ. California Publ. Ent., 71:27, 29.

Andrena camissoniae is a moderately large bee related to *rubrotincta* and *mojavensis* but marked by the pale buff or ochraceous vestiture in both sexes. In addition both sexes have the propodeum somewhat more coarsely sculptured than in *rubrotincta* or *mojavensis* and slightly darker wing membranes. Since the male has not been previously described, a complete description is given below.

FEMALE: Measurements and Ratios. N = 2; length, 10–11 mm; width, 3.0–3.5 mm; WL, 3.67–4.05 mm; FL/FW, 1.00–1.01; FOVL/FOVW, 3.28–3.31.

Diagnosis. Vestiture pale, yellowish to ochraceous, darker on face and dorsum of thorax, facial foveae with white tomentum in lower half or slightly more and reddish brown in upper half or less; wing membranes hyaline but slightly infumate, yellowish; metasomal terga piceous, without metallic reflections. Galeae as in *oenotherae*; labral process large, sides concave, apical part as broad as base of scape or slightly broader (Fig. 18); vertex above lateral ocellus equals less than one ocellar diameter. Clypeus with small round punctures separated mostly by less than half a puncture diameter, with very narrow impunctate median line. Vertex above lateral ocellus equals about half an ocellar diameter; ocelli not enlarged. Pronotum as in *rubrotincta*. Mesoscutum and scutellum with small round punctures separated largely by about half a puncture width, interpunctural surfaces dulled by fine reticular shagreening. Propodeum with dorsal surface distinct; dorsal enclosure moderately sculptured (Fig. 21), often with complete median rugula and at least basal half rugulate; surface outside of enclosure with some rugulae and relatively coarse punctures (not punctatorugose); surfaces finely tessellate; mesepisternum extremely shallowly punctatorugose, bottoms of punctures dulled by fine shagreening. Metasomal terga 2–4 with apical areas with minute punctures separated by three to five puncture widths, apical rim impunctate; basal areas punctures larger, separated mostly by two to three puncture widths; surfaces shiny. Thoracic dorsum with hairs longer than scape width; propodeum with lateral corbicula not distinctly formed, internal hairs plumose; tibial scopal hairs long, simple, sparse, scarcely hiding surface; metasomal terga 2–4 with basal area hairs erect, short (distinctly shorter than apical area hairs).

MALE: Measurements and Ratios. N = 3; length, 9–10 mm; width, 2.5–3.0 mm; WL, M = 3.06±0.845 mm; FL/FW, M = 1.00±0.003; FS1/FS2, M = 1.30±0.035.

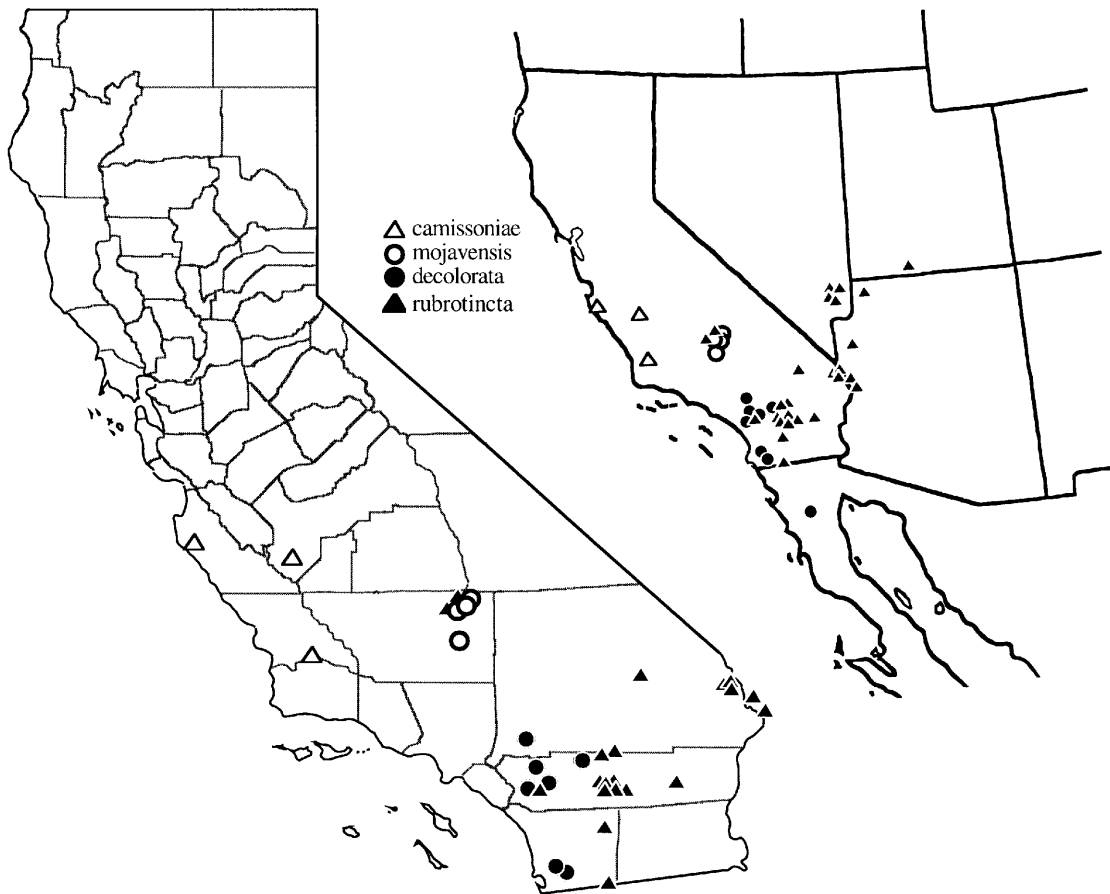


Fig. 6. Maps showing the distributions of *Andrena camissoniae*, *A. mojavensis*, *A. decolorata*, and *A. rubrotincta*.

Integumental Color. Black except as follows: mandible with apical fourth rufescent; terga with apical areas translucent, rufescent; antennal scape reddish brown below; wing membranes hyaline, slightly infumate, yellowish, veins red to reddish brown.

Structure. Antennae in repose just reaching scutellum; scape length equals first three flagellar segments; flagellar segment 1 longer than 2, about as long as 3, all flagellar segments longer than broad. Eyes each about three times as long as broad. Mandible with small, subapical inner tooth present (Fig. 22). Galeae long, dulled by fine tessellation. Maxillary palpus long, segmental ratio about as 1.0:0.85:1.0:0.85:0.85:0.85. Labial palpus with ratio about as 1.0:0.8:0.5:0.4. Labral process large, reflexed, strongly bidentate with U-shaped median emargination (Fig. 22). Clypeus short, punctures round, separated by half to one puncture width, surface shiny, without impunctate median line. Supraclypeal area moderately shiny, with small, close-set punctures. Face below ocelli with longitudinal rugae and interrugal punctures. Vertex above lateral ocellus equals about one ocellar diameter or slightly less. Genal area in profile twice as broad as eye, with posterior angle just below midline, surface dulled by fine shagreening and minute sparse punctures. Pronotum as in female. Mesoscutum and scutellum with crowded punctures and fine shagreening dulling surfaces. Propodeum sculptured as in female; mesepisterna with distinct punctures and shagreening dulling surface. Metasomal terga 2–5 sculptured as in female terga 2–4, surfaces shiny. Tergum 7 with pseudopygidial area absent or extremely narrow and hidden by hairs. Sterna 2–5 with basal areas punctate, apical areas impunctate, dulled by coarse shagreening. Terminalia as in *decolorata* as described below.

Vestiture. Pale yellowish to ochraceous except reddish brown on vertex and along inner margins compound eyes. Clypeus weakly bearded; hind basitarsus with long sparse

hairs, along anterior margin moderately long; metasomal tergum 2–4 with basal area hairs short, mostly shorter by half than those of tergum 1 and distinctly shorter than hairs of apical areas, erect; sterna 2–5 with subapical fimbriae weak.

Type Material. The female holotype (CAS No. 11,394) of *Andrena* (*O.*) *camissoniae* was collected from 28 mi. NW of New Cuyama, Santa Barbara Co., California, June 8, 1963, at flowers of *Camissonia campestris* (as *Oenothera dentata*) by G.I. Stage.

Distribution. *Andrena* (*O.*) *camissoniae* is known from only a few localities in southern California (Fig. 6). It has been collected March 30 to June 8 from the localities listed below.

CALIFORNIA. FRESNO CO.: Coalinga (7 mi. W). MONTEREY CO.: Arroyo Seco Camp (near Greenfield). SANTA BARBARA CO.: New Cuyama (28 mi. NW).

Floral Records. *Camissonia campestris*.

Andrena (*Onagrandra*) *decolorata*, new species.

Andrena decolorata is a second large pale species similar in color of the vestiture in both sexes to *A. camissoniae*. Like the previous three species *decolorata* has the pronotum with well-formed humeral angles and lateral ridges, the male mandibles decussate and the male genal area twice as broad as the eye in profile. This species can be told from *camissoniae* in both sexes by the propodeum being more declivous with a distinct dorsal surface lacking, terga 2–4 with basal areas having longer hairs (especially tergum 2), and the propodeum and mesepisterna being more finely sculptured as described below.

FEMALE: Measurements and Ratios. N = 7; length, 12–14 mm; width, 3.5–4.0 mm; WL, M = 4.36 ± 0.231 mm; FL/FW, M = 1.05 ± 0.007 ; FOVL/FOVW, M = 3.14 ± 0.076 .

Integumental Color. Black except as follows: mandible with apical half rufescent; flagellum bright orange to red below; wing membranes hyaline, colorless or slightly infumate, veins red to reddish brown; metasomal terga with apical areas somewhat translucent, rufescent; tibial spurs yellow.

Structure. Antennal scape as long as first four flagellar segments or almost so; flagellar segment 1 about as long as segments 2 plus 3 or slightly shorter, segment 2 slightly shorter than 3; segments 4–10 longer than broad. Eyes each about three and one-half times as long as broad, inner margins parallel. Mandibles long, moderately decussate, with distinct subapical tooth. Malar space linear, minimum length equal about one-tenth basal mandibular width. Galea pointed, broader near base, outer margin gently concave, weakly punctate, dulled by regular fine tessellation. Maxillary palpus long, extending beyond tip of galea by last two segments or more, segmental ratio about as 1.0:1.0:0.9:0.7:0.7:0.8. Labial palpus with long curved first segment, segmental ratio about as 1.0:0.5:0.4:0.5. Labral process (Fig. 23) large, apical part longer than broad, sides concave, weakly emarginate apically; labrum apical to process not sulcate, shiny. Clypeus shiny, with abundant small punctures separated by half puncture width or less except in impunctate midline, shagreened near base. Supraclypeal area dulled by fine shagreening and minute punctures. Face above antennal fossae longitudinally rugulate and punctate, surface moderately dulled, fossae separated from lateral ocellus by about half an ocellar diameter. Vertex above lateral ocellus short, equal to about half an ocellar diameter or slightly more. Genal area in profile distinctly broader than eye (about as 7:6), surface dulled by reticular shagreening, punctures minute, sparse.

Pronotum with humeral angles and lateral ridge, ridge not sharp or lamellate, surface dull, shagreened. Mesocutum with minute round punctures separated by half to one puncture width, surface shagreened, dull. Scutellum similar but shagreening weaker. Metanotum densely punctate and shagreened. Propodeum with dorsal surface lacking, declivous from anterior margin; dorsal enclosure with weak rugulae but median rugula usually complete,

shagreened; surface outside of enclosure with minute punctures separated by several puncture widths, surface dulled by shagreening. Mesepisterna sculptured similar to propodeum outside of dorsal enclosure. Fore wing with pterostigma narrow, long; vein first m-cu meets second submarginal cell beyond middle (usually near outer fourth).

Metasomal tergum 1 with apical area about as long as basal area, basal area punctures small, separated by one to three or four puncture widths, apical area punctate in basal half or more, punctures minute, surfaces dulled by coarse shagreening. Terga 2–3 with apical areas about as long as half of basal area, basal area punctures separated mostly by about 2 puncture widths or less, apical area punctate in basal half or slightly more, surfaces shiny, shagreening weak or absent. Pygidial plate with rounded apex, longer than broad at base, internal raised triangle weak, surface finely tessellate, dull. Sterna with basal areas distinctly punctate, apical areas impunctate, surfaces moderately shiny to dull, coarsely shagreened sternum 2 with long hairs of basal area similar to those of sternum 1.

Vestiture. Almost entirely pale, pale ochraceous to ochraceous, darker above, head with reddish brown hairs on vertex, along inner margins of eyes and along outer margins of eyes at least above; facial fovea with tomentum reddish brown in upper half, pale ochraceous below. Propodeum with lateral corbicula not distinctly formed, internal hairs long, plumose; hind tibiae with scopal hairs long, simple, sparse; trochanteral flocculus complete, weak; metasomal terga without fasciae.

MALE: Measurements and Ratios. N = 16; length, 11.5–13.0 mm; width, 2.5–3.5 mm; WL, M = 3.79±0.291 mm; FL/FW, M = 1.02±0.006; FS1/FS2, M = 1.25±0.028.

Integumental Color. Black except as follows: mandible with apical half or less rufescent; antennal flagellum reddish brown to brown below; wing membranes hyaline, colorless to slightly yellowed, veins red to reddish brown; metasomal terga with apical areas translucent, red to reddish brown; tibial spurs rufescent to testaceous.

Structure. Antenna moderately long, in repose reaches about midscutellum; scape length equals first two and one-third flagellar segments; flagellar segment 1 distinctly longer than segment 2 and about equal to segment 3, all segments longer than broad. Eyes each almost three and one-half times as long as broad in facial view, inner margins diverge slightly towards vertex. Mandibles decussate, subapical tooth present, small (Fig. 24). Galea as in female. Maxillary palpus as in female, segmental ratio not visible. Labial palpus as in female, segmental ratio about as 1.0:0.6:0.4:0.6. Labral process large, about as long as broad, bidentate apically; labrum apical to process without sulcus or cristae. Clypeus sculptured as in female but lacking median impunctate line and punctures larger, surface shiny throughout. Supraclypeal area and face above antennal fossae as in female. Vertex above lateral ocellus equals to half an ocellar diameter or more but less than one diameter (allotype almost one). Genal area broad, with rounded knob about opposite midpoint of compound eye, surface sculptured as in female.

Pronotum with humeral angle and lateral ridge as in female. Mesoscutum, scutellum, metanotum sculptured as in female. Propodeum as in female but enclosure with slightly more rugulae near base (Fig. 25); mesepisternum with small round punctures separated by half to one and one-half puncture widths, interpunctural spaces finely tessellate. Wing venation as in female.

Metasomal tergum 1 sculptured as in female but somewhat shinier. Terga 2–5 sculptured as in female terga 1–4 but basal area punctures slightly denser, separated mostly by one to two puncture widths, apical area punctures restricted to basal half, surfaces shiny. Tergum 7 with extremely narrow pseudopygidial area, almost parallel-sided. Sterna 2–5 sculptured as in female but basal area punctures sparser and shagreening usually coarser. Genital capsule as shown (Fig. 26). Sterna 7 and 8 similar to *rubrotincta* but sternum 7 with apical lobes narrower and sternum 8 more distinctly capitate (Figs. 63 and 64).

Vestiture. Pale ochraceous to ochraceous except as follows: brown to reddish brown across vertex, along inner margins eyes and in upper half along outer eye margins. Terga without apical pale fasciae; sterna with subapical fasciae present but weak, hairs relatively short; hind tibiae with hairs sparse, long, along anterior and posterior margins some hairs almost as long as dorsal femoral hairs; metasomal tergum 2 with basal area with long hairs longer than those of apical area and similar to those of tergum 1; terga 3 and 4 with basal hair hairs decreasing in length.

Type Material. The holotype female of *Andrena (Onagrandrena) decolorata* was collected 3 miles NE of Moreno, Riverside Co., California, April 5, 1963, by W.A. Steffan. The allotype male was collected 4 miles E of Elsinore, Riverside Co., in Railroad Canyon, April 14, 1965, by D. Veirs (Fig. 6). The holotype and allotype will be deposited in the collection of the California Academy of Sciences. Six female and 16 male paratypes (UCB, UCR, UCD, LACM, INHS) are as follows:

CALIFORNIA. RIVERSIDE CO.: Hemet: 1 female, April 26, 1961, from *Cryptantha* sp., Ewart and Browner; Millard Canyon: 1 female, April 18, 1968, from *Madia* (as *Layia*) *exigua*, P.H. Timberlake. SAN BERNARDINO CO.: Seeley Flats, San Bernardino Mts.: 1 female, July 3, 1917, H. Klotz; 1 female, July 10, 1917, R. May. SAN DIEGO CO.: Descanso-Alpine Site: 1 male, March 17, 1972, from *Cryptantha barbigera*, A.R. Moldenke; 1 male, March 17, 1972, from *Mirabilis californica* (as *laevis*), A.R. Moldenke; 7 males, April 5, 1972, from *Cryptantha intermedia*, A.R. Moldenke; 1 male April 5, 1972, from *Mirabilis californica* (as *laevis*), A.R. Moldenke; 1 female, 1 male, April 5, 1972, from *Salvia apiana*, A.R. Moldenke; 1 male, April 19, 1972, from *Cryptantha* sp., A.R. Moldenke; 1 male, April 25, 1972, from *Camissonia californica* (as *leptocarpa*), A.R. Moldenke; Lakeside (2 mi. NE), March 13, 1968, J. Powell; Newton (8 mi. NW): 2 males, April 14, 1934, from *Cryptantha intermedia*, P.H. Timberlake. MEXICO. BAJA CALIFORNIA DEL NORTE: La Zapopita, Valle de Trinidad: 1 female, April 9–14, 1961, F.S. Truxal.

Floral Records. Presumably this species is an oligolege of the genus *Camissonia*. It has been collected from flowers of plants listed below.

Camissonia californica (as *leptocarpa*), *Cryptantha* sp., *C. barbigera*, *C. intermedia*, *Madia* (as *Layia*) *exigua*, *Mirabilis californica* (as *laevis*), *Salvia apiana*.

INDEX OF SPECIES NAMES

This index consists of a list of all significant Latin names of generic or specific standing currently being used, placed in synonymy, and listed in alphabetical order so that the reader can readily find each name. Specific epithets in italics are currently recognized names, those in standard letters are here considered to be synonyms. The numbers in bold face refer the reader to the page where the name appears before the description of the species or in the synonymy listed on that page. The numbers in plain text refer to the pages of the keys to species or to the page where the name appears on a map.

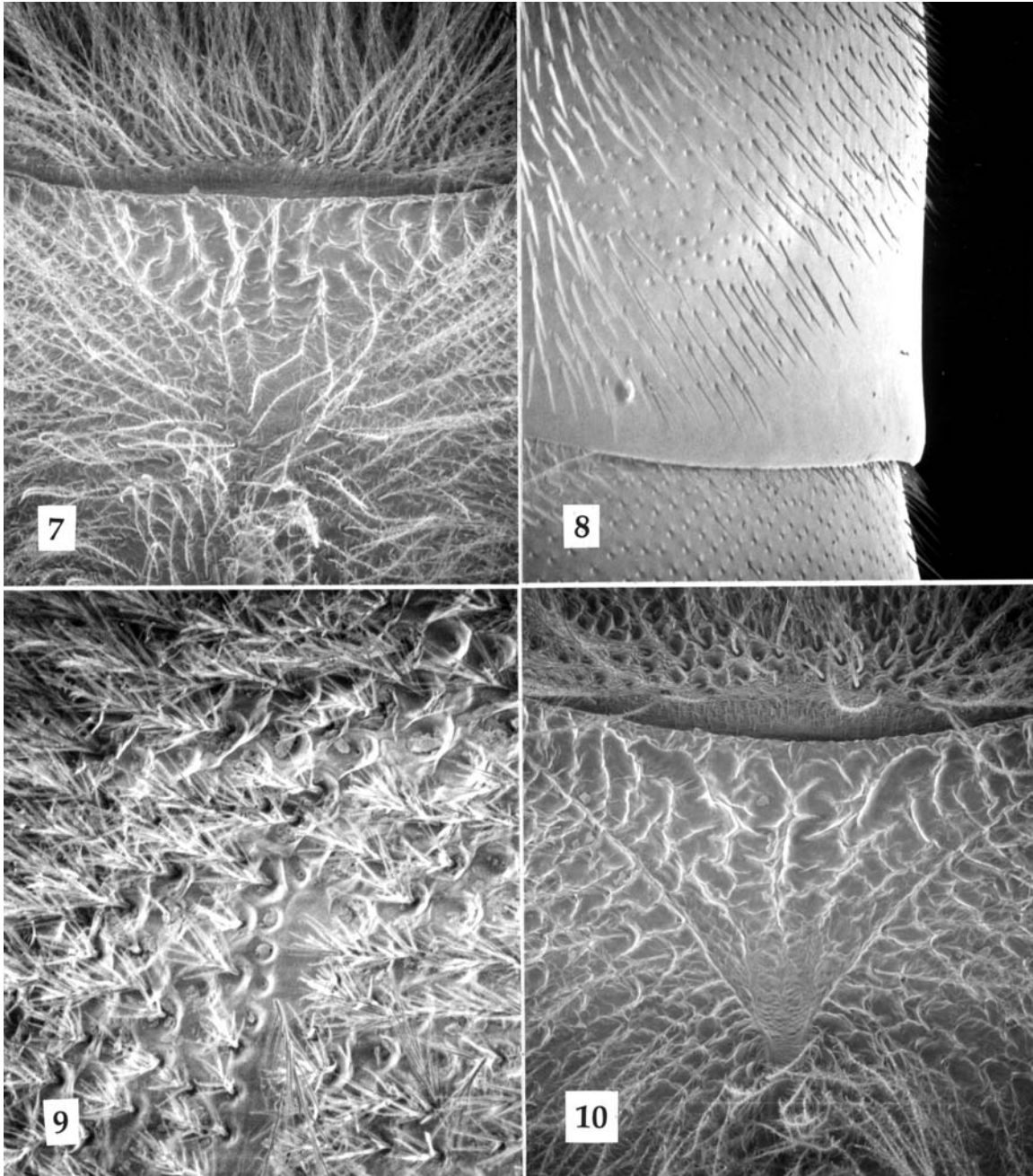
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BIBLIOGRAPHY

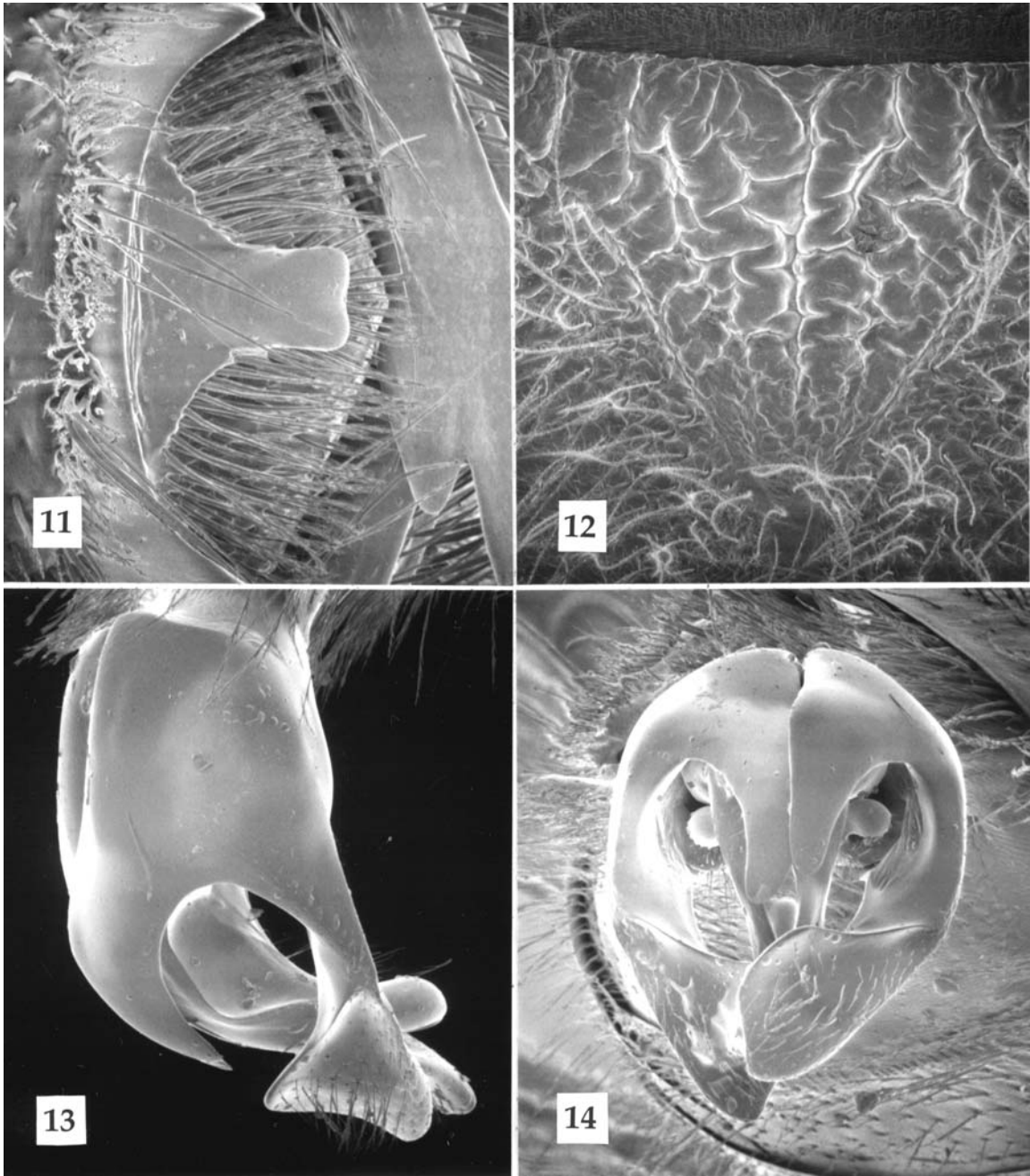
- Bohart, R.M. 1937. A preliminary study of the genus *Stylops* in California (Paert II). Pan-Pac. Entomol., 13:49–57.
- Bouseman, J.K., and W.E. LaBerge 1979. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part IX. Subgenus *Melandrena*. Trans. Am. Entomol. Soc., 104:275–389.
- Cockerell, T.D.A. 1901. In Morice and Cockerell, 1901. The American bees of the genus *Andrena* described by F. Smith. Canadian Entomol., 33:123–124, 149–155.
- . 1906. The bees of Florissant, Colorado. Bull. Am. Mus. Nat. Hist., 22(25):419–455.
- . 1924. Bees of the genus *Andrena* in the collection of the California Academy of Sciences. Pan-Pac. Entomol., 1(2):57–65.
- . 1934. Records of western bees. Am. Mus. Novit., No. 697:1–15.
- . 1937. Bees collected in Arizona and California in spring 1937. Am. Mus. Novit. 948:1–15.
- Davis, R., Jr., and W.E. LaBerge 1974. The nest biology of the bee *Andrena* (*Ptilandrena*) *erigeniae* Robertson (Hymenoptera: Andrenidae). Ill. Nat. Hist. Surv., Biol. Notes No. 95, pp. 1–16.
- Donovan, B.J. 1977. A revision of North American bees of the subgenus *Cnemidandrena* (Hymenoptera: Andrenidae). Univ. Calif. Publ. Entomol., 81: 1–107.
- Estes, J.R., and R.W. Thorp 1974. Pollination of *Ludwigia peploides* ssp. *glabrescens* (Onagraceae). Bull. Torrey Bot. Club 101:272–276.
- Frison, T.H. 1927. A list of the insect types in the collection of the Illinois Natural History Survey and the University of Illinois. Ill. State Nat. Hist. Surv. Bull. 16:137–309.
- Greggory, D.P. 1963–64. Hawkmoth pollination in the genus *Oenothera*. Aliso 5(3):357–384; 5(4):385–419.
- Hurd, P.D., Jr. 1957. Notes on the autumnal emergence of the vernal desert bee, *Hesperapis fulvipes* Crawford (Hymenoptera, Apoidea). J. Kans. Entomol. Soc. 30(1):10.
- LaBerge, W. E. 1964. Prodrum of American bees of the genus *Andrena* (Hymenoptera, Apoidea). Univ. Neb. State Mus. Bul. 4:279–316.
- . 1967. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part I. *Callandrena*. Univ. Neb. State Mus. Bul., 7:1–316.
- . 1969. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part II. *Plastandrena*, *Aporandrena*, *Charitandrena*. Trans. Am. Entomol. Soc., 95:1–47.
- . 1971. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part IV. *Scapteropsis*, *Xiphandrena*, and *Rhaphandrena*. Trans. Am. Entomol. Soc., 97:441–520.
- . 1973. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part VI. Subgenus *Trachandrena*. Trans. Am. Entomol. Soc., 99:235–371.
- . 1977. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part VIII. Subgenera *Thysandrena*, *Dasyandrena*, *Psammandrena*, *Rhacandrena*, *Euandrena*, *Oxyandrena*. Trans. Am. Entomol. Soc., 103:1–143.
- . 1980. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part X. Subgenus *Andrena*. Trans. Am. Entomol. Soc., 106:395–525.

- . 1986. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part XI. Minor subgenera and subgeneric key. *Trans. Am. Entomol. Soc.*, 111:441–567.
- . 1987. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part XII. Subgenera *Leucandrena*, *Ptilandrena*, *Scoliandrena*, and *Melandrena*. *Trans. Am. Entomol. Soc.*, 112:191–248.
- . 1989. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part XIII. Subgenera *Simandrena* and *Taeniandrena*. *Trans. Am. Entomol. Soc.*, 115:1–56.
- LaBerge, W.E., and J.K. Bouseman 1970. A revision of the bees of the genus *Andrena* in the Western Hemisphere. Part III. *Tylandrena*. *Trans. Am. Entomol. Soc.*, 96:543–605.
- . 1977. On the systematic position of three black *Andrena* from Western North America (Hymenoptera: Andrenidae). *J. Kans. Entomol. Soc.*, 50:601–612.
- LaBerge W.E., and D.W. Ribble 1972. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part IV. *Gonandrena*, *Geissandrena*, *Parandrena*, *Pelicanandrena*. *Trans. Am. Entomol. Soc.*, 98:271–358.
- . 1975. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part VII. Subgenus *Euandrena*. *Trans. Am. Entomol. Soc.*, 101:371–446.
- Lanham, U.N. 1949. A subgeneric classification of the New World bees of the genus *Andrena*. *Univ. Calif. Publ. Entomol.*, 8(5):183–238.
- Lewis H., and M.E. Lewis 1953. The genus *Clarkia*. *Univ. Calif. Publ. Bot.* 20(4):241–392.
- Lewis, H., and J. Sweykowski 1964. The genus *Gayophytum* (Onagraceae). *Brittonia* 16(4):343–391.
- Linsley, E.G. 1938. Studies in the Andrenidae of North America (Hymenoptera). *Proc. California Acad. Sci.*, Ser. 4, 23:263–282.
- . 1958. The ecology of solitary bees. *Hilgardia* 27:540–599.
- . 1972. The robber fly *Callinicus calcaneus* (Loew) as a predator on *Andrena omninigra* Viereck (Diptera: Asilidae; Hymenoptera: Andrenidae). *Pan-Pacific Ent.*, 48:94–96.
- Linsley, E.G., and J.W. MacSwain 1955. The North American andrenine bees of the subgenus *Melandrena* with descriptions of new species (Hymenoptera: Andrenidae). *Pan-Pac. Entomol.*, 31:163–172.
- . 1956. Further notes on the taxonomy and biology of the Andrenine bees associated with *Oenothera* (Hymenoptera: Andrenidae). *Pan-Pac. Entomol.*, 32:111–121.
- . 1961. Descriptions of *Onagrاندrena* associated with *Oenothera* and *Clarkia* with taxonomic notes on other species. *Pan-Pacific Ent.*, 37:117–130.
- . 1962. New species of *Onagrاندrena* associated with *Oenothera* in California, Nevada, and Wyoming (Hymenoptera: Andrenidae). *Pan-Pac. Entomol.*, 38:49–52.
- . 1963. Descriptions of new species and subspecies of *Onagrاندrena*, principally of the *Andrena oenotherae* complex (Hymenoptera: Andrenidae). *Pan-Pac. Entomol.*, 39:189–198.
- . 1968. A new species of *Onagrاندrena* associated with *Camissonia campestris*. (Hymenoptera: Andrenidae). *Pan-Pac. Entomol.* 44:144–145.
- Linsley, E.G., J.W. MacSwain, and P.H. Raven 1963a. Comparative behavior of bees and Onagraceae. I. *Oenothera* bees of the Colorado Desert. *Univ. Calif. Publ. Entomol.*, 33:1–24.

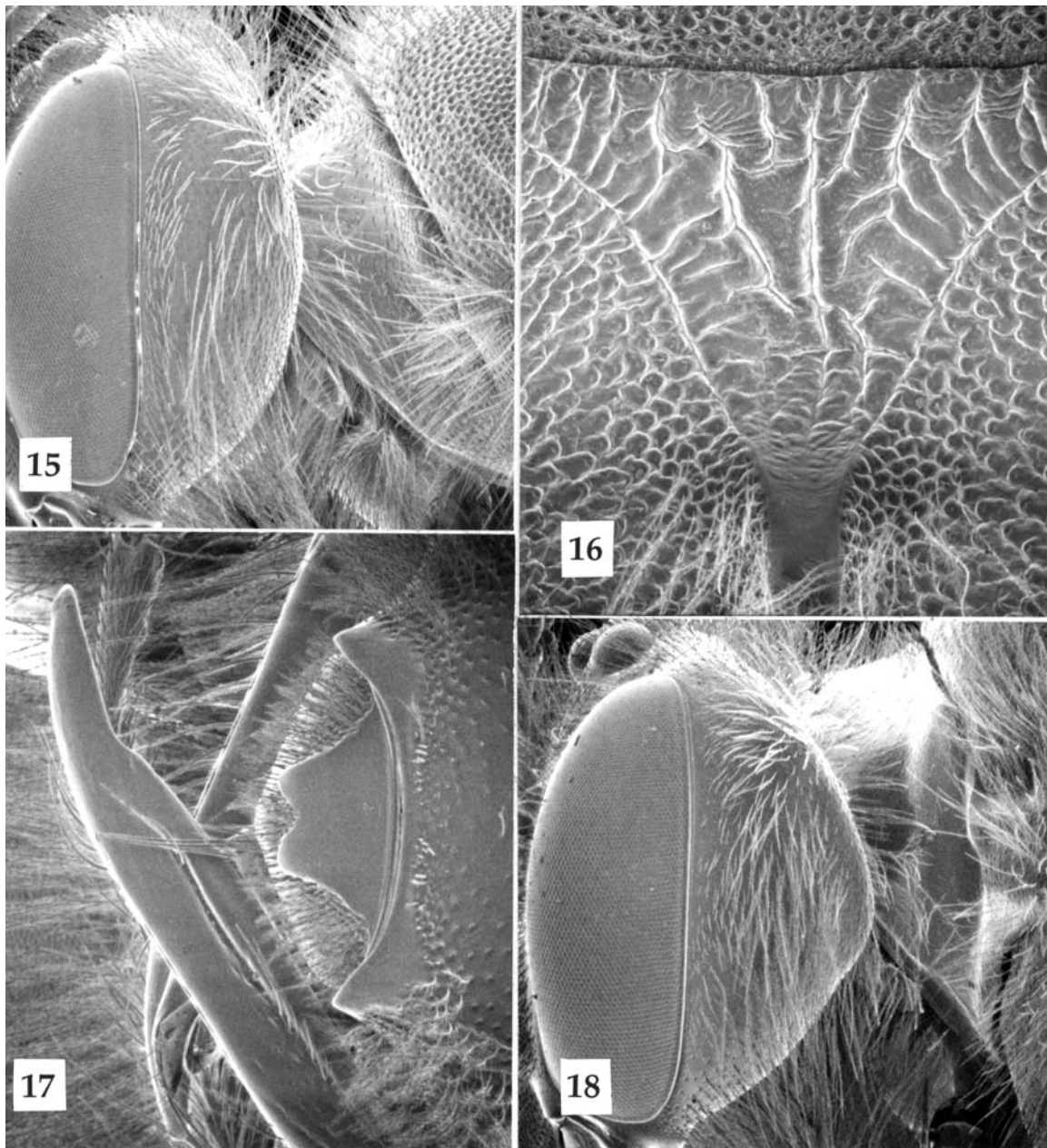
- . 1963b. Comparative behavior of bees and Onagraceae. II. *Oenothera* bees of the Great Basin. Univ. Calif. Publ. Entomol., 33:25–58.
- . 1964. Comparative behavior of bees and Onagraceae. III. *Oenothera* bees of the Mojave Desert, California. Univ. Calif. Publ. Entomol., 33:59–98.
- Linsley, E.G., J.W. MacSwain, P.H. Raven, and R.W. Thorp 1973. Comparative behavior of bees and Onagraceae. V. *Camissonia* and *Oenothera* bees of cismontane California and Baja California. Univ. Calif. Publ. Entomol., 71:1–68 + 6 plts.
- Linsley, E.G., J.W. MacSwain, and R.F. Smith 1955. Observations on the nesting habits and flower relationships of some species of *Melandrena*. Pan–Pac. Entomol. 31(4): 173–185.
- MacSwain, J.W., P.H. Raven, and R.W. Thorp 1973. Comparative behavior of bees and Onagraceae. IV. *Clarkia* bees of the western United States. Univ. Calif. Publ. Entomol., 70:1–80 + 3 plts.
- Mitchell, T.B. 1960. Bees of the eastern United States. North Carolina Agric. Exper. Stat., Tech. Bul. No. 141, 538 pp., 134 figs.
- Raven, P.H. 1962. The systematics of *Oenothera*: subgenus *Chylismia*. Univ. Calif. Publ. Bot. 34(1):1–122.
- Raven, P.H. 1964. The generic subdivision of Onagraceae, tribe Onagrae. Brittonia 16(3): 276–288.
- Raven, P.H. 1969. A revision of the genus *Camissonia* (Onagraceae). Contrib. U.S. Natl. Herb. 37(5):161–396.
- Raven, P.H. 1979. A survey of reproductive biology in Onagraceae. N. Z. J. Bot. 17:575–593.
- Rust, R.W., A. Menke, and D.R. Miller 1985. A biogeographic comparison of the bees, sphecid wasps, and mealybugs of the California Channel Island (Hymenoptera, Homoptera). Pp. 29–59 in Entomology of the California Channel Islands: Proceedings of the 1st symposium, San Diego, California, USA, 1981.
- Skvarla, J.J., P.H. Raven, W.F. Chissoe, and M. Sharp 1978. An ultrastructural study of viscin threads in Onagraceae pollen. Pollen et Spores 20:5–143.
- Small, E., I.J. Bassett, C.W. Crompton, and H. Lewis 1971. Pollen phylogeny in *Clarkia*. Taxon, 20:739–746.
- Tepedino, V.J. 1982. Flower visitation and pollen collection records for bees of high altitude shortgrass prairie in southeastern Wyoming. Southwestern Entomol., 7:16–25.
- Thorp, R.W. 1969. Systematics and ecology of bees of the subgenus *Diandrena* (Hymenoptera: Andrenidae). Univ. Calif. Publ. Entomol., 52:1–146.
- . 1970. The type locality of *Bombus franklini* and notes on putative Arizona records of other Bombini (Hymenoptera: Apoidea). Pan–Pac. Entomol., 46:177–180.
- . 1979. Structural, behavioral, and physiological adaptations of bees (Apoidea) for collecting pollen. Ann. Mo. Bot. Gard. 66:788–812.
- . 1987. A new species of *Andrena* (*Onagrandra*) from Utah's San Rafael Desert (Hymenoptera: Andrenidae). Pan–Pac. Entomol., 63:194–198.
- Ting, W.S. 1966. Pollen morphology of Onagraceae. Pollen et Spores. 8:9–36.
- Timberlake, P.H. 1937. New species of *Andrena* from California (Hymenoptera). Pan–Pac. Entomol., 13:69–74.
- United States Weather Bureau 1921. Climatological data: California section. USDA, Weather Bureau, 25(13):58.
- United States Weather Bureau 1951. Climatological data: California. US Dept. Commerce, Weather Bureau, 55(13):418.
- Viereck, H.L. 1917. *Andrena* of Canadian, Alleghanian and Carolinian plant zones occurring or likely to occur in Connecticut. Trans. Am. Entomol. Soc., 43:365–407.



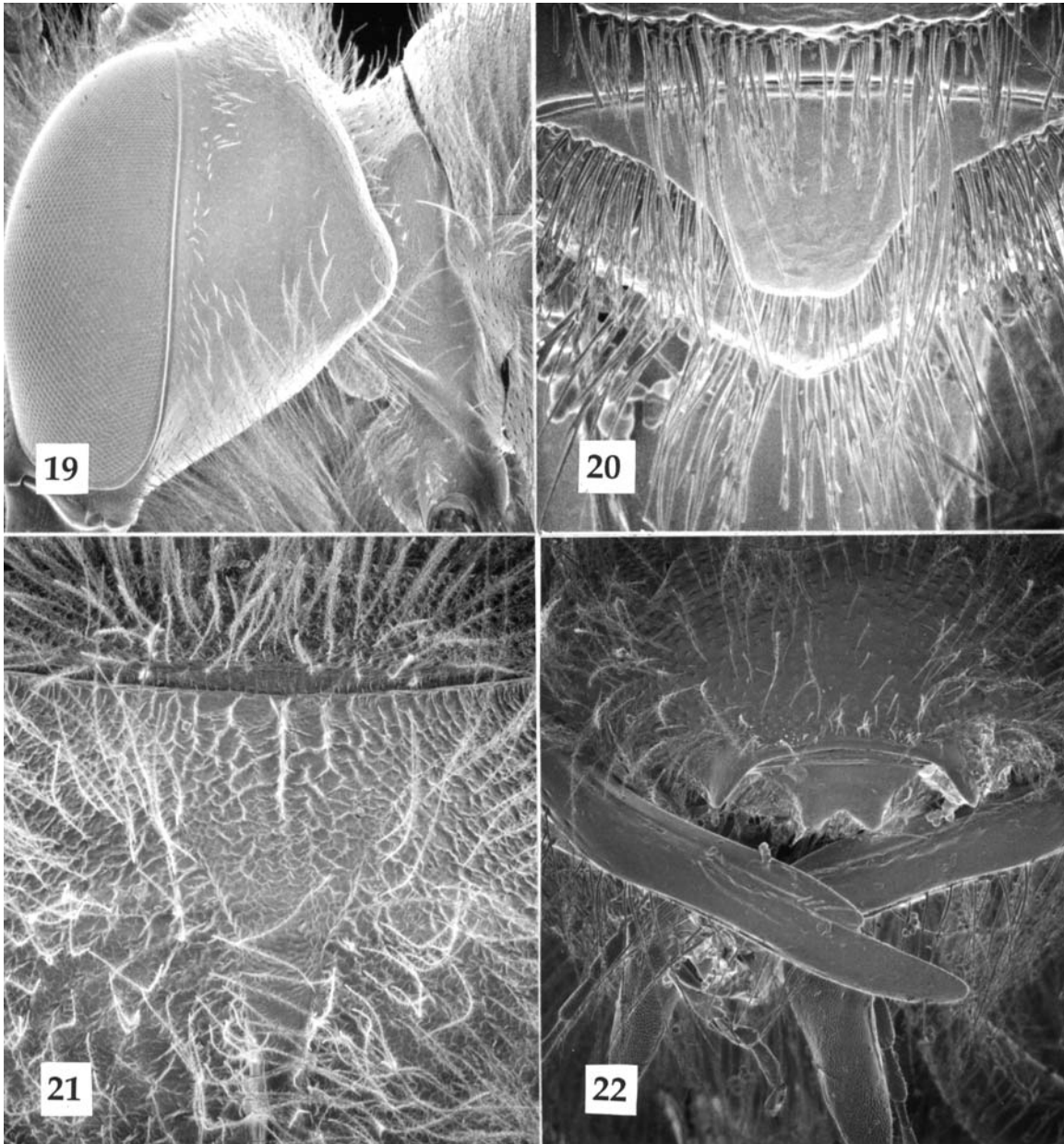
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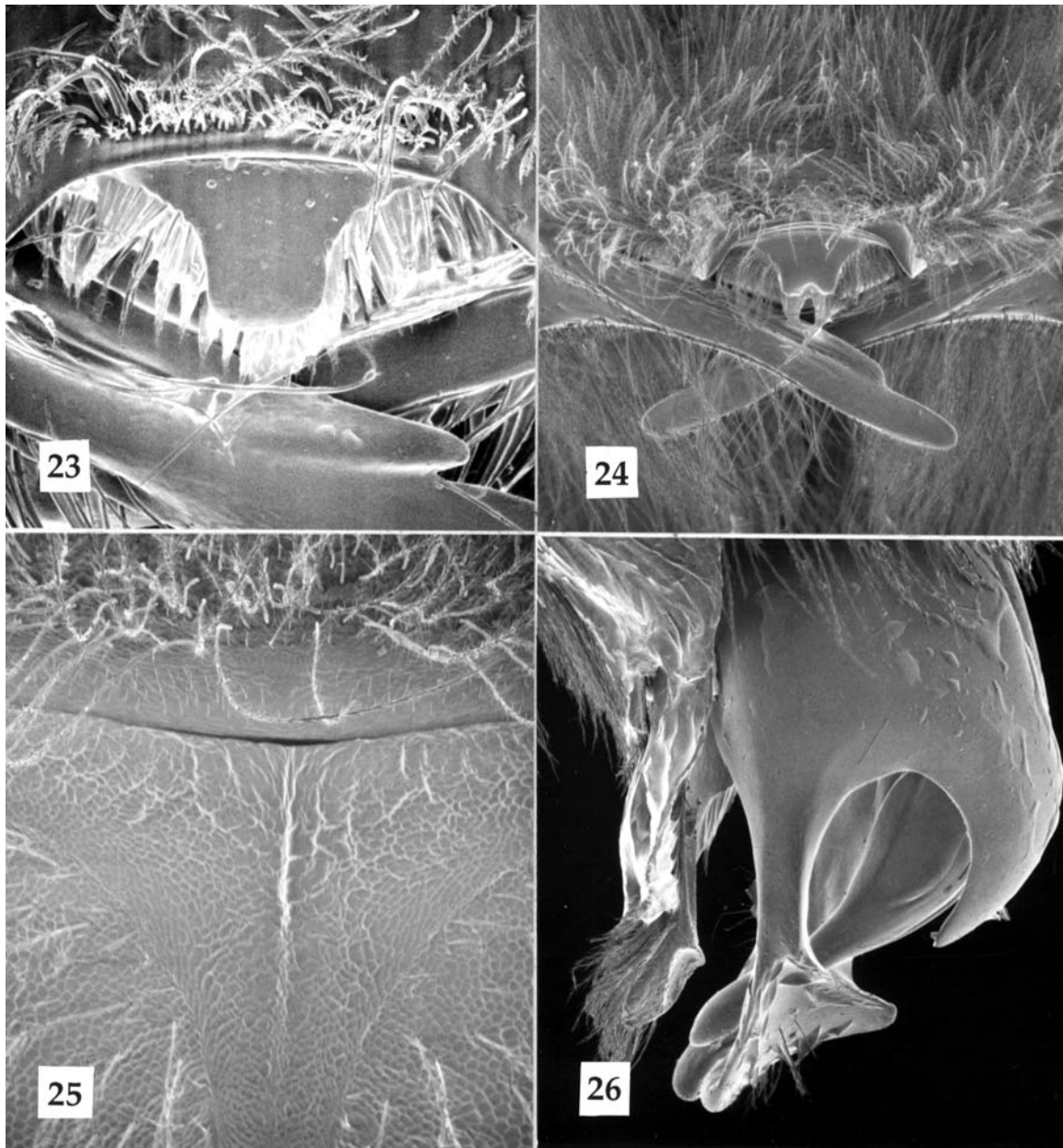
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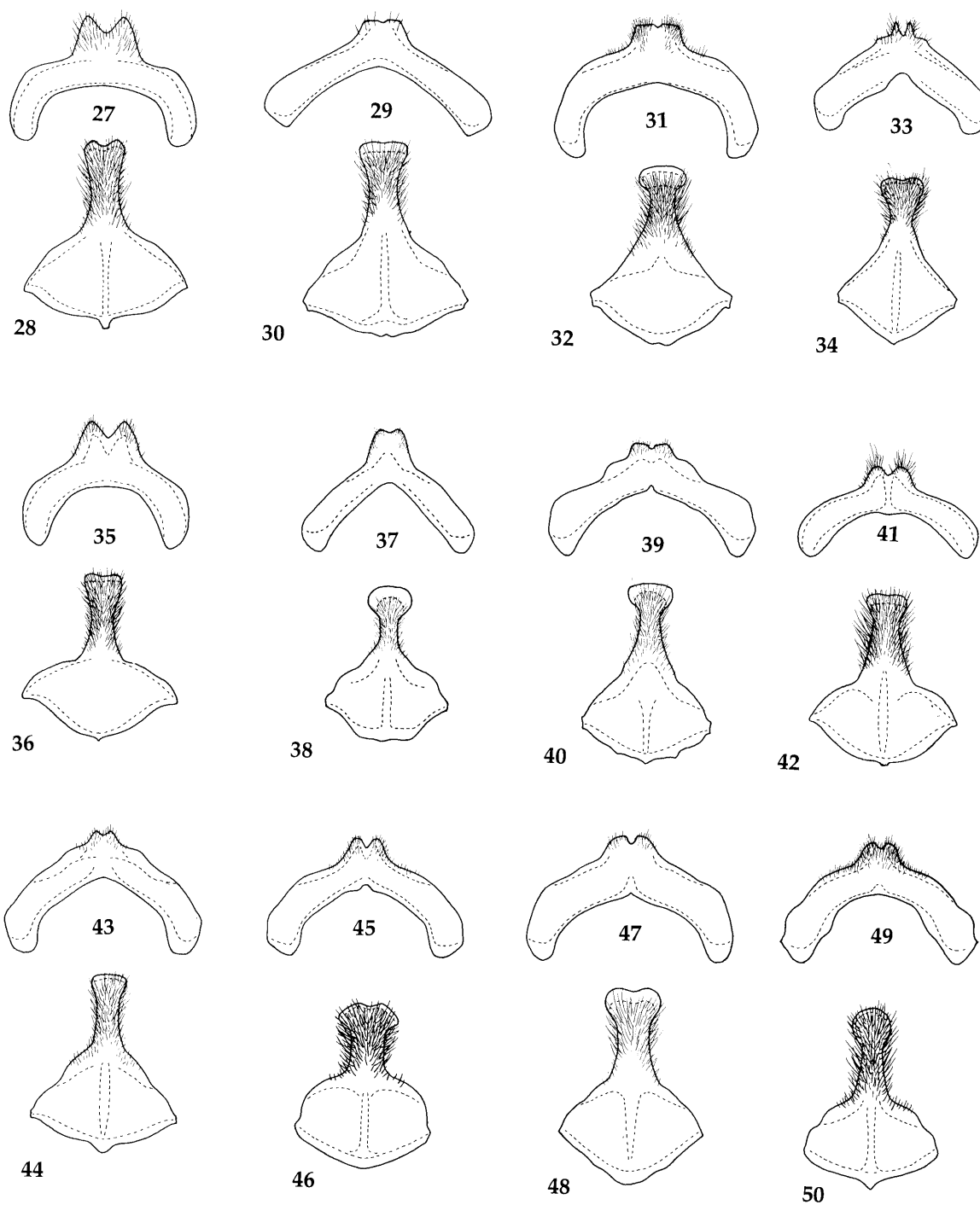
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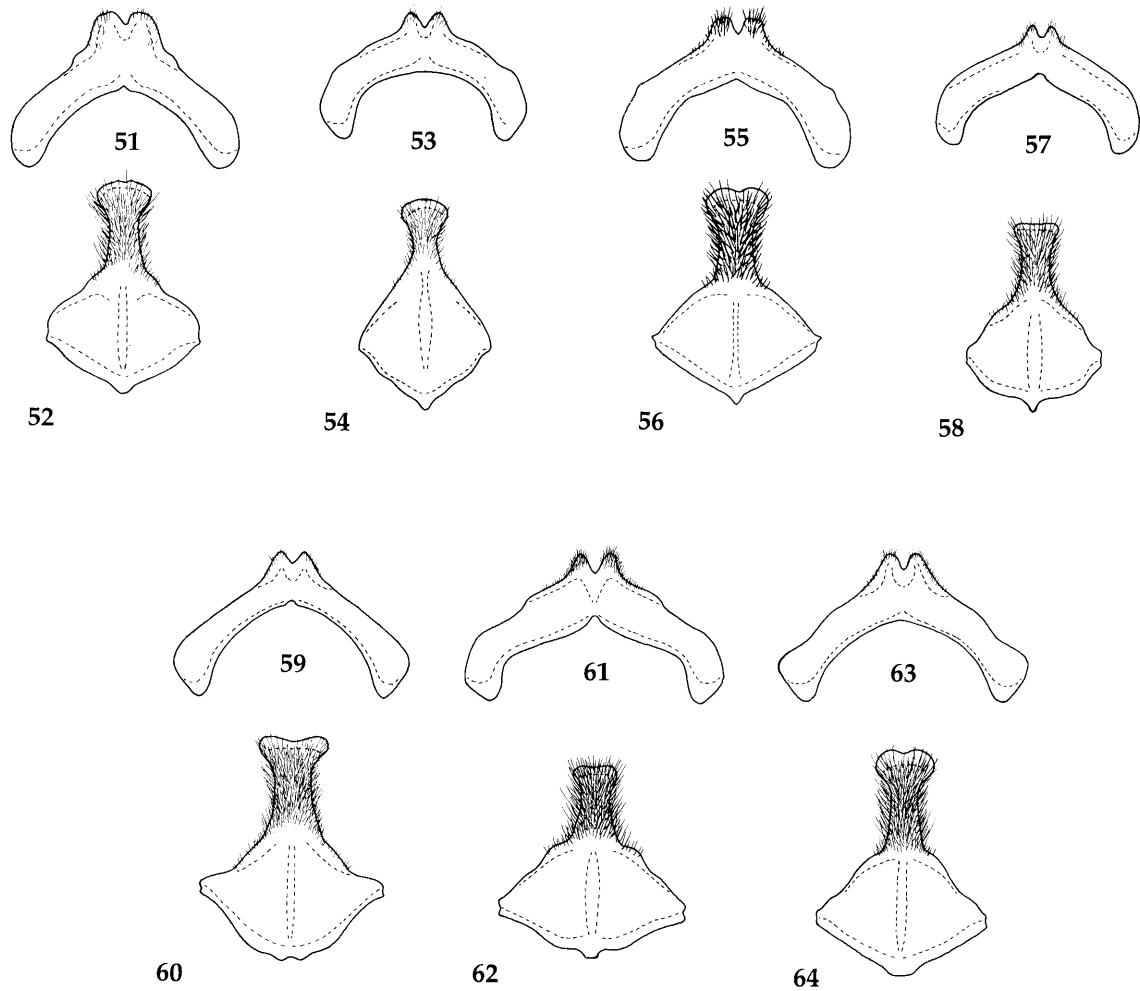
Figs. 19–22. *Andrena rubrotincta* Linsley: 19—male head (lateral view) and pronotum, X40, note pronotal angle and prominent genal posterior angle; 20—female labral process. *Andrena camissoniae* Linsley and MacSwain: 21—female propodeal dorsal area, X70; 22—male labral process and mandible, X50.



Figs. 23–26. *Andrena camissoniae* Linsley and MacSwain: 23—female labral process and mandible, X100. *Andrena decolorata* LaBerge and Thorp: 24—male labral process and mandible, X 40; 25—male propodeal dorsal area, X100; 26—male genital capsule, lateral view, X70.



Figs. 27–50. Sterna 7 and 8 of males of *Andrena* (*Onagrandrena*): 27–28—*A. anograe* Cockerell. 29–30—*A. linsleyana* Thorp. 31–32—*A. omninigra* Viereck. 33–34—*A. bernardina* Linsley. 35–36—*A. flandersi* Timberlake. 37–38—*A. furva* Linsley and MacSwain. 39–40—*A. blaisdelli* Cockerell. 41–42—*A. oenotherae* Timberlake. 43–44—*A. boronensis* Linsley and MacSwain. 45–46—*A. chylismiae* Linsley and MacSwain. 47–48—*A. vespertina* Linsley and MacSwain. 49–50—*A. rozeni* Linsley and MacSwain.



Figs. 51–64. Sterna 7 and 8 of males of *Andrena* (*Onagrandrena*): 51–52—*A. linsleyi* Timberlake. 53–54—*A. deserticola* Timberlake. 55–56—*A. raveni* Linsley and MacSwain. 57–58—*A. vanduzeei* Linsley. 59–60—*A. rubrotincta* Linsley. 61–62—*A. mojavenis* Linsley and MacSwain. 63–64—*A. decolorata* LaBerge and Thorp.

Appendix 1. *Onagrandra* phylogeny data matrix for Figure 1 based on characters listed in Table 1.

	0	10	20]
MATRIX				
decolorata	0001000000000111000000			
camissoniae	0000000000000101000000			
mojavensis	0010000001000101000000			
rubrotincta	0010000001000101010000			
bernardina	1110110010110100001001			
omninigra	1110111010010000001001			
flandersi	1110100010011000001011			
furva	1110101010110000100011			
raveni	1110000110010100001001			
linsleyi	1110000001000111000001			
vanduzeei	1110001110010000010001			
blaisdelli	1110000010110101100001			
rozeni	1110000010000000001001			
stagei	11100010100101011□□-			
boronensis	1110001010010000101001			
vespertina	1110001010010000101001			
oenotherae	1110001010010000101001			
chylismiae	1110001010010100101101			
nevadae	11100000100001001□□-			
deserticola	1110000010000000100001			
linsleyana	1110000010010011001101			
anograe	1110000010010000001001			
ancestor	0000000000000000000000			

ILLINOIS
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A Revision of the Bees of the Genus
Andrena of the Western Hemisphere
Part XV. Subgenus *Hesperandrena*

Robbin W. Thorp and Wallace E. LaBerge

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ABSTRACT

This work reports on a study of 1,200 specimens segregated into 9 species, 4 of which are new to science. One name is relegated to synonymy. The relationships within the subgenus and with other subgenera of *Andrena* are briefly discussed.

INTRODUCTION

The subgenus *Hesperandrena* was recognized and described by Timberlake in Lanham 1949 (p. 208) to include two previously described species, *Andrena escondida* Cockerell and *Andrena baeriae* Timberlake. These two species have in common a propodeum which Timberlake described as having the dorsal surface, "... broad, gently curved and inclined from base to apex, without definite truncation, the lateral margins distinctly carinate and convexly arcuate." This is the main character separating this subgenus (Fig. 4) from other subgenera of *Andrena* except that in the males of *Hesperandrena* the lateral margins of the propodeum are not carinate. Other characters are given in the description of the subgenus below. The species of this subgenus are very similar to one another and difficult to tell apart. The species are known only from California and Baja California.

The reader is referred to earlier sections of this revision (LaBerge 1967, 1969, 1971, 1973, 1977, 1980, 1986, 1987, 1989; LaBerge and Bouseman 1970, 1987; LaBerge and Ribble 1972, 1975; Bouseman and LaBerge 1979; Thorp 1969; Donovan 1977) for details of morphology and a more complete bibliography on the genus *Andrena*. No new terms have been introduced and the bibliography presented here includes only references cited. Published locality and floral records are included in the sections at the end of each species account. Institutions with type material are listed with contractions as follows:

AMNH—American Museum of Natural History, New York City
CAS—California Academy of Science, San Francisco
INHS—Illinois Natural History Survey, Champaign
LACM—Los Angeles County Museum (of Natural History), Los Angeles
PANS—Philadelphia Academy Natural Sciences
USNM—United States National Museum (of Natural History), Washington, D.C.
UCB—University of California at Berkeley (Entomology Collection)
UCD—University of California at Davis (Entomology Collection)
UCR—University of California at Riverside (Entomology Collection)
UKL—University of Kansas, Lawrence
USU—Utah State University, Logan

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The authors wish to thank the persons in charge of the collections at the Smithsonian Institution, Washington, D.C. and the American Museum of Natural History for allowing us to study types in their care. Specimens were borrowed, often for long periods of time, from the collections listed below and special thanks are extended to these persons and collections.

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Subgenus *HESPERANDRENA* Linsley and MacSwain

Hesperandrena Timberlake, 1949, in Lanham, 1949, Univ. California Pub. Ent., 8:208; LaBerge, 1964, Univ. Nebraska St. Mus. Bull., 4:301; 1986, Trans. American Ent. Soc., 111:443, 447, 452.

Bees of the subgenus *Hesperandrena* are small to medium with short malar spaces, short vertices (never taller than one ocellar diameter and mostly shorter), and genal areas of moderate width. Both sexes have relatively weak sculpturing, propodeal dorsal areas smooth with small, sparse punctures, and the terga with weak but distinct pale apical fasciae. The females have the propodeal corbicula developed but with internal hairs and scopal hairs that are moderate in length and weakly branched or simple. The males may or may not have subapical sternal fimbriae. We believe the flattened branchless hairs on sternum 7 to be a unique character found only in males of *Hesperandrena*.

Common Characters. Small to medium-sized bees; facial quadrangle quadrate to slightly wider than long; eyes with inner margins parallel to converging slightly towards mandibles; vertex above lateral ocellus usually equals less than one ocellar diameter; genal area as broad as eye in profile or slightly broader; galea broad with concave lateral margin, exceeded by one maxillary palpal segment or slightly more or less; labral process simple or bidentate, often shallowly emarginate; cheeks moderately broad, rounded behind.

Female. Facial fovea large, shallow; subgenal coronet present. Propodeal corbicula present, with well formed, long, dorsal hairs, usually with internal plumose hairs. Trochanteral flocculus present but usually sparse. Tibial scopal hairs moderately long, usually weakly branched.

Male. Antennae short, female-like, first segment usually longer than second. Sterna with subapical fimbriae; sternum 7 with apical lobe deeply emarginate; sternum 8 with area basal to expanded apex with flat, broad hairs with attenuate apices (Fig. 9).

PHYLOGENY

The phylogeny of the subgenus *Hesperandrena* is not clearly understood at present and additional work is obviously needed. We assume that the subgenus is closely related to the subgenera *Larandrena*, *Andrena s. str.*, *Opandrena*, *Ptilandrena*, and *Leucandrena*. All of these subgenera have species occurring today on the west coast where the *Hesperandrena* probably originated and all share in the modified pronotum with lateral angles and ridges usually being present. We believe the *Hesperandrena* to be especially similar to, and perhaps most closely related to the *Larandrena* and *Ptilandrena*.

BIOLOGY

Females of *Hesperandrena* appear to be oligolectic, most on Asteraceae but one species, *A. pulverea*, on flowers of Limnanthaceae. Because most of the *Hesperandrena* live in association with vernal pool ecosystems in California, the *Hesperandrena* are becoming recognized as an important group in conservation planning and mitigation issues. These species provide an important ecological service in pollination of showy flowers in vernal pool communities.

Distribution and Abundance. *Hesperandrena* is predominantly a California subgenus with one species reaching northern Baja California in Mexico (Thorp and Leong, 1998). Most are abundant when the showy displays of their pollen plants, *Lasthenia* (goldfields) or *Limnanthes* (meadowfoam), bloom in early spring.

Overwintering, Emergence, and Flight Season. Species of *Hesperandrena* have annual life cycles and emerge in early spring in association with bloom of their pollen plants (Thorp, 1990). They fly from early March into early July but are most abundant in March and April. Circumstantial evidence for the ability to delay emergence for a year during severe drought conditions is presented for *A. pulverea* Viereck (as *limnanthis* Timberlake) by Thorp (1990).

Male Behavior. Most species of the genus exhibit proterandry, i.e., males emerge before females. Males often cruise the pollen host plants of females, but some also cruise clustered nests.

Nest-sites, Architecture, and Construction. The nests of *Hesperandrena* are shallow, 7.5 to 10.2 cm deep, especially in vernal pool ecosystems where soil is shallow and the water table high. The burrows are typically L-shaped with a single brood cell at the end of each short lateral. There is usually more than one lateral per burrow, with each lateral filled after the egg is laid and the cell capped. Fill presumably comes from the succeeding lateral. Details of brood cells, pollen mass formation, cell cap, egg, and early larval position are figured in Thorp (1990). Brood cells are lined with a waxlike material. Pollen is deposited in the bottom of the cell and worked into a spherical mass with the addition of nectar. An egg is then deposited atop the mass. The larva ecloses from the egg, feeds, and progresses through its development during the spring. By summer it has reached the post-defecating stage and remains thus until autumn. During the autumn the larva pupates and transforms into an adult, but remains in the brood cell over the winter. The adult emerges in spring in synchrony with bloom of its pollen-host plant.

Flower Relationships. Females are mostly oligolectic on Asteraceae, especially *Lasthenia* (Thorp and Leong, 1995). One species, *A. pulverea* (as *limnanthis*), is an oligolectic of *Limnanthes* (Limnanthaceae) (Thorp and Leong, 1995). Using three colors of pan-traps to sample bees in patches of the white-flowered *Limnanthes douglasii* R. Br. var. *rosea* (Benth.) C. Mason, Leong and Thorp (1999) found that females of *A. pulverea* (as *limnanthis*) were most frequently trapped about equally in white and blue pans, while males were trapped predominantly in white pans. Yellow pans produced significantly lower captures of both sexes of this species. Other *Andrena*, especially those that are oligolectic of yellow flowers were most frequently trapped in the yellow pans. The females of *A. pulverea* were the most common bees found in patches of *Limnanthes* by Leong and Thorp (1990). The foraging patterns of *Hesperandrena*, especially females foraging for pollen, may influence genetic structure of pollen-host populations through near-neighbor, bee-mediated pollen flow (Thorp, 1999).

Pollen Competition. Two or more species of *Hesperandrena* often occur together (Thorp and Leong, 1998). Because they forage for pollen on different hosts, no resource overlap occurs between *A. pulverea* (as *limnanthis*) and other species of *Hesperandrena*. Nevertheless, pollen resources are often shared by multiple species that are sympatric and oligolectic on *Lasthenia*.

Parasites, Predators, and Associates. Strepsiptera: Stylopidae. Female *Stylops* have been found between the abdominal terga of species of *Hesperandrena*. **Hymenoptera: Anthophoridae.** Females of cuckoo bees of the genus *Nomada* have been observed in the vicinity of nests of *Hesperandrena* (R. W. Thorp personal observation).

Chromosome Number. Chromosome numbers for *Hesperandrena* are unusually low for bees. Goodpasture (1974) found numbers of $n=10$ for *A. (Hesperanda)* sp. (probably *dissona* Thorp and LaBerge) and $n=3$ for *A. duboisi* Timberlake. He compared the karyotypes of the two *Hesperandrena* and found that the total genome length in *duboisi* was half that in *dissona*, the other species he studied.

Role in Conservation. Vernal pool ecosystems are threatened in California. The important role of pollen-specialist solitary bees, especially *Andrena (Hesperandrena)* and *A. (Diandrena)*, as pollinators of many of the characteristic showy flowers and the need to protect these bees to continue their ecological service contributions have been stressed by Thorp (1976, 1990) and Thorp and Leong (1995, 1998). Females of *Hesperandrena* species are oligoleges of sensitive plants: *A. pulverea* on *Limnanthes vinculans* Ornduff (federally and state listed as endangered), and *A. [species? (probably duboisi and dissona)]* on *Lasthenia conjugens* Greene (Thorp personal observation). Both plants are endemic to California and are placed on List 1B (plants rare, threatened, or endangered in California and elsewhere) by the California Native Plant Society (Skinner and Pavlik 1994). These bee species are likely to be important pollinators of their endangered plant hosts and therefore part of the critical habitat necessary for the reproduction and perpetuation of the plants.

Key to the Females of *Hesperandrena*

1. Scopal hairs short, hind tibia broad, subcuneate; labral process usually about as long as basal width, no less than three-fourths as long as wide; tergal apical fasciae narrow, *pulverea* Viereck
 Scopal hairs uniformly long, hind tibia not broadened; labral process much shorter than its basal width, often half or less as long as broad; tergal apical fasciae often broad 2.
- 2(1). Dorsal thoracic hairs mostly short; facial fovea broad above, separated from lateral ocellus by half an ocellar diameter or slightly more or less
 *lativentris* Timberlake
 Dorsal thoracic hairs mostly long; facial fovea narrow above, separated from lateral ocellus by one ocellar diameter or slightly more..... 3.
- 3(2). Mesoscutum anteriorly, mesepisternum, face below ocelli, and abdomen with metallic greenish reflection 4.
 Mesoscutum and usually abdomen and face black, without metallic reflections 5.
- 4(3). Mesoscutum posteromedially shiny, tessellation weak or absent, punctures distinct; pronotum with humeral angle and ridge distinct; forewings narrowly clouded near tips *leucomystax* n. sp.
 Mesoscutum posteromedially usually dull, tessellate, punctures shallow, indistinct; pronotum with distinct humeral angle and dorsolateral ridge indistinct, especially below; forewings not clouded apically
 *duboisi* Timberlake
- 5(3). Metasomal terga 1–3 with basal areas moderately shiny, shagreening coarse, especially apically, but not completely dulling surface; clypeus with basal

- half or slightly more with distinct punctures, apical third to half coarsely or punctatorugose..... *eremophila* n. sp.
- Metasomal terga 1–3 with basal areas dull, shagreening fine and dense, surfaces dull; clypeus with basal three-fourths or more with punctures fine, sparse, scarcely visible, apical fourth or less more coarsely..... punctate 6.
- 6(5). Facial fovea with tomentum largely dark brown; mesoscutum and scutellum with hairs golden to brown; pronotal angle and ridge present but weak *compositarum* n. sp.
- Facial fovea with tomentum silvery; mesoscutum without brown hairs, white to pale ochraceous; pronotal angle and ridge present and distinct or absent 7.
- 7(6). Pronotum with distinct humeral angle and dorsolateral ridge..... 8.
- Pronotum without humeral angle or ridge *escondida* Cockerell
- 8(7). Mesoscutum tessellate, just mesad of parapsidal line punctures shallow, small, indistinct, obscured by dense fine tessellation, not at all shiny postero-medially; scutellum dulled by tessellation..... *baeriae* Timberlake
- Mesoscutum shinier, punctures distinct, not at all obscured by tessellation, often shiny and untessellate at least posteromedially; scutellum usually shiny to moderately so, tessellation weak or lacking at least medially..... *dissona* n. sp.

Key to the Males of
Hesperandrena

1. Sterna 2–5 with subapical fimbriae of extremely short, moderately dense, white, plumose hairs 2.
- Sterna 2–5 with subapical fimbriae of long straight hairs, long curled hairs, or without fimbriae 3.
- 2(1). Pronotum with distinct lateral angles and ridges; clypeus with dense beard of long, plumose, white hairs hiding surface; scutellum shiny at least medially, mesoscutum often shiny posteromedial *leucomystax* n. sp.
- Pronotum with pronotal angles weak, lateral ridges not extending below diagonal pronotal suture; clypeus with long, pale, plumose hairs, but hairs relatively sparse; scutellum and mesoscutum dulled by fine dense tessellation *duboisii* Timberlake
- 3(1). Sterna 2–5 lacking subapical fimbriae *pulverea* Viereck
- Sterna 2–5 with subapical fimbriae of long, straight or curled, pale hairs 4.
- 4(2). Sterna 2–5 with subapical fimbriae of dense, long, white, straight, plumose hairs; pronotum without lateral angles or dorsolateral ridges *escondida* Cockerell.
- Sterna 2–5 with subapical fimbriae of relatively sparse, extremely long, pale downwards curled hairs; pronotum often with lateral angles and ridges 5.

- 5(4). Clypeus dark, without yellow or cream-colored macula 6.
 Clypeus entirely pale or with large mediobasal, yellow or cream-colored.....
 macula 7.
- 6(5). Pronotal lateral carina sharply defined, extending from humeral angle to
 bottom of pronotum *baeriae* Timberlake
 Pronotum with lateral carina weakly defined, extends ventrad to diagonal
 pronotal suture *compositarum* n. sp.
- 7(5). Integument with metallic green reflections, especially on face and anterior
 third of mesoscutum; terga 2 and 3 rarely with pale brown lateral patches
 *dissona* n. sp.
 Integument black, without metallic green reflections; terga 2 and 3 often
 with small, pale brown, lateral patches..... *lativentris* Timberlake

SPECIES ACCOUNTS

Andrena escondida Cockerell

Andrena escondida Cockerell, 1938, Ann. Mag. Nat. Hist., ser. 11, 2:146.

Andrena (Hesperandrena) escondida: Timberlake, 1949, in Lanham, California

Univ. Publ. Ent., 8:208; Timberlake, 1951, Proc. United States Nat. Mus.,

101:386 Rust, Menke and Miller, 1985, Entomology of the California Channel
 Islands: Proc. 1st Symp., San Diego, California, Dec. 1981, p. 42.

This small species with black integument can be recognized in the female sex by the lack of pronotal humeral angles and dorsolateral ridges, the short labral process, and the relatively strongly punctate mesoscutum. The male of *escondida* has the clypeus black, lacks pronotal humeral angles, and has well-formed, sternal, subapical fimbriae of relatively long, dense, straight hair

FEMALE: Measurements and Ratios. N = 12; length, 8.0–9.5 mm; width, 2.0–2.5 mm; WL, M = 2.61±0.189 mm; FL/FW, M = 0.95±0.029; FOVL/FOVW, M = 2.60±0.157.

Integumental Color. Black except as follows: mandible with apical third rufescent; flagellum with last several segments reddened below; wing membranes hyaline, veins red to reddish brown; metasomal terga with apices narrowly hyaline, becoming darker towards base; tibial spurs yellow.

Structure. Antennal scape as long as first three and one-half flagellar segments or slightly more; flagellar segment 1 as long as segments 2 plus 3, which are equal in length; segments 5–7 about as long as broad. Eyes each about four times as long as broad, inner margins parallel. Mandibles short, overlapping when closed by one fourth or less of mandibular length; with subapical tooth. Malar space short, linear. Galea pointed, outer margin gently concave in apical half; surface dulled by fine tessellation. Maxillary palpus relatively short, when extended surpasses galea by about last segment, segmental ratio about as 0.7:1.0:0.9:0.6:0.5:0.6. Labial palpus normal, segmental ratio about as 1.0:0.6:0.3:0.5. Labral process short, entire, about three times as long as broad, not emarginate apically or only extremely shallowly so; shiny; labrum apical to process at least as long as process, flat, shagreened. Clypeus short, gently rounded from side to side, surface dull, tessellate with sparse, indistinct punctures, which become crowded and more distinct in narrow apical band. Supraclypeal area dull, coarsely tessellate. Face above antennal fossae

with fine longitudinal rugulae and shagreening. Facial fovea extends to just below line across lower margins of antennal fossae, three times as long as broad; separated from lateral ocellus by about one ocellar diameter. Vertex above lateral ocellus short, equals less than one ocellar diameter. Genal area in profile equals about one and one-third times width of eye, surface dull, shagreened. Pronotum without humeral angles or lateral ridges, surface dull, shagreened.

Mesoscutum dull, finely tessellate, with punctures medially separated mostly by two or more puncture widths, near parapsidal lines and in anterior fifth or more; dorsal enclosure of propodeum finely punctatorugose basally, outside of enclosure tessellate with scattered obscure punctures; basal sulcus almost parallel-sided, short; dorsoposterior surface separated from lateral surfaces by distinct carinae. Pleurae dull, finely tessellate, punctures absent or obscure.

Metasomal tergum 1 tessellate, somewhat more finely so in apical area, with minute obscure punctures not much larger than tesserae, separated by two to four puncture widths. Terga 2–4 similarly sculptured, tergum 5 more densely punctate. Pygidial plate U-shaped, raised rim, if present, extremely narrow. Sterna 2–5 with basal areas finely tessellate, slightly shiny, with distinct punctures separated by half to two puncture widths.

Vestiture. White to pale ochraceous except as follows: facial fovea with tomentum silvery white to entirely white in lower half and pale yellow to golden in upper half; terga 5 and 6 with mediobasal hairs dark ochraceous; inner surfaces of tarsi light yellow. Dorsal thoracic hairs long, mostly longer than width of flagellum. Tergum 2 with apical fascia of pale hairs interrupted medially by less than one-third width of tergum; terga 3 and 4 with complete apical pale fasciae. Tibial scopal hairs simple to weakly plumose; propodeal corbicula incomplete anteriorly with long internal hairs; trochanteral flocculus complete but relatively sparse.

MALE: Measurements and Ratios. N = 16; length, 7–9 mm; width, 1.5–2.5 mm; WL, M = 2.30±0.633 mm; FL/FW, M = 1.02±0.008; FS1/FS2, M = 2.06± 0.043.

Integumental Color. As in female except terga 2–5 with apical areas more broadly hyaline apically.

Structure. Antennae short, female-like; flagellar segment 1 twice as long as segment 2 or slightly longer, segment 2 usually slightly longer than 3, broader than long, segments 4–7 about as long as broad; scape length as in female. Eyes each almost four times as long as broad, inner margins diverging towards vertex. Mandibles apposite, short, with subapical tooth. Galeae as in female. Maxillary palpus as in female but ratio about as 0.7:1.0:0.6:0.6:0.5:0.6. Labial palpus as in female but ratio about as 1.0:0.5:0.4:0.5. Labral process short, more than twice as broad as long, apical margin gently concave, surface shiny; labrum apical to process about as long as process, finely shagreened. Clypeus sculptured as in female but punctures slightly more distinct and denser, separated mostly by one to two puncture widths. Supraclypeal area, face above antennal fossae, and vertex and genal area as in female.

Pronotum as in female. Thoracic sculpturing as in female except as follows: anterior fifth of mesoscutum with punctures sparse, mostly separated by two puncture widths; propodeum with dorsoposterior and lateral surfaces separated by weak carinae extending up from below to about half the length of propodeum.

Metasomal terga 1–6 sculptured as in female terga 1–5 but surfaces slightly shinier. Sterna as in female. Sterna 7 and 8 as in Figs. 20 and 21. Note that sternum 7 has apical lobes evenly rounded on external edges and median emargination narrow. Sternum 8 has apex not at all emarginate or extremely shallowly so, area of broad, flattened hairs covering half or more of neck.

Vestiture. Generally white to pale ochraceous but inner surfaces of tarsi pale yellow. Metasomal terga 2–5 with weak short apical pale fasciae, those on terga 2 and 3 interrupted

medially and often on tergum 4. Sterna 2–5 with distinct pale subapical fimbriae of long, almost straight, dense, plumose, white hairs.

Type Material. The holotype male of *escondida* (CAS 15,331) was collected at Rancho Escondido, Santa Catalina Island, Los Angeles Co., California, from flowers of *Encelia californica*, March 31, 1938, by W.P. Cockerell.

Distribution. *Andrena escondida* is known (Fig. 1) from Yolo County in central California south to San Diego County. It has been collected from March 2 through May 12, but chiefly in March and April. A total of 12 females and 16 males from localities listed below (including localities cited in the literature) were studied.

CALIFORNIA. ALAMEDA CO.: Midway. FRESNO CO.: Big Panoche Creek (Fresno-San Benito County line). KERN CO. LOS ANGELES CO.: Gorman (5 mi. S); Los Angeles; Santa Catalina Island. SAN DIEGO CO.: Escondido. SAN JOAQUIN CO.: Hospital Canyon; Tracy (6 mi. W). SANTA BARBARA CO.: Cachuma Canyon (2 mi. NW). SOLANO CO.: Dixon (8 and 9 mi. S); Putah Canyon. STANISLAUS CO.: Modesto. TULARE CO.: Visalia. YOLO CO.: Davis.

Floral Records. *Andrena escondida* should be considered as an oligolege of composites of the genus *Layia*. It has been collected from the plants listed below (including records in the literature).

Brassica sp., *Calchortus catalinae*, *Encelia californica*, *Lasthena chrysostoma*, *Layia* sp., *L. chrysanthemoides*, *Plagiobothrys* sp.

Andrena (Hesperandrena) pulverea Viereck

Andrena pulverea Viereck, 1917, Proc. Acad. Nat. Sci. Philadelphia, 68:569–570.

Andrena (Hesperandrena) limnanthis Timberlake, 1951, Proc. United States Nat. Mus., 101:387–388. **New synonymy.**

The female of *Andrena pulverea* is like that of *escondida* in lacking pronotal humeral angles and lateral ridges but can be recognized by the large labral process which is entire, about one and one-half times as broad as it is long, usually triangular with a low apical boss. The male of *pulverea* is like that of *escondida* in having a black clypeus but can be separated from that species by the presence of weak humeral angles, flagellar segment 3 being slightly longer than segment 2, rather than the inverse, and the lack of sternal subapical fimbriae.

FEMALE: Measurements and Ratios. N = 20; length, 9–10 mm; width, 2.0–2.5 mm; WL, M = 2.68±0.125 mm; FL/FW, M = 0.94±0.005; FOVL/FOVW, M = 3.04±0.047.

Integumental Color. Black except as follows: mandible with apical fifth to almost half rufescent; flagellum below dark brown; wing membranes hyaline, slightly infumate, yellowed, veins reddish brown to dark brown; metasomal terga with apical areas often slightly reddened, narrowly hyaline apically; tibial spurs yellow.

Structure. Antennal scape as long as first four flagellar segments or slightly shorter; flagellar segment 1 slightly longer than segments 2 plus 3, segments 2 and 3 subequal, shorter than 4, segments 5–7 about as long as broad. Eyes each almost four and a half times as long as broad, inner margins parallel. Mandibles short, apposite, with subapical tooth. Malar space short, linear. Galea as in *escondida*. Maxillary palpus as in *escondida* but segmental ratio about as 0.7:1.0:0.8:0.7:0.6:0.6. Labial palpus normal, segmental ratio about as 1.0:0.5:0.5:0.6. Labral process large, entire, usually triangular with blunted apex and small apical boss, occasionally rounded with apical boss; labrum apical to process as in *escondida*. Clypeus as in *escondida* but punctures sparse and indistinct almost to apical margin. Supraclypeal area and face above antennal fossae as in *escondida*. Facial fovea as

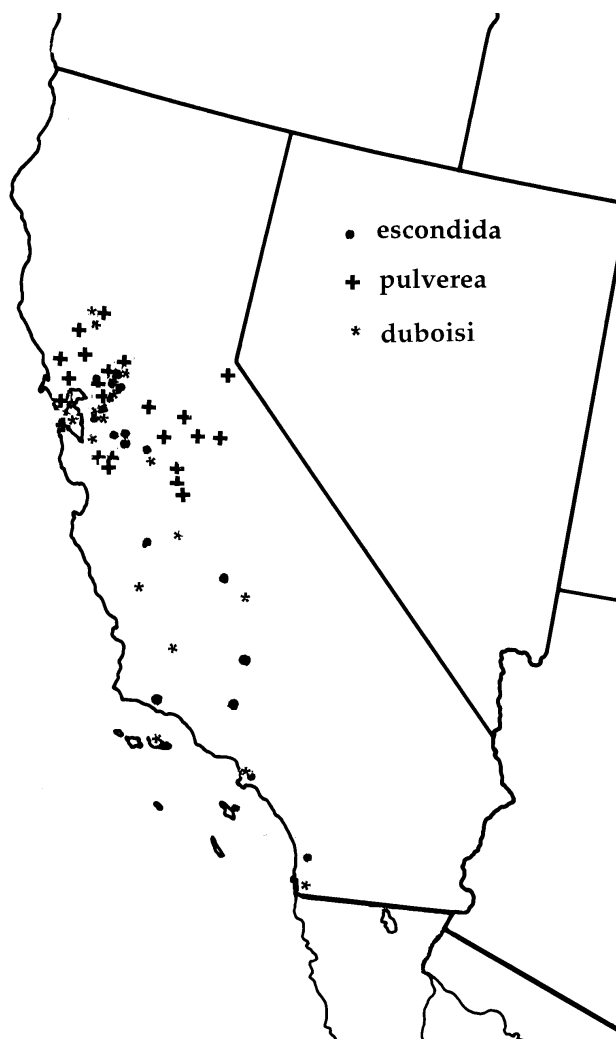


Fig. 1. Map showing the known distribution of *A. pulverea*, *A. escondida*, and *A. duboisi*.

in *escondida* but slightly longer. Vertex above lateral ocellus usually equals less than half an ocellar diameter. Genal area in profile as in *escondida*.

Pronotum as in *escondida*. Mesoscutum sculptured as in *escondida* but punctures sparse, obscure in anterior third and near parapsidal lines. Scutellum tessellate, punctures minute, widely separated. Propodeum as in *escondida* but dorsal enclosure not roughened basally. Pleurae as in *escondida*.

Metasomal terga sculptured as in *escondida*, punctures minute, essentially impunctate. Pygidial plate and sternal sculpturing as in *escondida*.

Vestiture. White to pale ochraceous except as follows: facial fovea with tomentum brown to golden brown, facial hairs otherwise often dark ochraceous; inner surfaces tarsi light yellow; scopal hairs often golden-brown along margin. Terga 2–4 with apical pale fasciae extremely weak, thin, that of tergum 2 interrupted medially by more than one-third width of tergum. Pollen-collecting hairs as in *escondida* but trochanteral flocculus usually with more abundant hairs.

MALE: Measurements and Ratios. N = 20; length, 7–9 mm; width, 1.5–2.5 mm; WL, M = 2.41 ± 0.123 mm; FL/FW, M = 0.96 ± 0.006 ; FS1/FS2, M = 1.85 ± 0.045 .

Integumental Color. As in female except as follows: wing membranes less infumate, veins often dark red; terga with apical areas translucent, ferruginous; sterna 2–5 narrowly hyaline apically.

Structure. Antennae short, female-like; flagellar segment 1 usually slightly shorter than in *escondida*, twice as long as segment 2, segment 3 distinctly longer than 2, broader than long, segments 4–7 usually slightly longer than broad; scape length as in female. Mandibles apposite, short, with subapical tooth. Maxillary palpus and segmental ratio as in female. Labial palpus as in female but ratio about as 1.0:0.5:0.5:0.5. Labral process about twice as long as broad, at least as long as labrum apical to process, bidentate, recurved, shiny. Clypeus sculptured as in female but punctures more abundant, separated mostly by one to three diameters. Face above antennal fossae with minute rugulae often strongly diverging towards ocelli. Vertex as in female. Genal area at least one and one-half times as broad as eye in profile, sculptured as in *escondida*. Pronotum with distinct humeral angles and weak lateral ridges. Thoracic sculpturing as in female. Metasomal terga sculptured as in female; sterna 2–5 tessellate, dull, with punctures mostly obscure. Terminalia (Figs. 22 and 23). Sternum 7 much as *escondida* but apical lobes slightly more separated; sternum 8 usually longer and narrower than in *escondida*.

Vestiture. White to pale ochraceous but inner surfaces of tarsi pale yellow and occasionally brown along inner margins of eyes and on vertex near ocelli. Metasomal terga 2–5 with apical pale fasciae extremely weak, that of tergum 2 interrupted medially by half width of tergum or more. Sterna 2–5 without dense subapical fimbriae of pale hairs.

Type Material. The holotype female of *pulverea* (PANS No. 4,043) was collected in California. The holotype female of *limnanthis* (USNM No 59,277) was collected at San Geronimo, Marin Co., California, April 23, 1913 by J.C. Bridwell.

Distribution. *Andrena pulverea* is known (Fig. 1) only from central California from Colusa County in the north to Merced County in the south. It has been collected from March 1 to June 2, but chiefly in late March and April. In addition to the types a total of 349 females and 93 males were examined from localities listed below (including records from the literature).

CALIFORNIA. CALAVERAS CO.: Angels Camp. COLUSA CO.: Bear Valley (9.7 mi. N of Highway 20). ELDORADO CO.: Alta. LAKE CO.: Middletown. MARIN CO.: Cypress Ridge; Fairfax; Olema (2 mi. S); Point Reyes; San Geronimo. MERCED CO.: Snelling (8 and 9 mi. NE). NAPA CO.: Pope Valley (and vicinity). SACRAMENTO CO.: Fair Oaks. SANTA CLARA CO.: Mt. Hamilton (5 mi. E); San Antonio Valley. SAN JOAQUIN CO.: Clements. SOLANO CO.: Dozier (11–12 mi. S of Dixon); Dixon (11 mi. S); Green Valley Estates. SONOMA CO.: Agua Caliente; Santa Rosa. STANISLAUS CO.: Evergreen Road (3.2 mi. W of Highway 120); La Grange (9 and 13 mi. NW). TUOLUMNE CO.: Chinese Camp; Mather (4–5 mi. S). YOLO CO.: Davis (and 5 mi. W).

Floral Records. *Andrena pulverea* is an oligolege of flowers of the genus *Limnanthes* and has been collected from flowers of the plants listed below.

Baeria sp., *Blennospermum nannum*, *Limnanthes alba alba*, *L. douglasii*, *L. douglasii* var. *nivea*, *L. rosea*, *Montia perfoliata*, *Platystemon californicus*, *Ranunculus* sp., *Raphanus sativus*.

Andrena (Hesperandrena) duboisi Timberlake

Andrena (Hesperandrena) duboisi Timberlake, 1951, Proc. United States Nat. Mus., 101:390–392.

Andrena duboisi is a small species marked by the lack of pronotal humeral angles and ridges, a metallic green integument (especially head and thorax), and galeae which are shiny and only extremely faintly shagreened. The male of *duboisi* can further be told from

either *A. escondida* or *A. pulverea* by the yellow marking on the clypeus as described below and by sterna 2–5 having subapical fimbriae of extremely short, white plumose hairs.

FEMALE: Measurements and Ratios. N = 20; length, 6.5–7.5 mm; WL, M = 2.36 ± 0.143 mm; FL/FW, M = 0.79 ± 0.007 ; FOVL/FOVW, M = 2.85 ± 0.050 .

Integumental Color. Head and thorax metallic green except clypeus, scutellum, and metanotum often with violaceous reflections. Metasomal terga black with faint metallic green reflections; tergal apical areas hyaline apically to red or reddish brown basally; sterna without metallic reflections, apical areas more broadly hyaline. Wing membranes hyaline, yellow, veins red to reddish brown. Mandible with apical fifth to fourth rufescent; antennal flagellum brown below; tibial spurs light yellow.

Structure. Antennal scape as long as first four and one-third flagellar segments; flagellar segment 1 slightly longer than following two segments together; segment 2 about as long as 3 and shorter than 4; segments 5–7 about as long as broad. Eyes each three and two-thirds times as long as broad, inner margins parallel. Mandibles short, apposite, with subapical tooth. Malar space linear. Galea shaped as in *escondida*, surface shiny, faintly if at all shagreened. Maxillary palpus as in *escondida* but segmental ratio about as 0.8:1.0:0.8:0.7:0.5:0.7. Labial palpus as in *escondida* but ratio about as 1.0:0.5:0.5:0.7. Labral process short, two to three times as broad as long, weakly emarginate apically with rounded lateral angles; labrum apical to process about as long as process, moderately dulled by shagreening. Clypeus shaped as in *escondida*; dulled by fine tessellation and minute punctures separated mostly by about two puncture diameters except more crowded along apical margin. Supraclypeal area dulled by coarse tessellation. Face above antennal fossae with small parallel rugulae to ocelli. Facial fovea as in *escondida*. Vertex above lateral ocellus equals about half an ocellar diameter. Genal area in profile one and one-half times width of eye or slightly less, surface dull, shagreened.

Pronotum without humeral angle or lateral ridge or with only a trace of these structures; surface dull, shagreened. Mesoscutum as in *escondida* but punctures separated by one to three puncture widths except slightly more crowded peripherally. Scutellum and metanotum similar. Propodeum as in *escondida* but finely punctatorugose, basal area extremely narrow. Pleurae as in *escondida*.

Metasoma sculptured as in *escondida*, virtually impunctate. Pygidial plate as in *escondida* but usually more pointed, V-shaped with apex rounded. Sterna as in *escondida*.

Vestiture. White to pale ochraceous except as follows: facial fovea with tomentum pale brown in upper three-fourths or more, pale at lower end only; hind tarsi with inner surface pale yellow; terga 2–4 with distinct apical pale hair bands, that on tergum 2 interrupted medially by less than one-third width of tergum, terga 3 and 4 with bands complete. Pollen-collecting hairs as in *escondida*.

MALE: Measurements and Ratios. N = 9; length, 6.0–7.0 mm; width, 1.0–1.5 mm; WL, M = 1.68 ± 0.169 mm; FL/FW, M = 0.95 ± 0.006 ; FS1/FS2, M = 2.10 ± 0.087 .

Integumental Color. As in female except as follows: clypeus with mediobasal pale yellow macula covering half of clypeus or more; head and thorax with metallic reflections blue or bluish green, mesoscutum occasionally with slight violaceous reflections; metasomal terga with metallic bluish green reflections on basal half of each tergum, hyaline apical margins broader than in female; distitarsi usually red.

Structure. Antennae short, female-like; flagellar segment 1 as long as 2 plus 3, which are subequal and shorter than 4, segments 5–8 as long as broad or slightly longer; scape as in female. Eyes each slightly longer than three times as long as broad, diverging

strongly towards vertex. Mandibles apposite, short, with subapical tooth. Galea as in female, shiny. Maxillary palpus as in female but segmental ratio about as 0.8:1.0:0.8:0.9:0.7:0.8. Labial palpus as in female but ratio about as 1.0:0.4:0.7:0.7. Labral process moderately long, about twice as broad as long, apical margin weakly emarginate, lateral teeth blunt, surface shiny; labrum apical to process about as long as process, dulled by shagreening. Clypeus sculptured as in female but minute punctures more abundant. Supraclypeal area as in female. Face above antennal fossae with parallel rugulae almost from inner eye margin to inner eye margin, in median third or less of facial area rugulae often diverge towards ocelli. Vertex short as in female. Pronotum with distinct humeral angles and complete lateral ridges, surface shagreened. Mesoscutum and scutellum sculptured much as in female. Propodeum as in female but surface outside of dorsal enclosure with punctures usually more distinct. Pleurae as in female.

Metasomal terga 1–6 sculptured as in female terga 1–5 but surfaces slightly shinier. Sterna much as in female. Sternum 7 has apical lobes broad and flattened, emargination much reduced. Sternum 8 with thick neck region, distinctly thicker than entire apical lobe.

Type Material. The female holotype (USNM No. 59, 279) of *Andrena duboisi* was collected at Davis, California, May 2, 1937 by J.J. DuBois.

Distribution. *Andrena duboisi* occurs in California (Fig. 1) from Colusa County in the north to San Diego County in the south. It has been collected from March 19 through May 12 and a total of 63 females and 9 males have been taken from localities listed below (including localities cited in the literature).

CALIFORNIA. ALAMEDA CO.: Niles. COLUSA CO.: Bear Valley (9.7 mi. N of Highway 20 and 13.5 km. N of Wilbur Springs). CONTRA COSTA CO.: Russelmann Park (Mt. Diablo); Walnut Creek. FRESNO CO.: Mendota. LOS ANGELES CO.: Los Angeles. MONTEREY CO.: Parkfield (6 mi. NE). SAN DIEGO CO.: San Diego. SAN FRANCISCO CO.: San Francisco. SAN LUIS OBISPO CO.: Simmler (15 mi. SE). SANTA BARBARA CO.: Christi Beach, Santa Cruz Island. SOLANO CO.: Dixon (9 mi. S); Dozier (11 mi. S of Dixon). STANISLAUS CO.: Turlock. TULARE CO.: Strathmore. YOLO CO.: Davis.

Floral Records. *Andrena duboisi* was collected at Davis by J.J. DuBois presumably at *Baeria* sp., according to Timberlake (1951). It has been collected from flowers listed below.

Baeria sp., *B. chrysostoma*, *Blennosperma nannum*, *Centromadia pungens*, *Lasthenia chrysostoma*, *Layia chrysanthemoides*, and *Limnanthes douglasii*.

Andrena (Hesperandrena) lativentris Timberlake

Andrena lativentris Timberlake, 1951, Proc. United States Nat. Mus., 101:388.

Andrena lativentris is a small species with pronotal humeral angles and lateral ridges in both sexes (although weak in the females) and black integument. The female can be recognized by the broad facial fovea separated from the lateral ocellus by about half an ocellar diameter or a little more and by the mesoscutal and scutellar hairs being mostly shorter than the width of the flagellum, although longer peripherally and especially in anterior fifth of the mesoscutum. The male of *lativentris* is marked by a yellow clypeal macula and sterna 2–5 with distinct subapical fimbriae of long, curled, relatively sparse, pale hairs.

FEMALE: Measurements and Ratios. N = 20; length, 8.0–9.5 mm; width, 2.0–3.0 mm; WL, 2.73±0.095 mm; FL/FW, 0.90±0.027; FOVL/FOVW, 2.78±0.56.

Integumental Color. Black except as follows: mandible with apical fourth rufescent; flagellum reddish brown below; wing membranes hyaline, not infumate, veins dark red or

reddish brown; metasomal terga 2–4 with apical areas broadly hyaline, colorless in apical fourth to third, reddened basally; tibial spurs pale yellow.

Structure. Antennal scape as long as first four flagellar segments or slightly more; flagellar segments as in *escondida*. Eyes each four times as long as broad, inner margins parallel. Mandibles short, apposite, with subapical tooth. Malar space short, linear. Galea as in *escondida*. Maxillary palpus as in *escondida* but segmental ratio about as 0.8:1.0:0.7:0.5:0.5:0.6. Labial palpus with ratio about as 1.0:0.5:0.4:0.4. Clypeus short, sculptured as in *escondida* but punctures extremely obscure. Supraclypeal area and face above antennal fossae sculptured as in *escondida*. Facial fovea extends below to just below a line at lower margins, antennal fossae two and one-fourth to two and one-third times as long as broad, separated from lateral ocellus by half an ocellar diameter or slightly more. Vertex above lateral ocellus short, equals about half an ocellar diameter or slightly more. Genal area in profile equals about one and one-third width of eye, surface dull, shagreened.

Pronotum without humeral angles and lateral ridges, surface dull, shagreened. Mesoscutum densely and finely tessellate, punctures minute, obscure, visible only at certain angles, separated by two or more puncture widths (slightly more crowded in anterior fifth and at extreme sides). Scutellum similar, not at all shiny. Propodeum declivous; dorsal enclosure tessellate, not at all punctatorugose; outside of enclosure with small sparse punctures; lateral carinae separated lateral from posterior surface complete. Pleurae dull, tessellate, punctures obscure, sculptured as in *escondida*.

Metasomal terga tessellate, dull, impunctate or punctures minute and obscure. Pygidial plate as in *escondida*. Sterna sculptured as in *escondida*.

Vestiture. White to pale ochraceous except as follows: facial fovea with tomentum silvery white to pale ochraceous, not brown in upper halves or more; metasomal terga 2–4 with white apical fasciae, that of tergum 2 narrowly interrupted medially; tergum 5 dark ochraceous medially. Pollen-collecting hairs as in *escondida*.

MALE: Measurements and Ratios. N = 15; length, 6.0–9.0 mm; width 2.0–3.0 mm; WL, M = 2.44±0.224 mm; FL/FW, M = 0.94±0.014; FSI/FS2, M = 1.92±0.085.

Integumental Color. As in female except as follows: clypeus with large pale yellow maculae, dark laterally and apically; metasomal terga 2–5 with apical areas with at least apical halves hyaline, colorless; distitarsi rufescent.

Structure. Antennae short, female-like; flagellar segment 1 at least twice as long as segment 2, which equals segment 3, and broader than long; segments 4–7 about as long as broad; scape length as in female. Eyes three and one third times as long as broad, inner margins diverging towards vertex. Mandibles apposite, short, with subapical tooth. Galea as in female. Maxillary palpus as in female but ratio about as 0.8:1.0:0.6:0.6:0.5:0.7. Labial palpus as in female but ratio about as 1.0:0.4:0.4:0.5. Labral process short, about twice as broad as long, emarginate, reflexed, shiny; labrum apical to process shorter than process. Clypeus dull, sculptured as in female. Supraclypeal area, face above antennal fossae and vertex as in female. Genal area as in female but only slightly broader than eye in profile.

Pronotum with weak humeral angles, lateral ridges present but weak, defined only above diagonal pronotal suture, dulled by fine shagreening. Thoracic sculpturing as in female but propodeum often finely punctatorugose at least basally; carina between lateral and posterior faces incomplete, short.

Metasomal terga sculptured as in female but surface slightly shiny, especially apical areas. Sternum 7 (Fig. 28) with lobes angulate laterally, apical imargination narrower. Sternum 8 (Fig. 29) with apical lobe entire, neck slightly broader than apical lobe, sternum thicker and broader than in *pulverea*.

Vestiture. White except inner surfaces of tarsi pale yellow. Metasomal tera 2–5 with relatively weak apical fasciae, broadly interrupted medially on tergum 2 and narrowly on tergum 3. Sterna 2–5 with distinct pale subapical fimbriae of long, sparse, curled, white hairs (as in *escondida* but longer and sparser).

Type Material. The holotype female of *lativentris* (USNM No. 59,278) was collected from flowers of *Baeria tenella* at Strathmore, Tulare Co., California, May 29, 1937.

Distribution. *Andrena lativentris* has been collected in California (Fig. 2) from Colusa County south to San Diego County. It has been taken from March 9 through July 5, but chiefly from late March into May. A total of 24 females and 17 males were examined from localities listed below (including localities cited in the literature).

CALIFORNIA. COLUSA CO.: Bear Springs (S of Leesville). CONTRA COSTA CO.: Mt. Diablo; Russelman Park. KERN CO.: no locality. NAPA CO.: Butts Canyon (0.5 mi. S. of Napa Co. line). RIVERSIDE CO.: Elsinore; Hemet Lake, San Jacinto Mts.; Herkey Creek, San Jacinto Mts. SAN DIEGO CO.: Cuyamaca Lake. SOLANO CO.: Dixon (9 mi. S); Dozier (11 mi. S. of Dixon). TULARE CO.: Earlimart; Goshen (5.6 mi. N); Strathmore. YOLO CO.: Davis.

Floral Records. *Andrena lativentris* is probably an oligolege of *Baeria* sp., but little is known concerning its floral preferences as yet. It has been collected from flowers of the following plants (records from the literature are included).

Baeria sp., *B. gracilis*, *B. tenella*, *Blennospermum nannum*, *Lasthenia chryostoma*, *Layia chrysanthemoides*, *L. platyglossa*.

Andrena (Hesperandrena) baeriae Timberlake

Andrena baeriae Timberlake, 1941, Bull. Southern California Acad. Sci., 39:194.

Andrena (Hesperandrena) baeriae: Lanham, 1949, Univ. California Publ. Ent., 8:208.

Andrena baeriae differs from females of the preceding species by the distinct pronotal angles and lateral ridges. As in *lativentris* the integument is black (occasional slight metallic tints may be present on the frons) and the facial fovea is broad, being separated from the lateral ocellus by less than one ocellar diameter. The female is often marked with brown hairs posteromedially on the mesoscutum and medially on the scutellum, as well as on the face along the inner margins of the eyes. The male of *baeriae* has (Fig. 10) pronotal angles and ridges (the integument posterior to the lateral ridge is frequently less shagreened and moderately shiny) and has sterna 2–5 with weakly formed subapical fimbriae of long hairs as described below.

FEMALE: Measurements and Ratios. N = 5; length, 8.5–10.0 mm; width, 2.5–3.0 mm; WL, M = 2.72±0.159 mm; FL/FW, M = 0.91±0.013; FOVL/FOVW, M = 1.90±0.045 mm.

Integumental Color. Integument black except as follows: frons above antennal fossae occasionally with slight metallic tints; mandibles with apical hyaline, veins red to reddish brown; metasomal terga narrowly hyaline apically, becoming dark towards base of apical area; tibial spurs pale yellow.

Structure. Antennal scape length about equal to first four flagellar segments; flagellar segment 1 as long as segments 2 plus 3, which are equal in length; segments 5–7 quadrate. Eyes each about four times as long as broad, inner margins parallel. Mandibles apposed, short, with subapical tooth. Malar space and galeae as in *escondida*. Maxillary palpus as in *escondida* but segmental ratio about as 0.8:1.0:0.7:0.6:0.5:0.6. Labial palpus as in *escondida* but ratio about as 1.0:0.5:0.6:0.6. Labrum as in *escondida* but usually gently emarginate apically. Clypeus, supraclypeal area and face above antennal fossae as

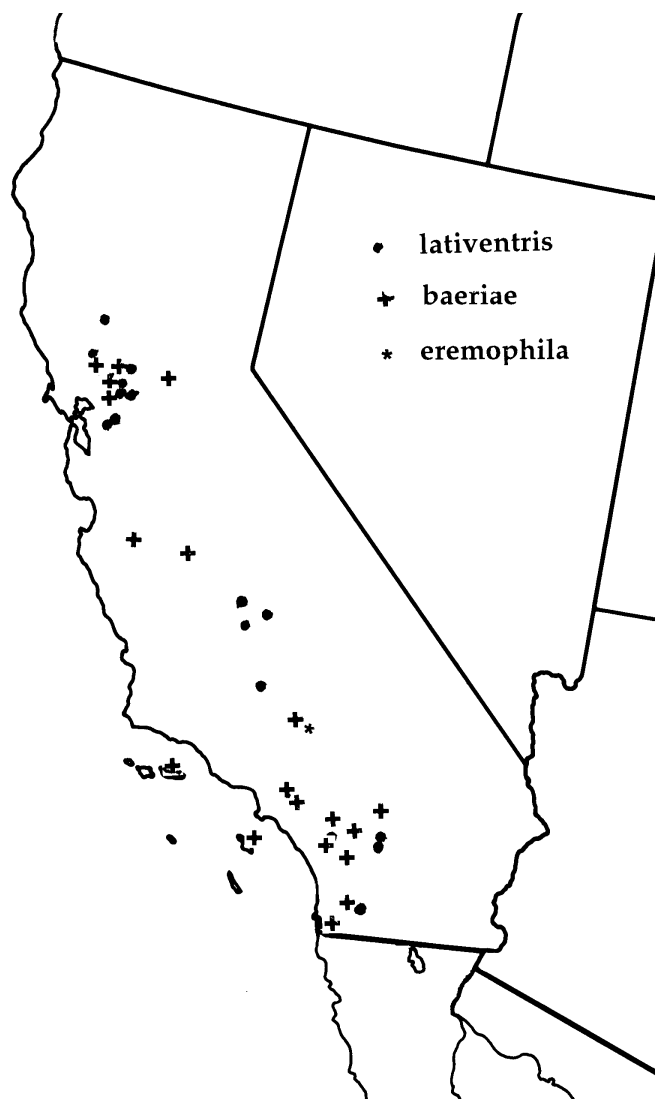


Fig. 2. Map showing the known distributions of *A. lativentris*, *A. baeriae*, and *A. eremophila*, n. sp.

in *escondida*. Facial fovea broad, separated from lateral ocellus by one ocellar diameter or somewhat more, extending below to well beyond a line across lower margins of antennal fossae. Genal area in profile almost one and one-half times as broad as eye, surface dull, shagreened.

Pronotum with humeral angles and lateral ridges (Fig. 10). Mesoscutum dull, tessellate, punctures sparse and obscure. Mesoscutum dull, tessellate, punctures sparse and obscure. Scutellum similar. Propodeum and pleurae as in *escondida*.

Metasomal terga sculptured as in *escondida*. Pygidial plate as in *escondida*, without raised rim in specimens at hand. Sterna 2–5 sculptured as in *escondida*.

Vestiture. White to pale ochraceous except as follows: along inner margins eyes and upper face dark ochraceous to brown; facial fovea with tomentum dark brown; mesoscutum and scutellum often with pale yellow hairs; apices of femora and tibial plates occasionally with brown hairs; terga 5 and 6 with brown hairs at least medially; tarsi with inner surfaces with pale yellow hairs. Mesoscutum and scutellum with hairs mostly longer than width of flagellum, relatively sparse; metasomal tergum 2 with apical pale fascia interrupted medially. Pollen collecting hairs as in *escondida*.

MALE: Measurements and Ratios. N = 11; length 6–8 mm; width, 1.5–2.0 mm; WL, M = 2.27 ± 0.370 mm; FL/FW, M = 0.95 ± 0.026 ; FS1/FS2, 2.24 ± 0.026 .

Integumental Color. As in female except as follows: terga 2–5 with apical areas more broadly hyaline apically, often half of apical area colorless; tergum 2 laterally usually with small, subapical, yellow spot surrounded by rufescent border, terga 1 and 3 rarely with similar spots but usually rufescent or reddish brown and without yellow.

Structure. Antennae short, female-like; flagellar segment 1 twice as long as segment 2, which is about as long as segment 3 and broader than long; segments 4–7 about as long as broad; scape length as in female. Eyes each about three and one-half times as long as broad or slightly longer, inner margins diverging towards vertex. Mandibles slightly decussate, short, with subapical tooth. Galeae as in female. Maxillary palpus as in female but ratio about as 0.8:1.0:0.8:0.5:0.5:0.6. Labial palpus as in female but ratio about as 1.0:0.5:0.4:0.5. Labral process and labrum as in *escondida*. Clypeus sculptured as in female but punctures slightly denser, separated largely by one to two puncture widths or less. Supraclypeal area as in female. Face above antennal fossae with rugulae as in female but diverging upward immediately below ocelli. Vertex and genal area as in female.

Pronotum with distinct humeral angles and lateral ridges, surface dulled by shagreening anterior to lateral ridge and shiny to moderately shiny posterior to ridge. Thoracic sculpturing as in female.

Metasomal sculpturing as in female but terga 1–5 slightly shinier. Sterna as in female. Sterna 7 and 8 small, sternum 7 (Figs. 13, 28) with emargination relatively deep and narrow, sides angulate near the apical margin; sternum 8 (Fig. 29) much as in *lativentris* but much smaller and narrower.

Vestiture. White to pale ochraceous but inner surfaces of tarsi pale yellow. Metasomal terga 2–5 with weak apical pale fasciae, those on terga 2 and 3 interrupted medially often by one-third width of tergum or more. Sterna 2–5 with distinct subapical fimbriae of long, curled, sparse hairs, individually each separated by two or more hair-widths so that distinct dense white bands not formed (as in *lativentris*).

Type Material. The holotype female (CAS No. 14,349) of *baeriae* was collected from flowers of *Baeria chrysostoma* var. *gracilis* and *B. aristata* at Riverside, California, from March 29 to April 6 by P.H. Timberlake.

Distribution. *Andrena baeriae* is known (Fig. 2) from San Diego County north to Yolo County, California. It has been collected from March 3 to July 5, but chiefly in late March into May. A total of 94 females and 16 males from the localities listed below (including records from the literature) were examined. La Mesa, San Diego County listed below is the probable locality for a single male labelled as from La Mesa, in Baja California, Mexico. However, the authors cannot find such a locality in Baja California. La Mesa in San Diego County, California, on the other hand, lies about 3 miles east of the San Miguel Mission in San Diego County which is mentioned on the original label and also not far from San Miguel Mountain. We conclude that an error was made on the hand-written label by the collector (T.D.A. Cockerell).

CALIFORNIA. KERN CO.: Rosamond (hills N of). FRESNO CO.: Mendota. LOS ANGELES CO.: Puente Hills; Santa Catalina Island; Whittier. NAPA CO.: Aetna springs (N. of Butts Canyon). RIVERSIDE CO.: Gavilan; Lake Perris; Riverside; Sta. Rosa Plateau Reserve (WSW of Murrieta). SACRAMENTO CO.: Folsom. SAN BENITO CO.: Hollister (35 mi. S). SAN BERNARDINO CO.: Morongo Valley. SAN DIEGO CO.: Lake Cuyamaca; La Mesa (3 mi. E of San Miguel Mission). SANTA BARBARA CO.: Christi Beach, Sta. Cruz Island. SOLANO CO.: Dixon (9 and 11 mi. S). YOLO CO.: Davis.

Floral Records. *Andrena baeriae* is probably an oligolege of flowers of the genus *Baeria* but little is actually known of its pollen preferences. It has been collected from

flowers of the plants listed below (including records from the literature).

Baeria sp., *B. aristata*, *B. chrysostoma* var. *gracilis*, *Layia* sp., *L. chrysanthemoides*.

***Andrena (Hesperandrena) leucomystax*, new species**

Andrena leucomystax is a small species with distinct pronotal angles and lateral ridges in both sexes. It differs from *lativentris* in both sexes by having distinctly metallic green integument on the face and mesoscutum, by having the scutellum and often the posteromedial area of the mesoscutum shiny with shagreening slight or absent. The female has metasomal terga 2 and 3 with apical pale fasciae that are much as in *escondida* or *baeriae*. The male has a dense beard of long white hairs on the mostly pale yellow clypeus and sterna 2–5 short white subapical fimbriae narrowly interrupted medially (usually by less than one-third width of tergum).

FEMALE: Measurements and Ratios. N = 20; length, 7.0–8.5 mm; width, 2.0–3.0 mm; wing length, M = 2.41±0.150 mm; FL/FW, M = 0.86±0.006; FOVL/ FOVW, M = 2.99±0.077.

Integumental Color. Black except as follows: frons above antennal fossae with greenish metallic tints; mandible with apical third to half rufescent; flagellar segments 3–10 dark red below, segments 1 and 2 dark brown; mesoscutum with anterior third with metallic green tints; wing membranes hyaline, yellowed, veins red to reddish brown; metasomal terga hyaline apically, becoming dark towards base of apical area, usually without metallic tints basally; tibial spurs testaceous.

Structure. Antennal scape as in *baeriae*. Eyes as in *baeriae* but diverging slightly towards vertex. Mandibles and malar space as in *escondida*. Face sculptured much as in *escondida* and *baeriae*. Galeae as in *escondida* except surface shiny, not at all tessellate or shagreened. Maxillary palpus short as in *baeriae*, segmental ratio about as 1.0:0.8:0.6:0.5:0.3:0.4. Labrum as in *baeriae*, with process short, broad, gently emarginate apicomediaally. Clypeus, supraclypeal area and face above antennal fossae as in *escondida* but face above antennal fossae with longitudinal rugulae relatively coarse. Facial fovea relatively short and narrow, separated from lateral ocellus by one ocellar diameter or slightly more. Vertex above lateral ocellus equal to half an ocellar diameter. Genal area as in *baeriae*.

Pronotum with humeral angles and lateral ridges well formed, space posterior to lateral ridge relatively shiny. Mesoscutum usually shiny and without shagreening posteromedially, otherwise as in *baeriae*. Scutellum usually without shagreening, shiny, with punctures scattered peripherally (Fig. 19). Propodeum and pleurae as in *escondida*.

Metasomal terga sculptured much as in *escondida* or *baeriae* but tergum 1 not densely tessellate, rather coarsely shagreened, and terga 2–4 with basal areas usually moderately shiny, shagreened but not densely so. Sterna 2–5 sculptured much as in *escondida*.

Vestiture. White to pale ochraceous except as follows: facial fovea with tomentum pale brown to dark ochraceous; vertex and thoracic dorsum with hairs ochraceous to yellow; terga 2–4 with white apical fasciae, those on terga 2 and 3 narrowly interrupted medially usually by distinctly less than one-third width of tergum; terga 5 and 6 with vestiture white. Pollen collecting hairs as in *escondida* (Figs. 16 to 18).

MALE: Measurements and Ratios. N = 20; length, 6.0–8.0 mm; width 1.2–2.0 mm; wing length, M = 2.26±0.190 mm; FL/FW, M = 0.93±0.007; FS1/FS2, M = 2.09±0.034.

Integumental Color. As in female except as follows: clypeus pale yellow except narrow infuscation along posterior border and in lateral angles and dark apical border;

terga 1–3 basal areas without lateral pale spots; face above antennal fossae and anterior third of mesoscutum with metallic green reflections.

Structure. Antennae short, female-like; flagellar segment 1 as long as segments 2 and 3 together or slightly longer; segment 2 subequal in length to segment 3; segments 4–6 about as long as broad, remaining segments distinctly longer. Eyes, mandible, and genal area as in *baeriae*. Galea as in female, surface shiny, unshagreened. Maxillary palpus as in female, ratio about as 1.0:1.0:0.8:0.6:0.4:0.8. Labial palpus as in female but segmental ratio about as 1.0:0.6:0.7:0.6. Labral process somewhat recurved, distinctly toothed. Clypeus sculptured as in female, but punctures not evident due to pale color. Supraclypeal area and face above antennal fossae sculptured as in female. Vertex and genal area as in female.

Pronotum with distinct humeral angles and lateral ridges, surface anterior to ridge tessellate, dull, posterior to ridge moderately shiny. Mesoscutum usually with small posteromedian area shiny, unshagreened; scutellum usually shiny, unshagreened or relatively faintly so.

Metasomal sculpturing as in female but terga 2–5 usually slightly shinier. Sterna as in female. Sternum 7 (Fig. 30) similar to that of *duboisii* (Fig. 24) but apical lobes broader and slightly slanted from the apex, median emargination slightly deeper; sternum 8 (Fig. 31) with apical lobe entire, neck region much broadened posteriorly as in *duboisii* (Fig. 25).

Vestiture. White to pale ochraceous but inner surfaces of tarsi pale yellow. Metasomal terga 2–5 with white apical fasciae usually interrupted medially on terga 2–4 as in *baeriae*. Sterna 2–5 with weak subapical fimbriae of extremely short, white, plumose hairs (as in *duboisii*).

Type Material. The holotype female and allotype male with one female paratype of *leucomystax* were reared from a nest site located at 9 miles S of Dixon, Solano County, California, October 18, 1968 by B.J. Donovan. The holotype and allotype are deposited in the collection of the California Academy of Sciences.

Distribution. *Andrena leucomystax* is known (Fig. 3) only from California. In addition to the type series associated with the holotype, 27 female and 24 male paratypes (CAS, UCD, UCR, LACM, USU, INHS) from California were collected as follows:

CALIFORNIA. FRESNO CO.: Coalinga (14.5 mi. N).— 1 female, Mar. 21, 1963, J.W. MacSwain. Mendota.— 4 females, March 22, 1967, R.R. Snelling; 2 males, March 14, 1957 from *Baeria* sp., R.R. Snelling. SAN LUIS OBISPO CO.: Simmler (15 mi. SE at south end of Soda Lake).— 1 male, March 2, 1969, H.B. Leach. SOLANO CO.: Dixon (9 mi. S).— 2 males on *Layia chrysanthemoides*, April 17, 1969, R.W. Thorp; 2 males, April 11, 1975, R.B. Kimsey; 1 male, April 24, 1969, R.W. Thorp; 2 females, April 27, 1949, W.F. Chamberlain on *L. chrysanthemoides*. Dozier (11 mi. S of Dixon).— 1 female on *Blennospermum nanum* Mar. 26, 1969, R.W. Thorp; 1 female, 1 male on *Limnanthes douglasii*, Mar 26, 1969, B.J. Donovan; 1 female on *Lasthenia chrysostoma*, April 3, 1969, B.J. Donovan; 1 female on *B. nanum*, Apr. 3, 1969, D.L. Briggs; 1 female, 2 males on *B. nanum*, March 19, 1969, R.W. Thorp; 3 females on *L. chrysostoma*, Apr. 17, 1969, R.W. Thorp; 5 females on *L. chrysostoma*, May 1, 1969, D.L. Briggs; 1 male on *B. nannum*, March 8, 1969, B.J. Donovan; 1 male, April 3, 1971, R.W. Thorp; 2 males on *B. nannum*, March 26, 1969, B.J. Donovan; 1 male on *B. nannum*, April 11, 1969, B.J. Donovan; 2 males on *L. chrysostoma*, April 3, 1969, B. J. Donovan; 2 males, April 3, 1969, J. Marsh; 1 male at nest, May 1, 1969, R.W. Thorp; 1 female on *B. nannum*, March 19, 1969, B.J. Donovan; 2 males on *Downingia pulchella*, April 24, 1969, R.W. Thorp; 1 female on *L. lasthenia*, May 1, 1969, R.W. Thorp; 1 male at nest site, April 3, 1969, B.J. Donovan; 1 female at nest site, May 1, 1969, B.J. Donovan. STANISLAUS CO.: LaGrange.— 1 female on *Baeria* sp., April 26, 1952, R. Snelling. TULARE CO.: Strathmore.— 1 female on

Baeria tenella, March 28, 1937, P.H. Timberlake. YOLO CO.: Davis.— 1 female, May 12, 1937, J.J. DuBois. Winters.— 1 female on *Baeria* sp., March 6, 1947, G.E. Bohart.

Andrena (Hesperandrena) dissona, new species

Andrena dissona is a small bee which has a distinct pronotal humeral angle and lateral ridge in both sexes. The female can be distinguished from that of other species with distinct pronotal angle and ridge by having a black, moderately shiny to shiny mesoscutum and scutellum, the apical fascia of tergum 2 usually broadly interrupted medially and has the mesoscutal punctures (especially just inside of parapsidal lines) more distinct and more crowded. The male has a partly yellow clypeus and sterna 2–5 with subapical fimbriae of long, down-curved, weakly plumose, relatively sparse hairs.

FEMALE: Measurements and Ratios. N = 5; length, 7.0–7.5 mm; width, 2.25–2.50 mm; wing length, 2.44 ± 0.287 mm; FL/FW, M = 0.85 ± 0.011 ; FOVL/FOVW, M = 2.63 ± 0.16 .

Integumental Color. Black except as follows: metallic tints occasionally present on face above antennal fossae but absent on mesonotum and mesepisternum; metasomal terga with apical areas entirely or largely hyaline, clear to yellowish; terga 1 and 2 with basal areas with small, apical, brownish yellow, apicolateral spots, with a narrow yellowish line connecting spots across tergum; sterna with apical areas hyaline; wing membranes hyaline, veins reddish brown.

Structure. Antennal scape equal to or slightly less than first four flagellar segments; flagellar segments as in *baeriae* but segments 5–9 about as long as broad or slightly longer, segment 10 distinctly longer than broad. Mandibles, malar space and galeae as in *baeriae* but galeae shinier, shagreening delicate (not as shiny as in *perdissona*). Labrum short and broad as in *baeriae* but usually not emarginate apicomediaally. Maxillary palpus as in *escondida* but segmental ratio about as 1.0:1.0:0.8:0.6:0.4:0.7. Labial palpus as in *escondida* but ratio about as 1.0:0.6:0.4:0.7. Clypeus, supraclypeal area and face above antennal fossae as in *escondida* but clypeal punctures somewhat more abundant in apical half and more distinct. Facial fovea and genal area as in *baeriae*. Vertex above lateral ocellus equals about half an ocellar diameter.

Pronotum with distinct humeral angles and lateral ridges. Mesoscutum moderately shiny, shagreening coarse; punctures moderately well formed, in area just mesad of parapsidal line mostly separated by one puncture width or slightly less. Scutellum similar but occasionally shagreening less distinct, moderately shiny. Propodeum and pleurae as in *escondida*.

Metasomal terga sculptured as in *escondida*. Pygidial plate as in *escondida*, with broad raised rim especially in apical two-thirds. Sterna 2–5 as in *escondida*.

MALE: Measurements and Ratios. N = 15; length, 6.5–7.0 mm; width, 2.0–2.5 mm; wing length, M = 2.23 ± 0.128 mm; FL/FW, M = 0.86 ± 0.007 ; FS1/FS2, M = 2.13 ± 0.065 .

Integumental Color. Black except as follows: clypeus with cream-colored or pale yellow mediobasal macula, apical third or fourth and lateral angles of clypeus black; face above antennal fossae and mesepisterna often with faint metallic reflections; flagellum below dark reddish brown; wing membranes hyaline, clear, veins reddish brown; metasomal terga and sterna with apical areas hyaline, colorless to slightly yellowed basally.

Structure. Antennae short, female-like; flagellar segment 1 longer than segments 2 plus 3, segment 2 subequal in length to 3 which is slightly shorter than 4, segments 5–10 about as long as broad, 11 distinctly longer than broad. Eyes each about one and one-half

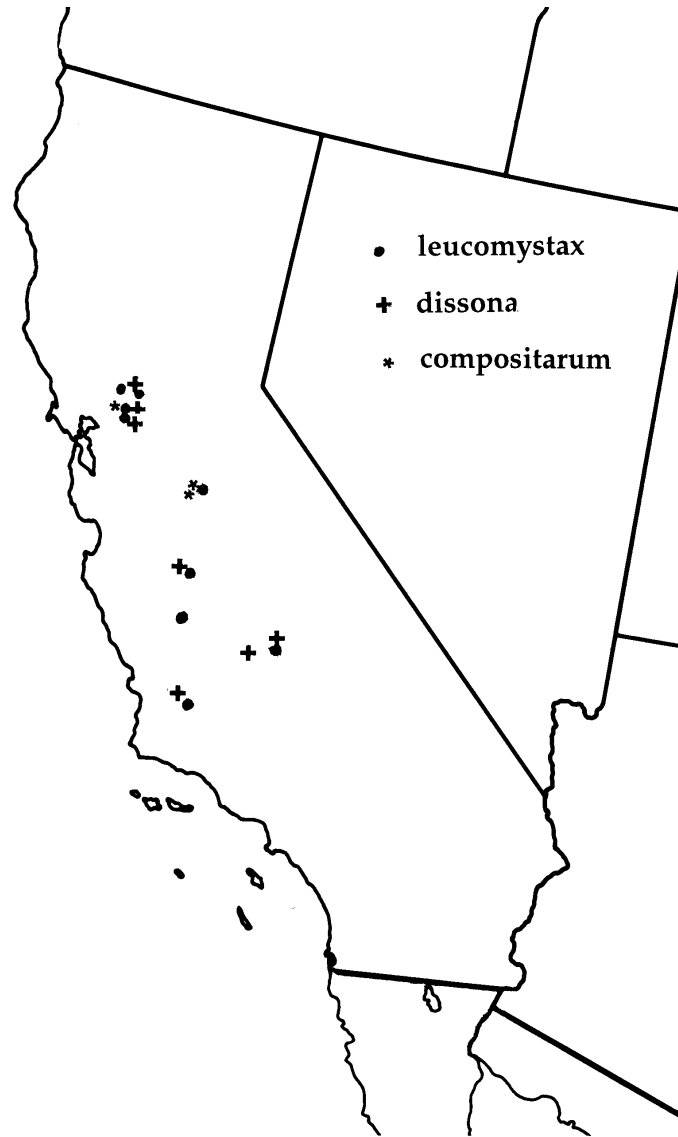


Fig. 3. Map showing the known distributions of *A. leucomystax*, n. sp.; *A. dissona*, n. sp.; and *A. compositarum*, n. sp.

times as long as broad, inner margins diverge towards vertex. Mandibles and galeae as in *baeriae*. Maxillary palpus as in female but segmental ratio about as 1.0:1.0:0.7:0.6:0.4:0.7. Labial palpus as in *baeriae* but ratio about as 1.0:0.3:0.2:0.3. Labral process and labrum as in *escondida* but not at all or only slightly emarginate apicomediaally. Clypeus as in *baeriae* but punctures hardly visible. Supraclypeal area and face above antennae as in *baeriae*. Vertex above lateral ocellus equals about half an ocellar diameter.

Pronotum with distinct humeral angles and lateral ridges much as in *baeriae*. Thoracic sculpturing as in female but scutellum occasionally moderately shiny, shagreened.

Metasomal sculpturing as in female but terga 3–5 moderately shiny. Sterna as in female. Sternum 7 (Fig. 32) with apical lobes narrow, sides not strongly angulate, emargination deep and narrow; sternum 8 (Fig. 33) much as in *lativentris* but much smaller.

Vestiture. White to pale ochraceous but on inner surfaces of tarsi yellow and on dorsum of thorax often slightly darker ochraceous. Metasomal terga 2–5 with weak apical pale fasciae, those on terga 2 and 3 interrupted medially, usually by more than a third of width of tergum. Sterna 2–5 with subapical fimbriae of relatively sparse, long, curved downward, plumose hairs.

Type Material. The holotype female of *dissona* (CAS) was collected at Strathmore, Tulare Co., California, from flowers of *Baeria chrysostoma*, March 29, 1937 by P.H. Timberlake. The allotype male of *dissona* (CAS) was collected at Earlimart, Tulare County from flowers of *Baeria terrella*, March 9, 1937 by P.H. Timberlake. Four female and fifteen male paratypes from California (Fig. 3) (UCB, UCD, INHS, CAS, LACM) are as follows:

CALIFORNIA. SOLANO CO.: Dixon (9 mi. S).— 1 male, April 24, 1969 from *Layia chrysanthemoides* or *Baeria chrysostoma*, B.J. Donovan; 1 male, April 24, 1969 from *L. chrysanthemoides* or *B. chrysostoma*, R.W. Thorp; 1 male April 17, 1969 from *L. chrysanthemoides*, R.W. Thorp; 1 male April 17, 1969, from *L. chrysanthemoides* D.L. Briggs. Dixon (11 miles S at Dozier).— 1 male April 17, 1969, from *Layia chrysanthemoides*, D.L. Briggs. YOLO CO.: Davis.— 1 male, May 12, 1937, M. DuBois.

Andrena (Hesperandrena) eremophila, new species

This modest-sized species is known only from specimens of the female sex all collected at one locality. Like the females of *A. escondida*, these females do not have pronotal angles nor pronotal dorsolateral ridges, nor do they have metallic reflections in the dark color. They differ from females of *escondida* by having a larger, coarsely rugulose apical clypeal area and by having the metasomal terga (especially the first three) shinier due to the more fragile and less dense shagreening.

FEMALE: Measurements and Ratios. N = 5; length, 8–9 mm; width, about 3 mm; wing length, 2.41 ± 0.093 mm; FL/FW, M = 0.93 ± 0.007 ; FOVL/FOVW, M = 3.20 ± 0.273 .

Integumental Color. Black except as follows: mandible with apical third to half rufescent; flagella slightly reddened below; wing membrane hyaline, veins brown to reddish brown; metasomal terga with apical areas half or more hyaline, basal areas often with rufescent areas present apically; tibial spurs yellow.

Structure. Scape as long as first four flagellar segments or slightly more; flagellar segment 1 longer than segments 2 plus 3 which are about equal in length and broader than long; segments 4–8 as broad as long or slightly longer. Eyes, mandibles, and malar space as in *escondida*. Galea pointed, outer margin apical half gently concave; surface moderately shiny, tessellation extremely fine. Maxillary palpus exceeds galea by last two segments, segmental ratio about as 1.0:1.4:0.5:0.4:0.4:0.5. Labial palpus normal, segmental ratio about as 0.8:1.2:0.3:0.4. Labral process about three times as broad as long, shallowly emarginate medially, labrum apical to process slightly shorter, shallowly, transversely grooved, moderately shiny. Clypeus gently rounded from side to side, surface in basal half or slightly more dull, tessellate with relatively sparse, small punctures; apical third to half moderately shiny, coarsely reticulorugose. Supraclypeal area, face, and facial foveae much as in *escondida*.

Pronotum without humeral angle or dorsolateral ridges, surface dull, shagreened. Mesoscutum and scutellum as in *escondida*. Propodeum and pleurae as in *escondida*. Metasomal terga sculptured as in *escondida*. Pygidial plate and sterna as in *escondida*.

Vestiture. Essentially as described for the female of *escondida*.

Type Material. The female holotype of *eremophila* (USU) and the three female paratypes were collected at Mojave, Kern County, California, April 10, 1936 by G.E. and R.M. Bohart (Fig. 2). One female paratype was collected at the same locality April 11, 1938 by G.E. and R.M. Bohart. Paratypes will be deposited at the following institutions: USU, OSU (Oregon State University), CAS, INHS.

Andrena (Hesperandrena) compositarum, new species

Andrena compositarum is a relatively small species similar to *A. escondida*. However, the female of *compositarum* has the pronotum with complete pronotal angles and dorsoventral ridges, although these may be weak. The female of *compositarum* can be distinguished by the facial foveae being covered with brown to dark brown hairs and the dorsum of the thorax having at least some brown hairs. The male of *compositarum* can be separated from that of *escondida* by having a black clypeus, weak but distinct pronotal angles and dorsolateral ridges, and sterna 2–5 with subapical fimbriae consisting of very long, curved hairs, longer than in *escondida* males but not as dense nor as white.

FEMALE: Measurements and Ratios. N = 6; length, 9–9.5 mm; width, 2.0–2.5 mm; WL, M = 2.69 ± 0.080 mm; FL/FW, M = 0.891 ± 0.008 ; FOVL/FOVW, M = 2.34 ± 0.061 .

Integumental Color. As in *escondida* in all particulars.

Structure. Antennal scape as long as first four flagellar segments or almost so; flagellar segment 1 as long as following three segments or slightly shorter, segments 2 and 3 shorter than broad, of equal length, and slightly shorter than segment 4; segments 5 to 7 or 8 about as long as broad. Eyes, mandibles as in *escondida*; malar space surpassing tip of galea to slightly shorter; segmental ratio about as 0.5:0.7:0.5:0.5:0.4:0.5. Labial palpus normal, segmental ratio about as 0.9:0.4:0.4:0.5. Labral process short, distinctly but shallowly emarginate; labrum apical to process flat to rounded, dull, often base (near process) with weak, short, longitudinal rugulae, finely tessellate. Clypeus, supraclypeal area and face sculptured as in *escondida*. Facial fovea extends to distinctly below lower margins of antennal fossae. Genal area (head in profile) more than twice as broad as eye, sculptured as in *escondida*.

Pronotum with humeral angles and dorsolateral ridges, but relatively weak. Mesoscutum and scutellum with small distinct punctures separated by one to two or three puncture widths, dulled by distinct tessellation. Scutellum as in *escondida* but basal area not reticulorugose, slightly roughened more than the general tessellation. Mesopleurae dull, tessellate, with scattered small but distinct punctures separated by two to four or more puncture widths.

Metasomal terga sculptured as in *escondida*; pygidial plate as in *escondida* but not as distinctly U-shaped, more V-shaped with rounded apex. Sterna sculptured as in *escondida*.

Vestiture. Pale ochraceous to ochraceous except as follows: facial foveae with short brown tomentum, paler on lower third or less; mesoscutum and scutellum with some brown hairs medially, usually largely brown; scopal hairs along posterior margin of tibia and basitarsis usually pale brown to brown. In other respects vestiture as *escondida*.

MALE: Measurements and Ratios. N = 11; length, 8–9 mm; WL, M = 2.60 ± 0.086 mm; FL/FW, M = 0.94 ± 0.010 ; FS1/FS2, M = 2.35 ± 0.081 .

Structure. Antennae as in *escondida* but flagellar segment 2 equal to or slightly shorter (allotype) than segment 3. Eyes each about three and a half times as long as broad, inner margins diverging strongly towards vertex. Mandibles and galeae as in *escondida*. Maxillary palpus short, exceeding galea by no more than last maxillary palpal segment, segmental ratio about as 7.0:7.0:4.5:4.0:3.5:3.5. Labial palpus with segmental ratio as 9.0:4.0:3.0:4.0. Labral process deeply emarginate apically, lateral teeth curved down, sharp; labrum apical to process (measured from tips of apical teeth) distinctly shorter than process, shiny. Clypeus, supraclypeal area, face and vertex above ocelli as in female. Genal area broad, in profile, one and one-half times as wide as width of eye or slightly longer. Pronotum with distinct lateral angles but dorso-ventral ridge weak, especially in

lower half, sculpture of thorax as in female. Metasomal terga sculptured much as in female but shagreening weaker and surfaces shinier, especially on terga 3–6.

Sternal sculpturing as in female. Sternum 7 with apical lobes rounded, emargination narrow, moderately deep. Sternum 8 with apical lobe short, shallowly emarginate medially, neck region almost parallel-sided, slightly broader than apical lobe.

Vestiture. Generally white to pale ochraceous, not brown on face or thoracic dorsum as in female. Terga 2–5 with distinct subapical fimbriae consisting of long, relatively sparse hairs (especially laterally) which curve downward, unlike the dense white bands of straight shorter hairs of *escondida*.

Type Material. The holotype female (UCD), allotype male (UCD), one female and one male paratype (INHS) of *compositarum* were collected from *Layia chrysanthemoides* at Dixon (9 miles S), Solano Co., California, by R.W. Thorp on April 17, 1969. The holotype and allotype are deposited in the California Academy of Natural Sciences. Paratypes are in the collections of the University of California at Davis and the Illinois Natural History Survey in Champaign. Four female and nine male paratypes were collected from California (Fig. 3) as follows:

SOLANO CO.: Dixon (9 mi. S). 1 female, May 8, 1969 from *Layia chrysanthemoides*, R.W. Thorp; 1 female, May 1, 1969, from *L. chrysanthemoides*, B.J. Donovan; 1 female, 1 male, April 24, 1969 from *L. chrysanthemoides*, R.W. Thorp; 2 males from *L. chrysanthemoides*, April 24, 1969, B.J. Donovan. STANISLAUS CO.: LaGrange (1 mi. N). 1 female, 4 males, S.M. Fullerton; LaGrange (3 mi. N). 2 males, Mar. 26, 1960, S.M. Fullerton.

INDEX OF SPECIES NAMES

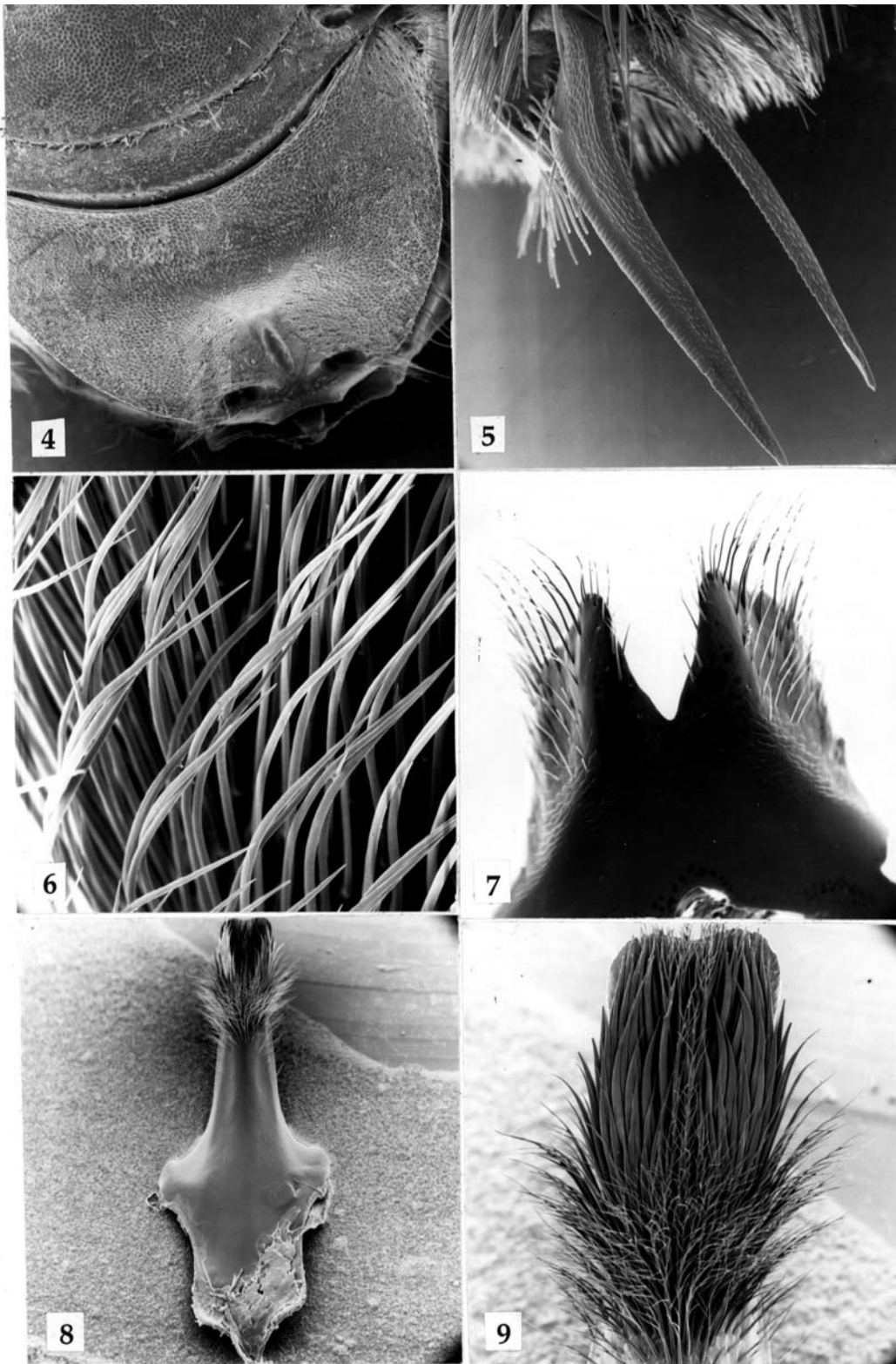
This index consists of all Latin names of generic and specific standing currently being used or placed in synonymy and listed in alphabetical order so that the reader can readily find each name. Specific epithets in italics are currently recognized names, those in standard type are considered to be synonyms. The numbers in bold-face refer the reader to the page where the name appears in the description of the species or in the synonymy listed on that page. Numbers in plain text refer the reader to the pages of the keys to species or to the page where the name appears on a map.

<i>baeriae</i> Timberlake	5, 6, 14 , 15.
<i>compositarum</i> , new species	5, 6, 20, 22 .
<i>dissona</i> , new species	5, 6, 19 , 20.
<i>duboisii</i> Timberlake	4, 5, 9, 10 .
<i>eremophila</i> , new species	5, 15, 21 .
<i>escondida</i> Cockerell	5, 6 , 9.
<i>Hesperandrena</i>	2 .
<i>lativentris</i> Timberlake	4, 6, 12 , 15.
<i>leucomystax</i> , new species	4, 5, 17 , 20.
<i>limnanthis</i> Timberlake	8 .
<i>pulverea</i> Viereck	4, 5, 8 , 9.

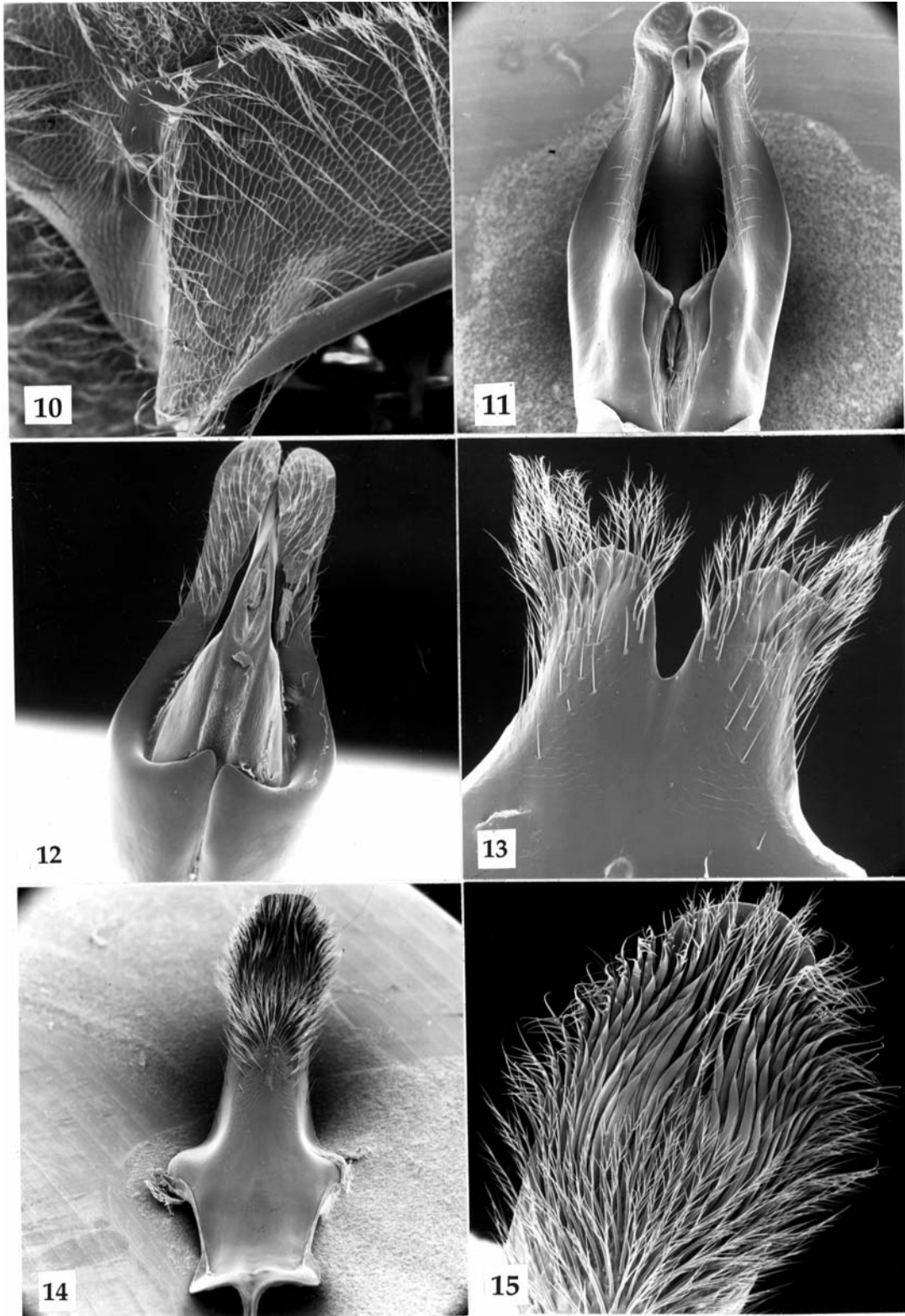
BIBLIOGRAPHY

- Bouseman, J.K., and W.E. LaBerge 1979. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part IX. Subgenus *Melandrena*. Trans. Am. Entomol. Soc., 104:275–389.
- Cockerell, T.D.A. 1938. Descriptions and records of bees.- CLXIX. Ann. Mag. Nat. Hist., (11)2:14
- Donovan, B.J. 1977. A revision of North American bees of the subgenus *Cnemidandrena* (Hymenoptera: Andrenidae). Univ. Calif. Publ. Entomol., 81: 1–107.
- Goodpasture, C.E. 1974. Cytological data and classification of the Hymenoptera. Ph. D. Dissertation. Univ. California at Davis.
- LaBerge, W.E. 1964. Prodrum of American bees of the genus *Andrena*. Bull. Univ. Neb. State Mus., 4(14):279–316.
- . 1967. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part I. *Callandrena*. Univ. Neb. State. Mus. Bul., 7:1–316.
- . 1969. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part II. *Plastandrena*, *Aporandrena*, *Charitandrena*. Trans. Am. Entomol. Soc., 95:1–47.
- . 1971. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part IV. *Scrapteropsis*, *Xiphandrena*, and *Rhaphandrena*. Trans. Am. Entomol. Soc., 97:441–520.
- . 1973. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part VI. Subgenus *Trachandrena*. Trans. Am. Entomol. Soc., 99:235–371.
- . 1977. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part VIII. Subgenera *Thysandrena*, *Dasyandrena*, *Psammandrena*, *Rhacandrena*, *Euandrena*, *Oxyandrena*. Trans. Am. Entomol. Soc., 103:1–143.
- . 1980. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part X. Subgenus *Andrena*. Trans. Am. Entomol. Soc., 106:395–525.
- . 1986. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part XI. Minor subgenera and subgeneric key. Trans. Am. Entomol. Soc., 111:441–567.
- . 1987. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part XII. Subgenera *Leucandrena*, *Ptilandrena*, *Scoliandrena*, and *Melandrena*. Trans. Am. Entomol. Soc., 112:191–248.
- . 1989. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part XIII. Subgenera *Simandrena* and *Taeniandrena*. Trans. Am. Entomol. Soc., 115:1–56.
- LaBerge, W.E., and J.K. Bouseman 1970. A revision of the bees of the genus *Andrena* in the Western Hemisphere. Part III. *Tylandrena*. Trans. Am. Entomol. Soc., 96:543–605.
- . 1977. On the systematic position of three black *Andrena* from Western North America (Hymenoptera: Andrenidae). J. Kans. Entomol. Soc., 50:601–612.
- LaBerge W.E., and D.W. Ribble 1972. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part IV. *Gonandrena*, *Geissandrena*, *Parandrena*, *Pelicanandrena*. Trans. Am. Entomol. Soc., 98:271–358.

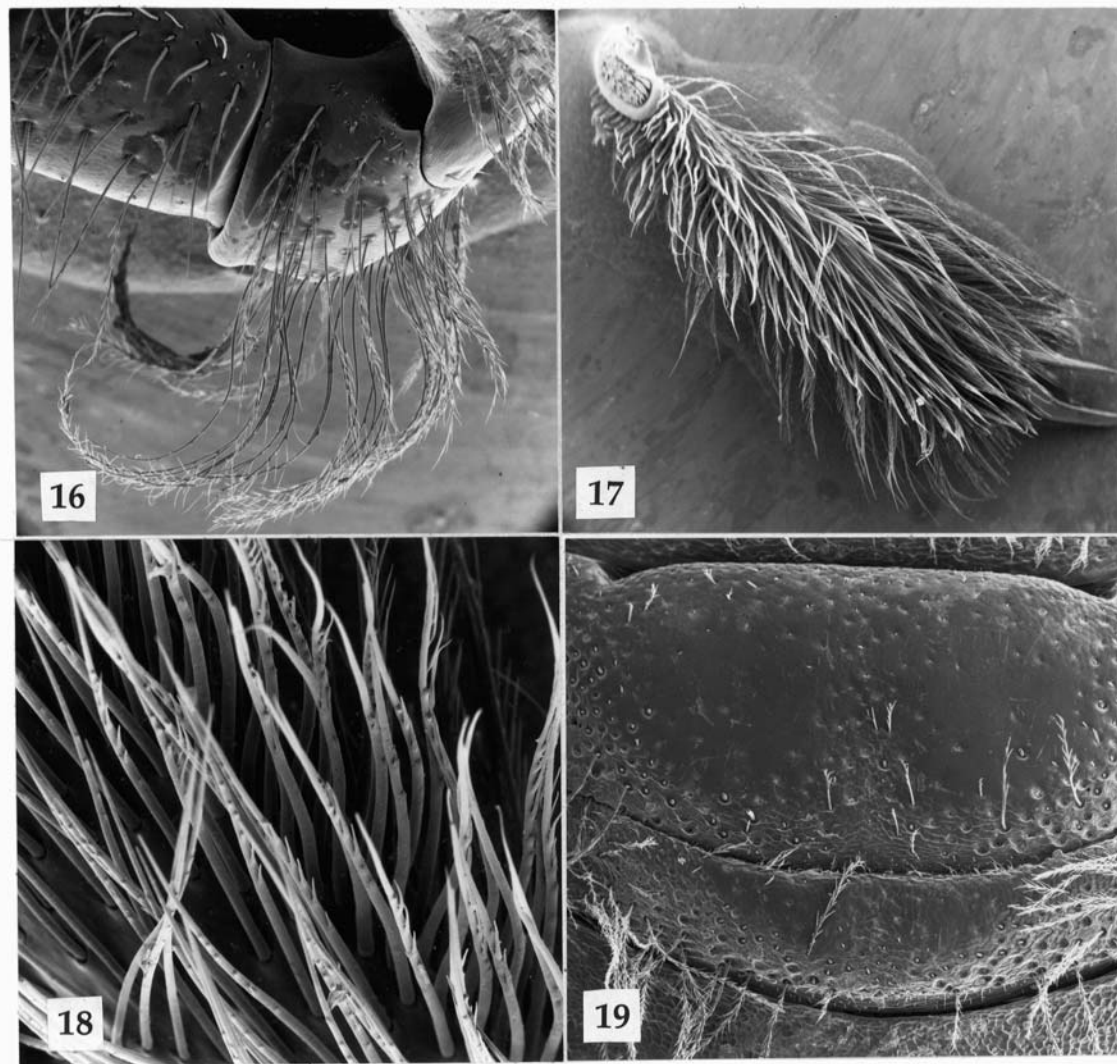
- . 1975. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part VII. Subgenus *Euandrena*. Trans. Am. Entomol. Soc., 101:371–446.
- Lanham, U.N. 1949. A subgeneric classification of the New World bees of the Genus *Andrena*. Univ. Calif. Publ. Entomol., 8:183–238.
- Leong, J.M. and R.W. Thorp. 1999. Colour-coded sampling: the pantrap colour Preferences of oligolectic and nonoligolectic bees associated with a vernal pool plant. Ecol. Entomol., 24:329–335.
- Rust, R., A. Menke and D. Miller. 1985. A bibliographic comparison of the bees, Sphecid wasps and mealy bugs of the California Channel Islands, U. S. A. Proc. 1st Symposium, Santa Barbara Mus. Nat. Hist., 1:29–60.
- Skinner, M.W. and B.M. Pavlik, eds. 1994. Inventory of rare and endangered vascular plants of California. California Native Plant Society, Spec. Publ. No. 1, 5th ed., Sacramento, CA. 336 pp.
- Thorp, R.W. 1969. Systematics and ecology of bees of the subgenus *Diandrena* (Hymenoptera: Andrenidae). Univ. Calif. Publ. Entomol., 52:1–146.
- Thorp, R.W. 1976. Insect pollination of vernal pool flowers. Pp. 36–40. In S. Jain, ed. Vernal Pools, Their Ecology and Conservation. Symposium Institute of Ecology, University of California, Davis. Publication No. 9, 93 pp.
- Thorp, R.W. 1990. Vernal pool flowers and host specific bees. Pp. 109–122. In Ikeda, D.H. and R.A. Schlising, eds. Vernal Pool Plants: Their Habitat and Biology. Studies from the Herbarium, No. 8. California State University at Chico, 178 pp.
- Thorp, R.W. and J.M. Leong. 1995. Native bee pollinators of showy vernal pool Plants. Fremontia, 23(2):3–7.
- Thorp, R.W. and J.M. Leong. 1998. Specialist bee pollinators of showy vernal pool flowers. Pp. 169–179. In C.W. Witham, E.T. Bauder, D. Belk, W.R. Ferren, Jr., and R. Ornduff, eds. Ecology, Conservation and Management of Vernal Pool Ecosystems. Proceedings from a 1996 Conference. California Native Plant Society, Sacramento, CA. 285 pp.
- Timberlake, R.H. In U. N. Lanham, 1949. A subgeneric classification of the New World bees of the genus *Andrena*. Univ. Calif. Publ. Entomol., p. 386.
- . 1951. New and little-known bees of the family Andrenidae from California. Proc. U.S. Nat. Mus., 101:373–414.
- Viereck, H.L. 1917. *Andrena* of Canadian, Alleghanian and Carolinian plant zones occurring or likely to occur in Connecticut. Trans. Am. Entomol. Soc., 43:365–407.



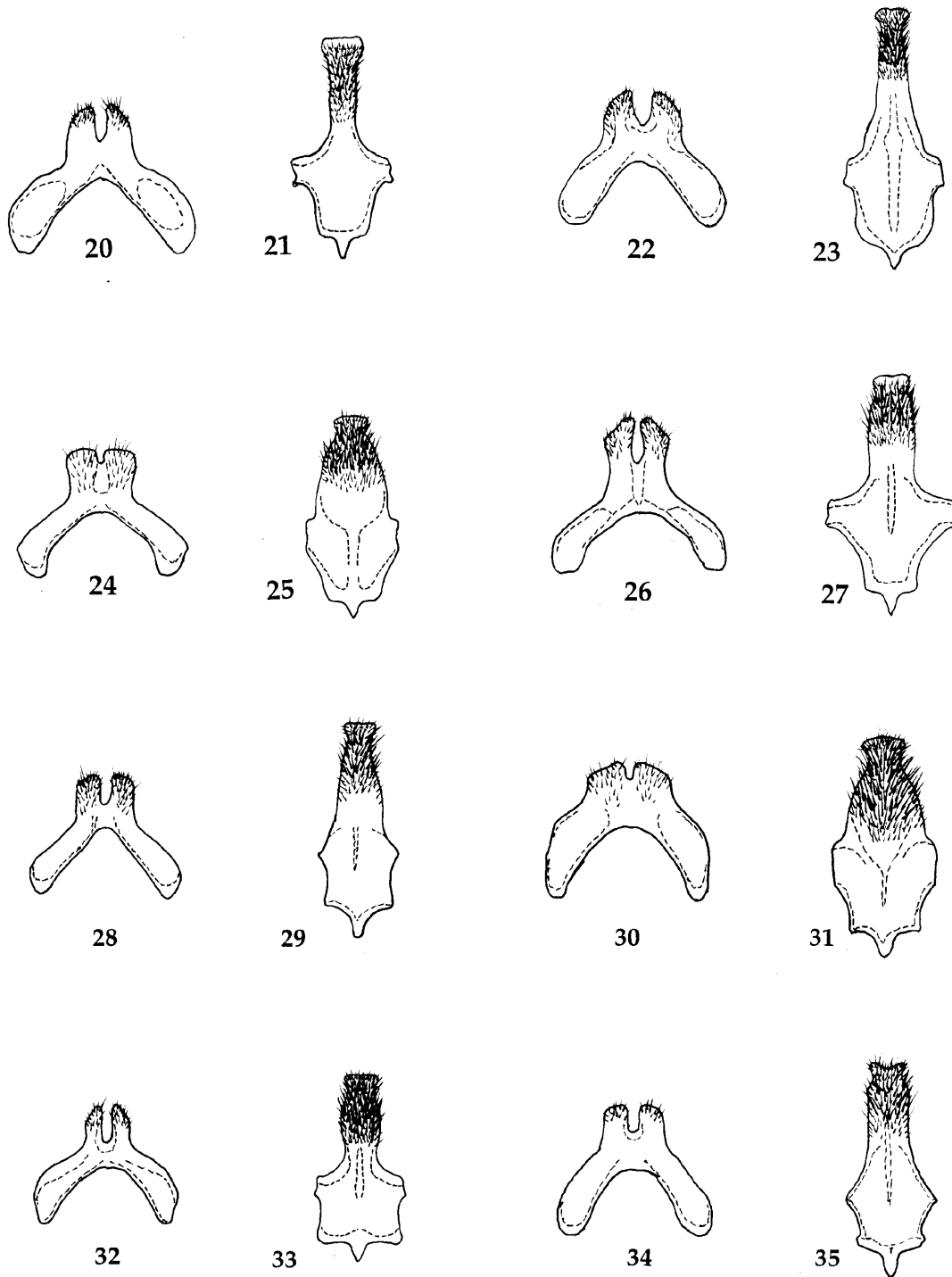
Figs 4–9. *Andrena pulverea* Viereck: 4—Male propodeum, dorsal view, note the lateral carinae extending most of the length on each side, X 30. 5—Female hind tibial spurs, note posterior spur broadened toward base, X 100. 6—Female central scopal hairs, X 100. 7— Male sternum 7, dorsal view, X 100. 8—Male sternum 8, X 100. 9—Male tip of sternum 8, enlarged, note flattened, spearlike hairs in apical half of neck region with plumose hairs basally, across tip and in thin line down middle, X150.



Figs. 10–15. *Andrena baeriae* Timberlake: 10—Male pronotum from above and slightly from anterior; note sharp dorsoventral ridge and rounded dorsolateral angle, X 70. 11—Male genital capsule, ventral view, X 30. 12—Male genital capsule, dorsal view, X 30. 13—Male sternum 7, X 100. 14—Male sternum 8, X 100. 15—Male tip of sternum 8, note flattened hairs as in Fig. 8, X 150.



Figs. 16–19. *Andrena leucomystax*, new species: 16—Female posterior hind leg showing trochanter and trochanteral flocculus, X 50. 17—Female right leg showing scopa, X 30. 18—Female showing scopal hairs enlarged, note weak plumosity, X 100. 19—Female scutellum and metascutum, dorsal aspect, X 70.



Figs. 20–35. Sterna 7 and 8 of males of species of *Andrena* subgenus *Hesperandrena*: 20–21—*A. escondida* Cockerall. 22–23—*A. pulverea* Viereck. 24–25—*A. duboisi* Viereck. 26–27—*A. lativentris* Timberlake. 28–29—*A. baeriae* Timberlake. 30–31—*A. leucomystax*, Thorp and LaBerge. 32–33—*A. dissona* Thorp and LaBerge. 34–35—*A. eremophila* Thorp and LaBerge.

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