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

ILLINOIS NATURAL HISTORY SURVEY



Part XIV Subgenus *Onagrandrena* Wallace E. LaBerge and Robbin W. Thorp

Part XV Subgenus *Hesperandrena* Robbin W. Thorp and Wallace E. LaBerge

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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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Subgenus ONAGRANDRENA Linsley and MacSwain

Onagrandrena 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.

Onagrandrena 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 *Onagrandrena* 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 separated the generalized *Onagrandrena* 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 *Onagrandrena*. 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 *Onagrandrena* 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 concensus 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 four species with distinct pronotal humeral angles and lateral ridges in both sexes could possibly be considered as a four species with distinct pronotal humeral angles and lateral ridges in both sexes could possibly be considered as a four, however, do not show any apomorphic characteristics that are not present in some or all of the remaining *Onagrandrena* species and the present authors prefer to recognize them as the most generalized species of the *Onagrandrena*.

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. 4.	Female vestiture entirely pale Propodeum with distinct	largely or entirely black. declivous from base.
5	dorsal surface Dorsal thoracic bairs 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. 11.	Female clypeal punctures dense Galeae normal, dulled by fine dense tessellation	punctures sparse. 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.
10.	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. Phylogentic diagram of the species of the subgenus *Onagrandrena*. 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 *Onagrandrena* is defined in large measure by a suite of behaviorial, 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 *Onagrandrena* 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 *Onagrandrena* 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 *Onagrandrena* 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 *Onagrandrena* 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 *Gaypohytum,* 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 *Onagrandrena* 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 *Onagrandrena* 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 *Onagrandrena* overwinter as adults in their brood cells (Linsley *et al.* 1963a). Some *Onagrandrena* 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 *Onagrandrena* 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 *Onagrandrena* all exhibit host-specificity for pollen (oligolecty) with members of the Onagraceae (Table 2). Females of 15 of 22 species of *Onagrandrena* collect pollen fom 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 *Onagrandrena* 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 *Onagrandrena* (*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 Onagreeae.

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 *Onagrandrena* 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 *Onagrandrena*. *Onagrandrena* 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 *Onagrandrena* 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 coexist-ence 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.

Table 2. Principal pollen flowers for species of Onagrandrena.

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

Examples of co-occurrence include: West of Blythe, CA—A. rozeni, linsleyi, rubrotincta (Linsley et al. 1963a); West of Austin, NV—A. rozeni, raveni, chylismae (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. blaisdeli, deserticola (Linsley et al. 1973); Northeast of Santa Margarita, CA—A. blaisdeli, 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.* 1963); *A. rozeni* (Linsley and MacSwain 1963, Linsley *et al.* 1963); *A. rozeni* (Linsley and MacSwain 1965, Linsley *et al.* 1963); *A. rozeni* (Linsley and MacSwain 1955, 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(1).	Vestiture entirely pale, yellow to ochraceous
3(2).	 Propodeum declivous, without distinct dorsal surface, areas outside of enclosure evenly tessellate with scattered puncture
4(2).	Mesoscutum at least posteromedially and scutellum shiny, at least in part unshagreened
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
6(5).	Wing membranes infumate, brown to almost black

7(6).	Labral process with apical portion about as broad as base of scape; vertex above lateral lateral ocellus equals about one ocellar
	Labral process with apical portion long, narrower than base of scape; vertex above lateral ocellus equals more than one ocellar diameter
8(6).	Terga 2 and 3 with apical area impunctate medially; mesoscutum with punctures large, deep, surface shiny at least posteromedially <i>Andrena flandersi</i> Timberlake.
	Terga 2 and 3 with apical areas punctate at least in basal half across entire tergum; mesoscutal punctures small, crowded, surface dull, shagreened
9(5).	Dorsal thoracic hairs dark brown to black10.Dorsal thoracic hairs pale, ochraceous to fox-red23.
10(9).	Metasomal terga black with distinct violaceous to blue reflections
	Metasomal terga black, violaceous reflections absent or faint 11.
11(10).	Mesoscutum dulled by fine dense shagreening
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(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
	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
	Galeae longer, dulled by fine dense shagreening; tergum 1 with basal area at least lightly shagreened
16(15).	Scutellar punctures relatively sparse (especially in anterior third), spaces tessellate

Scutellar punctures dense, separated by half a puncture width or less, often with interpunctural spaces lacking, punctatorugose 17.
Terga 2 and 3 with apical areas with punctures separated mostly by 3 to 5 puncture widths
Terga 2 and 3 with apical areas with punctures separated mostly by 1 to 3 puncture widths
Hind tibial scopal hairs long. sparse, scarcely hiding surface
Hind tibial scopal hairs shorter, dense, partially obscuring surface
Tergum 2 with median third of basal area with punctures separated mostly by half a puncture width or less
Hind tibial scopa with moderately abundant, long, simple hairs, surface of tibia somewhat obscured by hairs
Second hairs have a second a sharehouse a second have been timbered and MacSwam.
(Fig. 16); terga 2-4 with basal area punctures coarse, deep, abundant
Scopal hairs moderately long and dense; propodeal enclosure usually shallow, relatively sparse
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
Lower mesepisternum punctate, interpunctural spaces tessellate; scutellum with anterior punctate area shiny not tessellate: clypeal punctures
 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

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(3).	 Propodeum outside of enclosure punctatorugose or with distinct fine rugulae, dorsal enclosure finely to coarsely rugulose throughout
5(1).	Mesoscutum and scutellum shiny, interpunctural spaces not shagreened except lightly, especially peripherally
6(5).	Tergal vestiture entirely pale in color or almost so
7(6).	Mesepisternum and propodeum punctatorugose
8(5).	Thoracic hairs entirely black or dark brown
9(8).	 Propodeum outside of dorsal enclosure and scutellum punctatorugose; propodeal enclosure strongly rugose; ocelli of normal size
10(8).	 Metasomal terga black with relatively strong metallic blue or purple reflections on terga 2 to 5; mesoscutal vestiture entirely pale

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
13(11).	Clypeal hairs all or mostly pale, ochraceous or white
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
15(13).	 Propodeum outside of dorsal enclosure and mesepisternal surface coarsely punctatorugose (Fig. 10); lower mesepisternal surface punctatorugose
16(12).	 Terga 3–5 or 4–6 with weak metallic reflections; mesepisternum postero- medially and scutellum shiny
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
18(5).	Metasomal terga 2 and 3 with apical areas impunctate <i>Andrena flandersi</i> Timberlake. Metasomal terga 2 and 3 with apical areas minutely punctate at least in basal half
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

SPECIES ACCOUNTS

Andrena (Onagrandrena) 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 (Onagrandrena) 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 (Onagrandrena) 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, $M = 4.38 \pm 0.284$ mm; FL/FW, $M = 1.06 \pm 0.007$; FOVL/FOVW, $M = 2.88 \pm 0.053$.

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, $M = 3.85 \pm 0.270$ mm; FL/FW, $M = 1.10 \pm 0.008$; FS1/FS2, $M = 1.41 \pm 0.034$.

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. AL-BANY 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 (Onagrandrena) linsleyana Thorp

Andrena (Onagrandrena) 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 (Onagrandrena) 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 (Onagrandrena) 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 (Onagrandrena) 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 Canvon). SACRAMENTO CO .: Folsom. SAN BENITO CO .: Hollister. SAN DI-EGO 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 (Onagrnadrena) 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; FSI/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 l 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 apicomedially (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 (Onagrandrena) 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 (Onagrandrena) 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, $M = 3.26 \pm 0.159$; FL/FW, $M = 1.11 \pm 0.007$; FS1/FS2, $M = 1.13 \pm 0.024$.

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, $M = 3.20 \pm 0.120$ mm; FL/FW, $M = 0.97 \pm 0.004$; FOVL/FOVW, $M = 3.01 \pm 0.044$.

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. RIVER-SIDE CO.: Elsinore (4 mi. E in Railroad Canyon). SAN BENITO CO.: Pinnacles Nat. Monument. SAN BERNARDINO CO 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 (Onagrandrena) 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 (Onagrandrena) 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 (Onagrandrena) convallaria convallaria Linsley and MacSwain, 1963, Pan-Pacific Ent., 39:190–193. New synonymy.
- Andrena (Onagrandrena) convallaria subhyalina Linsley and MacSwain, 1963, Pan-Pacific Ent., 39:193–194; Linsley, MacSwain, and Raven, 1963, Univ. California Pub. Ent., 33:71–72. New synonymy.
- Andrena (Onagrandrena) 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 (Onagrandrena) 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 Onagrandrena. 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 apicomedially, 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, $M = 3.49 \pm 0.201$ mm; FL/FW, $M = 1.07 \pm 0.005$; FS1/FS2, $M = 1.24 \pm 0.025$.

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 apicomedially (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*) *campestris*. 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*) *campestris*.

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.: Alatimos 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 Reves Lighthouse (1 mi. NE); Point Reves 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); Verdemont; 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 Buenoventura 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 heterophbylla, 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 (Onagrandrena) vespertina Linsley and MacSwain

Andrena (Onagrandrena) 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, $M = 4.06 \pm 0.185$ mm; FL/FW, $M = 1.04 \pm 0.004$; FOVL/FOVW, $M = 2.82 \pm 0.037$.

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 *oenotherae*; 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 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 (Onagrandrena) 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 (Onagrandrena) boronensis Linsley and MacSwain

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

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

Andrena (Onagrandrena) 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, $M = 4.34 \pm 0.293$ mm; FL/FW, $M = 1.04 \pm 0.004$; FOVL/FOVW, $M = 2.96 \pm 0.042$.

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 deltoides 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. integrior, Melilotus officinalis, Oenotherae sp., *O. deltoides piperi, Sisymbrium altissimum, Stanleya pinnata, Stenotus* (as *Haplopappus*) *acaulis, Taraxacum officinale.*

Andrena (Onagrandrena) 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 (Onagrandrena) 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, $M = 4.05 \pm 0.175$ mm; FL/FW, $M = 1.10 \pm 0.004$; FOVL/FOVW, $M = 3.24 \pm 0.053$.

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 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. integrior, C. c. peirsonii, C. tanaecetifolia, Cryptantha clevelandii, C. intermedia, Encelia sp., E. farinosa, Geraea canescens, Hyptis emoryi, Isomeris arborea, Madia rammii, Medicago sativa, Mirabilis sp., Oenothera sp., O. deltoides 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. IMPE-RIAL 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 (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 (Onagrandrena) 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 (Onagrandrena) 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, $M = 3.81 \pm 0.141$ mm; FL/FW, $M = 1.00 \pm 0.004$; FOVL/FOVW, $M = 3.33 \pm 0.056$.

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 tergun 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 (Onagrandrena) nevadae Linsley and MacSwain

Andrena (Onagrandrena) 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 integrior* 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 (Onagrandrena) raveni Linsley and MacSwain

Andrena (Onagrandrena) 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, vellowish, 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 apicomedially, 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 integrior* 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. integrior, 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 (Onagrandrena) 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 (Onagrandrena) 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, $M = 3.86 \pm 0.158$ mm; FL/FW, $M = 1.05 \pm 0.004$; FOVL/FOVW, $M = 3.26 \pm 0.084$.

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 apicomedial 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 mesepisterum 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, $M = 4.48 \pm 0.166$ mm; FL/FW, $M = 1.04 \pm 0.006$; FOVL/FOVW, $M = 3.04 \pm 0.052$.

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 oligolege 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. c. aurantiaca, C. (as Oenothera) parryi, Hyptis emoryi, Lesquerella sp., Oenothera sp., Phoradendron californicum, Salix sp., Tamarix gallica.

Andrena (Onagrandrena) 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 (Onagrandrena) 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, $M = 4.50\pm0.081$ mm; FL/FW, $M = 1.01\pm0.005$; FOVL/FOVW, $M = 2.96\pm0.041$.

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 scutel-lum 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, $M = 3.85 \pm 0.279$ mm; FL/FW, $M = 1.00 \pm 0.004$; FS1/FS2, $M = 1.24 \pm 0.016$.

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* 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 (Onagrandrena) camissoniae Linsley and MacSwain

Andrena (Onagrandrena) 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 l 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 (Onagrandrena) 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, $M = 4.36 \pm 0.231$ mm; FL/FW, $M = 1.05 \pm 0.007$; FOVL/FOVW, $M = 3.14 \pm 0.076$.

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, $M = 3.79 \pm 0.291$ mm; FL/FW, $M = 1.02 \pm 0.006$; FS1/FS2, $M = 1.25 \pm 0.028$.

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 *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; 1 male, April 25, 1972, from *Camissonia californica* (as *leptocarpa*), A.R. Moldenke; 1 male, April 19, 1974, 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*), *Saliva 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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Figs. 7–10. Andrena onagrae Cockerell: 7—male propodeal dorsal area, X70. Andrena flandersi Timberlake: 8— male, profile view, tergum two, X1000. Andrena furva Linsley and MacSwain: 9—female, mesoscutum showing left parapsidal line, X200. Andrena oenotherae Timberlake: 10—male, propodeal dorsal area, X100.



Figs. 11–14. *Andrena oenotherae* Timberlake: 11—female labral process, X100. 12—female propodeal dorsal area, X100. 13—male genital capsule, lateral view, X70. 14—male genital capsule, end view, X40.



Figs. 15–18. *Andrena vespertina* Linsley and MacSwain: 15—female, lateral view of head and prothorax, X30, note lack of pronotal angle or lateral ridge. *Andrena nevadae* Linsley and MacSwain: 16—female propodeal dorsal area, X70. *Andrena rubrotincta* Linsley: 17—male labral process and simple mandible, X70. 18—female head and pronotum, lateral view, X30, note pronotal angle and lateral dorsoventral ridge.



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. mojavensis* Linsley and MacSwain. 63–64—*A. decolorata* LaBerge and Thorp.

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

[0		10			20]
MATRIX							
decolorata	0001	0000	0000	0111	00	000	0
camissoniae	0000	00000	0000	0101	00	000	0
mojavensis	0010	00000	0100	0101	00	000	0
rubrotincta	0010	00000	0100	0101	01	000	0
bernardina	1110	01100	1011	0100	00	100	1
omninigra	1110	01110	1001	0000	00	100	1
flandersi	1110	01000	1001	1000	00	101	1
furva	1110	01010	1011	0000	10	001	1
raveni	1110	0001	1001	0100	00	100	1
linsleyi	1110	00000	0100	0111	00	000	1
vanduzeei	1110	0011	1001	0000	01	000	1
blaisdelli	1110	00000	1011	0101	10	000	1
rozeni	1110	00000	1000	0000	00	100	1
stagei	1110	00010	1001	0101	.1	-	
boronensis	1110	00010	1001	0000	10	100	1
vespertina	1110	00010	1001	0000	10	100	1
oenotherae	1110	00010	1001	0000	10	100	1
chylismiae	1110	00010	1001	0100	10	110	1
nevadae	1110	00000	1000	0100	1	-	
deserticola	1110	00000	1000	0000	10	000	1
linsleyana	1110	00000	1001	0011	00	110	1
anograe	1110	00000	1001	0000	00	100	1
ancestor	0000	00000	0000	0000	00	000	0

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