

Wallace E. LaBerge

*A Revision of the Bees of the Genus
Andrena of the Western Hemisphere.
Part I. Callandrena.
(Hymenoptera: Andrenidae)*

ABSTRACT

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WALLACE E. LABERGE

This paper is the first part of a monograph of the bee genus *Andrena* in the western hemisphere and treats the subgenus *Callandrena*. Available data regarding phylogeny, distribution, biology, and flower preferences are presented together with keys to separate the species, diagnoses and descriptions of the species and discussions of geographic variation when applicable.

Seventy-nine species and one subspecies are recognized. Sixteen names are relegated to synonymy, one to homonymy and eight are removed from the subgenus *Callandrena*.

The thirty-nine species new to science are: *aerifera*, *aeripes*, *asimbriata*, *ardis*, *auripes*, *balsamorhizae*, *beameri*, *bilimeki*, *bullata*, *calvata*, *dreisbachelorum*, *fulminea*, *fulminoides*, *fumosa*, *humeralis*, *ignota*, *inculta*, *irrasus*, *levigata*, *levipes*, *limatula*, *mexicana*, *monticola*, *neomexicana*, *ofella*, *optanda*, *parilis*, *perpunctata*, *rava*, *repanda*, *rubens*, *sculleni*, *senticulosa*, *solivaga*, *sonorensis*, *tegularis*, *trimaculata*, *utahensis*, *vulpoides*.

ACKNOWLEDGEMENTS

The author is especially grateful to the National Science Foundation for having supported this study of *Callandrena*, part of a continuing study of the *Andrena* of North America. Without such sustained support this work would not have been possible.

Special recognition is due to the artists who have helped in preparing the illustrations for this paper. These are Mr. Chong Park of the University of Nebraska, Lincoln, Mrs. Diana Slevins of Champaign, Illinois, and Mrs. Ellen Larson of Chadron, Nebraska.

The author is indebted to the following persons who loaned, for long periods of time, specimens of *Andrena* in their care, permitted the author to study type specimens in their care, or loaned type specimens: Dr. W. T. Atyeo, University of Nebraska, Lincoln; Dr. G. E. Bohart, Utah State University, Logan; Dr. R. M. Bohart, University of California, Davis; Dr. G. B. Butler, University of Arizona, Tucson; Dr. R. L. Fisher, Michigan State University, East Lansing; Dr. H. G. Grant, Philadelphia Academy of Sciences; Dr. Paul D. Hurd, Jr., University of California, Berkeley; Dr. Karl V. Krombein, U.S. National Museum, Washington, D.C.; Dr. H. E. Milliron, Canadian National Collection, Ottawa; Dr. C. D. Michener, University of Kansas, Lawrence; Dr. T. B. Mitchell, North Carolina State University, Raleigh; Dr. R. A. Morse, Cornell University, Ithaca, N.Y.; Dr. Carl V. Rettenmeyer, Kansas State University, Manhattan; Dr. H. G. Rodeck, University of Colorado, Boulder; Dr. E. S. Ross, California Academy of Sciences, San Francisco; Dr. J. G. Rozen, Jr., American Museum of Natural History, New York City; Mr. R. R. Snelling, Los Angeles County Museum; Dr. W. P. Stephen, Oregon State University, Corvallis; Mr. P. H. Timberlake, Citrus Experiment Station, Riverside, California.

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INTRODUCTION

This work is based upon a study of 6,180 specimens. A total of 79 species and one subspecies is described, 39 of these being new. Sixteen older names are relegated to synonymy, one is relegated to homonymy, and eight are removed from the group of bees under consideration in this paper. A list of the species not considered as *Callandrena*, but previously placed in this group, appears near the end of the present paper.

The subgenus *Callandrena* as used in this paper includes all of the species previously included in the subgenera *Callandrena* and *Pterandrena* as defined by Lanham (1949). The *Callandrena* include a wide variety of *Andrena* ranging in size from about 7 mm in length to bees 16 mm or slightly more in length. These bees occur from southern Canada to Panamá and from coast to coast in the United States but have not been taken in the West Indies. In the northern parts of the range the species are chiefly summer or autumn bees with a few appearing in late autumn and a very few in early summer. In the southwestern states and in Mexico and Central America, however, a large number of species are active during the winter and early spring months.

The majority of the species of *Callandrena* collect pollen for their larvae from flowers of the Compositae. A few exceptions to this occur, especially among the early-season bees of Central America and the southwestern United States. Considerable oligolecty, and even monolecty, occurs among the species of *Callandrena* and this is discussed after each species description. Nothing has been published concerning the larvae or the nests of *Callandrena*. Presumably they are solitary bees nesting in the soil as are other *Andrena*. Certain studies now in progress will, it is hoped, soon fill this gap in our knowledge.

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DESCRIPTIVE METHODOLOGY

A number of specific characters are described which have not previously been used in *Andrena*. These and certain other characteristics need some explanations so that the key becomes more meaningful or so that certain measurements can be made accurately. The following list of characters with their explanations will serve to fulfill these needs. Morphological terms not explained below, such as that of wing venation and terminalia, are taken from Michener (1944).

1. Length—measured with head vertical, front of face to tip of pygidial plate.
2. Width—greatest width of abdomen.
3. Wing length—measured in a straight line from the base of cell M to the tip of the submarginal cell.
4. Facial length and width—length from apicomedian margin of clypeus to lower-medium margin of the median ocellus; width is measured at level of the lower surfaces of the antennal fossae between inner margins of compound eyes (FL/FW).
5. Flagellar segments 1 and 2 of the male—measured along lower (antennae stretched forward) surfaces of segments (FS1/FS2).
6. Parocular area—the space between the compound eyes and the upper part of the clypeus.
7. Eye length and width—both measured in facial view.
8. Malar space—width equals the maximum mandibular width at base; length equals length just above median articulation point where malar space is at its minimum length.
9. Genal area—width measured in strict profile which is attained by superimposing the two lateral ocelli; the eye width to be compared with the genal area width is measured in the same view.
10. Subgenal coronet—a row of stout, short, often slightly barbed, spinelike hairs along the rim of the mandibular fossa below the mandible.
11. Facial foveal length and width—maximum measurable length and width (FOVL/FOVW).
12. Pronotal angle and ridge—the posterior margin of the pronotum in some subgenera of *Andrena* and in one species of *Callandrena* forms a pair of more or less prominent angles marking the lateral limits of the dorsum. The lateral part of the posterior margin falls relatively abruptly down from this angle to the posterior lobe of the pronotum. Anterior to the lateroposterior margin of the pronotum (excluding the posterior lobe) is a ridge which runs ventrad from the pronotal angle. The pronotal angle is also referred to as the humeral angle.

13. Enclosure of the propodeum—the median triangular area of the dorsal surface, enclosed by usually faint sutures which converge on the posterior surface to enter or form the median longitudinal sulcus of the posterior surface.

14. Propodeal corbicula—lateral surfaces of the propodeum when partially or entirely rimmed by long incurling plumose hairs forming a pollen basket. A “complete” corbicula has these hairs both dorsally and anteriorly and lacks internal hairs. An almost complete corbicula has the internal hairs. An incomplete corbicula has the long hairs absent anteriorly, perhaps short dorsally, and present or absent internally.

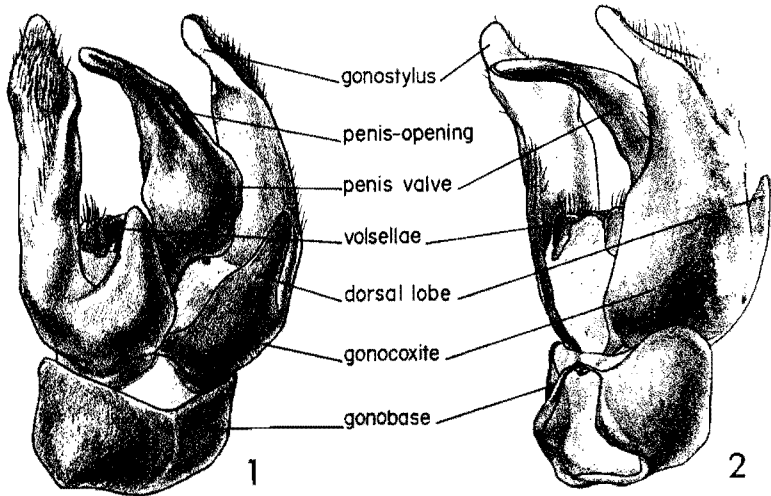
15. Tergal fascia—apical or subapical band of more or less dense, decumbent, plumose, usually white or pale ochraceous pubescence on terga 1–4.

16. The terga can be divided into several areas as follows: apical area—the more or less impressed area of the dorsal surface often covered by fasciae when present, occasionally includes most of dorsal area medially; basal area—area basal of apical area, not including the impressed extreme base which is hidden beneath margins of previous tergum on terga 2–6; lateral areas—that area which is folded ventrally at each side of a tergum (the lateral parts of the gradulus separates lateral from dorsal areas near base of tergum); marginal area—the extremely short marginal portions of the apical area, usually impunctate and often hyaline; lateral raised areas—slightly raised areas located just basad of apical area near lateral areas (in other words located apicolaterally in basal area).

17. Sternal fimbria—subapical bands, one or two hairs wide of long, suberect to erect, often recurved, pale hairs usually barbed at least in outer thirds on sterna 2–5.

18. Trochanteral flocculus—a group of long, curved, barbed hairs on the basal and lower portion of the hind trochanter. These hairs curve outwards, often reaching nearly to the middle of the lower edge of the femur.

Figures 1 and 2 illustrate the genital capsule of *A. helianthi* Robertson. These drawings are included here for two purposes. First, the drawings provide labels of salient genital structures which are described in the text. Second, drawings in which curvature and depth are shown will aid the observer in interpreting the line-drawings given for each species near the end of this paper. In order to accomplish the second objective, oblique views were chosen for figures 1 and 2, since one often thus observes the genital capsule either *in situ* or after it has been removed from the bee. Also, the oblique views command more of a sense of depth than either directly dorsal or ventral views.



FIGS. 1 and 2. Genital capsule of *A. (Callandrena) helianthi* Robertson. Figure 1 shows the capsule in an oblique-dorsal view, figure 2 in an oblique-ventral view.

Collections of bees have been borrowed from all of the major American collections and many smaller collections, both institutional and private. The location of specimens studied is not given in the following descriptions except for primary types and paratypes. In citing institutional and private collections as repositories of these type materials, initials are used to indicate the collection and the place. The following list will suffice to explain these initials:

AMNH—American Museum of Natural History, New York City, New York.

CAS—California Academy of Sciences, San Francisco, California.

CMP—Carnegie Museum, Pittsburgh, Pennsylvania.

GEB—Dr. G. E. Bohart collection, Logan, Utah.

INHS—Illinois Natural History Survey, Urbana, Illinois.

KSU—Kansas State University, Manhattan, Kansas.

LACM—Los Angeles County Museum, Los Angeles, California.

MSU—Michigan State University, East Lansing, Michigan.

NCSU—North Carolina State University, Raleigh, North Carolina.

NSM—Nebraska State Museum, University of Nebraska, Lincoln, Nebraska.

OSU—Oregon State University, Corvallis, Oregon.

PANS—Philadelphia Academy of Natural Sciences, Philadelphia, Pennsylvania.

PHT—Mr. P. H. Timberlake, Riverside, California.

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RBR—Mr. R. B. Roberts, University of Kansas, Lawrence, Kansas.

SECK—Snow Entomological Collection, University of Kansas, Lawrence, Kansas.

UAT—University of Arizona, Tucson, Arizona.

UCB—University of California, Berkeley, California.

UCD—University of California, Davis, California.

UCNH—University of Colorado Natural History Museum, Boulder, Colorado.

UMC—University of Missouri, Columbia, Missouri.

USNM—United States National Museum, Washington, D.C.

USU—Utah State University, Logan, Utah.

In the synonymies of species given at the beginning of each species treatment, references from the *Hymenoptera of America North of Mexico* by Muesbeck, *et al.* (1951) and *Catalogus Hymenopterorum* by Dalla Torre (1896) have been omitted unless new names or new status of old names are involved. Also, in order to conserve space the synonymical citations to Lanham (1949) and Robertson (1928) refer only to the page where the species are listed and not to other pages in these papers where the species may have been mentioned.

PHYLOGENY

Lanham (1949, p. 199) considered *Callandrena* and *Pterandrena* to be among the most primitive of the subgenera of *Andrena*. The present author believes that it is still premature to consider this subgenus as being primitive. Not enough is known as yet about the primitiveness of characters observed in the genus *Andrena*, and the Eurasian subgenera have not been studied with this in mind.

The 79 species of *Callandrena* can be divided into about 16 rather indistinct groups. Of these 16 groups, five are monotypic and the other eleven include from two to 18 species. The larger groups usually contain one or more species which can be considered annectants with one or more of the other groups. These groups and their included species are listed below:

- | | |
|--|--|
| 1. The <i>krigiana</i> -group <i>krigiana</i> Robertson <i>verecunda</i> Cresson <i>afimbriata</i> , n. sp. <i>crawfordi</i> , n. sp. <i>tonkaworum</i> Viereck <i>sitiliae</i> Viereck <i>senticulosa</i> , n. sp. | 3. The <i>solidaginis</i> -group <i>simplex</i> Smith <i>placata</i> Mitchell <i>asteris</i> Robertson <i>asteroides</i> Mitchell <i>bullata</i> , n. sp. |
| 2. The <i>levipes</i> -group <i>levipes</i> , n. sp. | 4. The <i>fulvipennis</i> -group <i>fulvipennis</i> Smith |

5. The *aureocincta*-group
simulata Smith
inculta, n. sp.
tegularis, n. sp.
uyacensis Cockerell
sodalis Smith
auripes, n. sp.
rubens, n. sp.
hondurasica Cockerell
amarilla Cockerell
bilimeki, n. sp.
duplicata Mitchell
solivaga, n. sp.
perpunctata, n. sp.
dreisbachelorum, n. sp.
levigata, n. sp.
limatula, n. sp.
optanda, n. sp.
agilis Smith
6. The *helianthi*-group
helianthi Robertson
parilis, n. sp.
braccata Viereck
vulpicolor Cockerell
sonorensis, n. sp.
pecosana Cockerell
fumosa, n. sp.
barberi Cockerell
rava, n. sp.
monticola, n. sp.
irrasus, n. sp.
beameri, n. sp.
haynesi Viereck
and Cockerell
7. The *discreta*-group
discreta Smith
fulminea, n. sp.
aeripes, n. sp.
fulminoides, n. sp.
vulpoides, n. sp.
aerifera, n. sp.
repanda, n. sp.
8. The *texana*-group
texana Cresson
9. The *gardineri*-group
gardineri Cockerell
isocomae Timberlake
neomexicana, n. sp.
ardis, n. sp.
balsamorhizae, n. sp.
berkeleyi Viereck
and Cockerell
utahensis, n. sp.
biscutellata Viereck
ofella, n. sp.
10. The *helianthiformis*-group
helianthiformis Viereck
and Cockerell
11. The *vidalesi*-group
vidalesi Cockerell
aliciarum Cockerell
12. The *aliciae*-group
aliciae Robertson
ignota, n. sp.
13. The *melliventris*-group
melliventris Robertson
rudbeckiae Robertson
14. The *accepta*-group
accepta Viereck
trimaculata, n. sp.
reflexa, n. sp.
calvata, n. sp.
sculleni, n. sp.
15. The *humeralis*-group
humeralis, n. sp.
16. The *manifesta*-group
manifesta Fox
pectidis Cockerell
verbesinae Cockerell
mexicana, n. sp.

Within the subgenus *Callandrena* it is possible to suggest the primitive condition for a number of characteristics and at least a preliminary phylogenetic scheme can thus be worked out for the 16 groups within the subgenus. The primitive condition of most of these characters is decided by their widespread presence in other bees, especially the Colletidae and/or the Halictidae, or their presence in related wasps of the superfamily Sphecoidea. These characters are as follows:

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| <i>Primitive Alternative</i> | <i>Specialized Alternative</i> |
|---|--|
| 1. Three submarginal cells. | 1. Two submarginal cells. |
| 2. Female clypeus and parocular areas black. | 2. Female clypeus yellow; parocular areas yellow. |
| 3. Male clypeus yellow; parocular area yellow or black. | 3. Male clypeus and parocular areas black. |
| 4. Cheek about as broad as eye in profile. | 4. Cheek much broader than eye in profile. |
| 5. Vertex above lateral ocellus equals about one ocellar diameter. | 5. Vertex above lateral ocellus equals at least two ocellar diameters. |
| 6. Basoventral mandibular angle and lamella absent. | 6. Basoventral mandibular angle and lamella present. |
| 7. Male sixth sternum flat apically. | 7. Male sixth sternum reflexed apically. |
| 8. Facial fovea oval, broader above than below or at least as broad above. | 8. Facial fovea narrower in lower third than in upper third. |
| 9. Female middle basitarsus not at all expanded medially. | 9. Female middle basitarsus greatly expanded medially. |
| 10. Propodeal corbicula without long anterior hairs, internal hairs abundant. | 10. Propodeal corbicula with long anterior hairs or without long internal hairs. |
| 11. Tergal apices flat, slightly or scarcely at all impressed, not reflexed. | 11. Tergal apical areas deeply impressed, rims reflexed. |
| 12. Hind basitarsus and claws not reduced in size. | 12. Hind basitarsus and claws reduced in size. |
| 13. Pterostigma relatively broad. | 13. Pterostigma extremely slender. |
| 14. Maxillary palpus at least as long as galea. | 14. Maxillary palpus distinctly shorter than galea. |

Table 1 gives the condition of these fourteen characters in each of the sixteen species-groups. A plus symbol indicates a specialized alternative, a zero indicates a primitive condition and a dash indicates primitive in at least some members of the group. A plus sign for a character may be misleading in that although it does indicate a specialized state for that character, some of the characters have more than one specialized state (for instance, number 10, the propodeal corbicula may have *either* long anterior hairs *or* lack of internal hairs *or* both). In such a case a plus sign in this row in two columns need not mean direct relationship. The five "groups" which are monotypic are marked by asterisks. A phylogenetic diagram (Fig. 3) shows the relationships as indicated by the fourteen characters listed above.

Of the 16 groups within *Callandrena*, the *krigiana*-group seems to be the most primitive. In fact, *A. krigiana* Robertson bears the primitive alternative for each of the fourteen characters used. This species is an early summer species of southeastern United States. Other members of the *krigiana*-group, such as *crawfordi*, *tonkaworum*, and *sitiliae*, are specialized in having males with black clypei or other specific specializations.

The *levipes*-group and the *solidaginis*-group are almost as primi-

TABLE 1. Characters and their states in sixteen groups of subgenus *Callandrena*. Plus = specialized; zero = primitive; dash = specialized in at least some species.

| Character No. | <i>krigiana</i> -group | <i>levipes</i> -group* | <i>solidaginis</i> -group | <i>fulvipennis</i> -group* | <i>aureocincta</i> -group | <i>helianthi</i> -group | <i>discreta</i> -group | <i>texana</i> -group* | <i>gardineri</i> -group | <i>helianthiformis</i> -group* | <i>vidalesi</i> -group | <i>aliciae</i> -group | <i>meliventris</i> -group | <i>accepta</i> -group | <i>humeralis</i> -group* | <i>manifesta</i> -group |
|---------------|------------------------|------------------------|---------------------------|----------------------------|---------------------------|-------------------------|------------------------|-----------------------|-------------------------|--------------------------------|------------------------|-----------------------|---------------------------|-----------------------|--------------------------|-------------------------|
| 1. | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | + |
| 2. | 0 | 0 | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 | + | + | - | + | + | + |
| 3. | - | 0 | 0 | 0 | - | - | 0 | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | + | + | + |
| 5. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | + | 0 | 0 | - | + | + | 0 |
| 6. | 0 | 0 | - | + | + | - | + | 0 | + | + | 0 | 0 | + | + | + | 0 |
| 7. | - | + | + | 0 | 0 | 0 | 0 | 0 | + | + | 0 | 0 | 0 | + | 0 | 0 |
| 8. | 0 | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9. | 0 | 0 | 0 | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | + | 0 | 0 | 0 |
| 10. | - | 0 | 0 | 0 | 0 | 0 | - | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11. | 0 | 0 | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 | 0 | 0 | - | - | 0 | - |
| 12. | 0 | 0 | 0 | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13. | - | 0 | 0 | 0 | - | + | + | + | + | + | + | + | + | + | + | + |
| 14. | 0 | 0 | + | + | + | + | + | + | - | + | + | + | + | + | + | + |

tive as the *krigiana*-group but bear certain specializations, such as the basoventral mandibular angle and lamella and the peculiar facial foveae, which indicate that they cannot be considered as being as near to the ancestors of the *Callandrena* as the *krigiana*-group. *A. levipes* has the maxillary palpi longer than in the *solidaginis*-group and so is slightly more primitive in this respect. The *solidaginis*-group, the *fulvipennis*-group and the *aureocincta*-group are related to one another by the extraordinary development of the basoventral mandibular angle and lamella which reaches its greatest development in these groups. Most of the species of the groups thus far discussed retain the primitive character of a relatively broad pterostigma.

The remaining groups all have species with extremely slender pterostigmata. They are divisible into two main groups on the basis of the presence or absence of yellow markings on the face of the female. The more primitive grouping, centered around the *helianthi*-group, have females with black clypei and parocular areas and, with two exceptions (the *helianthiformis*-group and the *texana*-group), males with yellow clypei. The males of this grouping also mostly have a flat sixth sternum, another primitive character.

The most specialized groups, including *accepta*, *humeralis*, *meliventris*, *aliciae*, *vidalesi* and *manifesta*, have in common a yellow

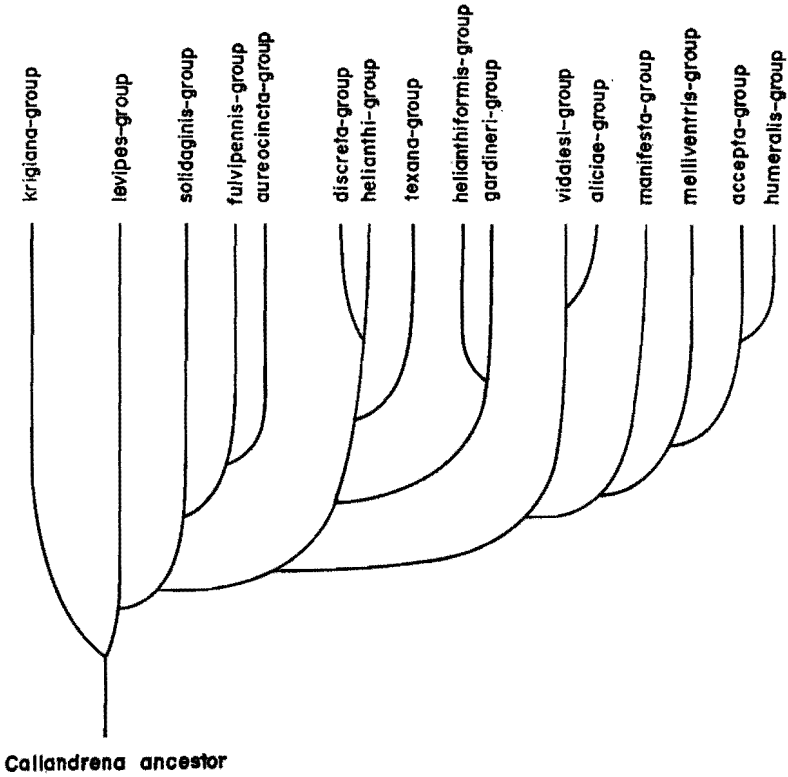


FIG. 3. Diagram of the suggested phylogeny of the sixteen species groups of the subgenus *Callandrena*. The lengths of the lines do not indicate relative age or a scale of time.

clypeus and/or parocular areas in the females, a slender pterostigma and frequently a high vertex and broad genal area. The shortest maxillary palpi also occur within some of these groups (especially *accepta* and *melliventris*). Several other specializations characterize one or more of these groups as indicated in Table 1.

In the phylogenetic scheme here proposed, several characters obviously must have arisen more than once. The black (femalelike) male clypeus has appeared four times—in the *krigiana*-group, the *helianthiformis*-group, the *texana*-group and the *aureocincta*-group. The reflexed apical margin of the male sixth sternum has appeared five times—in the *krigiana*-group (two species), the *levipes*-group (one species), the *solidaginis*-group (several species), the *gardineri*-*helianthiformis* stem, and *accepta*-group. This last character can be told by its form to have originated more than once; in some of the above groups the apical margin is entire and reflexed across the entire apex of the sternum (as in *solidaginis*), whereas in others it is

reflexed only laterally forming toothlike apicolateral angles (*levipes*) or is deeply emarginate medially (*accepta*). The presence of only two submarginal cells has appeared twice—in the *manifesta*-group and in one species of the *aureocincta*-group. A different phylogenetic scheme could be devised using these same fourteen characters and the same assumptions for each, but other schemes would indicate a much higher degree of parallelism. The author believes that the law of parsimony ought to be adhered to in devising such a scheme.

The *Callandrena* appear to have arisen in North America and remain a North and Central American group. The precise origin from other *Andrena* remains clouded due to a lack of information regarding the phylogeny of other *Andrena* subgenera. However, the appearance of *Callandrena* probably began with a shift in pollen preferences from spring flowers such as Rosaceae and Salicaceae to some late-spring or early-summer species of Compositae.

Once a shift to the Compositae as the primary source of pollen was made, a shift to later season flowers began, as a majority of composites bloom in summer and autumn. This move from spring-flowering Rosaceae, Salicaceae, and other plants to the summer-blooming Compositae permitted *Callandrena* to move further south in its range and to become the southern-most subgenus of *Andrena* in the Western Hemisphere. Some of the groups, such as the *aureocincta*-group, the *vidalesi*-group, the *discreta*-group, and the *manifesta*-group underwent considerable speciation in the Mexican plateau area where they remain abundant. Other groups of species occupied the prairies and the eastern parts of the continent. Very few species have become restricted to the western mountain regions.

A recent study of the Eurasian fauna has convinced the author that the primitive *krigiana*-group is in reality a New World representative of the Old World subgenus *Chrysandrena*. This group should have been separated from the rest of the *Callandrena*, but the information was not available until after this paper was in press. Such a change would not affect the phylogeny as outlined above, but would have some bearing on the zoogeographic considerations.

TAXONOMIC TREATMENT

Subgenus *Callandrena* Cockerell

Callandrena Cockerell, 1898, Trans. American Ent. Soc., vol. 25, p. 186; Michener, 1944, Bull. American Mus. Nat. Hist., vol. 82, p. 242; Lanham, 1949, Univ. California Publ. Ent., vol. 8, pp. 198–199; LaBerge, 1964, Bull. Univ. Nebraska State Mus., vol. 4, pp. 294–295 (synonymy).

Type species: *Panurgus manifesta* Fox, 1894, monobasic.

Pterandrena Robertson, 1902, Tran. American Ent. Soc., vol. 28, pp. 187, 193; Cockerell, 1927, Pan-Pacific Ent., vol. 4, p. 43; Timberlake, 1938, Pan-Pacific Ent., vol. 14, p. 24; Lanham, 1949, Univ. California Publ. Ent., vol. 8, pp. 199-200.

Type species: *Andrena pulchella* Robertson, 1891(= *Andrena accepta* Viereck, 1916), by original designation.

The subgenus *Pterandrena* Robertson was merged with the *Callandrena* Cockerell by LaBerge (1964, p. 294) and the reasons for doing so can be found in that work. The subgenus *Callandrena* as here constituted can be readily separated from most other subgenera of *Andrena* by the short maxillary palpaе of both sexes. These palpaе are usually shorter than the galeae when both are stretched forward and only occasionally are slightly longer. A few other subgenera, such as *Scotiandrena* and *Cnemidandrena*, have short maxillary palpi but these can be separated from the *Callandrena* by use of other characters as given in the key to the subgenera by LaBerge (1964). Females of *Callandrena* have highly plumose tibial scopal hairs, a flattened emarginate labral process and narrow pterostigma. The males of most *Callandrena* are marked by the narrow pterostigma, a yellow clypeus and often yellow parocular maculae, and a flat emarginate labral process. Both sexes of *Callandrena* lack the pronotal humeral angles and ridges (except two species newly described below), usually have tergal fasciae and finely sculptured propodeal enclosures. Except for the maxillary palpi, the characters of *Callandrena* all have exceptions in one or a few species within the subgenus.

Small to medium-sized bees. Facial quadrangle about as broad as long or slightly longer; lateral ocellus usually separated from vertex by about one ocellar diameter, occasionally by less and occasionally by two or more diameters; labial palpi normal; maxillary palpi short, usually distinctly shorter than galeae when both extended forward; labral process usually flat and bidentate, occasionally entire, trapezoidal or triangular; clypeus relatively flat, usually evenly rounded from side to side, protruding beyond eyes in facial view by one-fourth to one-third median clypeal length, usually coarsely punctate; malar space linear; genal areas in lateral view about as broad as eye to twice as broad as eye. Pronotum normal, without humeral angle or ridge, except in two species; propodeum with dorsal surface rather short, enclosure finely sculptured, lateral sutures marking dorsal enclosure not at all carinate, depressed or flat. Tergal integument impunctate and dull or shiny to coarsely punctate. Hind tibial spur usually normal, rarely bent and slightly expanded near base. Pterostigma usually narrower

than from inner margin prestigma to wing margin; first transverse cubital vein separated from pterostigma by more than three vein widths; usually with three submarginal cells, occasionally with two; vein 1st m-cu usually meets second submarginal cell near or before middle, occasionally in outer third of cell. Vestiture usually pale; terga 2-4 (and 5 in male) and occasionally tergum 1 with more or less distinct pale fasciae, occasionally absent or broadly interrupted medially.

Female. Facial fovea usually shallow, long and broad above but frequently relatively short and narrow; clypeus and/or parocular areas occasionally with yellow. Middle basitarsus often expanded medially and broader than hind basitarsus. Subgenal coronet usually well developed, occasionally weak or absent; tibial scopal hairs almost always plumose; trochanteral flocculus complete; propodeal corbicula usually incomplete, usually with long internal hairs which are simple or weakly plumose.

Male. Clypeus usually yellow, parocular areas often with yellow maculae; mandibles not decussate; first flagellar segment usually longer than second segment, second and third segments often equal in length to each other. Sterna 2-5 often with subapical fimbriae; sternum 6 often reflexed apically.

ARTIFICIAL KEY TO THE FEMALES OF THE SUBGENUS *Callandrena*
OF NORTH AND CENTRAL AMERICA

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| 1. Tegulae with small round punctures over entire surface, punctures separated by one puncture width or less, surface often dulled by fine reticular shagreening | 2 |
| Tegulae impunctate and shiny at least on summits | 3 |
| 2(1). Labral process slightly emarginate medially; hind basitarsus yellow or orange at least basally; apices of terga hyaline..... <i>see AZ</i> | 195 |
| <i>regularis</i> , n. sp., p. | |
| Labral process entire; hind basitarsus dark reddish-brown; apices of terga piceous, or at most slightly and narrowly translucent, brownish | |
| <i>see AZ, sub AZ, etc.</i> | |
| <i>perpunctata</i> , n. sp., p. | 222 |
| 3(1). Terga 2-4 strongly constricted near apices, apical areas hyaline, impunctate, with strongly reflexed rims; propodeal enclosure abruptly declivous posteriorly, posterior surface with median longitudinal sulcus narrow above, broad and rounded below, with distinct carinae separating lateral from posterior and dorsal surfaces..... | 285 |
| <i>repanda</i> , n. sp., p. | |

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| Terga 2-4 not strongly constricted subapically, apical areas with rims not reflexed; propodeum with dorsal enclosure not abruptly declivous, posterior surface with median sulcus parallel-sided or V-shaped, not carinate laterally..... | 4 |
| 4(3). Pronotum with distinct humeral angle and ridge; parocular areas yellow; clypeus black; lateral ocellus separated from margin of vertex by about one and one-half ocellar diameter..... <i>humeralis</i> , n. sp., p. | 76 |
| Pronotum without humeral angle or, if indistinct angle present, ridge absent; parocular areas often not yellow; clypeus usually black; lateral ocellus usually separated from vertex by less than one and one-half ocellar diameter, occasionally by more | 5 |
| 5(4). Fore wings with two submarginal cells; face with yellow (either clypeus or parocular areas or both) or cream-colored markings | 6 |
| Fore wings with three submarginal cells, <i>if</i> with only two, <i>then</i> face without yellow or cream-colored markings | 9 |
| 6(5). Thoracic dorsum with hairs short, erect, forming a mat hiding surface; clypeus yellow except narrow apical margin and often lateral angles; wing membranes often deeply infumate..... | 7 |
| Thoracic dorsum with hairs of moderate length, erect, not hiding surface; clypeus not entirely yellow; wing membranes not or slightly infumate apically and anteriorly..... <i>verbesinae</i> Viereck and Cockerell, p. | 47 |
| 7(6). Bees small, about 10 mm in length or less; terga 1-4 shiny, basally with minute punctures separated mostly by more than one puncture width..... | 44 |
| <i>pectidis</i> Cockerell, p. | 8 |
| Bees medium-sized, 11 or 12 mm in length or more; terga 1-4 moderately shiny, basally with small to medium-sized punctures separated mostly by less than one puncture width..... | 8 |
| 8(7). Terga 1-4 piceous with hyaline margins; tergum 2 with basal area punctures separated mostly by half a puncture width; pygidial plate rounded apically.... | 41 |
| <i>manifesta</i> (Fox), p. | 50 |
| Terga 1-4 at least in part red, apical margins hyaline; tergum 2 with basal area punctures separated mostly by one puncture width at least laterally; pygidial plate sharply V-shaped..... <i>mexicana</i> , n. sp., p. | 50 |

- 9(8). Small bees, less than 10 mm in length; inner margins compound eyes parallel or almost so; facial fovea long, broader in lower third than in upper third, well separated from eye margin; terga often entirely or largely red.....*levipes*, n. sp., p. 289
 Small to large bees; inner margins compound eyes usually not parallel, usually diverging above; facial fovea either broad or broad and short, not broader in lower third than in upper, usually not well separated from eye margin; terga black or red 10
- 10(9). Labral process large, triangular with apex forming a right angle or sharply acute angle; metasomal terga usually largely red (first tergum mostly black).....
*discreta* Smith (in part), p. 270
 Labral process not triangular, or if so, then bidentate or emarginate and terga black..... 11
- 11(10). Hind tarsal claws distinctly smaller than middle and fore tarsal claws; mandible abruptly narrowed about one-third distance from base, least width (near middle) equal to half or less of greatest width (near base); fore wings deeply infumate, dark blackish-brown.....*fulvipennis* Smith, p. 184
 Hind tarsal claws as large as or larger than fore and middle tarsal claws; mandible usually not abruptly broadened near base (without basoventral lamella), or if so, then fore wings not deeply infumate, clear to moderate infumate..... 12
- 12(11). Middle basitarsus produced apico-anteriorly into a sharp spine.....*senticulosa*, n. sp., p. 177
 Middle basitarsus not produced into a spine apico-anteriorly, rounded or slightly angulate..... 13
- 13(12). Propodeal corbicula with interior free of hairs or with several long hairs restricted to dorsoposterior third, or with minute hairs scattered over surface, anterior margin without long plumose hairs..... 14
 Propodeal corbicula with interior with long simple or plumose hairs scattered throughout or concentrated in upper half or anterodorsal area, if anterior without long hairs, then anterior margin with long plumose hairs (corbicula complete)..... 27
- 14(13). Terga with basal areas with abundant regular round coarse punctures, surface shiny, only slightly shagreened if at all 15
 Terga usually impunctate or punctures minute and

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| | sparse, surface dulled by regular tessellation or dense regular reticular shagreening..... | 18 |
| 15(14). | Small bees, 10 mm or less in length; clypeal surface dulled by dense, irregularly reticular shagreening; terga usually at least lightly shagreened | |
| | <i>krigiana</i> Robertson, p. | 157 |
| | Small to large bees, usually greater than 10 mm in length; clypeal surface shiny, shagreening delicate or absent (coarser and denser laterally); terga unshagreened or only extremely delicately so..... | 16 |
| 16(15). | Terga 2 and 3 shiny, unshagreened, punctures separated mostly by two puncture widths or less, especially on tergum 3..... | 17 |
| | Terga 2 and 3 dulled by fine reticular shagreening, punctures separated mostly by two to three puncture widths..... | |
| | <i>sitiliae</i> Viereck (in part), p. | 174 |
| 17(16). | Terga 2 and 3 without apical pale fasciae; lateral ocellus separated from posterior margin of vertex by about one ocellar diameter..... | |
| | <i>crawfordi</i> Viereck (in part), p. | 168 |
| | Terga 2 and 3 with pale apical fasciae, although relatively weak and occasionally narrowly interrupted medially on tergum 2; lateral ocellus separated from margin of vertex by distinctly more than one ocellar diameter..... | |
| | <i>verecunda</i> Cresson (in part), p. | 162 |
| 18(14). | Terga with small round regularly-spaced punctures separated mostly by two to three puncture widths and bearing erect hairs, surfaces dulled by fine reticular shagreening (or fine tessellation); apices of terga hyaline, yellow or reddish; apical tergal fasciae weak | 19 |
| | Terga impunctate or with minute scattered punctures separated irregularly but mostly by more than three puncture widths, surfaces tessellate; tergal apices usually not hyaline, or <i>if so, then</i> with dense apical fasciae covering margins..... | 20 |
| 19(17). | Tergal apices usually broadly hyaline, yellow; middle basitarsus expanded medially somewhat, about as broad as hind basitarsus or slightly broader..... | |
| | <i>tonkaworum</i> Viereck (in part), p. | 171 |
| | Tergal apices usually narrowly hyaline, usually colorless; middle basitarsus not expanded medially, narrower than hind basitarsus..... | |
| | <i>sitiliae</i> Viereck (in part), p. | 174 |

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| 20(18). Clypeus dulled by fine irregularly reticular or transverse shagreening | 21 |
| Clypeus shiny to moderately shiny, especially apico-medially, shagreening when present medially coarse and not dulling surface..... | 24 |
| 21(20). Mesocutum with brown hairs; propodeum with posterior median sulcus with distinctly carinate margins, internally shiny, the carinae marking a distinct change in sculpturing from propodeal surface to interior of sulcus; clypeus with crowded, coarse punctures, at least in lateral thirds..... | 22 |
| Mesoscutum without brown hairs; posterior median propodeal sulcus without carinae at sides, rounded with sculpturing of surface extending into sulcus; clypeus with small obscure punctures laterally | 23 |
| 22(21). Propodeum with posterior sulcus narrow, no more than one-third as broad as lateral part of propodeal posterior surface, not strongly V-shaped, almost parallel-sided; tergal tessellation exceedingly fine..... | |
| <i>monticola</i> , n. sp. (in part), p. | 125 |
| Propodeum with posterior or median sulcus broad, width equal to about half of lateral portion of posterior propodeal surface, strongly V-shaped, sides bowing outwards slightly; tergal tessellation relatively coarse..... | |
| <i>barberi</i> Cockerell, p. | 118 |
| 23(21). Tergum 2 with apical area medially equal in length to no more than one-third basal area; hind basitarsus and tibia brown to black; wing veins dark brown, membranes slightly infumate; tegulae piceous..... | |
| <i>braccata</i> Viereck, p. | 102 |
| Tergum 2 with apical area medially equal in length to or almost equal to one-half of basal area; hind basitarsus and tibia often yellow to orange-red; wing veins usually red, membranes infumate, brown, especially apically; tegulae usually testaceous..... | |
| <i>vulpicolor</i> Cockerell (in part), p. | 106 |
| 24(20). Labral process roughly rectangular with apical margin slightly concave, apicolateral angles rounded and about half as long as broad or somewhat longer... | |
| <i>vulpicolor</i> Cockerell (in part), p. | 106 |
| Labral process roughly trapezoidal in outline with distinct apical emargination (or distinctly bidentate), usually longer than half width..... | 25 |

A Revision of the Bees of the Genus *Andrena*

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| 25(24). Terga 2-4 with basal areas with abundant short erect hairs..... | <i>tonkaworum</i> Viereck (in part), p. | 171 |
| Terga 2-4 with basal areas almost glabrous | | 26 |
| 26(25). Terga 5 and 6 with brown hairs..... | <i>monticola</i> , n. sp. (in part), p. | 125 |
| Terga 5 and 6 with ochraceous, white or reddish hairs | <i>rava</i> , n. sp., p. | 122 |
| 27(13). Clypeus and/or parocular areas with yellow or cream-colored markings | | 28 |
| Clypeus and parocular areas black..... | | 36 |
| 28(27). Subgenal coronet poorly developed or absent; small bees, less than 10 mm in length..... | <i>vidalesi</i> Cockerell, p. | 55 |
| Subgenal coronet well developed, medium-sized to large bees, usually more than 10 mm long..... | | 29 |
| 29(28). Tibial scopal hairs dark brown to black; hind basitarsus (and usually tibia) yellow to red; terga at least partly red..... | <i>aeripes</i> , n. sp., p. | 278 |
| Tibial scopal hairs pale, or <i>if</i> dark, <i>then</i> hind basitarsus dark in color; terga partly or not at all red.... | | 30 |
| 30(29). Terga with distinct punctures separated mostly by one and one-half puncture widths or less, surfaces moderately shiny to shiny, shagreening fine, if present.... | | 31 |
| Terga without distinct punctures <i>and/or</i> surfaces opaque, dulled by dense reticular shagreening or fine tessellation | | 34 |
| 31(30). Lateral ocellus separated from posterior margin of vertex by about one ocellar diameter..... | | 32 |
| Lateral ocellus separated from margin of vertex by two or more ocellar diameters | | 33 |
| 32(31). Mesoscutum and scutellum completely covered by short, plumose, white or pale ochraceous hairs forming a matlike covering; clypeus punctate medially; terga with apical areas deeply impressed..... | <i>aliciarum</i> Cockerell, p. | 56 |
| Mesoscutum and scutellum medially with abundant short, dark-brown hairs and sparse long, white hairs scattered throughout, white peripherally; clypeus impunctate medially; terga with apical areas only slightly impressed..... | <i>sculleni</i> , n. sp., p. | 59 |
| 33(31). Clypeus with posteromedian one-third yellow; wings infumate apically..... | <i>accepta</i> Viereck, p. | 62 |

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| | Clypeus black or with very small yellow maculae posteromedially and laterally; wings not infumate apically..... | <i>trimaculata</i> , n. sp., p. | 68 |
| 34(30). | Propodeal enclosure with coarse rugae forming areola at least laterally; scopal hairs short... <i>ignota</i> , n. sp., p. | | 83 |
| | Propodeal enclosure not coarsely rugose; scopal hairs normal in length..... | | 35 |
| 35(34). | Mesoscutum, scutellum and metanotum with dense, short, pale ochraceous hairs; terga 2-4 with apical pale fasciae not interrupted medially, apices of terga hyaline; terga usually red in part..... | <i>melliventris</i> Cockerell, p. | 85 |
| | Mesoscutum, scutellum and metanotum with sparse white hairs; terga 2-4 with apical pale bands interrupted medially (especially on terga 2 and 3), apices of terga not hyaline, infumate; terga piceous..... | <i>aliciae</i> Robertson, p. | 78 |
| 36(27). | Propodeum with dorsal enclosure with fine transverse rugulae at least near apex (occasionally interrupted medially by a single longitudinal rugula); labral process short, entire or obscurely emarginate medially..... | | 37 |
| | Propodeal enclosure without rugulae or these restricted to short longitudinal basal rugulae or irregularly rugulose; labral process various, usually long, usually distinctly emarginate medially..... | | 42 |
| 37(36). | Terga 2-4 basad of apical pale fasciae with abundant distinct (if minute) punctures..... | | 38 |
| | Terga 2-4 basad of apical pale fasciae impunctate or virtually so..... | | 40 |
| 38(37). | Metasomal terga 2 and 3 with punctures minute but distinct, smaller than mesoscutal punctures, surfaces dulled by reticular shagreening..... | | 39 |
| | Metasomal terga 2 and 3 with punctures as large as mesoscutal punctures, surfaces shiny..... | <i>texana</i> Cresson, p. | 264 |
| 39(38). | Scutellum with punctures largely or entirely contiguous; integument not strongly metallic, if at all..... | <i>solivaga</i> , n. sp., p. | 221 |
| | Scutellum with punctures well-separated; integument metallic blue-black..... | <i>dreisbachorum</i> , n. sp. (in part), p. | 226 |
| 40(37). | Fore wing membranes hyaline; tergal integument not metallic..... | <i>optanda</i> , n. sp., p. | 235 |

- Fore wing membranes deeply infumate, especially in area of submarginal cell; tergal integument dark metallic blue-back or greenish-blue..... 41
- 41(40). Terga 1-3 shiny to moderately shiny, surfaces at most somewhat dulled by fine reticular shagreening; mesoscutum between parapsidal lines shiny, finely shagreened at most; terga 2-4 with apical fasciae golden-colored..... *levigata*, n. sp., p. 229
- Terga 1-3 dulled by regular tessellation; mesoscutum between parapsidal lines dulled by reticular shagreening; terga 2-4 with apical fasciae white to cinereous..... *limatula*, n. sp., p. 233
- 42(36). Small to medium-sized bees, 11 mm or less in length; facial fovea short, not extending down beyond level of upper margins of antennal fossae..... 43
- Medium-sized to large bees, usually 11 mm or more in length, or *if* smaller, *then* facial fovea extends down to about lower margins of antennal fossae (fovea often short in larger forms)..... 61
- 43(42). Terga without distinct punctures, surfaces reticularly shagreened, dull, *if* shiny to moderately shiny, *then* impunctate 44
- Terga with distinct punctures, surfaces usually at least moderately shiny, shagreening, if present, delicate, not obscuring punctures..... 47
- 44(43). Labral process deeply emarginate apicomediaally, strongly bidentate..... *simplex* Smith, p. 137
- Labral process entire or only slightly emarginate medially not bidentate..... 45
- 45(44). Mesoscutum with small distinct crowded punctures, surface moderately shiny at least medially; labral process entire..... *duplicata* Mitchell, p. 217
- Mesoscutum with punctures obscured by fine dense tessellation dulling surface; labral process usually slightly emarginate medially..... 46
- 46(45). Tergum 2 largely orange or red, tergum 1 with apex orange, forming a broad orange or red band near base of abdomen; basitarsi with brownish-black hairs..... *bilimeki*, n. sp. (in part), p. 215
- Tergum 2 largely or entirely black, tergum 1 not orange distally; basitarsi with pale fulvous to ochraceous hairs..... *inculta*, n. sp. (in part), p. 193
- 47(43). Terga 2 and 3 with pale apical pubescent fasciae absent or of sparse weak hairs not hiding surfaces;

- tergum 4 with weak apical fascia of sparse pubescence; clypeus strongly punctate, shiny..... 48
- Terga 1-4 or 2-4 or 3-4 with strong apical fasciae of dense pubescence hiding surfaces (occasionally interrupted medially on tergum 2); clypeus often dulled by shagreening..... 51
- 48(47). Terga 2-4 with weak apical pubescent fasciae of sparse hairs (tergum 2 with fascia occasionally interrupted medially by half width of tergum or less); terga 1-4 with apical area punctures almost as sparse as in basal areas; tibial scopal hairs washed with brown posteriorly.....*verecunda* Cresson (in part), p. 162
- Terga 2-4 without apical fasciae or fascia of tergum 2 interrupted medially by more than half width of tergum and terga 3 and 4 often with fasciae interrupted medially as well; terga 1-4 with apical area punctures smaller and denser than in basal areas; tibial scopal hairs not washed with brown posteriorly 49
- 49(48). Terga all or chiefly red; lateral ocellus separated from posterior margin of vertex by almost two ocellar diameters and from facial fovea by two-thirds of an ocellar diameter.....*balsamorhizae*, n. sp. (in part), p. 252
- Terga largely or entirely black; lateral ocellus separated from posterior margin of vertex by one ocellar diameter or less or *if* by considerably more, *then* separated from facial fovea by about half an ocellar diameter or less..... 50
- 50(49). Lateral ocellus separated from posterior margin of vertex by one ocellar diameter or slightly less and from facial fovea by more than half an ocellar diameter; posterior hind tibial spur normal, almost straight....
.....*KS-78*.....*crawfordi* (Viereck) (in part), p. 168
- Lateral ocellus separated from vertex by slightly more than one ocellar diameter and from facial fovea by about half an ocellar diameter; posterior hind tibial spur long, curved, slightly expanded near base.....
.....*afimbriata*, n. sp. (in part), p. 165
- 51(47). Tergum 1 with pale apical fascia present (often interrupted medially by one-fourth to one-third width of tergum); tergum 2 with pale apical fascia uninterrupted medially; clypeus with evenly-spaced round punctures.....*gardineri* Cockerell, p. 237

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| Tergum 1 with pale apical fascia absent; tergum 2 with pale apical fascia interrupted medially; clypeal punctures usually sparse or absent medially, often of irregular size..... | 52 |
| 52(51). Lateral ocellus separated from posterior margin of vertex by at least one and one-half ocellar diameters..... | |
| <i>A. Z. M. C. O.</i> <i>simulata</i> Smith (in part), p. 189 | 189 |
| Lateral ocellus separated from posterior margin of vertex by about one ocellar diameter..... | 53 |
| 53(52). Mesoscutum with distinct punctures, shiny or shagreened but shagreening does not obscure punctures..... | 54 |
| Mesoscutum with punctures sparse or absent and/or obscured by dense reticular shagreening or fine dense tessellation..... | 56 |
| 54(53). Propodeum with dorsal enclosure with relatively coarse, irregular rugulae..... | 221 |
| <i>solivaga</i> , n. sp., p. 221 | |
| Propodeum with dorsal enclosure without rugulae or these extremely fine..... | 55 |
| 55(54). Terga 2 and 3 with basal area punctures coarse, surfaces shiny..... | 189 |
| <i>A. E. M. C. O.</i> <i>simulata</i> Smith (in part), p. 189 | |
| Terga 2 and 3 with basal area punctures fine, surfaces moderately dulled by fine reticular shagreening..... | 198 |
| <i>uyacensus</i> Cockerell, p. 198 | |
| 56(53). Labral process entire, triangular in outline; terga largely red basally; tibial scopal hairs brown..... | 206 |
| <i>rubens</i> , n. sp., p. 206 | |
| Labral process at least weakly emarginate medially or, if entire, then not triangular but trapezoidal or evenly curved apically; terga usually black basally; tibial scopal hairs usually pale..... | 57 |
| 57(56). Terga 2 and 3 with basal surfaces shiny, unshagreened or only slightly so on tergum 3..... | 58 |
| Terga 2 and 3 usually dulled by fine reticular shagreening..... | 59 |
| 58(57). Mesoscutal and scutellar hair moderately long, relatively sparse, not hiding surfaces; terga black basally..... | 204 |
| <i>auripes</i> , n. sp., p. 204 | |
| Mesoscutal and scutellar hair short, dense, hiding surfaces; tergum 2 and usually 3 and 4 with orange or red tergal bands..... | 213 |
| <i>amarilla</i> Cockerell, p. 213 | |
| 59(57). Mesoscutal hairs relatively short and dense, hiding surface; at least tergum 2 partly or entirely red basally..... | 215 |
| <i>M. C. O.</i> <i>bilimeki</i> , n. sp., p. 215 | |

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| | Mesoscutal hairs moderately long and sparse, not hiding surface; terga usually black basally..... | 60 |
| 60(59). | Tergum 2 with apical pale fascia interrupted medially by at least half width of tergum; tergum 3 usually with pale apical fascia narrowly interrupted..... | |
| | <i>sodalis</i> Smith, p. | 200 |
| | Terga 2 and 3 with pale apical fasciae complete or extremely narrowly interrupted medially..... | |
| | <i>inculta</i> , n. sp., p. | 193 |
| 61(42). | Tibial scopa dark brown; wing membranes moderately to deeply infumate, yellow-brown to dark brown; large bees, 12 mm or more in length..... | 62 |
| | Tibial scopa ochraceous to yellow or white and/or wing membranes slightly infumate to hyaline; small to medium-sized bees, usually 12 mm or less in length..... | 65 |
| 62(61). | Tergum 1 without subapical fringe of long appressed to suberect hairs, basal hairs sparse or absent, almost completely impunctate throughout..... | 63 |
| | Tergum 1 either with subapical fringe of long appressed to suberect hairs arising from a zone of small crowded punctures or punctate and hairy in basal half or more..... | 282 |
| 63(62). | Pygidial plate slightly concave, without inner raised triangular area, broad basally, blunt-tipped..... | |
| | <i>haynesi</i> Viereck and Cockerell, p. | 179 |
| | Pygidial plate flat, with raised inner triangular area, narrow, pointed apically..... | 64 |
| 64(63). | Terga 1-5 with broad apical areas with integument yellow to red..... | 274 |
| | <i>fulminea</i> , n. sp., p. | |
| | Terga 1-5 with apical areas piceous or if yellowish, then only very narrowly so..... | 280 |
| | <i>vulpoides</i> , n. sp., p. | |
| 65(61). | Terga 1-5 with basal areas with coarse crowded round punctures bearing stiffly erect, barbed hairs; terga with surfaces usually dulled by tessellation, but not obscuring the coarse punctures..... | 66 |
| | Terga 1-5 with basal areas impunctate or with relatively small obscure punctures, or without erect hairs; if coarsely punctate and with erect hairs, then surface not tessellate, shiny to moderately shiny..... | 69 |
| 66(65). | Labral process large, subtriangular, that is, triangular with small obtuse apex..... | 270 |
| | <i>discreta</i> Smith (in part), p. | |
| | Labral process not at all triangular, usually bidentate..... | 67 |

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| 67(66). Clypeus with surface punctate, shiny, with weak sparse shagreening or none at all medially; thoracic dorsum with pile tawny; wings deeply infumate, yellow-brown to brown..... | 127 |
| <i>helianthiformis</i> Viereck and Cockerell, p. | |
| Clypeus with surface punctate, dulled medially by dense reticular shagreening; thoracic pile white to cinereous; wings clear, not deeply infumate..... | 68 |
| 68(67). Middle basitarsus broadly expanded medially, much broader than hind basitarsus..... | 90 |
| <i>rudbeckiae</i> Robertson, p. | |
| Middle basitarsus not much expanded medially, subequal in width to hind basitarsus .. <i>beameri</i> , n. sp., p. | 135 |
| 69(65). Terga, thorax and head (in part) metallic blue-green; propodeal corbicula often complete but with a few internal hairs..... | 226 |
| <i>dreisbachelorum</i> , n. sp. (in part), p. | |
| Terga, thorax and head black, terga may be red in part; propodeal corbicula usually without anterior fringe of long curled hairs, usually with internal hairs | 70 |
| 70(69). Terga 2 and 3 impunctate or virtually so, usually dulled by dense shagreening or tessellation..... | 71 |
| Terga 2 and 3 punctate, surfaces usually shiny, occasionally dulled by fine shagreening or fine tessellation but not obscuring the punctures..... | 80 |
| 71(70). Tergum 1 with a well-developed apical pale fascia of long appressed pubescence; terga 2-4 with apical pale fasciae thick, uninterrupted medially..... | 112 |
| <i>pecosana</i> Cockerell (in part), p. | |
| Tergum 1 without apical pale fascia or with fascia extremely weak and usually restricted to lateral patches; terga 2-4 with pale apical fasciae often interrupted medially, especially on tergum 2, and often weak..... | 72 |
| 72(71). Middle basitarsus expanded medially, broadest near middle and broader medially than hind basitarsus .. | 73 |
| Middle basitarsus not expanded, broadest at middle or above, scarcely if any broader than hind basitarsus | 76 |
| 73(72). Propodeal corbicula with interior largely free of hairs; apices of terga broadly hyaline, yellow..... | 277 |
| <i>fulminoides</i> , n. sp., p. | |

- Propodeal corbicula with interior with abundant, long, simple and/or branched hairs; apices of terga not hyaline or only narrowly so..... 74
- 74(73). Flagellar segment 4 distinctly shorter than broad and not much longer than third segment; propodeal corbicula with dense anterior fringe of long hairs as well as internal hairs.....*asteris* Robertson, p. 147
- Flagellar segment 4 distinctly longer than broad, and longer than segment 3; propodeal corbicula with anterior fringe of long plumose hairs usually absent or weak in lower half..... 75
- 75(74). Propodeum with dorsal enclosure irregularly rugulose; terga with apical fasciae composed of long, relatively weak yellowish hairs. *asteroides* Mitchell (in part), p. 151
- Propodeum with dorsal enclosure tessellate, without rugulae; tergal fasciae composed of short, dense, white, plumose hairs....*placata* Mitchell (in part), p. 143
- 76(72). Labral process short, broad, usually more than twice as broad as long, weakly emarginate medially or entire*helianthi* Robertson, p. 94
- Labral process longer, usually less than twice as broad as long, distinctly emarginate medially, usually bidentate 77
- 77(76). Hind tarsi and tibiae yellow to orange-red; terga red with brown median band..... *sonorensis*, n. sp., p. 110
- Hind tarsi and tibiae dark brown; terga dark brown or black, apical margins often narrowly hyaline 78
- 78(77). Tergum 1 usually with apical pale fascia present but often interrupted medially; tergum 2 with complete apical pale fascia....*pecosana* Cockerell (in part), p. 112
- Tergum 1 without apical pale fascia (subapical punctures sparse or absent at least medially); tergum 2 with apical pale fascia usually interrupted medially . 79
- 79(78). Wing veins dark brown, membranes slightly infumate*fumosa*, n. sp., p. 117
- Wing veins red to yellowish, membranes not infumate*parilis*, n. sp., p. 101
- 80(70). Mesoscutum with extremely short, erect, densely plumose, densely crowded, ochraceous hairs forming a velvety mat; medium-sized to large bees, more than 12 mm in length; tergum 1 almost impunctate*biscutellata* Viereck, p. 260
- Mesocutal hairs not densely crowded, short or of medium length, not extraordinarily plumose, not form-

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| | ing a matlike covering anteriorly, or if somewhat matlike, then small bees, 11 mm or less in length.... | 81 |
| 81(80). | Tergum 2 with punctures separated mostly by one to two punctures widths or less | 82 |
| | Tergum 2 with punctures separated mostly by two or more puncture widths..... | 94 |
| 82(81). | Terga red or largely so..... | 83 |
| | Terga black or, at most, apical areas hyaline and yellowish or colorless, not red..... | 85 |
| 83(82). | Lateral ocellus separated from posterior margin vertex by one and one-half ocellar diameters or slightly more | 84 |
| | Lateral ocellus separated from posterior margin of vertex by one ocellar diameter or slightly more | |
| | <i>utahensis</i> , n. sp. (in part), p. | 258 |
| 84(83). | Middle basitarsus expanded medially, broader than hind basitarsus medially; terga 2 and 3 with basal area punctures separated mostly by less than one puncture width or slightly more..... | |
| | <i>berkeleyi</i> Viereck and Cockerell (in part), p. | 255 |
| | Middle basitarsus not much expanded medially, narrower than hind basitarsus medially; terga 2 and 3 with basal punctures separated mostly by one to two puncture widths..... | |
| | <i>balsamorhizae</i> , n. sp., (in part), p. | 252 |
| 85(81). | Labral process very short and broad, three times as broad as long or more, extremely shallowly and broadly emarginate medially; pygidial plate rather truncate apically..... | |
| | <i>reflexa</i> Cresson, p. | 70 |
| | Labral process longer, about half as long as broad, often strongly bidentate; pygidial plate pointed or rounded apically..... | 86 |
| 86(85). | Terga and clypeus with surfaces dulled by fine reticular shagreening..... | |
| | <i>bullata</i> , n. sp., p. | 154 |
| | Terga and clypeus with surfaces mostly shiny and unshagreened or extremely sparsely and finely so, especially peripherally..... | 87 |
| 87(86). | Pygidial plate strongly pointed at apex, V-shaped; usually 11 to 13 mm in length..... | |
| | <i>ardis</i> , n. sp., p. | 249 |
| | Pygidial plate rounded apically, V-shaped or somewhat U-shaped; 9 to 14 mm in length..... | 88 |
| 88(87). | Middle basitarsus strongly expanded medially; bee medium-sized, 11 to 12 mm in length..... | 89 |

- Middle basitarsus not at all expanded medially, or if slightly expanded, bee small, 9 to 10 mm in length... 90
- 89(88). Lateral ocellus separated from posterior margin of vertex by one and one-half ocellar diameters or slightly more
berkeleyi Viereck and Cockerell (in part), p. 255
- Lateral ocellus separated from posterior margin of vertex by one ocellar diameter or slightly more
utahensis, n. sp. (in part), p. 258
- 90(88). Terga 2-4 with dense apical fasciae of white pubescence completely obscuring apical areas (occasionally interrupted medially on tergum 2) 91
- Tergum 2-4 without apical pale fasciae except laterally or fasciae composed of sparse hairs which scarcely hide surfaces 92
- 91(90). Facial fovea narrow, maximum width much less than twice width just above lower end; flagellar segments 4-11 red or reddish-brown below... ⁴⁻⁷*ofella*, n. sp., p. 267
- Facial fovea broad, especially above, at maximum width about twice width near lower end or almost so; flagellar segments dark brown to black below...
neomexicana, n. sp., p. 246
- 92(90). Terga 2-4 with weak apical pubescent fasciae (tergum 2 occasionally interrupted medially by as much as half width of tergum); terga 1-4 with apical area punctures about as sparse as in basal areas; tibial scopal hairs washed with brown posteriorly.....
verecunda Cresson (in part), p. 162
- Terga 2-4 with apical fasciae absent or broadly interrupted medially; terga 1-4 with apical area punctures slightly smaller and distinctly more crowded than in basal areas; tibial scopal hairs white to ochraceous, without brown 93
- 93(92). Lateral ocellus separated from vertex by one ocellar diameter or slightly less and from facial fovea by more than half an ocellar diameter (usually by two-thirds or more) ...*crawfordi* (Viereck) (in part), p. 168
- Lateral ocellus separated from vertex by slightly more than one ocellar diameter and from facial fovea by about half a diameter...*afimbriata*, n. sp. (in part), p. 165
- 94(81). Terga 5 and 6 with brown hairs; leg hairs (other than scopal hairs and hairs of inner surfaces tarsi) chiefly brown 95
- Terga 5 and 6 with pale hairs, white to pale ochra-

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| ceous; leg hairs chiefly white to yellow or ochraceous | 96 |
| 95(94). Hind tibia and basitarsus piceous..... | |
| <i>placata</i> Mitchell (in part), p. | 143 |
| Hind tibia and base of basitarsus with integument orange to red..... | 151 |
| <i>asteroides</i> Mitchell (in part), p. | |
| 96(94). Tergal basal areas with surfaces dulled by fine regular reticular shagreening..... | 97 |
| Tergal basal areas with surfaces shiny, unshagreened or only slightly so..... | 100 |
| 97(96). Tergal apices broadly hyaline, yellow..... | |
| <i>tonkaworum</i> Viereck (in part), p. | 171 |
| Tergal apices very narrowly hyaline, if at all, piceous to clear..... | 98 |
| 98(97). Lateral ocellus separated from vertex by slightly more than one ocellar diameter and from facial fovea by about half an ocellar diameter..... | |
| <i>sitiliae</i> Viereck (in part), p. | 174 |
| Lateral ocellus separated from vertex by about one ocellar diameter and from facial fovea by about one ocellar diameter..... | 99 |
| 99(98). Propodeal corbicula with internal hairs plumose..... | |
| <i>irrasus</i> , n. sp., p. | 131 |
| Propodeal corbicula with internal hairs simple or largely so..... | 135 |
| <i>beameri</i> , n. sp., p. | |
| 100(96). Labral process shallowly emarginate, not bidentate..... | |
| <i>ofella</i> , n. sp., p. | 267 |
| Labral process deeply emarginate, bidentate..... | |
| <i>isocomae</i> Timberlake, p. | 243 |

ARTIFICIAL KEY TO THE MALES OF THE SUBGENUS *Callandrena*
NORTH AND CENTRAL AMERICA

1. Pronotum with distinct humeral angles, with strong ridge extending ventrally from angle; clypeus and parocular areas yellow; mandibles decussate.....
-*humeralis*, n. sp., p. 76
- Pronotum without humeral angles or without ridge; clypeus and parocular areas yellow or black; mandibles usually not decussate..... 2
- 2(1). Terga 2-5 strongly constricted near apices, apical areas impunctate, hyaline, with strongly reflexed rims; propodeum with dorsal enclosure turned abruptly down to posterior surface, posterior sur-

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| | face with long median sulcus vase-shaped, narrow above and expanded below..... | <i>repanda</i> , n. sp., p. 285 |
| | Terga 2-5 not strongly constricted subapically, apical areas with rims not reflexed, or <i>if</i> somewhat constricted and reflexed, <i>then</i> propodeum with dorsal enclosure not abruptly turned down posteriorly but rounded and posterior surface with sulcus parallel-sided or almost so..... | 3 |
| 3(2). | Tegulae with distinct round punctures separated by one puncture width or less; bee coarsely sculptured, mesoscutum and scutellum with coarse round adjacent punctures as well as fine tessellation dulling surfaces | 4 |
| | Tegulae not punctate except occasionally anteriorly, or extremely finely and sparsely punctate; mesoscutum and scutellum either impunctate or punctures well separated at least posteromedially, often shiny.. | 5 |
| 4(3). | Clypeus largely yellow; first flagellar segment one and one-half to two times as long as second segment | |
| | <i>tegularis</i> , n. sp., p. 195 | |
| | Clypeus black; first flagellar segment equal to or only slightly longer than second... <i>perpunctata</i> , n. sp., p. 222 | |
| 5(3). | Front wings with two submarginal cells; clypeus and parocular areas with yellow; vertex above lateral ocellus equal to more than one ocellar diameter..... | 6 |
| | Front wings with three submarginal cells or, <i>if</i> with two cells, <i>then</i> at least parocular areas without yellow or vertex above lateral ocellus no more than about one ocellar diameter or both..... | 8 |
| 6(5). | Small bees, less than 10 mm in length; largely red, legs largely yellow..... | <i>pectidis</i> Cockerell, p. 44 |
| | Larger bees, 11 mm or more in length; metasomal terga largely black, legs dark reddish-brown to black..... | 7 |
| 7(6). | Hairs of mesoscutum mostly one-third or less as long as those of mesepisternum; hind basitarsus and tibia piceous..... | <i>verbesinae</i> Viereck and Cockerell, p. 47 |
| | Hairs of mesoscutum mostly at least half as long as those of mesepisternum; hind basitarsus yellow to orange, hind tibiae red to orange. <i>manifesta</i> (Fox), p. | 41 |
| 8(5). | Clypeus black..... | 9 |
| | Clypeus partly or wholly yellow or white..... | 22 |
| 9(8). | Flagellar segment 1 distinctly longer than segments 2 plus 3, segment 2 almost twice as broad as long; | |

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| terga usually shiny, with small but distinct punctures | 10 |
| Flagellar segment 1 subequal to or shorter than segments 2 plus 3, <i>if</i> slightly longer, <i>then</i> segment 2 almost as long as broad; terga opaque dulled by dense reticular shagreening which obscures the minute sparse punctures..... | 15 |
| 10(9). Flagellar segments 2 and 3 subequal in length and each distinctly shorter than segment 4, segment 4 usually subequal in length to segment 5 and at least as long as broad or longer..... | 11 |
| Flagellar segments 2, 3 and 4 subequal in length to each other and each distinctly shorter than segment 5, <i>or</i> segments 2 and 4 subequal, shorter than 5 and slightly longer than segment 3, <i>or</i> some other combination; segment 4 broader than long | 12 |
| 11(10). Tergal apices hyaline, yellowish to colorless | |
| <i>tonkaworum</i> Viereck, p. | 171 |
| Tergal apices infumate or extremely narrowly hyaline | |
| <i>senticulosa</i> , n. sp., p. | 177 |
| 12(10). Sterna 2-5 with strong subapical fimbriae of moderately long, curled, plumose, suberect hairs | |
| <i>verecunda</i> Cresson, p. | 162 |
| Sterna 2-5 without subapical fimbriae, subapical hairs similar to more basal hairs, often shorter or sparser or both..... | 13 |
| 13(12). Sternum 6 strongly reflexed, with posterolateral angles strongly sclerotized; lateral ocellus separated from margin of vertex by more than one ocellar diameter | 14 |
| Sternum 6 weakly reflexed, posterolateral angles weakly sclerotized; lateral ocellus separated from vertex by one ocellar diameter or less..... | |
| <i>crawfordi</i> (Viereck), p. | 168 |
| 14(13). Terga strongly punctate, middle of tergum 2 with punctures separated mostly by one puncture width, surfaces shiny, unshagreened or only delicately so.... | |
| <i>afimbriata</i> , n. sp., p. | 165 |
| Terga weakly punctate, middle of tergum 2 with punctures separated mostly by two or more puncture widths, surface dulled by fine dense reticular shagreening..... | |
| <i>sitiliae</i> Viereck, p. | 174 |
| 15(9). Propodeum with dorsal enclosure with fine transverse | |

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| | rugulae at least near junction with posterior surface and often basally..... | 16 |
| | Propodeum with dorsal enclosure without rugulae or at least without transverse rugulae (a short longitudinal basal rugulae or highly irregular rugulae may be present)..... | 19 |
| 16(15). | Terga 1-5 distinctly punctate; labral process usually bidentate | 17 |
| | Terga 1-5 impunctate or punctures extremely sparse; labral process usually weakly emarginate, scarcely bidentate | 18 |
| 17(16). | Flagellar segment 1 subequal to segment 2 in length or slightly longer | 215 |
| | <i>bilimeki</i> , n. sp., p. | |
| | Flagellar segment 1 at least twice as long as segment 2 | 264 |
| | <i>texana</i> Cresson, p. | |
| 18(16). | Terga 1-4 with surfaces shiny, scarcely if at all shagreened; terga 6 and 7 and sternal hairs fulvous | 229 |
| | <i>levigata</i> , n. sp., p. | |
| | Terga 1-4 with surfaces at least slightly dulled by reticular shagreening; terga 6 and 7 and sternal hairs pale ochraceous | 233 |
| | <i>limatula</i> , n. sp., p. | |
| 19(15). | Large species, 12 mm or more in length; flagellar segment 1 subequal in length to segments 2 plus 3 or slightly longer..... | 179 |
| | <i>haynesi</i> Viereck and Cockerell, p. | |
| | Small species, 10-11 mm in length; flagellar segment 1 distinctly shorter than segments 2 plus 3 (not much longer than segment 3 which is fully as long as segment 4)..... | 20 |
| 20(19). | Flagellar segment 1 shorter than 3 and subequal to segment 2; apices of terga opaque..... | 226 |
| | <i>dreisbachorum</i> , n. sp., p. | |
| | Flagellar segment 1 subequal to or longer than 3 and longer than segment 2; apices of terga translucent, yellow | 21 |
| 21(20). | Flagellar segment 1 at least twice as long as segment 2 and only slightly longer than 2 and 3 together | 221 |
| | <i>solivaga</i> , n. sp., p. | |
| | Flagellar segment 1 not nearly twice as long as segment 2 and only slightly longer than third alone | 210 |
| | <i>hondurasica</i> Cockerell, p. | |
| 22(8). | Tergal apical areas moderately constricted, apical margins slightly reflexed; mesoscutal hairs extremely short; bee small, 9-10 mm in length | 56 |
| | <i>aliciarum</i> Cockerell, p. | |

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| Tergal apical areas not constricted or with reflexed rims, or <i>if</i> constricted, <i>then</i> mesoscutal hairs of normal length; size various..... | 23 |
| 23(22). Tarsal claws and distitarsi reduced in size; hind distitarsi distinctly shorter than hind basitarsi; wing membranes deeply infumate, especially apically, deep brown to yellowish-brown..... | 184 |
| <i>fulvipennis</i> Smith, p. | 184 |
| Tarsal claws of normal size; distitarsi not reduced, hind distitarsi as long as hind basitarsi, often longer, rarely slightly shorter; wing membranes clear to infumate | 24 |
| 24(23). Propodeum with dorsal enclosure with fine transverse rugulae; small species, 10 mm or less in length..... | 25 |
| Propodeum with dorsal enclosure without transverse rugulae, occasionally with irregularly reticular or short longitudinal rugulae basally; <i>if</i> with transverse rugulae, <i>then</i> more than 11 mm in length... | 28 |
| 25(24). Lateral ocellus separated from posterior margin of vertex by one to one and one-half ocellar diameters.. | 26 |
| Lateral ocellus separated from posterior margin of vertex by at least two ocellar diameters..... | 27 |
| 26(25). Pleura and propodeum with surfaces shiny, unshagreened or only slightly so; clypeus with punctures evenly spaced throughout; first flagellar segment as long as segments 2 and 3 together..... | 55 |
| <i>vidalesi</i> Cockerell, p. | 55 |
| Pleura and propodeum with surfaces opaque, dulled by fine irregular tessellation; clypeus impunctate medially; first flagellar segment no longer than third segment alone or only extremely slightly longer..... | 59 |
| <i>sculleni</i> , n. sp., p. | 59 |
| 27(25). Clypeus protruding beyond lower margins of compound eyes by about one-fourth to one-fifth median clypeal length; flagellar segment 2 slightly shorter than 3; wings hyaline, not infumate apically..... | 62 |
| <i>accepta</i> Viereck (in part), p. | 62 |
| Clypeus scarcely protruding beyond lower margins of compound eyes; flagellar segment 2 subequal to 3 in length; wings infumate apically..... | 68 |
| <i>trimaculata</i> , n. sp. (in part), p. | 68 |
| 28(24). Sternum 6 strongly and abruptly reflexed across entire apical margin, broadly emarginate if at all, without a strongly V-shaped emargination..... | 29 |

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| Sternum 6 flat, not reflexed apically or only weakly so (occasionally reflexed apicolaterally somewhat and not at all medially), often with a strongly V-shaped, median emargination and then apicolateral angles may be reflexed..... | 48 |
| 29(28). Clypeus (except apical third or less and maculae below and mesad of tentorial pits and occasionally lateral angles) yellow or cream-colored; parocular areas with small to large pale maculae..... | 30 |
| Clypeus yellow in part or entirely; parocular areas without yellow..... | 41 |
| 30(29). Terga conspicuously punctate; mesoscutum with posteromedial area punctures crowded, separated by one to two puncture widths or less..... | 30 |
| Terga not conspicuously punctate, punctures minute or absent, or <i>if</i> with small sparse punctures, <i>then</i> mesoscutum posteromedially almost impunctate, punctures separated largely by three or more puncture widths..... | 39 |
| 31(30). Vein 1st m-cu meets second submarginal cell well beyond middle of cell..... | 31 |
| Vein 1st m-cu meets second submarginal cell at or before middle of cell or barely beyond middle..... | 33 |
| 32(31). Flagellar segment 1 twice as long as segment 2 or longer..... | <i>gardineri</i> Cockerell (in part), p. 237 |
| Flagellar segment 1 not twice as long as segment 2..... | <i>bullata</i> , n. sp., p. 154 |
| 33(31). Terga 2 and 3 with basal area punctures large, crowded; flagellar segment 2 subequal to 3 in length and 2 and 3 each considerably shorter than segment 4..... | 34 |
| Terga 2 and 3 with basal area punctures small, less crowded <i>and/or</i> flagellar segment 2 distinctly shorter than 3 which is subequal in length to segment 4..... | 36 |
| 34(33). Dorsal enclosure of propodeum relatively coarsely and irregularly rugulose with strong but short longitudinal basal rugulae; mesoscutum largely dulled by coarse reticular shagreening..... | <i>gardineri</i> Cockerell (in part), p. 237 |
| Dorsal enclosure of propodeum with extremely fine, longitudinal basal rugulae, otherwise tessellate; mesoscutum shiny at least in large part, shagreening less dense and mostly peripheral..... | 35 |

- 35(34). Lateral ocellus separated from posterior margin of vertex by almost two ocellar diameters; terga 1 and 2 with apical pale fasciae absent or broadly interrupted medially; dorsal enclosure of propodeum moderately shiny.....*balsamorhizae*, n. sp. (in part), p. 252
- Lateral ocellus separated from posterior margin of vertex by one and one-half ocellar diameters or less; terga 1 and 2 with pale apical fasciae complete or only tergum 1 with fascia interrupted medially; dorsal enclosure of propodeum dull.....
.....*utahensis*, n. sp. (in part), p. 258
- 36(33). Vertex above lateral ocellus equals more than one and one-half times lateral ocellar diameter; tergum 1 with apical pubescent fascia absent or weak especially medially.....*biscutellata* Viereck, p. 260
- Vertex above lateral ocellus equals about one ocellar diameter or slightly more; tergum 1 with apical pale fascia usually distinct across entire tergum (occasionally weak medially)..... 37
- 37(36). Clypeus and parocular areas white to pale cream-colored; wing veins chiefly yellow to red.....
.....*neomexicana*, n. sp., p. 246
- Clypeus and parocular areas lemon-yellow to orange-yellow; wing veins usually red to brown or black.... 38
- 38(37). Tergum 3 with basal area punctures separated mostly by less than one puncture width.....*ardis*, n. sp., p. 249
- Tergum 3 with basal area punctures smaller, mostly separated by more than one puncture width and often by two or more puncture widths.....
.....*isocomae* Timberlake, p. 243
- 39(30). Terga 2-4 basally with minute but distinct, sparse punctures separated by three or four puncture widths, surfaces shiny to moderately shiny.....
.....*placata* Mitchell (in part), p. 143
- Terga 2-4 basally virtually impunctate, surfaces dull, reticularly shagreened..... 40
- 40(39). Flagellar segment 3 slightly broader than long and slightly longer than segment 2, segment 4 slightly longer than broad.....*asteris* Robertson, p. 147
- Flagellar segments 2 and 3 subequal to each other in length, each much broader than long, segment 4 as broad as long.....*simplex* Smith (in part), p. 137
- 41(29). Small bees, 8 to 9 mm in length; at least one or two terga with integument rufescent in part; flagellar

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| segment 1 shorter than 2 and 3 together..... | |
| <i>levipes</i> , n. sp., p. | 289 |
| Small to large bees, if as small as 9 mm in length, then terga entirely black and flagellar segment 1 longer than 2 and 3 together..... | 42 |
| 42(41). Terga coarsely punctate, punctures large, round, sepa- rated mostly by one to two puncture widths..... | 43 |
| Terga impunctate or punctures small to minute and separated by two to four puncture widths..... | 45 |
| 43(42). Flagellar segment 1 at least as long as segments 2 plus 3 or longer..... | 44 |
| Flagellar segment 1 slightly longer than segment 2 alone..... <i>bullata</i> , n. sp., p. | 154 |
| 44(43). Terga densely tessellate basally as well as punctate, surface opaque..... | |
| <i>helianthiformis</i> Viereck and Cockerell, p. | 127 |
| Terga shiny to moderately shiny, surfaces at most lightly shagreened, not tessellate..... | |
| <i>gardineri</i> Cockerell (in part), p. | 237 |
| 45(42). Flagellar segment 1 distinctly longer than segments 2 plus 3, segments 2 and 3 subequal in length and each only slightly longer than half of segment 4..... | 47 |
| 46(45). Terga virtually impunctate, surfaces dulled by fine tessellation..... <i>simplex</i> Smith (in part), p. | 137 |
| Terga with small round punctures, surfaces moder- ately shiny, with weak reticular shagreening at most <i>krigiana</i> Robertson (in part), p. | 157 |
| 47(45). Flagellar segment 1 subequal to or slightly longer than segment 2 and shorter than segment 3; terga dulled by reticular shagreening..... | |
| <i>asteroides</i> Mitchell, p. | 151 |
| Flagellar segment 1 longer than 2 and longer than or subequal to segment 3; terga moderately shiny to shiny, reticular shagreening delicate, if present..... | |
| <i>placata</i> Mitchell (in part), p. | 143 |
| 48(28). Genal area in profile equals or almost equals twice width of eye medially <i>and/or</i> lateral ocellus sepa- rated from posterior margin of vertex by two or more ocellar diameters..... | 49 |
| Genal area in profile equals eye in width or only slightly broader; lateral ocellus separated from pos- terior margin of vertex by much less than two ocellar diameters (usually by about one ocellar diameter).... | 52 |

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| 49(48). Terga with punctures minute, general appearance of being impunctate under medium to low magnifications..... | 74 |
| Terga with crowded coarse punctures..... | 50 |
| 50(49). Head length (tip of clypeus to lower margin of middle ocellus) equal to least breadth between compound eyes or longer..... | 51 |
| Head length distinctly less than the least breadth between compound eyes (length: breadth as 4:5)..... | 70 |
| <i>reflexa</i> Cresson, p. | |
| 51(50). Clypeus protrudes beyond lower margins of compound eyes by about one-fourth to one-third median clypeal length; second flagellar segment slightly shorter than third; wings hyaline apically not infumate..... | 62 |
| <i>accepta</i> Viereck (in part), p. | |
| Clypeus protrudes scarcely at all beyond lower margins of compound eyes; second flagellar segment subequal to third in length; wings infumate apically.... | 68 |
| <i>trimaculata</i> , n. sp. (in part), p. | |
| 52(48). Clypeus yellow; parocular areas with yellow or cream-colored maculae..... | 53 |
| Clypeus yellow at least partially; parocular areas without pale maculae..... | 61 |
| 53(52). Flagellar segment 1 longer than segments 2 plus 3..... | 54 |
| Flagellar segment 1 equal to or shorter than segments 2 plus 3..... | 58 |
| 54(53). Terga coarsely punctate with long barbed hairs all erect or nearly so..... | 90 |
| <i>rudbeckiae</i> Robertson, p. | |
| Terga punctate, moderately or coarsely, with at least apical hairs on terga 2-4 decumbent and forming fasciae, basal area hairs short, erect, suberect, decumbent, or sparse..... | 55 |
| 55(54). Terga opaque, dulled by fine dense tessellation..... | 85 |
| <i>melliventris</i> Cockerell, p. | |
| Terga shiny to moderately shiny, reticular shagreening fine and sparse, if present..... | 56 |
| 56(55). Tergum 1 with basal area punctures coarse, separated mostly by half a puncture width or less..... | 255 |
| <i>berkeleyi</i> Viereck and Cockerell, p. | |
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| 57(56). Lateral ocellus separated from posterior margin of vertex by almost two ocellar diameters; terga 1 and 2 | |

- with apical pale fasciae absent or broadly interrupted medially; dorsal enclosure of propodeum moderately shiny....*balsamorhizae*, n. sp. (in part), p. 252
- Lateral ocellus separated from posterior margin of vertex by one and one-half ocellar diameters or less; terga 1 and 2 with pale apical fasciae complete or only tergum 1 with fascia interrupted medially; dorsal enclosure of propodeum dull.....
*utahensis*, n. sp. (in part), p. 258
- 58(53). Terga 1-5 with distinct, complete apical pale fasciae; labral process trapezoidal, with deep apical emargination, bidentate; terga 2 and 3 with basal areas usually punctate, surfaces dulled by reticular shagreening or tessellation..... 59
- Tergum 1 with pale apical fasciae absent or weak and broadly interrupted medially and often terga 2 and 3 likewise, or *if* tergum 1 with complete pale fascia, *then* labral process with sides almost parallel and apical emargination broad and shallow; terga 2 and 3 often impunctate and dull or moderately shiny.... 60
- 59(58). Clypeus strongly bowed outwards, sparsely punctate; flagellum black below.....*aerifera*, n. sp., p. 282
- Clypeus relatively flat, strongly punctate; flagellum reddish-brown to brown below.....
*pecosana* Cockerell, p. 112
- 60(58). Tergal basal areas with surfaces opaque, dulled by fine dense tessellation, punctures usually obscure.....
*vulpicolor* Cockerell (in part), p. 106
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- 61(52). Hind tarsi and often tibiae yellow to orange-red 62
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- 62(61). Front wing with vein 1st m-cu meeting second submarginal cell well beyond middle of cell and usually in outer third of cell..... 63
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| <i>sodalis</i> Smith (in part), p. | |
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| <i>sodalis</i> Smith (in part), p. | |
| Flagellar segment 1 as long as or longer than segments 2 and 3 together; terga shiny, without shagreening even basally..... | 204 |
| <i>auripes</i> , n. sp. (in part), p. | 204 ^{5A-11} |
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| <i>barberi</i> Cockerell (in part), p. | |
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| 70(69). Tergum 2 basally with abundant suberect to erect hairs arising from minute punctates separated | |

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| | mostly by about three puncture widths or less | 71 |
| | Tergum 2 basally with suberect to erect hairs sparse, almost absent, punctures separated mostly by four puncture widths or more | 81 |
| 71(70). | Tergum 2 with crowded, almost contiguous, shallow punctures in basal areas; terga with red bands, parapsidal lines longer than from posterior end to margin of scutum on that side | |
| | <i>discreta</i> Smith (in part), p. | 270 |
| | Tergum 2 with basal area punctures separated by at least one and usually by two or more puncture widths; terga with or without red bands; parapsidal lines often shorter than from their posterior ends to margin of scutum | 72 |
| 72(71). | Terga 2-4 with special areas without distinct pubescent bands, apical hairs of same length and type as basal area hairs and not much decumbent | 73 |
| | Terga 2-4 with apical area pale pubescent fasciae distinct from erect basal area hairs in length and in being decumbent | 74 |
| 73(72). | Flagellar segment 1 equal in length to segment 2 plus 3 or very slightly shorter, sterna largely red; terga with apical thirds red or yellow... <i>fulminea</i> , n. sp., p. | 274 |
| | Flagellar segment 1 slightly longer than segment 2 plus 3; sterna piceous, at most narrow apical margins hyaline; terga piceous, narrow apical margins often slightly hyaline (less than one-third of tergum) | 280 |
| | <i>vulpoides</i> , n. sp., p. | |
| 74(72). | Terga 1-3 and sterna partially or entirely red, terga 4-6 at least partly red; flagellar segments 4 and 5 scarcely any longer than broad... <i>sonorensis</i> , n. sp., p. | 110 |
| | Terga and sterna without red color or only slightly reddened basal to apical hyaline margins; flagellar segments 4 and 5 distinctly longer than broad | 75 |
| 75(74). | Tergum 1 with distinct band of decumbent white pubescence although somewhat weaker than on tergum 2; wing membranes hyaline, almost colorless | 76 |
| | Tergum 1 without distinct apical pubescent band or hairs not entirely decumbent and not white; wing membranes moderately infumate, brownish-yellow | 77 |
| 76(75). | Flagellum usually dark red below; clypeal punctures coarse, crowded..... <i>peconsana</i> Cockerell (in part), p. | 112 |
| | Flagellum dark brown to black below; clypeus less coarsely punctate... <i>vulpicolor</i> Cockerell (in part), p. | 106 |

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| 77(75). | Labral process weakly emarginate medially or entire.... | 78 |
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| 78(79). | Flagellar segment 1 scarcely if any longer than segment 3; terga 1-5 with apical areas scarcely if at all impressed at least medially..... | |
| | <i>duplicata</i> Mitchell (in part), p. | 217 |
| | Flagellar segment 1 almost as long as segments 2 plus 3; terga 1-5 with apical areas distinctly impressed medially..... | |
| | <i>auripes</i> , n. sp. (in part), p. | 204 |
| 79(77). | Wing membranes infumate, yellowish-brown; hind tibiae orange to reddish-orange..... | |
| | <i>rava</i> , n. sp. (in part), p. | 122 |
| | Wing membranes slightly infumate; hind tibiae piceous except perhaps near tips..... | 80 |
| 80(79). | Parocular area usually with small yellow macula; tergum 1 with basal area punctures medially separated mostly by one to two puncture widths, distinct..... | |
| | <i>pecosana</i> Cockerell (in part), p. | 112 |
| | Parocular area black; tergum 1 with basal area punctures medially separated mostly by two to three punctures widths, weak..... | |
| | <i>fumosa</i> , n. sp., p. | 117 |
| 81(70). | Wing membranes rather deeply infumate, yellowish-brown..... | |
| | <i>rava</i> , n. sp. (in part), p. | 122 |
| | Wing membranes not at all infumate or only slightly so apically..... | 82 |
| 82(81). | Tergum 2, usually tergum 3 and often tergum 4 with pale apical fascia interrupted medially, basally with minute but distinct punctures not completely obscured by the relatively fine tessellation; propodeum with dorsal enclosure tessellate, slightly roughened in small mediobasal area..... | |
| | <i>helianthi</i> Robertson, p. | 94 |
| | Terga 2-4 with apical fasciae uninterrupted (unless worn in which case punctures indicate former presence), basally with punctures obscured by dense coarse tessellation especially on tergum 2; propodeum with dorsal enclosure with mediobasal area usually finely areolate..... | |
| | <i>braccata</i> Viereck, p. | 102 |
| 83(61). | Tergum 1 with a conspicuous, complete, apical, pale pubescent band..... | 84 |
| | Tergum 1 without pale apical band or this band weak and usually broadly interrupted medially..... | 85 |
| 84(83). | Parocular area with large yellow macula; flagella red or reddish-brown below; clypeus coarsely punctate.... | |
| | <i>pecosana</i> Cockerell (in part), p. | 112 |

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| | Parocular area black or with minute yellow macula; flagella below dark brown to black; clypeus less coarsely punctate... <i>vulpicolor</i> Cockerell (in part), p. | 106 |
| 85(82). | Flagellar segment 1 distinctly longer than segment 2 (about one and one-half to two times as long) | 86 |
| | Flagellar segment 1 subequal to, shorter than, or only slightly longer than segment 2..... | |
| | <i>duplicata</i> Mitchell (in part), p. | 217 |
| 86(85). | Flagellar segment 2 less than half length of segment 1 and about equal to segment 3 in length | |
| | <i>krigiana</i> Robertson (in part), p. | 157 |
| | Flagellar segment 2 equals half length of segment 1 or slightly more, <i>if</i> slightly less, <i>then</i> distinctly shorter than segment 3..... | 87 |
| 87(86). | Sternum 8 with exposed portion extremely slender, much more than twice as long as broad, with sparse hairs, not emarginate apically... <i>monticola</i> , n. sp., p. | 125 |
| | Sternum 8 with exposed portion normal, about half as broad as long or broader, hairy, often emarginate apically | 88 |
| 88(87). | Terga strongly punctate, punctures small, round, crowded, surfaces shiny... <i>discreta</i> Smith (in part), p. | 270 |
| | Terga weakly punctate or impunctate, surfaces dulled by fine shagreening..... | 89 |
| 89(88). | Propodeal posterior sulcus with sharp, almost carinate margins, broad, about twice as long as broad..... | |
| | <i>barberi</i> Cockerell (in part), p. | 118 |
| | Propodeal posterior sulcus without subcarinate margins at least above, narrow or linear, more than twice as long as broad..... | 90 |
| 90(89). | Lower surface of scape with punctures minute, separated mostly by two or more puncture widths..... | |
| | <i>aliciae</i> Robertson, p. | 78 |
| | Lower surface of scape with minute round punctures separated mostly by one puncture width or less, punctures deeper and more distinct..... | |
| | <i>irrasus</i> , n. sp., p. | 131 |

Andrena (Callandrena) manifesta (Fox)

Panurgus manifestus Fox, 1894, Proc. California Acad. Sci., series 2, vol. 4, pp. 113-114.

Callandrena manifesta: Cockerell, 1898, Trans. American Ent. Soc., vol. 25, p. 186; Viereck and Cockerell, 1914, Proc. U.S.N.M., vol. 48, p. 2; Viereck, 1917, Proc. Acad. Nat. Sci. Philadelphia, vol. 68, p. 593.

Andrena (Callandrena) manifesta: Michener, 1944, Bull. American Mus. Nat. Hist., vol. 82, p. 242; Lanham, 1949, Univ. California Pub. Ent., vol. 8, p. 198.

This is the type species of the subgenus *Callandrena*. It is very similar and closely related to *A. verbesinae*. It is further removed from *A. accepta* than is *A. verbesinae*, the latter being an annectant form between the other two species. *A. manifesta* is like *verbesinae* in having two submarginal cells, in the subgenal coronet being poorly developed, and in the trimaculated face of the female. It differs from *verbesinae* females in the scalelike thoracic hairs and the generally finer punctures. The male of *manifesta* differs from that of *verbesinae* by the shorter second flagellar segment, the generally finer punctation, the less impressed tergal apices, and the more distinctly rugulate propodeal enclosure.

Female. MEASUREMENTS AND RATIOS: N = 2; length, 11-12 mm.; width about 3-4 mm.; wing length, 3.6-3.8 mm.; FL/FW = 1.10; FOVL/FOVW = 2.67.

INTEGUMENTAL COLOR: Black except as follows: clypeus with shield-shaped median yellow macula equal to about two-thirds of clypeus; parocular areas to level of upper margin of antennal fossae yellow; flagellar segments 3-10 dark red below; wing membranes infumate, brown, especially apically; tegulae dark testaceous; tergal and sternal apices broadly hyaline, almost colorless; distitarsi rufescent.

STRUCTURE: Scape longer than flagellar segments 1-3; flagellar segment 1 longer than 2 plus 3, segment 2 shorter than 3 and both shorter than 4. Eyes about three and one-half times as long as broad, inner margins subparallel. Malar space linear, at least six times as broad as long medially. Mandible in repose extends about $\frac{1}{4}$ its length beyond middle of labrum, bidentate, lacking ventro-basal lamella. Subgenal coronet poorly developed; hypostomal carina at apex angulate, without marked spinelike process. Galea densely tessellate, lateral surface less than half of dorsal. Maxillary palpus short, not exceeding galea, segments in ratio of about 1.2:1.4:1.0:0.7:1.1. Labial palpus with first two segments com-

pressed, first segment curved along inner margin, almost straight externally, segments in ratio of about 2.6:1.0:1.0:1.3. Labral process short, more than three times as broad as long, emarginate medially but not strongly bidentate. Clypeus somewhat flattened medially, strongly constricted just before apical margin, with large round punctures separated mostly by half a puncture width or more except along impunctate midline, surface shiny, shagreening delicate. Supraclypeal area with minute punctures separated mostly by one to two puncture widths, surface shiny, shagreening sparse, delicate. Genal area slightly broader than eye in profile, with minute round punctures crowded near eye and well separated posteriorly, surface shiny, unshagreened. Vertex short, above lateral ocellus equals about one and one-half an ocellar diameter, at apex punctures crowded, laterally with punctures separated by two or more puncture widths, surface moderately shiny, reticularly shagreened. Face above antennal fossae with crowded round punctures separated by half to one puncture width, shiny. Facial fovea more than half length of eye, about as 4 is to 7, rounded above, rather pointed below on eye margin, deeply impressed.

Pronotum with minute punctures separated mostly by more than one puncture width especially laterally, surface moderately shiny, with fine, reticular shagreening. Mesoscutum with small uniformly crowded punctures separated by less than half a puncture width, surface shiny. Scutellum and metanotum similar but the latter tessellate. Propodeum with enclosure with distinct complete transverse rugulae becoming finer toward apex, surface shiny, slightly shagreened; laterally with small punctures separated by about one puncture width becoming sparser on posterior surface, dulled by fine tessellation; corbicular area with sparse scattered punctures, reticular shagreening, surface shiny. Mesepisternum with small punctures separated by one to two puncture widths, surface moderately dulled by coarse reticular shagreening. Metepisternum almost impunctate below, shiny, shagreening fine. Fore wing with two submarginal cells; vein 1st m-cu meets second submarginal cell one-fifth or less beyond base of cell; pterostigma small, narrower than from inner margin of prestigma to wing margin. Middle basitarsus narrower than hind, parallel-sided. Tibial spurs and claws normal.

Metasomal tergum 1 with small round punctures separated by half a puncture width or slightly more, somewhat smaller and more crowded in apical area except narrow impunctate apex, surface shiny, unshagreened; terga 2-4 similar but basally punctures slightly smaller and surface on tergum 4 with extremely delicate shagreening. Tergum 5 with punctures scattered and shagreening

dulling surface. Terga 1-5 with apical areas slightly impressed. Pygidial plate V-shaped with blunt apex. Sterna 2-5 with scattered punctures basally becoming crowded near apex, surfaces slightly dulled by reticular shagreening.

VESTITURE: Head hairs pale ochraceous with a few brown on vertex. Thoracic dorsum with short, highly plumose, scalelike hairs forming an opaque ochraceous mat over dorsum; laterally and ventrally normal in length and pale ochraceous. Propodeal corbicula incomplete anteriorly, with long, weakly barbed, internal hairs. Terga 2-4 with basal areas with hairs very short, almost simple, mostly decumbent, surfaces appearing almost hairless, with distinct apical pale fasciae. Tergum 1 with apical fascia restricted to small lateral patches. Terga 5 and 6 with white to yellowish long hair. Sterna 2-5 with long, suberect, plumose hairs forming subapical bands. Trochanteral flocculus complete by scanty. Tibial scopal hairs weakly barbed, appearing largely simple except under high magnification. Leg hairs pale ochraceous except inner surfaces tarsi yellow.

Male. MEASUREMENTS AND RATIOS: N = 20; length, 9-11 mm.; width, 2.5-3.5 mm.; wing length, M = 3.49 ± 0.319 mm.; FL/FW, M = 1.20 ± 0.034 ; FS1/FS2, M = 2.35 ± 0.043 .

INTEGUMENTAL COLOR: Color as in female except as follows: clypeal yellow area usually more extensive, often without black peripherally except at lateral angles and along apical margin; flagellum without red below.

STRUCTURE: Antennae not exceeding tegulae in repose; scape slightly longer than flagellar segments 1-3; flagellar segment 1 about equal in length to 2 plus 3 or slightly longer. Eye about 2 times as long as broad, converging towards mandibles. Malar space, mandibles and galeae as in female. Hypostomal carina not spined at apex. Maxillary palpus exceeding galea by no more than length of last segment, in ratio of about 2.3:2.3:1.1:1.0:1.0:1.5. Labial palpus as in female but ratio about 2.8:1.0:0.8:1.4. Labral process bidentate, slightly reflexed. Clypeus as in female but more punctate basomedially and with sparse reticular shagreening slightly dulling surface. Supraclypeal area, genal area, vertex and face as in female but vertex very slightly shorter. Sculpturing of thorax as in female except as follows: propodeal enclosure with transverse rugulae more distinct, lateral and corbicular surfaces with coarse punctures and reticular shagreening similar to posterior surface. Mesepisternal and metepisternal sculpturing as in female but punctures separated by one-half to one puncture width and metepisternum with more abundant minute punctures below. Wings as in female. Metasomal terga 1-5 like female terga 1-4 but punctures slightly more crowded

and apical areas more distinctly depressed. Sterna as in female but shinier and sternum 6 flat, not reflexed apically, with shallow, indistinct median emargination.

Sternum 7 (Fig. 18) deeply emarginate apically, apical lobes long, rounded, abundantly hairy. Sternum 8 (Fig. 19) with apex about twice as broad as neck, rounded, hairs abundant; lateral apodemes at level of about lower sixth of plate. Genital capsule (Figs. 15-17) with moderately short dorsal lobes of gonocoxites; gonocoxite with lateral arm with short sparse hairs; penis valves broadened near base with narrow but distinct laterobasal lamellae.

VESTITURE: Head hairs pale ochraceous with brown on vertex to just below level of ocelli. Thoracic hairs dorsally short, plumose, not scalelike, on mesoscutum and scutellum brown posteromedially, white peripherally, elsewhere white. Tergal hairs as in female except as follows: apical area hairs brown except narrow white band along margin, tergum 5 similar to 4, terga 6 and 7 with long pale ochraceous hairs. Sterna as in female. Leg hairs white or pale ochraceous except inner surfaces tarsi slightly yellowed; hind tibia with outer surface with hairs short, medially no longer than width of tibia or shorter.

Type Material. The lectotype (CAS) female, here designated, and the lectoallotype (CAS) male, here designated, were collected at El Taste (3,400 feet), Baja California, México. One female and one male paratype were part of the original type series and sent to T. D. A. Cockerell for examination (Cockerell, 1898, p. 186). These have not been located.

Distribution. This species is known only from Baja California. In addition to the type series, two female and twenty males from Baja California collected by E. S. Ross and R. M. Bohart have been examined as follows: 1 ♀ from Las Animas, Sierra Laguna, October 12, 1941; 1 ♀, 11 ♂♂ from Big Canyon, Sierra Laguna, October 13, 1941; 9 ♂♂ from La Laguna, Sierra Laguna, October 14, 1941.

Andrena (Callandrena) pectidis (Cockerell)

Panurgus pectidis Cockerell, 1897, Trans. American Ent. Soc., vol. 24, p. 148.

Andrena (Callandrena) pectidis: Lanham, 1949, Univ. California Publ. Ent., vol. 8, p. 199.

This beautiful small species of *Callandrena* can be readily separated from the foregoing species as follows: both sexes have large, parocular yellow maculae which in the female extend well above the antennal fossae in narrow lines alongside of the eyes, and bright red abdomens. The female has scalelike hairs on the

dorsum of the thorax as in *A. manifesta* to which it seems to be closely allied.

Female. MEASUREMENTS AND RATIOS: N = 1; length about 9.0 mm.; width about 2.5 mm.; wing length about 3.10 mm.; FL/FW, 1.01; FOVL/FOVW, 2.00.

INTEGUMENTAL COLOR: Black except as follows: clypeus pale yellow with dark apical border and two small dark maculae below tentorial pits; parocular area pale yellow to just above antennal fossa and with a thin pale line extending to top of eye along inner eye margin; supraclypeal area with small median pale spot in specimen before me; mandibles largely rufescent; flagellar segments 3-10 red below; tegulae hyaline, testaceous; wings infumate apically, hyaline basally, veins reddish-brown; metasoma red except brown pygidial plate and small brown lateral round maculae on tergum 2; legs red except coxae, trochanters and femora reddish-brown.

STRUCTURE: Antennae as in *manifesta*. Eyes about three and three-fourths times as long as broad, inner margins parallel. Malar space, mandibles, subgenal coronet as in *manifesta*. Hypostomal carina not angulate at apical angle. Galeae as in *manifesta*. Maxillary palpus as in *manifesta*, segments in ratio of about 1.0:1.0:1.0:0.9:0.5:1.1. Labral process as in *manifesta*. Clypeus rounded, protruding beyond eyes by about one-fourth its length, with deep round punctures separated by one to four puncture widths medially, more crowded laterally, surface shiny, unshagreened. Supraclypeal area with minute round punctures separated mostly by one puncture width, surface shiny, unshagreened. Genal areas almost twice as broad as eye in profile, with minute punctures separated mostly by two puncture widths (less near eye), surface shiny, unshagreened. Vertex short, above lateral ocellus equals about one ocellar diameter, with abundant small punctures becoming sparser near apex of compound eyes. Face above antennal fossae with crowded small deep punctures, surface slightly dulled by irregular shagreening. Facial fovea equals less than half length of eye (about 5:12), rounded above, pointed below near eye margin, deeply impressed.

Pronotum with minute punctures separated by two puncture widths above, becoming impunctate laterally, surface slightly dulled above, shiny and unshagreened laterally. Mesoscutum with small, uniform, round punctures separated by about one-half a puncture width, surface slightly dulled by irregular shagreening. Scutellum similar. Metanotum with punctures more crowded, smaller and shagreening denser. Propodeum with enclosure with many complete transverse rugulae but these extremely fine, slightly dulled by irregular shagreening especially apically and laterally; dorsolateral

and posterior areas punctate, shiny; corbicular areas hidden in specimen before me. Mesepisternum with small round punctures separated by one to two puncture widths, surface shiny, unshagreened. Metepisternum impunctate and shiny below. Fore wing with two submarginal cells, venation and pterostigma as in *manifesta*. Middle basitarsus narrower than hind, parallel-sided. Tibial spurs and claws normal.

Metasomal tergum 1 with apical area impunctate, not impressed, basal area with small, irregularly-spaced, round punctures, separated by one to four puncture widths, surface shiny, unshagreened. Terga 2-4 similar to tergum 1, but basal area punctures slightly smaller. Tergum 5 with more abundant basal punctures. Pygidial plate narrow, pointed, V-shaped. Sterna 2-6 impunctate medially and basally, with small round punctures near apex and laterally, surface somewhat dulled by reticulo-transverse shagreening.

VESTITURE: Generally pale ochraceous in color. Thoracic dorsum with hairs short, erect, blunt, with close-set barbs giving scale-like appearance, but narrow. Tergal hairs sparse, apical fasciae lacking or reduced to sparse lateral patches. Tibial scopal hairs simple to weakly plumose, of normal length. Inner surfaces tarsi with hairs yellow.

Male. MEASUREMENTS AND RATIOS: N = 1; length about 9.0 mm.; width about 2.5 mm.; wing length about 2.78 mm.; FL/FW, 1.18; FS1/FS2, 1.60.

INTEGUMENTAL COLOR: Generally as in female with the following differences: clypeus with dark maculae below tentorial pits absent; parocular areas reach upper margin of antennal fossae where they round off to the eye margin, without narrow extensions along eye margins above; supraclypeal area without pale spot; antennal segments 2-11 reddish below; tergum 1 brownish black in basal half or slightly more; terga 5-7 black and tergum 4 reddish brown basally, apical areas hyaline; sterna 3-6 infused with brown basad of hyaline apical areas.

STRUCTURE: Antennae slightly surpassing tegulae in repose; scape equal to flagellar segments 1-3; flagellar segment 1 shorter than segments 2 plus 3 and the latter shorter than 4. Eye about three times as long as broad, converging towards mandibles. Malar space, mandibles, galeae, genal areas, vertex, and face as in female. Maxillary palpus exceeds galea by terminal segment, segments in ratio of about 1.4:1.0:1.0:1.0:1.4. Labial palpus as in female, segments in ratio of about 2.0:0.9:0.6:1.0. Labral process bidentate, slightly reflexed.

Pronotum as in female. Mesoscutum with small round punctures separated by one to two puncture widths, surface shiny, unsha-

greened. Scutellum similar. Metanotum with smaller, more crowded punctures, surface dulled by irregular shagreening. Propodeum sculptured as in female but enclosure with transverse rugulae shorter (incomplete laterally) and absent apically where enclosure is smooth and shiny; lateral surfaces punctate as dorsolateral surfaces in upper halves, impunctate or almost so below. Mesepisterna and metepisterna as in female. Wings as in female.

Tergal sculpturing as in female but terga 4-7 with basal area punctures more crowded. Sterna 2-5 as in female but subapical punctures sparser. Sternum 6 not reflected apically, emarginate apicomediaally.

Sterna 7 and 8 and genital capsule (Figs. 20-24) similar to those of *manifesta*, but broader apex of penis valve, fewer hairs, shallower emargination of sternum 7 and rounder apex of sternum 8.

VESTITURE: Generally pale ochraceous in color. Thoracic dorsum with hairs normal in appearance. Terga 2-6 with weak apical pale fasciae. Sterna with apical fasciae of long suberect hairs. Tarsi with inner surfaces with hairs golden yellow.

Type Material. The female holotype and one female paratype were collected on September 17, at Las Cruces, New Mexico, by T. D. A. Cockerell on flowers of *Pectis papposa* (USNM No. 4867).

Distribution. This species is known only from New Mexico and Texas. In addition to the holotype, three specimens have been examined. Data for these are given below.

NEW MEXICO: 1 ♀ paratype, same data as holotype; 1 ♂, 20 miles northwest of Deming, Luna County, September 22, 1950, Willis Gertch and Mont Cazier. TEXAS: 1 ♀, Big Bend National Park: October, 1957, A. H. Alex.

Andrena (Callandrena) verbesinae Viereck and Cockerell

Andrena verbesinae Viereck and Cockerell, 1914, Proc. U.S. Nat. Mus., vol. 48, p. 1; Lanham, 1949, Univ. California Pub. Ent., vol. 8, p. 199.

This species known only from Texas is one of several with only two submarginal cells in the front wing. It differs in this respect from *A. accepta* to which it is closely allied. The female of *verbesinae* has a large yellow clypeal macula as in *trimaculata* and large parocular yellow maculae as in *accepta* and *trimaculata*. The vertex is not quite as high nor the genal areas as broad in either sex as in *accepta*. Also, *A. verbesinae* lacks a subgenal coronet and has a tooth at the apex of the hypostomal carina.

Female. MEASUREMENTS AND RATIOS: N = 1; length, about 12

mm.; width, about 4 mm.; wing length, 4.45 mm.; FL/FW = 1.08; FOVL/FOVW = 2.81.

INTEGUMENTAL COLOR: Black except as follows: clypeus with basomedial yellow macula with trilobed apical margin which equals about one-fifth clypeal area; parocular areas yellow to level of antennal fossae; tegulae testaceous; wing membranes slightly infumate, especially apically, veins reddish-brown; terga hyaline apically, yellowish becoming rufescent basally especially on first two terga, area basal to hyaline area and extreme base of all terga red, leaving dark median band in some specimens; sterna hyaline apically; often red basally; tarsi rufescent, tibiae reddish but darker than tarsi; tibial spurs yellow, dark-tipped.

STRUCTURE: Antennae missing in specimen available. Eyes one and one-half times as long as broad, subparallel. Malar space as in *accepta* or slightly shorter. Mandible (outer) in repose extends one-fourth of its length beyond middle of labrum, without ventro-basal lamella. Subgenal coronet lacking or poorly developed; hypostomal border at apex with a strong toothlike process. Galea as in *manifesta*. Maxillary palpus short (last two segments missing in specimen available), in ratio of about 1.2:1.0:1.0:0.8:x:x. Labral palpi missing in specimen available. Labral process short, more than three times as broad as long, weakly emarginate apicomediaally. Clypeus flat medially, with round coarse punctures separated by about 3 puncture widths along midline and by about half a puncture width laterally, surface slightly dulled by reticular shagreening. Supraclypeal area with small round punctures separated by half to one puncture width, surface shiny. Genal area equals less than one and one-half times width of eye in profile, with small crowded punctures separated mostly by half a puncture width throughout, surface shiny. Vertex moderately tall, above lateral ocellus equals about 2 ocellar diameters, closely punctate except just lateral of lateral ocelli, surface moderately dulled by fine dense tessellation. Face with weak longitudinal rugulae and closely spaced interrugal punctures, shiny; inverted impressed triangle below median ocellus impunctate, shagreened. Facial fovea about half as long as eye or slightly longer, rounded above, narrow below but not markedly pointed.

Pronotum, mesoscutum, and scutellum as in *accepta* but punctures slightly more crowded. Propodeal enclosure with extremely fine transverse rugulae near middle, irregular basally, surface shagreened, dull; outside of enclosure as in *accepta*. Mesepisternal punctures separated by half to one puncture width, surface dulled by dense reticular shagreening. Metepisternum impunctate below, shiny. Middle basitarsus no broader than hind basitarsus, sides

almost parallel. Hind tibia as in *accepta*. Tibial spurs normal but anterior spur of hind tibia slightly sinuate. Front wing with pterostigma as in *accepta*; with two submarginal cells; vein 1st m-cu meets second submarginal cell 2 to 3 vein widths beyond its base.

Metasomal tergum 1 with apical area distinctly impressed, basal area with punctures separated by half to one puncture width, surface shiny medially, shagreened peripherally. Terga 2 and 3 similar but punctures slightly sparser, surfaces duller, and apical area less distinctly impressed. Terga 4 and 5 with apical areas scarcely impressed, basal area punctures widely separated, surfaces dulled by fine, dense reticular shagreening. Pygidial plate quite pointed, rather narrow. Sterna 3-6 as in *accepta*; sternum 2 with scattered punctures basally.

VESTITURE: In general hair ochraceous to slightly reddish on thoracic dorsum. Distribution and type of hairs as in *accepta* except as follows: thoracic dorsum with hairs shorter; tergal basal areas with hairs weak, long and mostly erect; tibial scopal hairs dark ochraceous.

Male. MEASUREMENTS AND RATIOS: N = 1; length about 12 mm.; width about 3.5 mm.; wing length, 4.15 mm.; FL/FW = 1.13; FS1/FS2 = 2.24.

INTEGUMENTAL COLOR: As in *accepta* except as follows: clypeus yellow except narrow apical border and extremely narrow posterior border; parocular yellow maculae extend to top margins of antennal fossae; wing membranes moderately infumate, especially apically; tarsi and apical one-third or more of tibiae reddish-yellow; terga and sterna vary as in female.

STRUCTURE: Antennae short, reaching tegulae in repose; scape subequal to flagellar segments 1 plus 2; flagellar segment 1 longer than segments 2 plus 3 which are subequal to each other and each slightly shorter than segment 4. Malar space, mandibles and galeae as in female but mandibles slightly longer. Maxillary palpal ratio about 1.4:1.0:0.8:1.0:0.7:1.3. Labial palpal ratio about 1.7:1.0:0.5:0.6. Labral process as in female. Clypeus protruding distinctly below lower level of eyes, sculptured as in female. Supraclypeal area, genal area, vertex, and face as in female. Thoracic sculpture as in female but lateral surfaces of propodeum with more abundant punctures. Metasomal terga 1-5 with apical areas deeply impressed, apex not noticeably reflexed, basal area punctures coarse, separated mostly by less than half a puncture width on all terga, surfaces dulled by coarse shagreening. Terga 6 and 7 with apical areas less impressed. Sterna 2-5 much as in female but punctures more abundant basally. Sternum 6 densely punctate, with apical margin convex or almost straight, not reflexed or emarginate.

Sterna 7 and 8 and genital capsule as figured (Figs. 25-29); note blunt gonostylus, large blunt penis valves, U-shaped emargination of sternum 7 and laterally angulate apex of sternum 8.

VESTITURE: In general pale ochraceous or cinereous. Distribution and type of hairs as in *accepta* but basal tergal hairs long, weak, mostly erect.

Type Material. The female holotype (USNM No. 18, 119), three female and seven male paratypes (USNM) were collected at Cotula, Texas, by F. C. Pratt, May 12, 1906, on *Verbesina encelioides*. An additional male paratype (USNM) was collected by J. C. Crawford, May 12, 1906, on *Verbesina encelioides*. Two additional paratypes (AMNH) are as follows: 1 ♂, 1 ♀, San Antonio, Texas, June 6, 1905 by J. C. Crawford.

Andrena (Callandrena) mexicana, n. sp.

This colorful species was first recognized as new by H. L. Viereck who left a female in the collection of the University of Nebraska with the name given above on a label. The species is known from the holotype, but it is so distinctive that it is wholly reasonable to consider it a valid species. *A. mexicana* is most similar to and most closely related to *A. verbesinae* from which it can readily be distinguished by its red abdomen, the deeply infumate wings, the bright color of the vestiture, and the sculpturing as described below.

Female. MEASUREMENTS AND RATIOS: N = 1; length about 13.5 mm.; width about 4.0 mm.; wing length, 5.20 mm.; FL/FW, 1.02; FOVL/FOVW, 2.50.

INTEGUMENTAL COLOR: Black except as follows: clypeus yellow except reddish-brown apical margin with sinuous posterior border and small dark maculae below and mesad of tentorial pits; parocular areas yellow to bottom of facial fovea; mandibles red to orange except tips; antennae rufescent, tegulae testaceous; wing membranes deeply infumate, brown, veins dark brown; terga red except brown basolaterally on tergum 1 and brown mediolaterally on terga 2-4, hyaline-testaceous apically, sterna reddish-brown medially, red basally, narrowly hyaline apically except last sternum wholly red; legs yellowish to orange-red.

STRUCTURE: Scape slightly longer than flagellar segments 1-3; first flagellar segment distinctly longer than segments 2 plus 3 which are subequal in length and each slightly shorter than segment 4. Eyes about three and one-half times as long as broad, subparallel. Mandible (outer) in repose extends one-third its length beyond middle of labrum, without ventrobasal lamella. Subgenal coronet

absent; hypostomal carina at apex without process. Galeae as in *manifesta*. Maxillary palpus as in *manifesta*, but segments ratio about 1.0:1.0:0.8:0.8:0.7:1.1. Labial palpus as in *manifesta*, but segments ratio about 2:1:1.0:0.6:1.1. Labral process slightly more than three times as broad as long, weakly emarginate medially, rounded. Cylpeus flat mediobasally, punctures coarse, round, virtually absent mediobasally and along midline, becoming crowded apically and laterally, surface shiny, unshagreened. Supraclypeal area impunctate at base, with small round crowded punctures at sides and above, surface shiny, unshagreened. Genal area somewhat broader than eye in profile (less than 1.5 times as broad), with small round punctures separated mostly by one-half to one puncture width or less, surface shiny, unshagreened. Vertex above lateral ocellus equals one and one-half ocellar diameters, with crowded round deep punctures above ocelli, more sparsely punctate laterally, surface somewhat dulled by reticular shagreening. Face above antennal fossae with crowded small punctures, not rugulate, surface delicately shagreened. Facial fovea less than half length of eye, rounded above, narrow below on eye margin but not pointed.

Pronotum normal, above with minute crowded punctures, laterally with punctures separated by one to two puncture widths, shiny, delicately shagreened laterally, unshagreened above. Mesoscutum with moderate-sized deep punctures separated by half a puncture width or less, surface shiny, unshagreened. Scutellum and metanotum similar but metanotum with delicate shagreening. Propodeal enclosure with abundant, very fine, transverse rugulae, surface shiny, with delicate reticular shagreening; dorsolateral and posterior surfaces with crowded punctures, shiny; corbicular area with scattered punctures especially in anterior half, surface moderately dulled by reticular shagreening. Mesepisternum with large deep round punctures separated by one-half to one puncture width, surface shiny, unshagreened. Metepisternum below impunctate, unshagreened. Middle basitarsus slightly narrower than hind basitarsus, parallel-sided. Tibial spurs and claws normal. Front wing with pterostigma narrow, not as broad as from inner margin prestigma to wing margin; with two submarginal cells; vein 1st m-cu meets second submarginal cell 5 to 6 vein widths from base of cell or more.

Metasomal tergum 1 basally with large deep round punctures separated by one-half to one puncture width, apical area with minute punctures separated mostly by one puncture width or more except narrow apical impunctate area, surface moderately shiny, irregularly and delicately shagreened. Terga 2-4 similar to 1 but punctures of basal areas somewhat smaller and surfaces shinier.

Sterna sparsely punctate mediobasally, punctures crowded laterally and apically except in narrow impunctate apical margin, surfaces moderately shiny, with reticular shagreening.

VESTITURE: Yellowish-ochraceous becoming almost orange on thoracic dorsum and vertex of head. Thoracic dorsum with hairs short, erect, plumose, hiding surface (almost matlike). Terga 2-4 with weak but complete apical pubescent fasciae. Propodeal corbicula incomplete anteriorly, with abundant, long, simple or weakly barbed, internal hairs. Trochanteral flocculus incomplete, consisting of few normal-length hairs. Tibial scopa of normal length, hairs highly plumose, medially hairs with outer half or more with 3-6 short branches.

Type Material. The holotype (NSM) female collected in Lerdo, Durango, México, in November, 1887.

Andrena (Callandrena) vidalesi Cockerell

This small species from Central America has been split into two subspecies, *vidalesi* s. str. and *panamensis*. The present author is recognizing these subspecies, although there is not enough material available to determine precise boundaries for the forms represented, nor to properly describe the variation.

Andrena vidalesi is a small species related to the *manifesta* group and to certain species of *Callandrena* to be described below. It is another anectant form between the *manifesta* group and the other *Callandrena*. It is similar to *manifesta* in the lack of the subgenal coronets and basoventral mandibular lamellae, in the presence of transverse rugulae in the enclosure of the propodeum, and the yellow clypeus and parocular areas of both sexes. It differs from *manifesta* in its small size, the three submarginal cells, and the less punctate and shiny integument.

Female. MEASUREMENTS AND RATIOS: N = 2; length, 8.0-9.0 mm.; width, 2.0-2.5 mm.; wing length, 10.5-11.8 mm.; FL/FW, 1.08-1.09; FOVL/FOVW, 2.91-3.36.

INTEGUMENTAL COLOR: Black except as follows: clypeus yellow except narrow brown apical margin and dark triangular maculae below and mesad of tentorial pits; parocular areas yellow to lower level of antennal fossae or less; mandibles and flagellar segments 4-10 below rufescent; tegulae testaceous; wing membranes only slightly infumate, veins blackish-brown; terga hyaline apically, may be rufescent just basad of hyaline margin; tibial spurs rufescent.

STRUCTURE: Scape as long as flagellar segments 1-4; flagellar segment 1 slightly longer than segments 2 plus 3 which are short, subequal in length, and shorter than segment 4. Eyes more than

three and one-half times as broad as long, converging towards mandibles. Malar space linear. Mandible (outer) in repose extends about one-third its length beyond middle of labrum, bidentate, without ventrobasal lamella. Subgenal coronet absent; hypostomal carina not angulate at apex. Galea as in *manifesta*. Maxillary palpus considerably shorter than galea, segments in ratio of about 1.4:1.0:1.0:1.0:0.9:1.1. Labral palpus as in *manifesta* with ratio of about 2.6:1.5:1.0:1.2. Labral process short, more than four times as broad as long, shallowly emarginate medially. Clypeus gently rounded, sparsely punctate, medial one-fourth impunctate, scattered punctures becoming more crowded at extreme sides, surface shiny, unshagreened. Supraclypeal area with minute punctures separated by one to two puncture widths, with irregular reticular shagreening slightly dulling surface. Genal areas subequal to eye in width, with minute punctures separated mostly by two to three puncture widths, surface shiny, unshagreened. Vertex short, above lateral ocellus equals no more than one ocellar diameter, with sparse punctures and fine reticular shagreening. Face above antennal fossae with indistinct longitudinal rugulae which are short just above fossae and long near foveae, area just above fossae finely tessellate, elsewhere with small interrugal punctures and fine reticular shagreening. Facial fovea less than half length of eye, rounded above, rounded and indistinct below, narrow, separated from lateral ocellus by about three-fourths of one ocellar diameter.

Pronotum normal, above with minute punctures separated mostly by one puncture width, becoming impunctate laterally, somewhat dulled by reticular shagreening. Mesoscutum with coarse, round punctures separated mostly by one-half to one puncture width, surface shiny, unshagreened. Scutellum similar but punctures slightly smaller and sparser medially. Metanotum with punctures minute, crowded, and surface dulled by fine shagreening. Propodeum with enclosure with complete transverse rugulae and reticulo-transverse shagreening slightly dulling surface; dorsolateral and posterior surfaces with small punctures which are quite sparse posteriorly, surfaces shiny, unshagreened; corbicular area with extremely sparse punctures and surface slightly dulled by coarse reticular shagreening. Mesepisterna with small punctures separated mostly by 2 to 3 puncture widths, surface dulled by coarse reticular shagreening. Metepisternum impunctate below, surface dulled. Fore wing with vein 1st m-cu meeting second submarginal cell near middle of cell or beyond. Middle basitarsus about equal in width to hind, sides gently curved. Tibial spurs and claws normal.

Metasomal tergum 1 with extremely minute, sparse punctures, surface shiny, unshagreened except in apical hyaline area; terga

2-4 with minute punctures separated mostly by 2 to 3 puncture widths; surface shiny, reticular shagreening in apical hyaline areas but fine or absent basally; terga 5 and 6 more punctate and dulled by shagreening. Pygidial plate broad, with well-rounded apex. Sterna 2-5 impunctate or with scattered punctures basally, with crowded punctures apically, surfaces dulled by reticular shagreening.

VESTITURE: Hair white except as follows: vertex with few brown; mesoscutum and scutellum brown medially, ochraceous peripherally; terga 2-4 with basal area hairs short, sparse, brown; terga 5 and 6 with long hairs ochraceous washed with brown; tarsi brown; middle and hind tibiae ochraceous to brown. Hairs of thoracic dorsum sparse, thin, not hiding surface. Terga 2-4 with narrow, pale, apical fimbriae but interrupted medially on tergum 2 and often 3. Propodeal corbicula incomplete anteriorly, dorsal hairs relatively sparse, with 3-8 long internal hairs. Trochanteral flocculus complete but weak. Tibial scopal hairs of normal length, plumose, relatively sparse.

Male. MEASUREMENTS AND RATIOS: N = 5; length, 8.0-9.0 mm.; width, 2.0-2.5 mm.; wing length, M = 2.58 ± 0.041 mm.; FL/FW; M = 1.13 ± 0.033 ; FS1/FS2, M = 2.24 ± 0.008 .

INTEGUMENTAL COLOR: As in female except as follows: clypeus and parocular areas often infused with black or brown; antennae dark brown to black below; tegulae testaceous to piceous; terga with apical hyaline areas narrow.

STRUCTURE: Antennae barely exceeding tegulae in repose; scape subequal in length to flagellar segments 1-3; flagellar segment 1 subequal in length to 2 plus 3 which are subequal in length to each other and shorter than segment 4. Eye about three times as long as broad, strongly converging towards mandibles. Malar space, mandibles, galeae, genal areas, vertex and face as in female. Maxillary palpal segments in ratio of about 1.4:1.0:1.0:1.0:0.9:0.9. Labial palpal segments in ratio of about 2.5:1.5:1.0:1.2. Labral process bidentate, slightly reflexed. Clypeal, supraclypeal areas, vertex and genal area as in female.

Sculpturing of thorax and metasoma as in female except as follows: dorsum of thorax with punctures slightly more sparse; mesepisterna and metepisterna shiny, with shagreening extremely fine or absent; terga 2-5 as in 2-4 of female but shinier; terga 6 and 7 duller, shagreening coarser and punctures more crowded; sternum 6 with a strong U-shaped median apical emargination.

Genital capsule and sterna 7 and 8 as figured (Figs. 30-34); note narrow penis valves, sparse hairs, sternum 7 with broad V-shaped emargination.

VESTITURE: White except as follows: vertex with some ochra-

ceous; dorsum of thorax ochraceous to brown medially, white peripherally; terga 2-5 with basal area hairs sparse, short, subrect, brown; terga 6 and 7 with hairs washed with brown; tarsi usually brown; tibiae often brown. Terga 2-5 with distinct, complete, apical, white fimbriae (occasionally interrupted medially on tergum 2).

Andrena (Callandrena) vidalesi vidalesi Cockerell

Andrena vidalesi Cockerell, 1949, Proc. United States Nat. Mus., vol. 98, p. 434; Michener, 1954, Bull. American Mus. Nat. Hist., vol. 104, p. 31.

C. D. Michener (1954, pp. 31-34) has described the subspecies *panamensis* in considerable detail and has pointed out the essential differences between it and the typical subspecies. Since there are few differences between these subspecies only diagnoses are being presented here.

Andrena vidalesi s. str. can be distinguished from the subspecies *panamensis* on the basis of the wing venation of both sexes and clypeal color of the males. In *vidalesi s. str.* the front wing has vein 1st m-cu meeting the second submarginal cell at about two-thirds of the distance from the base of the cell. The male of *vidalesi s. str.* has the antennae black beneath, the clypeus and parocular areas yellow as described above for the female, and the tibiae, as well as the tarsi, with brown hairs on the outer surfaces. The female of *vidalesi s. str.* has the tibial scopal hairs uniformly pale to dark brown.

Type Material. The holotype male of *vidalesi* from Zamorano, Honduras, was collected in October by G. Vidales (USNM No. 58,436). A single male collected with the holotype was identified as this species in Cockerell's handwriting, but not labeled as a paratype. The male is identical to the holotype and should be considered as a paratype.

Distribution. The author has seen 16 specimens collected by Irwin and Cavagnare in El Salvadore in addition to the type material from Honduras. The data from these are given in full.

EL SALVADORE: Quezatepeque: 5 ♂♂, July 2, 1963; 1 ♂, July 5, 1963; 1 ♀, 1 ♂, July 11, 1963; 1 ♂, July 15, 1963; 4 ♂♂, August 4, 1963; 2 ♂♂, August 6, 1963.

Andrena (Callandrena) vidalesi panamensis Michener

Andrena (Pterandrena) vidalesi panamensis Michener, 1954, Bull. American Mus. Nat. Hist., vol. 104, pp. 31-34.

This subspecies has been adequately described by Michener. The male of *panamensis* is distinctive in its clypeus being infused

with brown or brownish-black so that only a small basomedial yellow macula remains and the parocular yellow maculae are reduced in size. Both sexes have the front wing with vein 1st m-cu meeting the second submarginal cell near the middle of the cell, the flagella rufescent beneath, the tegulae testaceous, the metasomal terga usually slightly reddened and the leg hairs (particularly the tibial hairs) ochraceous.

Type Material. The holotype (AMNH) male and the allotype (AMNH) female from Panamá City, Panamá Province, Panamá, were collected by C. D. Michener, December 24, 1944.

Distribution. Known only from Panamá, this subspecies is known only from the type material. Michener (1944, p. 34) lists 22 female and two male paratypes from the following localities in Panamá: PANAMÁ PROVINCE: Panamá City; Old Panamá. CANAL ZONE: Ancón Hill; Cerro Cobra; Corozal; Paraízo. COCLÉ PROVINCE: El valle de Antón.

Remarks. This subspecies has been collected several times from flowers of *Simsia grandiflora* during the months of December, January and February.

Andrena (Callandrena) aliciarum Cockerell

Andrena aliciarum Cockerell, 1897, The Entomol., vol. 30, p. 138.
Andrena (Pterandrena) aliciarum: Lanham, 1949, Univ. California Publ. Ent., vol. 8, p. 200.

This is a small red-abdomened species which superficially appears like *A. pectidis* (Cockerell). It differs from *pectidis* in several respects, such as the three submarginal cells, the coarser sculpturing, the well-developed subgenal coronet, and the bidentate labral process. It is here placed near *A. accepta* to which it is probably closely related in spite of lacking the high vertex and broad genal areas of *accepta*. *A. aliciarum* is one of those species which tie the *accepta*-group closely to the *manifesta*-group through species such as *pectidis* and *verbesinae*.

Female. MEASUREMENTS AND RATIOS: N = 2; length, 9.0–10.0 mm.; width, 3.0–3.5 mm.; wing length, about 3.55 mm.; FL/FW, 1.13; FOVL/FOVW, 2.40.

INTEGUMENTAL COLOR: Black except as follows: clypeus pale yellow except apical one-third or less with brown band with sinuous basal border and brown triangular maculae below tentorial pits; parocular area pale yellow to lower margin of facial fovea (upper margin of antennal fossa) and with narrow pale line between fovea and compound eye to within upper third of eye; supraclypeal area, scape and flagellar segments 4–10 below rufescent; tegulae rufescent;

wing membranes infumate apically, hyaline basally, veins dark brown; terga hyaline apically, tergum 1 piceous in basal half or more, red apically near hyaline marginal area, terga 2-6 red basally or piceous basally except near hyaline apical area (holotype is dark), or basal area more or less infused with brown medially; sterna red but last two sterna becoming infused with brown; legs red except coxae, trochanters and femora reddish-brown.

STRUCTURE: Scape subequal to flagellar segments 1-3; flagellar segment 1 longer than 2 plus 3, segment 2 subequal to 3 and each shorter than segment 4. Eye about four times as long as broad, converging slightly to mandibles. Malar space linear, six times as broad as long. Mandible in repose extends beyond middle of labrum by less than one-fifth its length, bidentate, lacking ventrobasal lamella. Subgenal coronet present. Galea as in *accepta*. Maxillary palpus short, not quite reaching apex of galea, segments in ratio of about 1.3:1.5:1.0:0.9:0.8:1.3. Labial palpus as in *accepta* but ratio about 3.0:1.0:0.9:1.5. Labral process short, strongly bidentate. Clypeus somewhat flattened posteromedially, protruding beyond ends of eyes by about one-third its length, with coarse round punctures separated mostly by half a puncture width or less, slightly sparser along midline, surface moderately shiny, with irregular shagreening. Supraclypeal area with abundant small almost confluent punctures, surface moderately shiny. Genal area equal to or slightly broader than eye in profile, with small round punctures separated by one-half to one puncture width, surface shiny, unshagreened. Vertex above lateral ocellus equals slightly more than one ocellar diameter, above ocelli with crowded punctures, laterally with punctures separated mostly by one-half to one puncture width or more, surface shiny. Facial fovea about half length of eye, rounded above, narrowly rounded below near eye margin, deeply impressed. Face above antennal fossae with almost confluent, moderate-sized punctures, without rugae except median ruga.

Pronotum normal, with minute punctures separated by one-half to one puncture width, becoming sparsely punctate laterally, surface shiny, unshagreened. Mesoscutum with small, round, regular, deep punctures separated by half a puncture width or less, surface shiny, shagreening delicate, if present. Scutellum and metanotum similar. Propodeum with enclosure with short, fine, longitudinal, median rugula, lateral to this finely areolate or granular or with incomplete or anastomizing, extremely fine, transverse rugulae; dorsolateral areas and posterior surface punctate, punctures sparser posteriorly, surfaces shiny, unshagreened; corbicular areas smooth, with widely-spaced punctures and surfaces slightly dulled by fine reticular shagreening. Fore wing with three submarginal cells; vein

1st m-cu meets second submarginal cell at about two-thirds distance from base of cell; pterostigma as in *accepta*. Middle basitarsus, tibial spurs and claws as in *accepta*.

Metasomal terga 1-4 basally with round, deep, regular punctures separated mostly by about one-half a puncture width, surfaces shiny, unshagreened, apical areas with punctures slightly smaller and more crowded. Terga 5 and 6 with punctures minute, well-separated, surfaces dulled by dense fine reticular shagreening. Pygidial plate somewhat V-shaped with well-rounded apex. Sterna 2-5 with narrow apical areas impunctate, basally with widely-scattered punctures except on sternum 5 punctures close-set near apical area, surfaces moderately dulled by reticular shagreening.

VESTITURE: White below and on sides to pale ochraceous above except as follows: dorsum of thorax may be dark ochraceous or pale brown in middle of sclerites (not in holotype); inner surfaces distitarsi and front and middle basitarsi yellow; inner surfaces hind basitarsi yellow infused with reddish-brown in some specimens (not holotype). Thoracic dorsum with hairs extremely short, erect, highly plumose, scalelike under low magnifications but branches not as dense as in *manifesta* or *pectidis*; terga 2-4 with apical pubescent fasciae, often interrupted medially on tergum 2 (interrupted in holotype); terga 1-4 with basal areas with abundant, short, erect, largely simple hairs scarcely obscuring surfaces; sterna without sub-apical fimbriae except on sternum 5 where poorly developed. Propodeal corbicula incomplete anteriorly, with long simple or sparsely barbed internal hairs. Trochanteral flocculus complete, weak. Tibial scopal hairs plumose, of normal length, white.

Male. MEASUREMENTS AND RATIOS: N = 2; length, about 9 mm.; width, about 2.5 mm.; wing length, 2.90-3.08 mm.; FL/FW, about 1.18; FS1/FS2, 2.09-2.18.

INTEGUMENTAL COLOR: As in female except as follows: parocular area with upper margin rounded, reaching level of upper margins antennal fossae, without pale line extending up alongside of compound eye; terga 1-6 piceous basally except rufescent in extremely narrow area just basad of hyaline apical margins; hind tibiae and tarsi dark red.

STRUCTURE: Antennae short, barely reaching middle of tegulae in repose; scape equal or slightly longer than flagellar segments 1-3; flagellar segment 1 longer than segments 2 plus 3, segment 2 shorter than 3 which is shorter than 4. Eye slightly less than three times as long as broad, converging towards mandibles. Malar space, mandible, galea, genal area, vertex and face as in female. Maxillary palpal ratio about 0.9:1.0:0.8:0.7:0.6:1.0. Labial palpal ratio about

2.7:1.0:0.9:0.8. Labral process bidentate, narrow, reflexed. Clypeus and supraclypeal area as in female.

Sculpturing of thorax and metasoma as in female except as follows: pronotal punctures separated mostly by one puncture width or slightly more; propodeum as in female in one specimen but transverse rugulae lacking in second, finely shagreened, propodeal lateral surface with punctures slightly smaller than mesepisternal and sparser ventrad, surface shiny; terga 1-4 with apical areas deeply impressed with reflexed rims. Sternum 6 relatively flat with a broad, V-shaped, apical emargination.

Genital capsule and sterna 7 and 8 as figured (Figs. 40-44); note extremely short and blunt gonoforceps and apices of penis valves, sternum 7 with V-shaped apical emargination and sparse hairs, sternum 8 with apex entire.

VESTITURE: As in female but thoracic dorsum with hairs slightly longer and slightly less plumose (not forming a matlike covering); tergal basal area hairs longer; sterna 3-5 with subapical fimbriae of long, slightly curled, white hairs.

Type Material. The holotype female (USNM No. 13,394) of *aliciarum* from Organ Pass, New Mexico, September 29, 1896, was collected by T. D. A. Cockerell.

Distribution. This species is known only from six specimens in addition to the holotype. The data for these are given in full.

ARIZONA: Wilcox, Cochise County, 1 ♀, August 20, 1958, R. M. Bohart. NEW MEXICO: Granite Pass, Hidalgo County, 1 ♀, August 25, 1958, P. D. Hurd, on *Eriogonum* sp. Rodeo, Hidalgo County, 2 ♀♀, August 18, 1964, C. D. Michener, on *Pectis papposa*; 1 ♂, July 25, 1958, C. G. Moore. MÉXICO: SONORA: Guaymas, 1 ♂, September 10, 1938, R. H. Crandall.

Andrena (Callandrena) sculleni, n. sp.

This small Mexican species is named in honor of Dr. H. A. Scullen who collected the type series. *A. sculleni* is a small species related to *A. aliciarum*. Both sexes of *sculleni* have yellow clypei and large yellow parocular maculae, short vertices and punctate terga as in *aliciarum*. Both sexes differ from those of *aliciarum* in having longer thoracic hairs (not matlike on mesoscutum and scutellum), in the terga having apical areas barely impressed and not as coarsely punctate and in having the clypeus impunctate medially. The female of *sculleni* is distinctive in that the mesoscutum and scutellum have large medial areas with extremely short, erect, dark brown hairs with long white hairs scattered throughout. The male

of *sculleni* differs from that of *aliciarum* also in its broader head and short first flagellar segment as described below.

A. sculleni seems to be related also to *A. humeralis* which it resembles in having a weakly developed humeral angle on the pronotum. However, this is much less developed than in *humeralis* and the dorsoventral ridge is lacking completely. It may be considered as an annectant form between the *humeralis* and the *accepta* groups.

Female. MEASUREMENTS AND RATIOS: N = 13; length, 10–12 mm; width, 4.0–4.5 mm; wing length, M = 3.84 ± 0.138 mm; FL/FW, M = 1.06 ± 0.004 ; FOVL/FOVW, M = 3.08 ± 0.091 .

INTEGUMENTAL COLOR: Black except as follows: clypeus yellow except apical fourth and triangular maculae below and mesad of tentorial pits; parocular areas with yellow maculae which laterally reach or almost reach tip of facial fovea and inner margins to level of posterior clypeal margin; apical third of mandible rufescent; flagellar segments 3–10 red below; wing membranes hyaline, veins dark reddish-brown; tegulae slightly rufescent; terga with apical margins narrowly hyaline, yellowed basad and narrowly rufescent just basad of hyaline areas; tibial spurs testaceous; distitarsi dark rufescent.

STRUCTURE: Scape length equals first four and one-half flagellar segments; flagellar segment 1 longer than 2 plus 3, segment 2 about equal in length to 3 and shorter than 4. Eye about three and three-fourths as long as broad, inner margins subparallel. Malar space, mandible and galeae as in *aliciarum*. Maxillary palpal ratio about 1.2:1.0:0.7:0.8:0.6:1.1. Labial palpal ratio about 3.1:1.0:0.9:1.3, segments strongly flattened. Labral process short, broad, entire or extremely weakly emarginate medially. Clypeus shaped as in *aliciarum*, punctures irregular laterally, separated mostly by one to two puncture widths or more, impunctate medially, surface shiny. Supraclypeal area with small round punctures separated mostly by half a puncture width, surface shiny, weakly shagreened. Genal areas slightly broader than eye in profile, punctures minute, separated by two to four puncture widths, surface shiny. Vertex as in *aliciarum* but punctures sparse except immediately above facial foveae and surface dulled by fine reticular shagreening. Facial fovea as in *aliciarum*. Face above antennal fossae with abundant longitudinal rugulae almost reaching ocelli medially, moderately shiny.

Pronotum with weak humeral angles, without dorsolateral ridge, with suture running somewhat anteriorly and dorsally from just below posterior lobe unusually deep and broad and crossed by several short distinct rugulae, surface dulled by fine irregularly reticular shagreening. Mesoscutum and scutellum as in *aliciarum* but

punctures slightly smaller and surfaces somewhat dulled by extremely fine shagreening. Propodeum with dorsal area with a median longitudinal rugula and fine irregular lateral transverse rugulae, surface dulled by fine tessellation; dorsolateral and posterior surfaces tessellate, punctures inconspicuous; corbicular area shiny, with coarse reticular shagreening and scattered punctures. Mesepisternum with shallow punctures crowded anteriorly, sparse posteriorly, surface dulled by reticular shagreening. Metepisternum dulled by reticular shagreening in upper third, shiny below. Tegulae impunctate. Wing venation as in *aliciarum*. Middle basitarsus expanded, broader than hind basitarsus medially. Tibial spurs and claws normal.

Metasomal terga 1-4 with apical areas with minute punctures separated mostly by one to two puncture widths; tergum 1 with basal area punctures minute, separated by two to five puncture widths; terga 2-4 with basal area punctures separated mostly by two puncture widths; terga 1-4 with surfaces moderately shiny, finely shagreened. Pygidial plate V-shaped, apex rather sharp, internal raised triangle present, margins closely approach margins of plate. Sterna 2-5 as in *aliciarum* but punctures more abundant in subapical areas.

VESTITURE: White or pale ochraceous except as follows: mesoscutum and scutellum with white hairs peripherally, medially with extremely short, dark brown hairs with long white hairs (four or five times as long as the brown) scattered throughout; terga 5 and 6 medially pale brown; terga 2-4 with basal area hairs short, sparse, dark brown, suberect. Terga 2-4 with apical pale pubescent fasciae, often extremely narrowly interrupted medially on tergum 2 and weak medially on 3. Propodeal corbicula, trochanteral flocculus and tibial scopa as in *aliciarum*.

Male. MEASUREMENTS AND RATIOS: N = 2; length, 8-9 mm; width, 2.0-2.5 mm; wing length, 3.25-3.58 mm; FL/FW, 1.00-1.06; FS1/FS2, 1.00-1.11.

INTEGUMENTAL COLOR: As in female except as follows: parocular yellow macula near eye margin extends to level of lower margin of antennal fossa or slightly above, this lateral arm broader than in female.

STRUCTURE: Antennae long, in repose reaching well beyond tegulae; scape length equals about first two and two-thirds flagellar segments; flagellar segment 1 longer than segment 3; segments 3-11 longer than broad. Malar space as in female. Mandible as in female but longer and thinner. Galeae as in female. Maxillary palpal ratio about 0.7:1.0:0.8:0.6:0.5:0.9. Labial palpal ratio about 2.0:0.6:0.5:1.0. Labral process bidentate, broad, strongly reflexed. Clypeus

broad, protruding beyond ends of compound eyes by one-fourth median length, not much flattened, punctures as in female. Supraclypeal areas as in female, but punctures sparser. Genal area distinctly broader than eye in profile, sculptured as in female. Vertex and face above antennal fossae as in female.

Thoracic sculpturing as in female except as follows: mesoscutal and scutellar punctures slightly sparser; lateral surfaces propodeum dulled, tessellate, with punctures more abundant. Fore wings with vein 1st m-cu meeting second submarginal cell near middle or only slightly beyond. Tibial spurs and claws normal. Metasomal terga 1-5 sculptured as in female terga 1-4 but punctures slightly sparser, especially in apical areas and surfaces shinier. Narrow pseudopygidial area present. Sterna 2-5 as in female. Sternum 6 flat, apical margin broadly and shallowly emarginate.

Sterna 7 and 8 as in *gardineri* but sternum 7 with few or no apical hairs and sternum 8 with neck region hairs sparser. Genital capsule as in *gardineri* but gonocoxite lateral lobes slightly more acute in dorsal and ventral views and hairs extremely sparse, penis valves not much expanded basally, and dorsal lobe of gonocoxite slightly shorter.

VESTITURE: Generally white except as follows: mesoscutum and scutellum medially with short (but not as short as in female), dark brown hairs mixed with long white; terga 2-5 basal areas with short, suberect, sparse, dark brown hairs; distitarsi with inner surfaces yellow. Terga 2-5 with weak but distinct pale apical pubescent fasciae interrupted medially especially on tergum 2. Sterna 2-5 with subapical fimbriae not distinctly distinguishable from more basal long hairs.

Type Material. The holotype female (OSU), allotype male (OSU), and one male paratype (INHS) were collected by H. A. Scullen, October 16, 1957, at 4500 feet altitude, at Saltillo (14 miles N.), Coahuila, México. Twelve female paratypes (OSU, INHS) were also collected in México by H. A. Scullen as follows: Gomex Palacio, (25 miles N.W.), Durango, at 4150 feet altitude, 6 ♀♀, October 18, 1957; Hidalgo de Parral (70 miles S.), Chihuahua, at 6500 feet altitude, 6 ♀♀, October 24, 1957.

Andrena (Callandrena) accepta Viereck

Andrena pulchella Robertson, 1891, Trans. American Ent. Soc., vol. 18, p. 57 (preoccupied); Cockerell, 1896, Ann. Mag. Nat. Hist., ser. 6, vol. 18, p. 88; Viereck, 1916, Connecticut Geol. Nat. Hist. Surv., Bull. 22, p. 717; Cockerell, 1931, Amer. Mus. Nov. No. 458, p. 7.

Pterandrena pulchella: Robertson, 1902, Trans. American Ent. Soc., vol. 28, pp. 193, 194 (new genus); 1914, Ent. News, vol. 25, p. 70; 1925, Ecology, vol. 6, p. 426; 1926, Ecology, vol. 7, p. 379; 1929, Flowers and Insects, p. 9; Pearson, 1933, Ecol. Monogr., vol. 3, p. 383.

Andrena (Pterandrena) accepta Viereck, 1916, Proc. Biol. Soc. Washington, vol. 29, p. 127 (new name for *A. pulchella* Robertson); Leonard, 1928, Cornell Univ. Agr. Exp. Sta. Mem. 101, p. 1022; Cockerell, 1931, American Mus. Nov. No. 458, p. 7; Lanham, 1949, Univ. California Pub. Ent., vol. 8, p. 200; Bohart, Knowlton, and Bailey, 1950, Utah St. College, Mimeo. Ser. No. 371, p. 3; Mitchell, 1960, North Carolina Agric. Exp. Sta. Tech. Bull. No. 141, pp. 137-138; LaBerge, 1964, Bull. Univ. Nebraska St. Museum, vol. 4, pp. 294-295.

Andrena accepta is a moderately large bee found throughout most of the United States and into northern Mexico. The female can be recognized by the yellow parocular areas, the black clypeus and the shiny, punctate terga. The males are also marked by large yellow parocular maculae and have the clypeus almost entirely yellow as well. The males are also distinguished by the moderately coarse tergal punctation and by the fine transverse rugulae on the propodeal enclosure. Both sexes are characterized by a very high vertex which extends above the lateral ocelli by two to three ocellar diameters. The genal area in both sexes is broad, being considerably broader than the eye in lateral view.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 11.0-12.5 mm; width, 3.5-4.5 mm; wing length, M = 4.03 ± 0.130 mm; FL/FW, M = 1.40 ± 0.026 ; FOVL/FOVW, M = 2.08 ± 0.027 .

INTEGUMENTAL COLOR: Head black except as follows: clypeus with small yellow areas posteromedially and laterally; parocular areas yellow to level of antennal fossae. Antennae dark red below. Thorax black; tegulae hyaline, yellow. Wing membranes hyaline, colorless; veins dark yellowish-brown to black. Terga 1-5 broadly hyaline apically, colorless to yellow. Sterna somewhat rufescent, hyaline apically. Distitarsi rufescent; tibial spurs yellow.

STRUCTURE: Flagellar segments 1-3 slightly shorter than scape, segments 2 and 3 shorter than 1 and each shorter than succeeding segments. Eyes about three times as long as broad or slightly longer, with inner margins subparallel to slightly converging above. Malar space extremely short, less than one-fifth as long as broad. Mandible in repose extends one-third of its length or slightly more beyond middle of labrum, with well-developed ventrobasal lamella. Galea opaque, densely tessellate, lateral surface less than half as broad

as dorsal surface. Maxillary palpus short, not reaching apex of galea, segmental ratio about 1.5:1.5:1.0:1.0:0.7:1.5. Labial palpal segments 1-3 strongly compressed, segment 1 strongly curved basally, segmental ratio about 1.6:1.0;0.7:0.8. Labral process short, about three times as broad as long, with small median emargination. Clypeus flat with round, coarse, irregularly spaced punctures crowded peripherally, sparse or absent medially. Supraclypeal area with small to minute, crowded punctures and reticular shagreening dulling surface. Genal area broad, almost twice as broad as eye in profile, with minute round punctures separated by one or more puncture widths, surface shiny. Vertex broad, above lateral ocelli equals 2-3 ocellar diameters, with small round punctures sparse above eye and ocelli, becoming crowded at apex. Face above antennae with distinct longitudinal rugae, interrugal spaces with small round punctures. Facial fovea extremely short, less than half length of eye, about two times as long as broad, rounded above, pointed below.

Pronotum with minute punctures crowded above, sparse laterally, surfaces moderately shiny to dulled by fine reticular shagreening. Mesoscutum with dense, regular, round punctures separated by one-half a puncture width, surface dulled by fine reticular shagreening. Scutellar punctures similar but sparser medially, surface shiny to moderately shiny, shagreening sparse. Propodeum with enclosure with extremely fine transverse rugulae, surface dulled by reticulo-transverse shagreening; lateral area with small sparse punctures, surface dulled by dense reticular shagreening; posterior surface with punctures and reticular shagreening similar to mesoscutum; corbicular areas moderately shiny, reticularly shagreened. Mese-pisternum with small round punctures separated mostly by one to two puncture widths, surface dulled by dense reticular shagreening. Metepisternum with minute punctures half diameter of mese-pisternal and separated mostly by one puncture width, surface shiny, unshagreened. Middle basitarsus not markedly expanded, broadest medially, slightly broader than hind basitarsus, more than twice as long as broad. Hind tibia moderately cuneate, slightly curved, about four times as long as broad. Tibial spurs normal. Wing with pterostigma linear, more than four times as long as broad, vein 1st m-cu meets second submarginal cell slightly beyond middle.

Metasomal tergum 1 with punctures deep, round, regularly spaced, separated mostly by one-half puncture width, smaller near apex, narrow apical margin impunctate, surface shiny with extremely sparse and delicate shagreening. Terga 2-4 similar but shagreening denser. Tergum 5 with punctures obscured by dense shagreening. Pygidial plate broad at base, V-shaped, with apex rounded.

Sterna 2-6 impunctate basomedially, with scattered punctures apically and laterally, surface dulled by regular reticular shagreening.

VESTITURE: Head hairs ochraceous; facial foveal hairs pale ochraceous to white. Thoracic hairs ochraceous, yellowish to yellowish-orange above. Propodeal corbicula complete with internal compound hairs at least in upper half. Tergal vestiture ochraceous; terga 1-4 with weak apical fasciae. Sternal hairs ochraceous; sterna 2-5 with long barbed hairs near apices, shorter medially. Trochanteral flocculus complete. Tibial scopal hairs of medium length, becoming rather short apically, with short barbs in outer half to three-fifths. Leg hairs ochraceous to white, becoming reddish on inner surfaces of tarsi.

Male. MEASUREMENTS AND RATIOS: N = 20; length, 9.5-12.5 mm; width, 2.5-3.5 mm; wing length, $M = 3.66 \pm 0.130$ mm; FL/FW, $M = 1.41 \pm 0.007$; FS1/FS2, $M = 2.82 \pm 0.059$.

INTEGUMENTAL COLOR: Color as in female except as follows: clypeus yellow except broad apical margin with small lobes extending onto clypeus and maculae at tentorial pits black; wing veins yellow to dark red; distarsi yellow to red, basitarsi red, middle and hind tibiae often rufescent, fore tibia and middle and hind femora often rufescent.

STRUCTURE: Antennae short, barely reaching tegulae in repose; scape longer than flagellar segments 1-3; flagellar segment 1 longer than 2 plus 3. Eye about three times as long as broad, converging slightly toward mandibles. Malar space, mandibles and galeae as in female except mandibles without ventrobasal lamellae. Maxillary palpal ratio about 1.7:1.8:1.2:1.0:1.1:1.5. Labial palpus as in female. Labral process strongly bidentate, reflexed. Clypeus protruding distinctly below lower level of eyes, with small round punctures of irregular size separated by less than one to three or four puncture widths, surface shiny. Supraclypeal area, front, genal area and vertex as in female. Sculpturing of thorax as in female except as follows: mesoscutum shiny, shagreening sparse; propodeum with enclosure with fine transverse rugulae near apex medially. Metasomal terga sculptured as in female but surfaces shinier, shagreening sparse. Sterna much as in female but less punctate. Sternum 6 with shallow apical V-shaped emargination, with abundant, moderately short hairs arising from small punctures on shiny surface.

Sternum 7 (Fig. 38) with basal apodemes turned slightly inward; deeply emarginate apically, processes on either side of emargination with short sparse hairs. Sternum 8 (Fig. 39) with apex and neck region shorter than basal region; apex deeply emarginate; neck area provided with abundant long hairs. Gonoforceps (Figs. 35-37) in dorsal and ventral views appearing blunt, in lateral view appearing

more pointed. Penis valves strongly bent downwards, apex at right angles to base, apex slightly expanded, in lateral view about as long as gonoforceps.

VESTITURE: Color in general as in female but usually paler, especially above; inner surfaces of tarsi yellow.

Type Material. The lectotype (INHS) female (here designated) (No. 8637) and the lectoallotype (INHS) male (here designated) (No. 15, 215) were collected by Charles A. Robertson at Carlinville, Illinois, in 1888 and 1893, respectively.

Bionomics. *A. accepta* is an oligolege of Compositae, especially of the genus *Helianthus*. Table 2 summarizes the floral data taken from specimens available to the author.

TABLE 2. Summary of floral records for *Andrena accepta* Viereck

| Family | Plant Data | | | Record of <i>A. accepta</i> | | |
|-------------------|------------------|-------------------|-----------------------|-----------------------------|-----------------|----------------------|
| | Number of Genera | Number of Species | Number of Collections | Number of Females | Number of Males | Total number of bees |
| Compositae: | | | | | | |
| <i>Helianthus</i> | 1 | 7 | 103 | 194 | 126 | 320 |
| <i>Silphium</i> | 1 | 2 | 3 | 0 | 13 | 13 |
| <i>Grindelia</i> | 1 | 1 | 7 | 3 | 14 | 17 |
| <i>Solidago</i> | 1 | 1 | 7 | 6 | 1 | 7 |
| Other Genera | 10 | 12 | 20 | 15 | 8 | 23 |
| Leguminosae | 2 | 2 | 2 | 1 | 1 | 2 |
| Totals | 16 | 25 | 142 | 219 | 163 | 382 |

Distribution. This species occurs from eastern California and Oregon, east to New Jersey and south to Arizona, northern México and Georgia (Fig. 4). It has been collected from July 27th until October 29th, but chiefly during the months of August and September. A total of 345 females and 397 males have been examined. The following list of localities in which *A. accepta* has been collected includes those from the literature.

ARIZONA: Bridgeport; Kirkland Junction, Yavapai Co.; Nogales; Prescott. CALIFORNIA: Big Pine, Inyo Co. COLORADO: Berkeley; Boulder Co.; Burlington; Coaldale, Fremont Co.; Fort Collins; Fort Morgan; Limon (and 9 miles S. of); Lump Gulch, Gilpin Co.; San Luis Lakes; Turkey Creek; Two Buttes (5 miles W.), Baca Co.; Wiggins (6 miles E.); Wray. GEORGIA: Atlanta; Stone Mountain. IDAHO: Boise; Parma. ILLINOIS: Carlinville; Cicero; Volo. INDIANA: Lafayette. IOWA: Ames; Davis Co.; Hardin Co.; Sioux City. KANSAS: Allen Co.; Baldwin; Baldwin

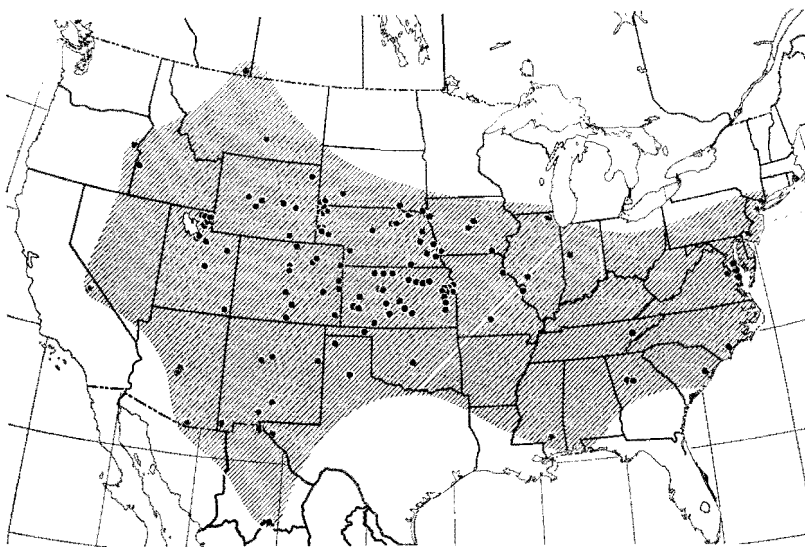


FIG. 4. Map showing the known distribution of *A. (Callandrena) accepta* Viereck.

Junction, Douglas Co.; Clark Co.; Clay Co.; Cloud Co.; Cullison; DeSoto, Johnson Co.; Douglas Co.; Ellis (3 miles E.); Ellis Co.; Franklin Co.; Garden City (9 miles S.); Garnet; Hutchinson (5 miles N.); Kansas City; Lake View, Douglas Co.; Lakin; Larned; Lawrence; Manhattan; Norton Co.; Phillips Co.; Riley Co.; Scott City (8 miles N.); Sedgwick Co.; Sterling; Sunflower. MARYLAND: Chesapeake Beach. MISSISSIPPI: Hattiesburg. MISSOURI: Hannibal; Ozark Lake; St. Louis. MONTANA: Pompey's Pillar (6 miles N.E.), Yellowstone Co. NEBRASKA: Atkinson (24 miles S.); Bassett (9 miles E.); Bridgeport; David City, Butler Co.; Gavins Point Dam (20 miles N.W. of Crofton); Glen, Sioux Co.; Grant (3 miles N.); Haigler; Halsey; Hardy; Harrison (7 and 13 miles N.); Lincoln; Mitchell; Montrose, Sioux Co.; Monroe Canyon, Sioux Co.; Morrill; Nebraska City; Omaha; Scottsbluff; Toadstool State Park (10 miles N. of Crawford). NEVADA: Fallon, Churchill Co. NEW JERSEY: Kearny; Palmyra. NEW MEXICO: Albuquerque; Algodores; Las Cruces; Rodeo (2.5 miles N.), Hidalgo Co.; San Jon; Tularosa. NEW YORK: White Plains. NORTH CAROLINA: Burgaw. OKLAHOMA: Beaver Co.; Oklahoma City. OREGON: Huntington (4 miles W.), Malheur Co. SOUTH CAROLINA: Sumter. SOUTH DAKOTA: Ardmore; Bad Lands; Dallas (3 miles W.); Elk Point; Hot Springs (5 miles E.). TENNESSEE: Knoxville. TEXAS: Cisco; Dalhart (10 miles S.W.); Fabens. UTAH: Bluff; Delta; Garfield; Hyrum; Lampo; Lehi; Logan; Myton; North

Ogden; Ogden; Petersboro; Sandy, Salt Lake Co.; Springville; Stanish Fork. VIRGINIA: Chain Bridge; Falls Church; Kearney, Arlington Co. WYOMING: Casper (22 miles S. on Bates Creek); Douglas (10 miles S.); Gillette (12 miles E.); Lander (3 miles N.W. on Baldwin Creek); Laramie; Riverton (15 miles N.E.); Shoshoni (5 miles N.); Sundance (6 miles S.). *México*. CHIHUAHUA: Ciudad Juárez; Salaiques. *Canada*. ALBERTA: Medicine Hat.

Floral Records. *Andrena accepta* has been collected on the following genera and species of plants. This list includes records reported in the literature.

Aster sp., *A. ericoides villosus*, *Bidens* sp., *B. aristosa*, *Cassia chamaecrista*, *Chrysothamnus* sp., *Coreopsis tripteris*, *Gaillardia pulchella*, *Grindelia* sp., *G. squarrosa*, *Gutierrezia sarothrae*, *Haplopappus* sp., *Helianthus* sp., *H. augustifolius*, *H. annuus*, *H. divaricatus*, *H. giganteus*, *H. grosseserratus*, *H. maximilliani*, *H. petiolaris*, *H. salicifolius*, *H. scaberimus*, *H. strumosus*, *H. tuberosus*, *Machaeranthera* sp., *Medicago sativa*, *Prionopsis ciliata*, *Silphium* sp., *S. integrifolium*, *S. perfoliatum*, *S. speciosum*, *Solidago* sp., *S. nemoralis*, *Verbesina occidentalis*, *V. oreophila*.

Andrena (Callandrena) trimaculata, n. sp.

This small species is the nearest relative of *A. accepta*. The female of *trimaculata* differs from that of *accepta* by the three large facial maculae (two parocular and one clypeal). The male can be distinguished from that of *accepta* by the shorter clypeus. Both sexes have the supraclypeal area shinier and more punctate than in *accepta* and have the genal area less broad.

Female. MEASUREMENTS AND RATIOS: N = 1; length about 10.0 mm; width about 3.0 mm; wing length, 3.38 mm; FL/FW = 1.14; FOVL/FOVW = 2.38.

INTEGUMENTAL COLOR: As in *accepta* except as follows: clypeus with mediobasal yellow macula equal to about one-third of clypeal area and almost equal to parocular maculae in area; flagellar segments 4–10 reddish-orange below; tegulae brown; wing membranes moderately infumate apically, veins dark brown; tergal apices broadly hyaline, reddish; sterna piceous.

STRUCTURE: Antennae and eyes as in *accepta* but eyes converging slightly towards mandibles. Malar space, mandible and galea as in *accepta* but mandible lacks ventrobasal lamella. Maxillary palpus shorter than galea, in ratio of about 1.6:1.8:1.2:1.0:0.8:1.4. Labial palpus with segment 1 compressed and strongly curved and longer than succeeding segments together, in ratio of about 2.7:1.0:0.6:0.9. Labral process as in *accepta*. Clypeus flat with large round punctures

of irregular size, largest twice diameter of smallest or more, separated by one-half to one puncture width except sparser medially; yellow mediobasal area of clypeus much flatter, surrounded apically by irregular, low ridge, surface shiny, shagreening extremely sparse. Suparclypeal area with small round crowded punctures, surface shiny. Genal area only slightly broader than eye in profile, with round crowded punctures near eye, separated by half or less puncture width, sparser further from eye, surface shiny. Vertex equals about two ocellar diameters above lateral ocellus, punctures deep, crowded at apex, sparse laterad of ocelli, surface dulled by sparse reticular shagreening. Face as in *accepta* but punctures more abundant. Facial fovea more than two times as long as broad.

Pronotum as in *accepta* but surfaces moderately shiny. Mesoscutum and scutellum as in *accepta* but punctures somewhat more crowded and surfaces shiny, unshagreened. Propodeum with enclosure with extremely fine, irregular rugulae basally, granular in apical half; lateral and posterior areas with punctures separated by half a puncture width or less, moderately shiny; corbicular areas as in *accepta*. Mesepisternum and metepisternum as in *accepta* but the latter largely impunctate and shiny. Hind tibia and tibial spurs as in *accepta*. Wing venation as in *accepta* but 1st m-cu meets second submarginal cell at about two-thirds distance from base of cell.

Metasomal terga as in *accepta* but punctures seem deeper and more crowded, generally separated by less than half a puncture width, surfaces shiny, unshagreened or only delicately so. Pygidial plate and sterna as in *accepta*.

VESTITURE: Hair generally light ochraceous or cinereous except inner surfaces tarsi and outer surfaces hind basitarsi brownish-red. Distribution and type of hairs as in *accepta* except as follows: mesoscutal and scutellar hairs much shorter, highly plumose, giving dorsum of thorax a velvety appearance; terga with basal area hairs mostly extremely short and fine, basal areas except in profile appear almost naked.

Male. MEASUREMENTS AND RATIOS: N = 1; length about 10.0 mm; width about 2.5 mm; wing length, 3.4 mm; FL/FW = 0.96; FS1/FS2 = 2.50.

INTEGUMENTAL COLOR: Color as in female except as follows: clypeus yellow except broad apical margin and two small maculae at tentorial pits brown to black; flagellar segments 2-11 dark red below tegulae reddish-brown; basitarsi and tibiae somewhat rufescent.

STRUCTURE: Antennae as in *accepta*. Eye more than three times as long as broad, converging strongly toward mandibles. Malar space, mandible and galea as in female. Maxillary palpal ratio

about 1.0:1.0:0.8:0.8:0.6:1.1. Labial palpus as in female, palpal ratio about 2.6:1.0:0.7:1.1. Labral process narrow apically, strongly reflexed, bidentate and ribbed. Clypeus flat, barely protruding below lower margins of eyes, apical margin turned out and thickened, with large round punctures separated by one-half to one puncture width except sparser medially, surface shiny, unshagreened. Supraclypeal area as in female. Genal area considerably broader than eye in profile (but less than one and one-half times eye), sculptured as in female. Vertex above lateral ocellus equals almost three ocellar diameters, sculpturing as in female but punctures more abundant laterally and surface shiny, unshagreened. Face as in female. Thoracic sculpturing as in female except as follows: propodeal enclosure with weak transverse rugulae throughout, dorsolateral, posterior and corbicular areas with punctures sparser and surfaces shinier; mesepisternum with surface shiny. Terga as in female. Sterna 2-6 as in *accepta*.

Sterna 7 and 8 and genital capsules (Figs. 50-54) similar to that of *accepta*.

VESTITURE: Color white to cinereous (slightly darker above) except inner surfaces tarsi yellow. Distribution and type of hairs as in *accepta* except terga with basal area hairs somewhat shorter and tergum 1 with apical area with a more distinct appressed pubescent band.

Type Material. The holotype female was collected by G. D. Butler at Canello, Arizona, October 19, 1957. The allotype male was collected by G. D. Butler at Canelo Arizona, October 11, 1955. Both specimens are the property of the University of Arizona at Tucson but are on permanent loan to the Illinois Natural History Survey.

Remarks: A male collected by P. H. Arnaud, Jr., E. S. Ross and D. C. Rentz, 9 miles south of San Juan del Río, Durango, México, August 21, 1960, is placed with this species although it differs from the allotype male. The Durango male is slightly smaller than the allotype, has the pale facial maculae cream-colored rather than yellow, and the hind basitarsus and apex of the hind tibiae orange.

Andrena (Callandrena) reflexa Cresson

Andrena reflexa Cresson, 1872, Trans. American Ent. Soc., vol. 4, p. 256; Howard, 1905, The Insect Book, pl. III, fig. 2.

Andrena permitis Cresson, 1872, Trans. American Ent. Soc., vol. 4, p. 257 (*new synonymy*).

Andrena (Pterandrena) reflexa: Lanham, 1949, Univ. California Publ. Ent., vol. 8, p. 200.

Andrena (Pterandrena) permitis: Lanham, 1949, Univ. California Publ. Ent., vol. 8, p. 200.

Cresson (1872) named the two sexes from Texas as two species. The male of *reflexa* is similar to that of *A. accepta* in the high vertex, broad genal areas, yellow parocular maculae (usually), and sculpturing. The male can be distinguished from that of *accepta* by the short clypeus, the short labral process, the long mandibles and the reflexed tergal apices. The female of *reflexa* differs markedly from that of *accepta* by its shorter vertex, lack of yellow on the clypeus and parocular areas, and short labral process.

Female. MEASUREMENTS AND RATIOS: N = 3; length, about 12 mm; width, about 4 mm; wing length, 4.11–4.44 mm; FL/FW, 0.91–1.04; FOVL/FOVW, 3.00–3.23.

INTEGUMENTAL COLOR: Black except as follows; mandibles largely rufescent; flagellar segments 3–10 red below; tegulae testaceous; wing membranes moderately infumate, darker apically, veins reddish-brown to black; terga with apical thirds hyaline, colorless to slightly rufescent basad; sterna 2–5 more narrowly hyaline apically, clear to yellowish, basally rufescent; tarsi rufescent; tibial spurs yellow.

STRUCTURE: Antennae of moderate length; scape equal to flagellar segments 1–3; flagellar segment 1 equal in length to segments 2–4 plus half of 5, segment 2 equal to 3 and each shorter than segment 4. Eye slightly longer than three and one-half times as long as broad, inner margins parallel or converging slightly towards vertex. Malar space linear. Mandible of moderate length, bidentate, outer mandible in repose extends beyond middle of labrum by one-fifth its length; ventrobasal angle not developed; subgenal coronet well developed. Galea with lateral surface about one-fourth as broad as dorsal; opaque, with scattered obscure punctures and regular coarse tessellation. Maxillary palpus shorter than galea when extended forward, segmental ratio about 1.0:1.0:0.9:0.7:0.6:0.7. Labial palpus as in *accepta* but ratio about 1.9:1.0:0.8:0.8. Labral process short, flat, about six times as broad as long not bidentate, median emargination extremely broad and shallow. Clypeus flat, protruding beyond ends of compound eyes by about one-third its own length, with regular round punctures separated mostly by half a puncture width except narrow impunctate midline, surface shiny, shagreening extremely delicate. Supraclypeal area with small punctures and fine shagreening dulling surface. Genal area about one and one-half times as broad as eye in profile, punctures minute, separated by one puncture width except more crowded near eye, surface shiny. Vertex above lateral ocellus equal to almost

two ocellar diameters, punctures crowded above ocelli, sparse laterally, surface moderately dulled by reticular shagreening. Face above antennal fossae with well-developed longitudinal rugulae reaching ocelli above but not between lateral ocelli and foveae, interrugal spaces with large punctures and fine shagreening. Facial fovea deep, short, extending little below level of upper margin of antennal fossa, slightly narrowed below, separated from eye margin and converging above, separated from lateral ocellus by slightly less than one ocellar diameter.

Pronotum normal, with small punctures crowded above, scattered at sides and reticular shagreening dulling surface. Mesoscutum, scutellum and metanotum opaque, with crowded round punctures and coarse tessellation dulling surfaces. Parapsidal lines of normal length. Tegulae impunctate. Propodeum with dorsal enclosure tessellate with anastomizing rugulae; dorsolateral and posterior surfaces with round punctures, sparse posteriorly, and fine reticular shagreening, moderately shiny; corbicular area shiny, with scattered punctures and coarse reticular shagreening. Mesepisternum like mesoscutum but punctures separated by one to two puncture widths or more. Metepisternum with crowded punctures above, like corbicular area below. Middle basitarsus about as broad as hind, sides subparallel without apical anterior process. Fore wing with three submarginal cells; vein 1st m-cu meets second submarginal cell near middle of cell; pterostigma long, narrower than from inner margin prestigma to wing margin. Claws and tibial spurs normal.

Terga 1-4 with apical areas slightly impressed and apices narrowly reflexed; basal areas with large crowded punctures separated by less than half a puncture width, surfaces shiny; apical area punctures slightly smaller. Pygidial plate V-shaped, usually with blunt apex. Sterna 2-5 impunctate in basal halves, with crowded punctures near apical hyaline margins.

VESTITURE: Generally pale ochraceous, somewhat brighter on vertex and thoracic dorsum. Terga 2-4 with pale apical pubescent fasciae. Tibial plate and tarsi with reddish-brown hairs. Propodeal corbicula incomplete anteriorly, with long, apically plumose, interior hairs in upper half to two-thirds. Trochanteral flocculus complete. Tibial scopal hairs long, plumose throughout.

Male. **MEASUREMENTS AND RATIOS:** N = 4; length, 11-13 mm; width, 3.5-4.0 mm; wing length, $M = 4.16 \pm 0.663$ mm; FL/FW, $M = 0.77 \pm 0.023$; FS1/FS2, $M = 2.97 \pm 0.145$.

INTEGUMENTAL COLOR: Black except as follows: clypeus yellow except apical margin, lateral areas to and including tentorial pits (about mediobasal one-half or slightly more is yellow); parocular area with small yellow macula at apex (absent in one specimen,

very large in another); flagellar segments 3-11 slightly reddened below; tegulae brownish-red; wing membranes moderately infumate especially apically, veins dark brown; terga and sterna broadly hyaline apically, colorless to slightly yellowed; tarsi, tibiae and usually femora in part somewhat rufescent.

STRUCTURE: Antennae short, barely reaching tegulae; scape subequal to or slightly shorter than flagellar segments 1-3; flagellar segment 1 subequal in length to 2 through 4, segments 2 and 3 subequal to one another, each shorter than 4. Eye more than three times as long as broad, subparallel or converging slightly towards vertex. Malar space short, about five times as broad as long, slightly broader below. Mandible short, extends beyond midline of labrum in repose by about one-fourth its length, broad near apex, obscurely tridentate, with large cutting edge along inner margin in apical third. Galea as in *accepta*. Maxillary palpus as in *accepta* but ratio about 1.2:1.0:0.9:0.8:0.8:1.2. Labial palpus as in *accepta*, but ratio about 1.8:1.0:0.6:0.9. Labrum small, no wider than one-third distance between mandibular bases, process not well developed, obscurely bidentate, flat, short. Clypeus short, not protruding beyond lower level of eyes, rounded medially, with round punctures separated mostly by half a puncture width except sparser medially, surface shiny. Supraclypeal area with small distinct punctures separated by one-half to one puncture width, surface somewhat dulled by reticular shagreening. Genal areas broad, almost two times width of eye in profile, with small round punctures separated by one-half to one puncture width (sparser posteriorly), surface shiny. Vertex tall, above lateral ocellus equals about 4 ocellar diameters, with small round punctures separated by one puncture width at apex and sparser laterally, surface dulled above by reticular shagreening. Face punctate up to level of ocelli, without longitudinal rugae below ocelli.

Pronotum as in *accepta*. Mesoscutum as in *accepta* but surface dulled by fine, dense, reticular shagreening. Scutellum as in *accepta*. Propodeum as in *accepta* but enclosure without transverse regulae, either granular or with irregular, extremely fine, largely longitudinal rugulae. Episterna as in *accepta*. Wings as in *accepta* but vein 1st m-cu meets second submarginal cell at or before middle of cell. Legs and spurs normal.

Metasomal terga with apical areas moderately strongly impressed with apices reflexed; terga with punctures separated by one-half to one puncture width, smaller but no more crowded in apical areas except narrow reflexed border impunctate; surface shiny. Sterna 2-5 with scattered punctures except apical areas impunctate and

slightly reflexed. Sternum 6 flat with apical margin straight or gently concave.

Genital capsule and sterna 7 and 8 (Figs. 55-59) similar to those of *accepta* but note: emarginate apex of sternum 7, broad and only slightly emarginate apex of sternum 8, hairs of gonoforceps.

VESTITURE: Hair generally ochraceous (one specimen rather reddish on thoracic dorsum). Distribution and type of hairs as in *accepta*.

Type Material. The lectotype (PANS) male (No. 2159) of *reflexa* and the lectotype (PANS) female (No. 2158) of *permitis* were collected in Texas.

Distribution. *A. reflexa* has been taken only a few times in Texas and México. The collection data are given below in full.

TEXAS: Fort Davis. 1 ♂, October 7, 1930, G. F. Englehardt. Lampasas (8 miles N. of highway U.S. 190 on the Lampasas River). 1 ♀, October 8, 1955, Mathews. Six ♀♀ and four ♂♂ (paratypes) labeled "Tex" and "Belfrage collection." MÉXICO. CHIHUAHUA: Minaca (22 miles S.). ♂♂, August 23, 1950, Ray F. Smith. JALISCO: Guadalajara (15 miles N.W.). 1 ♂, September 13, 1938, L. J. Lipovsky. MICHOACÁN: Carapán. 1 ♂, September 1, 1962, on *Crotalaria longirostrata*, D. H. Janzen.

Variation. The male from Fort Davis differs from the Mexican specimens by having large yellow parocular areas (extending up to the antennal fossae), the clypeus almost entirely yellow, and the mandible yellow in median half. The Guadalajara males and the Carapán males differ from the other three in lacking parocular yellow areas. All of the males studied are very similar in structure and sculpturing.

Andrena (Callandrena) calvata, n. sp.

This species is closely related to *A. reflexa* from which it can be distinguished by the sparse punctures over most of the body but especially on the metasomal terga which are shiny and almost glabrous. It is placed, together with *reflexa*, near *accepta* because of the high vertex, broad genal areas, and yellow parocular maculae. *A. calvata* is known only from three males.

Male. MEASUREMENTS AND RATIOS: $N = 3$; length, 9-12 mm; width, 2.5-4.0 mm; wing length, $M = 4.79 \pm 3.175$ mm; FL/FW, $M = 0.93 \pm 0.032$; FS1/FS2, $M = 2.57 \pm 0.083$.

INTEGUMENTAL COLOR: Black except as follows: clypeus yellow except narrow apical margin and small maculae at tentorial pits; parocular areas yellow to level of antennal fossae; tegulae testaceous; wing membranes moderately infumate, especially apically, veins

dark brown; terga and sterna with broad hyaline apical margins yellow to reddish, sterna often reddish medially in basal areas; disitarsi and basal half of tibiae yellow to reddish-yellow.

STRUCTURE: Antenna of moderate length, surpasses tegulae; scape subequal to flagellar segments 1-3 in length; flagellar segment 1 equals segments 2 through 4, segments 2 and 3 subequal and each shorter than 4. Eyes about three and one-half times as long as broad, converging slightly towards mandibles. Malar space as in *accepta*. Mandibles moderately decussate, in repose portion extending beyond middle of labrum equals one-third of mandible, bidentate. Gafea opaque, dulled by regular tessellation; shape as in *accepta*. Maxillary palpus as in *accepta* but segmental ratio about 1.6:1.0:0.6:0.8:0.6:0.8. Labial palpus as in *accepta* but segmental ratio about 3.3:1.0:0.9:1.1. Labrum as in *reflexa* but process more distinct, rhomboidal in shape and weakly bidentate apically. Clypeus as in *reflexa* but with punctures absent or minute and sparse in medially one-fourth. Supraclypeal area as in *reflexa* but slightly sparser punctures. Genal area equals about one and one-half times eye in profile, punctures minute, separated mostly by 2 to 3 puncture widths, surface shiny, unshagreened. Vertex above lateral ocellus equals about 3 ocellar diameters, at apex punctate and reticularly shagreened, laterally with punctures small and sparse, surface shiny. Face above level of antennal fossae with longitudinal rugulae which do not reach ocelli, interrugal spaces punctate and area above rugulae punctate, medially surface moderately dulled by reticular shagreening, shiny laterally.

Pronotum as in *accepta* or *reflexa* but punctures almost obscured by tessellation. Mesoscutum, scutellum and metascutum with surfaces dulled by fine dense tessellation, punctate but punctures shallow, sparse and obscured by the tessellation. Propodeum with enclosure granulate to tessellate, outside of enclosure uniformly tessellate with sparse, shallow, obscured punctures separated by one to two puncture widths. Mesepisternum with extremely shallow, large, closely-spaced punctures which run into one another giving surface uneven appearance, surface reticularly shagreened, moderately dulled. Metepisternum smooth, impunctate below, reticularly shagreened, shinier than mesepisternum. Tibial spurs of hind legs moderately strongly curved in outer third or more.

Metasomal terga with minute, widely-spaced punctures separated mostly by three to four puncture widths or more, slightly less in apical areas; apical areas not impressed nor borders reflexed. Sterna with extremely few scattered punctures. Sternum 6 with broadly V-shaped, shallow apical emargination, more punctate than basal sterna.

Genital capsule and sterna 7 and 8 (Figs. 60–64) similar to those of *reflexa* but note the following: gonoforceps shorter, blunter; penis valve turned down and back at less than a right angle; sternum 7 deeply emarginate as in *accepta*; sternum 8 with small, shallow emarginate apex and narrow neck region.

VESTITURE: Hair generally white to ochraceous (in holotype ochraceous). Distribution and type of hairs much as in *accepta* but terga almost glabrous, without apical pale fasciae, and sterna without distinct apical bands of long hairs.

Type Material. The holotype male (CAS) and one male paratype (INHS) from 22 miles west of Springerville, Apache County, Arizona, were collected by P. D. Hurd, September 14, 1961, on *Viguiera annua*. One male paratype (GEB) from Willow Creek, New Mexico, was taken by R. M. and G. E. Bohart on September 3, 1933.

Andrena (Callandrena) humeralis, n. sp.

Andrena humeralis is closely related to *A. accepta* from which it can be distinguished readily by the well-developed humeral angles on the pronotum. This is an unusual character in the subgenus *Callandrena* and will distinguish this species from all others. In addition *humeralis* differs from *accepta* in both sexes by a shorter vertex and less punctate terga, in the females by a more strongly bidentate process and lack of yellow on the clypeus, and in the males by a shorter clypeus and broader genal areas.

Female. MEASUREMENTS AND RATIOS: N = 1; length, about 11 mm; width, about 3.5 mm; wing length, 1.08 mm; FL/FW = 1.08; FOVL/FOVW = 2.12.

INTEGUMENTAL COLOR: Color as in *accepta* except as follows: clypeus without yellow; wing membranes infumate apically; veins reddish-brown; pygidial plate yellow medially, rufescent peripherally.

STRUCTURE: Flagellar segments 1–3 distinctly shorter than scape, segments 2 and 3 equal to one another, shorter than succeeding segments and together equal to about two-thirds length of first segment. Eye about four times as long as broad, inner margins slightly converging above. Malar space as in *accepta*. Mandible as in *accepta* but ventrobasal lamella poorly developed. Galea as in *accepta*. Maxillary palpus shorter than galea, in ratio of about 3.0:2.3:1.0:1.0:1.5. Labial palpus with first segment compressed and strongly curved, in ratio of about 4.0:1.2:1.0:1.2. Labral process about three times as long as broad, strongly bidentate. Clypeus flat with round, coarse punctures separated mostly by one-half to one puncture width, surface shiny, only slightly dulled by fine shagreening. Supra-

clypeal area with minute crowded punctures, surface shiny. Genal area as in *accepta*. Vertex above lateral ocellus equals about one and one-half an ocellar diameter, sculptured as in *accepta*. Face as in *accepta*. Facial fovea longer than in *accepta*, length equals about half length of eye.

Pronotum with well-developed humeral angles with a blunt ridge running ventrad from angle but interrupted by the pronotal suture, sculptured as in *accepta*. Mesoscutal and scutellar sculpturing as in *accepta* but mesoscutum shinier. Propodeum as in *accepta* but enclosure with transverse rugulae in basal two-thirds. Mese-pisternal punctures separated mostly by one puncture width, otherwise as in *accepta*. Metepisternum impunctate below, surface shiny. Middle basitarsus about as broad as hind, not markedly expanded medially. Hind tibia, tibial spurs, and wings as in *accepta*.

Metasomal tergum 1 with punctures small, round, separated mostly by one to two puncture widths, smaller and more crowded near apex, surface shiny, unshagreened. Terga 2-4 similar but slightly dulled by shagreening at least on tergum 4. Tergum 5 with punctures and shagreening denser, dulling surface. Pygidial plate narrow, an elongated V in shape, with rounded apex. Sterna as in *accepta*.

VESTITURE: Uniformly ochraceous except inner surfaces basitarsi brown; distribution and types of hairs as in *accepta*.

Male. MEASUREMENTS AND RATIOS: N = 1; length, about 11 mm; width, about 2.5 mm; wing length, 3.3 mm; FL/FW = 0.81; FS1/FS2 = 2.00.

INTEGUMENTAL COLOR: Color as in female but clypeus entirely yellow except narrow brown apical border and small brown maculae at tentorial pits; distitarsi, basitarsi and tibiae rufescent (but tibiae darker especially basally).

STRUCTURE: Antennae short, barely reaching tegulae, scape longer than segments 1-3; flagellar segment 1 longer than segments 2 plus 3 which are subequal in length and each shorter than succeeding segments. Eye slightly longer than three times breadth, inner margins subparallel. Malar space, mandibles, galeae, maxillary and labial palpi, and labral process as in female but mandible lacks ventrobasal lamella. Clypeus flat, barely, if at all, protruding beyond lower level of eyes, with coarse round punctures but sparse along midline, surface shiny. Supraclypeal area, frons and vertex as in female but vertex less punctate and shinier laterad of ocelli. Genal area almost twice as broad as eye in profile, with small punctures separated by one to two puncture widths, surface shiny, unshagreened. Structure of thorax as in female except as follows: pronotum with humeral angle more distinct and ridge extending down

from angle better developed, surface posterior to ridge with several vertical rugulae; propodeum with enclosure with more distinct transverse rugulae, outside of enclosure with small punctures separated by two or more puncture widths, surface dulled by coarse reticular shagreening. Tergal and sternal sculpturing as in female but punctures of terga even more widely spaced (mostly by one to three puncture widths) and surfaces everywhere shinier. Sternum 6 extremely shallowly and broadly emarginate, flat.

Genital capsule and sterna 7 and 8 similar to those of *accepta* but note the following: dorsal lobes of gonocoxites narrow and more pointed; gonoforceps slightly blunter, penis valves narrower near base; sternum 7 with apical emargination forming a right angle; sternum 8 shallowly emarginate.

VESTITURE: Generally hair color cinereous; distribution and type as in *accepta*.

Type Material. The holotype female (CAS) was collected by B. J. Adelson in San Antonio, Texas (Loop 13), October 25, 1952, on *Baccharis* sp. The allotype male was collected by A. H. Alex in Bexar County, Texas, November 7, 1954, on *Aster* sp. The allotype male belongs to the Texas A. and M. College, College Station, Texas, but is on indefinite loan to the Illinois Natural History Survey.

Andrena (Callandrena) aliciae Robertson

Andrena aliciae Robertson, 1891, Trans. American Ent. Soc., vol. 18, p. 57; Graenicher, 1905, Trans. Acad. Sci. Wisconsin, vol. 15, p. 92; 1911, Bull. Pub. Mus. Milwaukee, vol. 1, p. 236.

Pterandrena aliciae: Robertson, 1902, Trans. American Ent. Soc., vol. 28, p. 194; 1914, Ent. News, vol. 25, p. 70; 1925, Ecology, vol. 6, p. 426; 1926, Ecology, vol. 7, p. 379; 1928, Flowers and Insects, p. 10; Pearson, 1933, Ecol. Monogr., vol. 3, p. 383.

Andrena (Pterandrena) aliciae: Lanham, 1949, Univ. California Pub. Ent., vol. 8, p. 200; Mitchell, 1960, North Carolina Agric. Exp. Sta. Tech. Bull. No. 141, p. 138; Knerer and Atwood, 1964, Proc. Ent. Soc., Ontario, vol. 94, p. 45-46.

This common eastern species is quite distinctive and probably should constitute a group by itself. It is related to the *accepta* group by the yellow clypeus of the female, but the parocular areas of both sexes lack yellow maculae. It seems to be closely related to *A. asteris* Robertson and *A. simplex* Smith, but differs from either of these by the sculpturing, the form of the flagellar segments, the yellow female clypeus, and the sculpturing of the propodeum as described below.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 12.5–14.0 mm; width, 3.5–4.5 mm; wing length, M = 4.51 ± 0.216 mm; FL/FW, M = 0.99 ± 0.056 ; FOVL/FOVW, M = 2.55 ± 0.036 .

INTEGUMENTAL COLOR: Black except as follows: clypeus yellow except narrow brown apical margin and small dark spots below and mesad of tentorial pits; flagellar segments 4–10 rufescent below; tegulae piceous; wing membranes moderately infumate; sterna narrowly hyaline apically; distitarsi rufescent; tibial spurs yellow or yellowish-brown.

STRUCTURE: Scape subequal in length to flagellar segments 1–3; flagellar segment 1 equal to or slightly shorter than segments 2 through 4, segment 2 slightly shorter than 3, and 3 distinctly shorter than 4. Eye about three and three-fourths times as long as broad, inner margins slightly converging towards vertex. Malar space linear, about six times as broad as long. Mandible (outer) in repose extends beyond middle of labrum by one-fourth or less of its own length, with distinct ventrobasal lamella. Subgenal coronet well developed; hypostomal carina without process. Galea densely tessellate, opaque, lateral surface indistinct, surface curves gently from dorsum to side, lateral area equals about half dorsal surface. Maxillary palpus not reaching tip of galea, segments in ratio of about 1.3:1.5:1.0:1.1:0.9:1.1. Labial palpus with first segment curved on inner margin, flattened, broader at apex than at base, segments in ratio of about 2.5:1.5:1.0:1.3. Labral process short, about five times as broad as long, evenly curved apically with shallow, indistinct emargination. Clypeus evenly rounded, protruding below lower ends of eyes by about one-fourth its length, impunctate along narrow midline, elsewhere with irregularly-sized punctures separated by one-half to one or more puncture widths, surface shiny, unshagreened medially, with fine reticular shagreening peripherally. Supraclypeal area with small round punctures separated by one to two puncture widths, surface moderately dulled by longitudinal shagreening. Genal area slightly broader than eye in profile, with minute punctures, near eye margin separated by one to two puncture widths, posteriorly mostly by two to four puncture widths, surface dulled by reticular shagreening. Vertex short, above lateral ocellus equals about one and one-half ocellar diameters, with minute sparse punctures and dense tessellation dulling surface. Face above antennal fossae with coarse, anastomizing, longitudinal rugae, interrugal spaces with small indistinct punctures and reticular shagreening dulling surface. Facial fovea extends just below middle of eye, rounded and broad above, narrow but rounded below and turned slightly from eye margin, shallow.

Pronotum normal, with minute, indistinct, relatively sparse

punctures, surface opaque, finely tessellate. Mesoscutum with shallow round punctures of moderate size separated mostly by one to two puncture widths, surface opaque (slightly shiny mediobasally), tessellate. Scutellum and metanotum similar to mesoscutum. Propodeal enclosure opaque, coarsely tessellate, narrow basal zone with short, irregular rugae sometimes forming shallow, incomplete areola; dorsolateral and posterior areas sculptured like mesoscutum but punctures more crowded; corbicular area with sparse punctures in upper half, surface moderately shiny, with coarse, reticular shagreening. Mesepisternal sculpturing like mesoscutal. Metepisternum below impunctate and reticularly shagreened like corbicular area. Fore wing with three submarginal cells; vein 1st m-cu meets second submarginal cell beyond middle of cell and usually at about two-thirds distance from base of cell; pterostigma narrow, equal in width or slightly broader than from inner margin of prestigma to wing margin. Middle basitarsus slightly broader than hind basitarsus, with evenly curved sides, broadest near middle. Tibial spurs and claws normal.

Metasomal terga 1-4 with basal segments with punctures indistinct due to dense tessellation dulling surfaces, apical areas with punctures more crowded and distinct, tessellation grading into reticular shagreening apically. Terga 5 and 6 with punctures small, distinct, separated by two to four puncture widths, surfaces dulled by reticular shagreening. Pygidial plate V-shaped with truncate apex (occasionally worn and then rounded). Sterna with narrow apical impunctate margin, basal half impunctate or extremely sparsely punctate, apical half except margin with abundant punctures separated by two to three puncture widths, surfaces dulled by coarse reticular shagreening.

VESTITURE: Head white, sparse except labrum and mandibles with long golden or golden-brown hairs. Thoracic vestiture white, dorsum with hairs sparse, of moderate length, tending to be ochraceous posteromedially on mesoscutum and medially on scutellum. Terga 2-4 with basal areas with extremely short, simple suberect, extremely sparse, black hairs; tergum 1 almost glabrous except at sides. Terga 2-4 with white apical pubescent fasciae but these interrupted medially (broadly so on tergum 2). Terga 5 and 6 with long hairs golden-ochraceous to brownish. Sternal hairs white to pale ochraceous, concentrated near apices of sterna. Propodeal corbicular incomplete anteriorly, with long, minutely barbed, internal hairs in upper half. Trochanteral flocculus complete, moderately thick. Tibial scopa ochraceous or yellowish, plumose with median hairs long, plumose in outer third or slightly more. Legs white to ochraceous except inner surfaces tarsi golden-yellow.

A Revision of the Bees of the Genus Andrena

Male. MEASUREMENTS AND RATIOS: N = 20; length, 10.0–13.0 mm; width, 2.5–3.5 mm; wing length, M = 3.94 ± 0.171 mm; FL/FW, M = 1.00 ± 0.056; FS1/FS2, M = 2.32 ± 0.034.

INTEGUMENTAL COLOR: Color essentially identical with female.

STRUCTURE: Antennae barely surpass tegulae in repose; scape distinctly shorter than flagellar segments 1–3; flagellar segment 1 subequal in length to segments 2 plus 3, segment 2 shorter than 3 and 3 subequal to 4. Eye about four times as long as broad, inner margins parallel or slightly converging towards vertex. Malar space, galeae, hypostomal carina, and mandibles as in female but without ventrobasal lamella. Maxillary palpus as in female but ratio about 1.0:1.2:1.0:0.8:0.7:0.9. Labial palpus as in female but ratio about 2.7:1.5:1.0:1.6. Labral process as in female. Clypeus protrudes beyond lower margin of eyes by about one-fourth its length, evenly rounded, with small scattered punctures separated mostly by one to three puncture widths, often impunctate along midline, surface shiny, unshagreened except at extreme lateral angles. Supraclypeal area with abundant small punctures separated by half a puncture width or slightly more, surface moderately shiny, finely shagreened. Genal area, vertex, and face above antennal fossae as in female. Small, vestigial facial fovea or pseudofoveae present near margin of upper end of eyes. Thoracic sculpturing as in female except propodeal enclosure often with basal half with small areola and corbicular area with sparse punctures scattered throughout and surface opaque, tessellate. Wings as in female but second submarginal cell frequently smaller, especially above, and vein 1st m-cu often near middle of cell. Tergal and sternal sculpturing as in female except as follows: tergum 5 like 2–4; terga 6 and 7 like 5 and 6 of female; sterna with punctures sparse in apical half except impunctate margin. Sternum 6 with strong, apical, V-shaped emargination.

Genital capsule and sterna 7 and 8 (Figs. 65–69) similar to those of *accepta* but differ as follows: gonoforceps rather abruptly narrowed near tips; penis valves extremely narrowed apically, narrower near base; dorsal lobes of gonoxites very short; sternum 7 with apicolateral lobes bluntly rounded, long, emargination narrow; sternum 8 with neck region slightly expanded medially, shallowly emarginate.

VESTITURE: Color as in female except terga with minute basal-area hairs pale; distribution as in female except usual secondary sexual differences.

Type Material. The holotype female (INHS) was collected at Carlinville, Illinois, September 20, 1890, on *Bidens chrysanthemoides*, by Charles A. Robertson (Robertson No. 9529). A male in the same collection bears the label "lectoallotype" and the Robert-

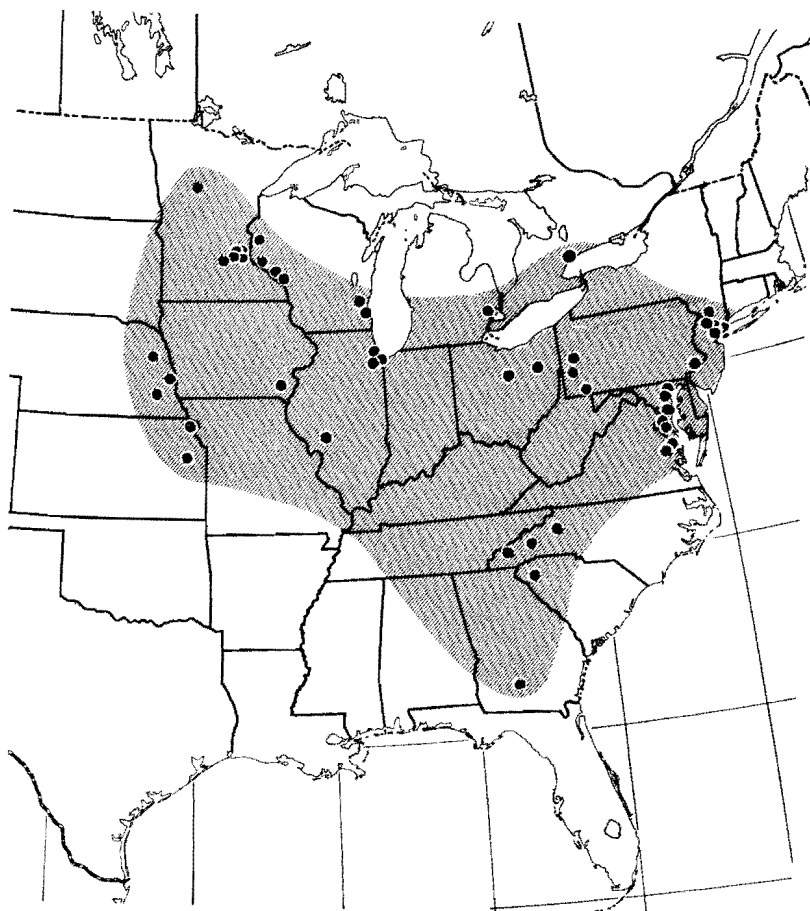


FIG. 5. Map showing the known distribution of *A. (Callandrena) aliciae* Robertson.

son No. 15,265. Since Robertson described *aliciae* from a single female specimen this cannot be an allotype of any kind. Also, this male was collected at Carlinville in 1893, two years after the original description was published.

Distribution. This species is known to occur from Minnesota south to Kansas and east to New York and Georgia (Fig. 5). It has been taken from July 30 through October 2, but chiefly from the end of August through September. In addition to the type the author has examined 164 females and 72 males from localities listed below (published records are also listed):

GEORGIA: Tifton. ILLINOIS: Beverly Hills; Carlinville; Chicago; Palos; Southern Illinois. IOWA: Mt. Pleasant (6 miles S.W.). KANSAS: Doniphan County; Douglas County. MARYLAND:

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Cabin John; Chesspeake Beach; Glen Echo; Plummers Island. MICHIGAN: Pontiac. MINNESOTA: Cass County; Hastings; Lake Independence, Hennepin Co.; Powder Plant Woods, Ramsey Co.; St. Paul; Zumbra Heights, Carver Co. NEBRASKA: Lincoln; Omaha; West Point. NEW JERSEY: Bear Swamp (near Ramsey); Englewood; Greenwood Lakes; Ramsey. NEW YORK: Tuxedo Park. NORTH CAROLINA: Bryson City; Marion; Swannanoa. OHIO: Mansfield; Stark County. PENNSYLVANIA: Cambridge; Alleghany Co.; Dorseyville; Ohio Pyle; Philadelphia. SOUTH CAROLINA: Greenville. VIRGINIA: Bellview; Chain Bridge; Great Falls; Hunter; Offute's Island. WISCONSIN: Farmington, Polk Co.; Fountain City, Buffalo Co.; Milwaukee; Maiden Rock; Pierce Co.; Never's Dam, Polk Co.; Washington Co. Canada. ONTARIO: Toronto.

Floral Records. Of the specimens examined by the author only 53 representing 23 collections had floral data. Of these, 28 specimens (8 collections) were from some species of *Helianthus* and all but one of the remainder were taken on some species of Compositae. The exception was one male taken from the flower of a squash (*Cucurbita* sp.). In view of these data one can state that *A. aliciae* is an oligolege of the Compositae and seems to prefer the genus *Helianthus*. This agrees reasonably well with Robertson's conclusions (Robertson, 1925, 1926). Plants from which *aliciae* has been collected are listed below (this list includes published records).

Aster azurella, *Bidens aristosa*, *B. chrysanthemoides*, *B. laevis*, *B. trichosperma*, *Cucurbita* sp., *Helianthus* sp., *H. augustifolius*, *H. divaricatus*, *H. giganteus*, *H. microcephalus*, *H. strumosus*, *H. tuberosus*, *Heliopsis helianthoides*, *Rudbeckia* sp., *R. fulgida*, *R. laciniata*, *R. lanceolata*, *R. triloba*, *Silphium perfoliatum*, *Solidago* sp., *S. occidentale*.

Andrena (Callandrena) ignota, n. sp.

This species is known from a single female from South Carolina. It is so unusual that a description seems justified at this time. The female of *ignota* is similar to that of *aliciae* in having a yellow clypeus and tessellate thorax and terga. However, *ignota* can be distinguished from all species of *Callandrena* by its coarsely rugose propodeal enclosure and the rugulose nature of the sculpturing of several areas of the head and thorax as described below.

Female. MEASUREMENTS AND RATIOS: N = 1; length, about 12.5 mm; width, about 4.0 mm; wing length, 4.15 mm; FL/FW, 1.01; FOVL/FOVW, 2.67.

INTEGUMENTAL COLOR: Black except as follows: clypeus yellow

except apical margin brownish-black (sinuous posterior border) and small dark triangular maculae below and mesad of tentorial pits; mandibles and flagellar segments 4–10 below slightly rufescent; tegulae piceous; wing membranes slightly infumate, veins reddish-brown; terga extremely narrowly hyaline-testaceous apically, slightly rufescent just basad of hyaline area; sterna rufescent basally, yellow-hyaline apically; distitarsi, fore and hind basitarsi, and tibiae slightly rufescent.

STRUCTURE: Scape about equal in length to flagellar segments 1–3; flagellar segment 1 longer than segments 2 plus 3; segment 2 equal to 3 and shorter than 4. Eye about three times as long as broad, inner margins converging towards mandibles. Malar space linear, six times as broad as long. Mandible in repose extends one-third its length or less beyond middle of labrum, bidentate, with ventrobasal lamella poorly developed. Subgenal coronet present; hypostomal carina without apical process. Galeae reticularly shagreened, shiny in basal half, shape as in *aliciae*. Maxillary palpus not extending to tip of galea, segments in ratio of about 1.8:1.5:1.2:1.0:1.0:1.0. Labial palpus as in *aliciae* but first segment slightly curved on outer margin and less flattened, segments in ratio of about 2.8:1.4:1.0:1.0. Clypeus protruding beyond ends of eyes by about one-third its length, somewhat flattened medially, with round punctures separated by one-half to two puncture widths or more in median half, smaller and more crowded laterally and near apex, surface shiny, unshagreened medially, reticularly shagreened peripherally. Supraclypeal area moderately dull, extremely finely punctatorugulose. Genal area slightly broader than eye in profile, with minute round punctures, in band near eye punctures separated by two to three puncture widths and interconnected by irregular fine rugulae, posteriorly punctures separated by three or more puncture widths and interconnected by longitudinal rugulae occasionally interrupted; surface tessellate. Vertex above lateral ocellus equals about one and one-half ocellar diameters, above ocelli finely punctatorugulose, laterally tessellate with minute, sparse punctures. Face above antennal fossae punctatorugulose, moderately shiny. Facial fovea extends down slightly beyond middle of eye (to about middle of antennal fossa), broad and rather flattened above, separated from lateral ocellus by about three-fourths an ocellar diameter, narrowed and rounded below near eye margin, shallow.

Pronotum normal, with scattered, indistinct, minute punctures, surface tessellate, along posterior margin above punctatorugulose. Mesoscutum with small shallow punctures separated by one to three puncture widths, surface moderately shiny, dulled by coarse tessellation and fine, irregular rugulae, especially peripherally. Scutellum

similar but more coarsely rugulose. Metanotum irregularly rugose (almost areolate), coarsely tessellate. Propodeum with enclosure with coarse sharp rugae forming several areola, dorsally; dorsolateral and posterior surfaces dull, punctatorugulose; corbicular area moderately shiny, with scattered punctures in upper half, surface coarsely tessellate. Mesepisternum coarsely punctatorugulose. Metepisternum below tessellate. Fore wings as in *aliciae* but pterostigma slightly narrower than prestigma to wing margin and vein 1st m-cu meets second submarginal cell near middle. Middle basitarsus extremely slightly broader than hind, posterior margin almost straight, anterior margin curved. Tibial spurs and claws normal.

Metasomal terga 1-4 uniformly coarsely tessellate, with minute, sparse, scarcely visible punctures. Terga 5 and 6 with punctures coarser, tessellate. Pygidial plate V-shaped with truncate apex. Sterna 2-5 with apical hyaline area impunctate, weakly shagreened, basal areas reticularly shagreened basally becoming tessellate apically, basal areas with scattered punctures becoming more densely punctate apically.

VESTITURE: Head white, sparse. Thoracic vestiture white, hairs short, sparse, highly plumose so as to appear opaque-white, on dorsum very sparse or largely absent. Tergum 1-4 with basal areas glabrous or almost so, with apical white pubescent fasciae which on tergum 1 reduced to lateral fasciae about one-fourth width of tergum, on tergum 2 interrupted medially by about one-third width of tergum, on tergum 3 narrowly interrupted medially. Terga 5 and 6 with long brown hairs. Sterna 2-5 with hairs white, short basally, long and forming apical erect fringes near hyaline apices. Propodeal corbicula incomplete anteriorly, upper half with long, weakly plumose hairs. Trochanteral flocculus complete, sparse. Tibial scopal hairs short, shorter than width of tibia along posterior margin, highly plumose, brown. Leg hairs white except scopae brown, outer surfaces tarsi brown to ochraceous, and inner surfaces tarsi yellow to golden-brown.

Type Material. The holotype female (AMNH) is from Florence, South Carolina, October 12, 1916.

Andrena (Callandrena) melliventris Cresson

Andrena melliventris Cresson, 1872, Trans. American Ent. Soc., vol. 4, p. 257.

Andrena (Pterandrena) melliventris: Lanham, 1949, Univ. California Pub. Ent., vol. 8, p. 200.

A. melliventris is a large species of the southern plains area. It is not closely related to any of the foregoing species but belongs

in the same group as *aliciae* as is evidenced by the yellow female clypeus, the yellow male parocular areas, the short facial foveae (although longer than in *aliciae*), the smooth propodeal enclosure and the short vertex. It differs from *aliciae* by the more or less reddened terga in both sexes and by the coarser punctation throughout. In addition, *melliventris* females usually have dark scopal hairs and have the middle basitarsus markedly expanded medially.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 12.0–15.0 mm; width, 4.0–5.5 mm; wing length, M = 4.48 ± 0.167 mm; FL/FW, M = 1.04 ± 0.016 ; FOVL/FOVW, M = 2.55 ± 0.045 .

INTEGUMENTAL COLOR: Black except as follows: clypeus yellow except testaceous to brown apical margin (with sinuous or broadly scalloped posterior margin), and small triangular dark maculae below and mesad of tentorial pits; parocular areas often with small yellowish maculae near mandibles; supraclypeal area usually rufescent; mandible red basally; flagellum red-brown below; tegulae testaceous, hyaline; wing membranes hyaline, veins red to red-brown; terga entirely red except hyaline, yellowish apical margin, or slightly reddened just basad of apical margins (usually tergum 1 more extensively reddened), or intermediate between these extremes, terga 5 and 6 generally less reddened than terga 1–4; sterna entirely orange-red with narrow hyaline apical margins, or reddened basally and near hyaline margins, or intermediate in color, basal sterna generally more reddened than apical; legs generally only slightly rufescent in palest specimens, especially femora and trochanters reddened.

STRUCTURE: Scape slightly longer than flagellar segments 1–3; flagellar segment 1 slightly longer than segments 2 plus 3 which are subequal in length and shorter than segment 4. Eyes slightly more than three and one-half times as long as broad, inner margins parallel or converging extremely slightly toward mandibles. Malar space linear, more than six times as broad as long. Mandible (outer) in repose extends about $\frac{1}{3}$ its length beyond middle of labrum, bidentate, ventrobasal lamella moderately well developed. Subgenal coronet present; hypostomal carina without process at apical angle. Galea tessellate, opaque, curved evenly down at sides, lateral surface about equal to dorsal in width. Maxillary palpus short, not extending to tip of galea, segments in ratio of about 1.2:1.1:1.0:1.0:0.7:1.0. Labial palpus as in *aliciae* but segmental ratio about 3.3:1.6:1.0:1.3. Labral process twice as broad as long or slightly broader, bidentate. Clypeus evenly rounded, not flattened medially and not much bowed out, protruding beyond ends of eyes by almost half its own length, with moderate-sized, regular, round punctures separated by less than one puncture width and mostly by about half

a puncture width, narrow median longitudinal impunctate area usually present, surface moderately dulled by reticular shagreening. Supraclypeal area dulled by minute, crowded punctures and reticular shagreening. Genal area distinctly broader than eye in profile (about as 7:5), with minute punctures which near eye separated mostly by one puncture width, posteriorly by two puncture widths, surface moderately shiny, reticularly shagreened. Vertex short, above lateral ocellus equals no more than one and one-half ocellar diameters, with abundant small punctures above ocelli becoming sparse laterally, surface dulled by dense tessellation. Face above antennal fossae with longitudinal rugulae, interrugal spaces with crowded punctures. Facial fovea more than half length of eye, extends down to level of lower margin of antennal fossa or almost so, broad and rounded above with less than half an ocellar diameter between fovea and lateral ocellus, narrow but well-rounded below, shallow.

Pronotum normal, above with moderate-sized to minute punctures separated mostly by one to two puncture widths, becoming sparse on lower lateral surface, surfaces moderately dulled by reticular shagreening. Mesoscutum, scutellum and metanotum with crowded, moderate-sized, deep, round, punctures separated mostly by less than half a puncture width, surfaces irregularly shagreened. Propodeum with enclosure smooth, regularly and coarsely tessellate, lateral margins slightly concave; dorsolateral and posterior surfaces with regular, round, shallow punctures separated mostly by one to two puncture widths, surfaces tessellate; corbicular surface with widely scattered small punctures and regular reticular shagreening scarcely dulling surface. Mesepisternum with small, shallow, indistinct punctures separated by one to two puncture widths, surface tessellate. Metepisternum below similar to corbicular area but impunctate. Fore wing with three submarginal cells; vein 1st m-cu meets second submarginal cell at or before middle of cell; pterostigma narrow as in *accepta*, portion basad of vein Rs longer than prestigma. Middle basitarsus broad, expanded at middle or just above middle of anterior margin, broader than hind basitarsus which is also broader than usual. Tibial spurs and claws normal.

Metasomal terga 1-4 with broad apical areas with small punctures separated mostly by half a puncture width, basal areas with smaller punctures separated by about two puncture widths (more widely separated on tergum 1 and less so on tergum 4), surfaces dulled by fine dense tessellation. Terga 5 and 6 more densely punctate. Pygidial plate V-shaped with truncate apex and sides straight or slightly concave. Sterna with narrow apical impunctate areas, crowded punctures near apical areas, and becoming sparse basally

(especially sparse on basal sternum), surfaces moderately dulled by fine reticular shagreening.

VESTITURE: Head ochraceous, average length. Thorax ochraceous, dorsum with hairs extremely short, densely plumose, erect, having a matlike appearance hiding surface. Propodeal corbicula incomplete anteriorly, with sparse, long, simple, internal hairs. Terga 1-4 with weak but usually complete pale apical fasciae (often interrupted on terga 1 and 2), basally with short, erect, barbed hairs, hairs pale ochraceous. Terga 5 and 6 with long golden-ochraceous hairs. Sterna with abundant, long, suberect, white to pale ochraceous hairs near apical impunctate areas, hairs becoming short and sparse basad. Propodeal corbicula incomplete anteriorly, complete above, with several long, simple internal hairs especially in upper two-thirds. Trochanteral flocculus complete, dense. Tibial scopal hairs relatively short, plumose. Leg hairs white to pale ochraceous except as follows: tibial scopa dark ochraceous to pale brown, basitarsi brown to dark brown, middle tibiae with outer surface reddish-brown to dark ochraceous.

Male. MEASUREMENTS AND RATIOS: N = 20; length, 11.0-14.5 mm; width, 3.0-4.5 mm; wing length, $M = 4.45 \pm 0.160$ mm; FL/FW, $M = 1.11 \pm 0.006$; FS1/FS2, $M = 2.50 \pm 0.032$.

INTEGUMENTAL COLOR: As in female with as much variation but with following differences: parocular areas yellow to level of lower margins of antennal fossae or almost; supraclypeal area yellow; flagellar segments 3-11 red beneath; posterior pronotal lobes often rufescent; terga 1-6 like terga 1-4 of female but basal areas of 5 and 6 usually dark; distitarsi rufescent.

STRUCTURE: Antennae not exceeding tegulae in repose; scape slightly longer than flagellar segments 1-3; flagellar segment 1 slightly longer than segments 2 plus 3 which are subequal in length and each shorter than segment 4. Eyes about three times as long as broad, converging slightly toward mandibles. Malar space, galeae, mandibles, and labral process as in female. Maxillary palpus as in female but segments in ratio of about 1.6:1.5:1.1:1.0:0.6:1.0. Labial palpus as in female but segments in ratio of about 2.8:1.0:0.6:0.9. Clypeus as in female but punctures coarser, more crowded laterally and median impunctate area narrower or more frequently absent. Supraclypeal area as in female. Genal area sculptured as in female but broader, in profile almost one and one-half times as broad as eye (about as 8:5). Vertex and face as in female but facial rugulae finer and punctures more distinct. Pronotum as in female. Mesoscutum, scutellum, and metanotum as in female but punctures slightly larger and spaced slightly farther. Propodeal enclosure, dorsolateral and posterior surfaces of propodeum as in female; lateral surfaces

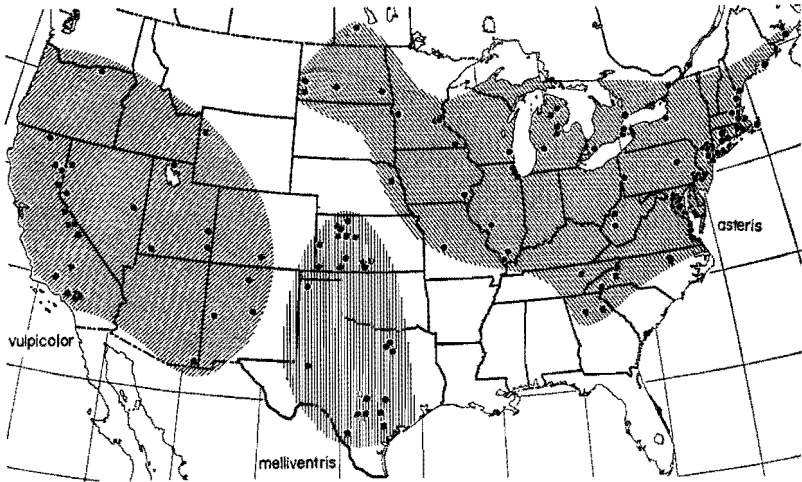


FIG. 6. Map showing the known distributions of *A. (Callandrena) asteris* Robertson, *A. (Callandrena) melliventris* Cockerell and *A. (Callandrena) vulpicolor* Cockerell.

with sparse, minute punctures, surface dulled by coarse reticular shagreening. Episternal surfaces as in female. Wings as in female. Metasomal terga sculptured as in female but tergum 5 similar to 4 and terga 6 and 7 as in terga 5 and 6 of female. Sterna 2-5 as in female but punctures slightly more abundant near apices. Sternum 6 with broad, shallow, apical emargination and margin moderately to slightly reflexed in median third.

Genital capsule and sterna 7 and 8 as figured (Figs. 70-73). Note the following structures: blunt gonoforceps; long dorsal lobes of gonocoxites; relatively small opening in gonobase.

VESTITURE: In general as in female but paler and with following differences: dorsum of thorax with hairs moderately short, plumose, erect, but not having matlike appearance nor obscuring surface; tergum 1 with apical pubescent fascia weak, often not evident except at extreme sides; terga 6 and 7 with long hairs pale ochraceous; sterna 2-5 with thick, short, subapical bands of suberect hairs; leg hairs entirely white to pale ochraceous except inner surfaces basitarsi brownish and inner surfaces distitarsi golden-yellow.

Geographical Variation. The specimens from Texas average darker in color than those from Kansas. This variation is presumably in a north-south cline but too few specimens are available to adequately describe the cline in detail.

Type Material. The holotype female of *melliventris* is from Texas, Belfrage collector (USNM No. 1755).

Distribution. *A. melliventris* is known only from Kansas and

Texas (Fig. 6) with the exception of a single male which is dubiously labeled as from southern Arizona. It has been taken from June 12th through July 19th in Kansas and April 11th through June 6th in Texas. A total of 44 females and 82 males have been examined from the localities listed below (not including the dubious Arizona record).

KANSAS: Clark Co.; Dodge City; Ellis Co.; Gove Co.; Hamilton Co.; Isabel (8 miles N.E.); Kingman; Larned; Medicine Lodge; Morton Co.; Quinter, Sheridan Co. (5 miles N.); Sheridan Co.; Trego Co. TEXAS: Bexar Co.; Catarina; Sherry Springs; Cyprus Mills, Blanco Co.; Dalhart; Dallas; Denton; Lytle, Atascosa Co.; McDade; Midland; Palmetto State Park, Gonzales Co.; Roanoke, Denton Co.; Sabinal; Weser, Goliad Co.

Floral Records. *A. melliventris* has been collected most often from species of *Gaillardia* (11 out of 14 collections with data). However, two few reliable flower records exist to be able to draw reliable conclusions regarding the flower preferences of this species. *A. melliventris* has been collected from the following flowers:

Aster tenacetifolium, *Coreopsis cardaminefolia*, *Gaillardia* sp., *G. pulchella*, *Monarda punctata*.

Andrena (Callandrena) rudbeckiae Robertson

Andrena rudbeckiae Robertson, 1891, Tr. American Ent. Soc., vol. 18, p. 56; Cockerell, 1899, Ent. News, vol. 10, p. 255; Graenicher, 1911, Bul. Pub. Mus. Milwaukee, vol. 1, pp. 226, 236.

Pterandrena rudbeckiae: Robertson, 1902, Tr. American Ent. Soc., vol. 28, p. 194; 1914, Ent. News, vol. 25, p. 70; 1925, Ecology, vol. 6, p. 426; 1926, Ecology, vol. 7, p. 379; 1929, Flowers and Insects, p. 10; Pearson, 1933, Ecol. Monogr., vol. 3, p. 384.

Andrena (Pterandrena) rudbeckiae: Lanham, 1949, Univ. California Pub. Ent., vol. 8, p. 200; Mitchell, 1960, North Carolina St. Agric. Exp. Sta. Tech. Bull. No. 141, pp. 149-151.

This is a large, relatively poorly known species occurring throughout much of eastern United States. It is related closely to *A. melliventris*. Both sexes of *rudbeckiae* differ from *melliventris* by lacking the tendency toward red integument, the wing membranes being moderately infumate, the vestiture being largely white, and the face above the antennal fossae being punctate, not rugulose. The females lack yellow on the clypeus or this is reduced to a small subapical, ill-formed macula.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 13.0-15.0 mm; width, 4.0-5.5 mm; wing length, M = 4.85 ± 0.231 mm; FL/FW, M = 1.04 ± 0.003 ; FOVL/FOVW, M = 2.68 ± 0.059 .

INTEGUMENTAL COLOR: Black except as follows: clypeus often with small subapical median yellow macula of variable size but never more than one-tenth area of clypeus; flagellar segments 4-10 reddish beneath; tegula occasionally rufescent; wing membranes moderately infumate, brown; veins dark brown to reddish-brown; terga with apical areas hyaline, yellowish towards apices and rufescent basad; sterna broadly hyaline apically, rufescent basally in part; distitarsi dark rufescent; tibial spurs yellow.

STRUCTURE: Scape distinctly longer than flagellar segments 1-3; flagellar segments as in *melliventris*. Eyes about three times as long as broad, inner margins converging slightly towards mandibles. Malar space, mandibles and subgenal coronet as in *melliventris*. Galea strongly curved down at sides, dorsal surface with outer two-fifths thickened, sclerotized, strongly punctate, weakly shagreened, moderately shiny, inner three-fifths almost membranous, hyaline but brownish, dulled by fine tessellation. Maxillary palpus short, not exceeding tip of galea, segments in ratio of about 1.5:1.6:1.2:1.0:0.8:1.0. Labral palpus short, flattened, first segment slightly curved, not much broader apically than basally, segments in ratio of about 4.0:1.0:0.6:0.8. Labral process as in *melliventris*. Clypeus evenly rounded, protruding beyond lower ends of eyes by no more than one-third its median length or less, with moderate-sized, round punctures separated by one-half to one puncture width except sparser along narrow midline, surface moderately dulled by regular reticular shagreening. Supraclypeal area as in *melliventris*. Genal area equals width of eye in profile or slightly less, sculptured as in *melliventris*. Vertex as in *melliventris*. Face above antennal fossae dulled by crowded punctures and tessellation, without longitudinal rugulae. Facial fovea as in *melliventris* but separated from lateral ocellus by almost one ocellar diameter.

Pronotum normal, with small punctures above separated by puncture width or less and scattered or absent laterally, surface reticularly shagreened above, tessellate laterally. Mesoscutum, scutellum, and metanotum with crowded, moderate-sized, shallow punctures separated by mere ridges, surface opaque, shagreened. Propodeum as in *melliventris* but enclosure with basal third or so roughened by weak, irregular, anastomizing rugulae masked by the coarse tessellation. Mesepisternum and metepisternum as in *melliventris*. Wing venation as in *melliventris*. Middle basitarsus expanded as in *melliventris*. Tibial spurs and claws normal.

Metasomal tergum 1-4 with apical area punctures of same size as basal area punctures, separated mostly by one-half to one punctures width, becoming sparser in basal halves of terga, surfaces opaque, finely tessellate. Pygidial plate as in *melliventris*. Sterna 2-5

with narrow apical area impunctate, apical halves of basal areas with coarse punctures separated mostly by two to four puncture widths, largely impunctate in basal halves, surfaces moderately dulled by coarse reticular shagreening.

VESTITURE: Head white, on vertex often ochraceous to pale ochraceous. Thorax white below to pale ochraceous or white above, dorsum of thorax with hairs short, erect, plumose, but not matlike nor obscuring surfaces appreciably. Terga 1-4 with long, weak, plumose, apical hairs forming weak fasciae often more or less interrupted medially, basally with abundant, long, erect, barbed hairs. Terga 5-6 with long hairs yellowish medially to white laterally. Sterna 2-5 with long, erect to suberect, white to ochraceous, sparse hairs, with a simple row of longer hairs along base of hyaline apical area. Propodeal corbicula as in *melliventris*. Trochanteral flocculus complete, sparse. Tibial scopal hairs of moderate length, highly plumose throughout. Leg hairs white except inner surfaces tarsi yellow and middle and hind tibiae with outer surfaces ochraceous at least in part.

Male. MEASUREMENTS AND RATIOS: N = 16; length, 11.0-13.0 mm; width, 3.5-4.5 mm; wing length, M = 4.48 ± 0.058 mm; FL/FW, M = 1.08 ± 0.009 ; FS1/FS2, M = 2.44 ± 0.052 .

INTEGUMENTAL COLOR: Black except as follows: clypeus yellow except apical margin and triangular maculae below and mesad of tentorial pits brown to reddish-brown; parocular areas yellow to level of tentorial pits, occasionally yellow area smaller, rarely larger; flagellum slightly rufescent below, especially segments 4-11; tegulae testaceous, reddish-brown, or piceous; wing membranes moderately infumate, brown, veins dark brown to reddish-brown; terga 1-5 as in female but terga 1 and 2 occasionally slightly rufescent basally; sterna as in female; legs as in female.

STRUCTURE: Antennae as in *melliventris*. Eyes distinctly less than three times as long as broad, converging towards mandibles. Malar space, galea, mandible and labral process as in female. Maxillary palpus as in female but segments in ratio of about 1.1:1.4:1.0:0.9:0.6:0.9. Labial palpus as in female but ratio of about 2.6:1.0:0.4:0.9. Clypeus as in female but punctures slightly coarser and median longitudinal line of sparse punctures less evident. Supraclypeal area as in female. Genal area slightly broader than eye in profile, sculptured as in female but shinier. Vertex and face above antennal fossae as in female but vertex with punctures more abundant laterally. Pronotum as in female. Dorsum of thorax as in female but scutellum and posteromedian area of mesoscutum with punctures more discrete, separated by about one-half a puncture width, surfaces moderately shiny, shagreening fine. Propodeum as in female but

lateral surface with more abundant punctures and dulled by regular, coarse tessellation. Episternal surfaces as in female but mesepisternum with punctures slightly more abundant. Wings as in female. Metasomal terga as in female but terga 5 and 6 similar to 4 but with punctures more abundant and punctures everywhere coarser, although not spaced closer. Sterna 2-5 as in female but punctures more crowded near apical areas. Sternum 6 with broad, shallow, almost V-shaped, apical emargination and apex moderately reflexed especially laterally.

Genital capsule and sterna 7 and 8 similar to those of *melliventris*; note the shorter neck region of sternum 7.

VESTITURE: Generally white. Tergal banding as in female but weaker. Sterna 2-5 with apical bands of erect hairs more evident than in female and hairs generally ochraceous. Legs white except tarsi and tibiae ochraceous, inner surfaces distitarsi yellow.

Type Material. Lectotype male and lectoallotype female, here designated, plus ten paratype females, were taken by Charles Robertson, June 12 and 23, 1886, Carlinville, Illinois, on flowers of *Rudbeckia hirta* (INHS). The lectotype male was taken *in copula* with the lecto-allotype female.

Geographical Variation. Specimens of *A. rudbeckiae* from Texas, both male and female, differ from those from other regions by having the wings somewhat less infumate. The female Texas specimens average slightly smaller in size and have the vestiture generally paler, although one female from Bexar County, Texas, is as large or larger than average and has more ochraceous vestiture than usual. We do not believe that these differences justify recognizing a subspecies at this time, especially in view of the paucity of material.

Distribution. This species is known from Minnesota south to Texas and from Colorado east to North Carolina (Fig. 7). It has been taken from May 5th through August 13th, but chiefly in June and early July. A total of 88 females and 33 males have been examined in addition to the type material. Localities are listed below for specimens examined and from published records.

COLORADO: Holyoke. **ILLINOIS:** Carlinville; Galena Junction; McHenry; Urbana. **IOWA:** Ames (4 miles S.); Bremer Co.; Dickinson Co.; Floyd Co.; Lyon Co. **KANSAS:** Baldwin; Baxter Springs (5 miles S.); Bourbon; Cherokee Co.; Coffeyville; Ellis Co.; Lawrence; Oswego; Parsons; Thomas Co. **MICHIGAN:** Gull Lake Biological Station, Kalamazoo Co. **MINNESOTA:** Wabasha (5 miles W.). **MISSOURI:** Colombia; Kirkwood; Smithton; Pettis Co.; Wheatland. **NEBRASKA:** Imperial (9 miles S.); Pine Ridge; Roscoe (4 miles E.). **NORTH CAROLINA:** Marion; Raleigh. **OKLAHOMA:** Blue; Hugo; Nowata (5 miles S.E.); Pawhuska, Pawnee Co.

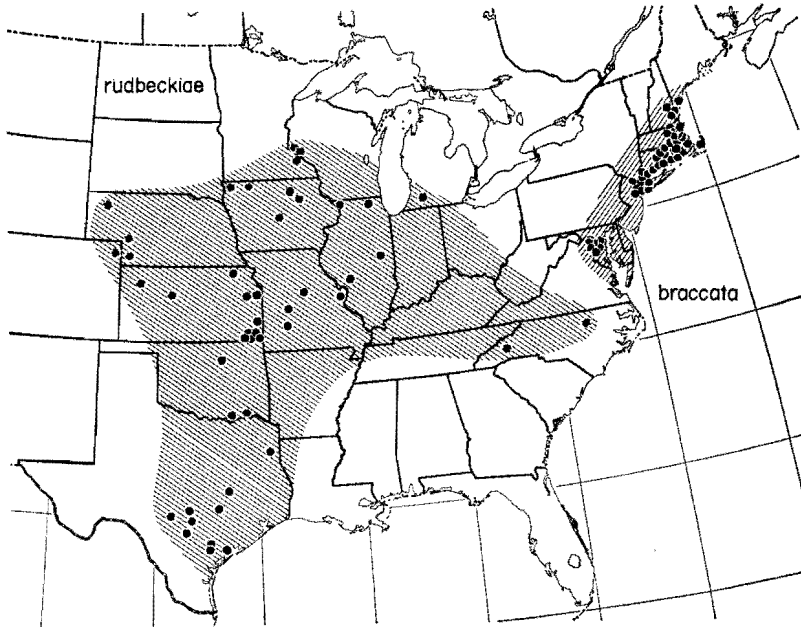


Fig. 7. Map showing the known distributions of *A. (Callandrena) braccata* Viereck and *A. (Callandrena) rudbeckiae* Robertson.

TEXAS: Brazos Co.; Camp Bullis, Bexar Co.; Cypress Mills, Blanco Co.; Fedor, Lee Co.; Goliad (10 miles E.); Kerr Co.; New Braunfels; Victoria; Waskom; Weser. WISCONSIN: Maiden Rock, Pierce Co.; Prescott, Pierce Co.

Flower Records. *A. rudbeckiae* is an oligolege of the Compositae and seems to prefer the genera *Ratibida* and *Rudbeckia* as sources of pollen. More than half of the collections (11 out of 15 with floral data) available to the author were made from these two genera of plants. Robertson (1925, 1926) regarded this species as an oligolege of the genus *Rudbeckia*, as the specific name suggests. This species has been collected from flowers of the plants listed below (including published records).

Centaurea americana, *Chrysopsis* sp., *Echinacea augustifolia*, *Gaillardia pulchella*, *Ratibida* sp., *R. columnaris*, *R. columnifera*, *R. pinnata*, *Rudbeckia* sp., *R. hirta*, *R. lanceolata*, *R. triloba*, *Verbesina helianthioides*.

Andrena (Callandrena) helianthi Robertson

Anarena helianthi Robertson, 1891, Trans. American Ent. Soc., vol. 18, p. 55; Cockerell, 1900, Ann. Mag. Nat. Hist., ser. 7, vol. 5, p. 405; Graenicher, 1905, Trans. Wisconsin Acad. Sci., vol. 15,

- pp. 92, 94; 1911, Bull. Pub. Mus. Milwaukee, vol. 1, pp. 222; Leonard, 1928, Cornell Univ. Agr. Exp. Sta., Mem. 101, p. 1023; Cockerell, 1931, American Mus. Nov. No. 458, p. 11; Stevens, 1949, Bimo. Bull. North Dakota Agr. Exp. Sta., vol. 12, p. 21.
- Pterandrena helianthi*: Robertson, 1902, Trans. American Ent. Soc., vol. 28, p. 194; 1914, Ent. News, vol. 25, p. 70; 1925, Ecology, vol. 6, p. 426; 1926, Ecology, vol. 7, p. 379; 1929, Flowers and Insects, p. 10; Pearson, 1933, Ecol. Monogr., vol. 3, p. 383.
- Andrena (Pterandrena) helianthi*: Lanham, 1949, Univ. California Pub. Ent., vol. 8, p. 200; Bohart, Knowlton, Bailey, 1950, Utah St. Coll., Mimeo. Ser. No. 371, p. 3; Mitchell, 1960, North Carolina Agr. Exp. Sta. Tech. Bull. No. 141, pp. 147-148.
- Andrena nitidior* Cockerell, 1900, Ann. Mag. Nat. Hist., ser. 7, vol. 5, p. 406 (*new synonymy*).
- Andrena graenicheri* Cockerell, 1902, Ann. Mag. Nat. Hist., ser. 7, vol. 9, p. 104 (*new synonymy*); Graenicher, 1905, Trans. Wisconsin Acad. Sci., vol. 15, p. 92.
- Andrena lincolnella* Viereck and Cockerell, 1914, Proc. United States Nat. Mus., vol. 48, p. 46 (*new synonymy*).

This is a large common bee of the Northcentral, Midwestern and Rocky Mountain States. *A. helianthi* is not closely related to any of the foregoing species of *Andrena*. It is being described here as a typical species of the *helianthi*-group. The females are distinctive in having a very shiny, black, somewhat flattened and protruding clypeus. The males have a shiny yellow clypeus and black parocular areas. In both sexes the vertex is short and the labial palpus is shorter than in the preceding species and has the first or basal segment flattened and strongly curved. The females of *helianthi* have the propodeal corbicula incomplete anteriorly, with abundant long internal hairs, the middle basitarsus not markedly expanded medially, the propodeal enclosure tessellate, and the terga weakly banded. The males are marked by the red to yellow tarsi (usually the tibia is also in part light-colored), the terga with hyaline apices and weak hair bands, and the sixth sternum not reflexed at the apex.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 12.0-15.0 mm; width, 3.5-5.0 mm; wing length, $M = 4.75 \pm 0.187$ mm; FL/FW, $M = 1.01 \pm 0.004$; FOVL/FOVW, $M = 2.76 \pm 0.041$.

INTEGUMENTAL COLOR: Black except as follows: flagellar segments 3-10 rufescent below; tegulae hyaline, yellowish; wing membranes hyaline, colorless, veins reddish-brown; terga very narrowly hyaline apically, often somewhat rufescent just basad of hyaline apex; pygidial plate rufescent; sterna 2-5 hyaline apically, largely

rufescent with blotches of brown basally; tarsi red to yellow; hind tibiae usually rufescent in part; tibial spurs pale yellow.

STRUCTURE: Scape subequal in length to flagellar segments 1-3 or slightly shorter; flagellar segment 1 longer than segments 2 plus 3, shorter than 2 through 4, segment 2 subequal in length to 3 or 4. Eye almost four times as long as broad, inner margins parallel or extremely slightly converging towards vertex. Malar space linear, more than six times as broad as long. Mandibles short, outer mandible in repose extends less than one-fourth its own length beyond middle of labrum, bidentate; ventrobasal lamella present but poorly developed. Galea dulled by fine regular tessellation, lateral surface equal in width to about one-third width of dorsal surface, curved evenly from dorsum to side. Maxillary palpus short, not reaching tip of galea when both stretched forward, segments in ratio of about 1.1:1.1:1.1:1.1:1.0:1.4, segments 3-5 subtriangular. Labial palpus with first segment flattened, strongly curved on both outer and inner margins, broadest near apex, segments in ratio of about 1.6:1.0:0.7:0.9. Labral process short, about four times as broad as long, simple or with vague, shallow, median emargination. Clypeus flattened medially, protruding beyond lower ends of eyes by half its median length or slightly more; punctures round, of rather irregular size, deep, laterally separated mostly by half a puncture width, medially by one-half to one or two punctures widths, surface shiny, unshagreened except peripherally. Supra-clypeal area with minute punctures separated by one puncture width or less and coarse longitudinal shagreening dulling surface. Genal area distinctly broader than eye in profile but equals less than one and one-half eye widths, with minute punctures separated mostly by one to two puncture widths, impunctate in narrow zone next to eye, surface smooth and unshagreened next to eye, dulled posteriorly by coarse reticular shagreening. Vertex short, above lateral ocellus equals one ocellar diameter or slightly more, with crowded punctures above ocelli and scattered, sparse punctures laterally, surface dulled by fine tessellation, above facial fovea with 4 or 5 irregular rugulae following contour of fovea. Face above antennal fossae with longitudinal rugulae, interrugal spaces with minute punctures, surface dulled by sparse shagreening. Facial fovea shallow, extends to just below lower margin of antennal fossa, rarely to about middle of fossa, upper end broad, separated from lateral ocellus by half an ocellar diameter, lower end rounded but narrower and so shallow as to be indistinct.

Pronotum normal, with minute, indistinct punctures above, becoming coarser and well-separated at sides, surface dulled by fine reticular shagreening above and coarser reticular shagreening on

sides. Mesoscutum, scutellum, and metanotum with fine, round, shallow, indistinct punctures separated mostly by one-half to one puncture width, slightly more distinct peripherally on mesoscutum and scutellum, surfaces dulled by fine regular tessellation. Tegulae normal, impunctate. Propodeum with enclosure with sides straight or slightly concave, surface regularly tessellate, often with extremely short, indistinct, irregular rugulae at extreme base; dorsolateral and posterior surfaces with small punctures separated by one to two puncture widths, surfaces dulled by coarse tessellation; corbicular area with small scattered punctures in upper half or more, surface moderately shiny, with coarse reticular shagreening. Mesepisternum sculptured like mesoscutum but punctures more evident. Metepisternum with lower part sculptured like corbicular area but without punctures. Middle basitarsus not expanded medially, with evenly rounded sides, about as broad as hind basitarsus or slightly narrower. Tibial spurs and claws normal. Front wing with three submarginal cells; vein 1st m-cu meets second submarginal cell before or near middle of cell; pterostigma narrower than from inner margin of prestigma to wing margin, basal portion considerably longer than prestigma and about twice as long as apical portion.

Metasomal terga 1-4 except in apical areas usually appear virtually impunctate except under high magnification. Metasomal tergum 1 with minute punctures not much larger than minute tesserae dulling surface, punctures separated mostly by 4 or more puncture widths. Terga 2-4 similar but punctures become progressively more abundant on succeeding terga and apical areas of each with minute punctures separated mostly by one puncture width or slightly more, surfaces dulled by fine tessellation. Tergum 5 coarsely punctate, punctures well separated, dulled by fine shagreening. Pygidial plate narrow, V-shaped with small truncate apex. Sterna 3-5 with apical areas impunctate, basal areas with punctures crowded near apical area and sparser basad, surfaces moderately dulled by regular shagreening.

VESTITURE: Generally yellowish or dark ochraceous, often vertex of head and thoracic dorsum somewhat reddened, almost fox-red. Tergum 1 lacks apical pale fascia, terga 2-5 with apical pale fasciae but always interrupted medially on tergum 2 and occasionally on 3. Fasciae and long hairs of terga 5 and 6 pale ochraceous. Sternal hairs forming bands of long hairs near apices, pale ochraceous. Propodeal corbicula incomplete anteriorly, with abundant, long, simple, internal hairs. Trochanteral flocculus complete. Tibial scopal hairs plumose throughout, of normal length. Leg hairs pale ochraceous except inner surfaces tarsi more golden yellow or slightly reddened.

Male. MEASUREMENTS AND RATIOS: N = 20; length, 10.0–12.5 mm; width, 2.5–4.5 mm; wing length, $M = 4.23 \pm 0.221$ mm; FL/FW, $M = 1.04 \pm 0.004$; FS1/FS2, $M = 2.11 \pm 0.039$.

INTEGUMENTAL COLOR: As in female except as follows: clypeus yellow except testaceous to brown apical margin, small dark spots mesad and below tentorial pits, and lateral angles brown; flagellar segments 3–11 rufescent below; terga 1–6 rather broadly hyaline apically and rufescent just basad of hyaline areas, hyaline apices yellowish; legs with tarsi orange to yellow and at least apices of middle and hind tibia red, occasionally hind tibia mostly red.

STRUCTURE: Antennae extend to posterior margins of tegulae in repose; scape slightly shorter than flagellar segments 1–3; flagellar segment 1 subequal in length to segments 2 plus 3, segment 2 slightly shorter than 3 and 3 slightly shorter than 4. Eye about three and one-half times as long as broad or slightly longer, inner margins parallel. Malar space, mandibles, and galea as in female. Maxillary palpus as in female, but segmental ratio about 1.3:1.2:1.0:0.9:0.8:1.1. Labial palpus as in female but ratio about 2.7:1.5:1.0:1.5. Labral process as in female. Clypeus and supraclypeal area as in female but clypeus less flattened medially and punctures slight coarser and usually sparser medially. Genal area, vertex, and face above antennal fossae as in female but face with fine longitudinal rugulae reaching vertex between lateral ocelli and compound eyes. Sculpturing of thorax as in female except as follows: propodeum with lateral surfaces with more abundant punctures and dulled by tessellation. Wings, claws and tibial spurs as in female. Terga 1–5 as in female terga 1–4 but punctures slightly more distinct. Sterna 2–5 apically with broad hyaline areas impunctate, basally with scattered small punctures separated mostly by 4 to 5 puncture widths, surface moderately dulled by reticular shagreening. Sternum 6 flat, not reflexed at apex, with apicomedian V-shaped emargination.

Genital capsule and sterna 7 and 8 (Figs. 94–98) as figured. Note the following structures: gonoforceps abruptly narrowed near apex; dorsal lobes of gonocoxites moderately long; volsellae small; sternum 7 with deep apical emargination with broad apicolateral lobes; sternum 8 with neck region somewhat swollen, apical emargination broad and extremely shallow.

VESTITURE: In general pale ochraceous to ochraceous, slightly darker on vertex of head and thoracic dorsum. Tergum 1 without pale apical band. Tergum 2 with pale apical band broadly interrupted medially, usually by at least one-third width of tergum. Tergum 3 with more narrowly interrupted pale apical band. Terga 4 and 5 with complete pale apical bands. Terga 6 and 7 with long pale ochraceous hairs. Sternal hairs pale ochraceous, diffuse, long,

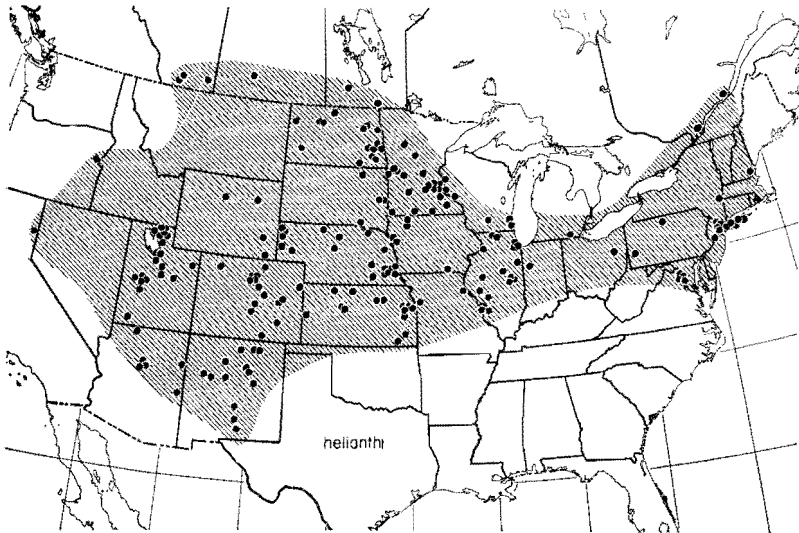


FIG. 8. Map showing the known distribution of *A. (Callandrena) helianthi* Robertson.

long, not forming subapical bands. Leg hairs white to pale ochraceous except inner surfaces tarsi yellow.

Type Material. The lectotype male (Robertson No. 7019) of *helianthi*, lectoallotype female of *helianthi* (Robertson No. 6955), from Carlinville, Illinois, September 12–25, 1887, were collected on flowers of *Helianthus grosse-serratus* by Charles Robertson (INHS). Eleven female and seven male paratypes were taken with the lectotype and lectoallotype and these are also at Urbana. The holotype female of *nitidior* Cockerell, from San Ignacio, New Mexico, was collected by W. Porter, September 1, 1899 (USNM No. 18,929). The holotype female of *graenicheri* Cockerell from Milwaukee, Wisconsin, was collected by S. Graenicher, August 28th (USNM No. 18,917). The holotype female of *lincolnella* Viereck and Cockerell (NSM) is presumably from Lincoln, Nebraska.

Distribution. The known distribution (Fig. 8) of *A. helianthi* includes the region from the Canadian Provinces of Alberta, Manitoba, and Quebec south to Arizona and New Mexico in the west and Kansas, Indiana, and Virginia in the east and from northeastern California and southeastern Oregon east to New Hampshire, New Jersey, and Virginia. This species has been taken from July 16th through September 30th but chiefly during August. A total of 558 females and 327 males have been examined in addition to the type material mentioned above. The localities of these records are listed below together with all published records.

ARIZONA: Flagstaff; Fredonia; Nutrioso (8 miles N.); Oak Creek Canyon; Sanders, Apache Co.; Sno-bowl (15 miles N.W. of Flagstaff), Coconino Co. CALIFORNIA: Montague, Siskiyou Co.; Standish (5 miles W.), Lassen Co. COLORADO: Alder; Arriba; Aurora; Berkeley; Boulder; Boulder Co.; Canfield; Coal Creek, Boulder Co.; Coaldale, Fremont Co.; Elbert (Hubbard Ranch), Elbert Co.; Fort Collins; La Junta; Limon; Morley; Pikes Peak (9000 feet alt.); Steamboat Springs; Wray. ILLINOIS: Ashkum; Bath; Bluffs, Scott Co.; Carlinville; Champaign; Chicago; Cicero; Cook Co.; Dupo; Fulton; Mahomet; Normal; Oak Park; Rockford; Starved Rock; Urbana. INDIANA: Lafayette. IOWA: Davis Co.; Dickinson; Don Green's Slough, Clay Co.; Sioux City; Stone State Park (near Sioux City). KANSAS: Allen County; Baldwin; Clay Co.; Douglas Co.; Ellis; Greeley Co.; Hays; Lawrence; Manhattan; Montgomery Co.; Natural History Reservation, Douglas Co.; Norton County; Ottawa; Smith Co. MICHIGAN: Jackson; Lenawee Co. MINNESOTA: Ashby; Benton Co.; Big Stone Co.; Fairmont; Freeborn Co.; Grant Co.; Hastings; Hennepin Co.; Itasca State Park; Lake Vadnais, Ramsey Co.; Mount Springs State Park, Rock Co.; Park Rapids; Ramsey Co. (Powder Plant Woods and Mid-hills Golf Club); Renville; Rochester; Sedan; St. Paul; Stanton; Taylor Falls; Zumbra Heights, Carver Co. MISSOURI: Hannibal; Kansas City; St. Louis. MONTANA: "Montana." NEBRASKA: Agate, Sioux Co.; Bridgeport; Glen, Sioux Co.; Granada; Halsey; Hastings; Henderson; Lincoln; Long Pine; Malcolm; Mitchell; Monroe Canyon, Sioux Co.; Nebraska City; Niobrara; Omaha; Roca; Valentine (30 miles S.); Wabash; West Point. NEVADA: Panaca, Lincoln Co. NEW HAMPSHIRE: Pelham. NEW JERSEY: Englewood; Kearney; Newark; Ramsey; Trenton. NEW MEXICO: Albuquerque; Beulah; Carrizozo; Grants; Jemez Springs; Las Vegas; Maxwell; Mountain Park (3 miles W.); Pecos; Rociada; San Ignacio; San Mateo, Valencia Co.; Tularosa, Otero Co. NEW YORK: Flatbush; Flushing, Long Island; Hillsdale; New Lots, Long Island; Riverhead, Long Island; Tuxedo Park; White Plains. NORTH DAKOTA: Bottineau; Dickinson; Edmore; Fargo (and 7 miles N.); Gardner (1 mile S.); Grand Forks; Lakota; McLeod, Ransom Co. (1 miles S.E.); Minot; Minto (12 miles S.E.); Monango; Sheldon (7 miles S.E.); Tower City; Valley City; Williston. OHIO: Starr Co. OREGON: Huntington (4 miles W.), Baker Co. PENNSYLVANIA: Galeton (8 miles E.); Alleghany Co. (Sample Station). SOUTH DAKOTA: Brookings; Houghton; Ravinia; Volga. UTAH: Cornish; Delta; Fillmore; Millard Co.; Garfield; Hinckley; Indianola; Lehi; Logan; Morairity; Newton; Ogden; Petersboro; Price, Carbon Co.; Promontory; Salt Lake City; Sugarville; Thistle; Topaz; Vernal;

Wellsville Canyon (near Wellsville); Zion National Park. VIRGINIA: Fairfax Co.; Kearny, Arlington Co.; Vienna (and 2 miles W.). WISCONSIN: Farmington, Polk Co.; Fountain City, Buffalo Co.; Madison; Maiden Rock, Pierce Co.; Milwaukee; Racine. WYOMING: Cheyenne; Gillette (12 miles E.); Hoffman's Ranch, Platte Co.; Worland. *Canada*. ALBERTA: Lethbridge; Magrath; Medicine Hat. MANITOBA: Altona; Aweme; Brandon. QUEBEC: Montreal; Mt. Royal.

Floral Records. *Andrena helianthi* is an oligoecious of the Compositae and, in particular, seems to prefer flowers of the genus *Helianthus*. This is supported by Charles Robertson in his detailed observations in southern Illinois (Robertson, 1925 and 1926). Table 3 summarizes floral data available to the author. Below are listed the plants from whose flowers this species has been collected. This list includes published records.

Aster sp., *A. novaeangliae*, *Bidens* sp., *B. aristosa*, *Chrysothamnus* sp., *C. nauseosus*, *Cirsium undulatum*, *Cleome serrulata*, *Gilia* sp., *Gutierrezia sarothrae*, *Helianthus* sp., *H. annuus*, *H. coloradinus*, *H. coronatus*, *H. divaricatus*, *H. giganteus*, *H. grosse-serratus*, *H. maximilliani*, *H. petiolaris*, *H. rigidus*, *H. subrhomboides*, *H. tuberosus*, *Medicago sativa*, *Rudbeckia laciniata*, *Silphium perfoliatum*, *Solidago* sp., *S. canadensis*, *S. rigida*, *Verbesina encelioides*, *V. oreophila*.

TABLE 3. Summary of floral records for *Andrena helianthi* Robertson.

| Plant Data | | | Records of <i>A. helianthi</i> | | | |
|------------------------|------------------|-------------------|--------------------------------|-------------------|-----------------|----------------------|
| Family | Number of Genera | Number of Species | Number of Collections | Number of Females | Number of Males | Total Number of Bees |
| Compositae: | | | | | | |
| <i>Helianthus</i> spp. | 1 | 11 | 113 | 215 | 119 | 334 |
| Other Composites | 9 | 9 | 18 | 18 | 8 | 26 |
| Leguminosae | 2 | 2 | 3 | 1 | 2 | 3 |
| Polemoniaceae | 1 | 1 | 1 | 0 | 1 | 1 |
| Totals | 13 | 23 | 135 | 234 | 130 | 364 |

Andrena (*Callandrena*) *parilis*, n. sp.

This is a medium-sized bee from México known only from three females. These females closely resemble those of *A. helianthi* but differ in having a longer bidentate labral process and darker hairs on terga 5 and 6 and sterna 2-5. In addition, the scopal hairs of

parilis tend to be pale brown, unlike the pale ochraceous scopal hairs of *helianthi*.

Female. MEASUREMENTS AND RATIOS: N = 3; length, 12–13 mm; width, about 4 mm; wing length, 4.16–5.21 mm; FL/FW, 1.02–1.06; FOVL/FOVW, 2.93–3.17.

INTEGUMENTAL COLOR: As in *helianthi* with the following exceptions: wing membranes slightly infumate apically, veins orange to red; distitarsi dark rufescent; basitarsi and tibiae dark reddish-brown.

STRUCTURE: Generally as in *helianthi* with the following differences: maxillary palpal ratio about 1.2:1.0:0.8:0.8:0.6:0.8; labial palpal ratio about 1.8:1.0:0.7:1.0; labral process long, emarginate medially, bidentate; vertex above lateral ocellus equals about one and one-half ocellar diameters; facial fovea extends to below level of epistomal suture below, separated from lateral ocellus by half an ocellar diameter or slightly more.

VESTITURE: Generally as in *helianthi* except terga 5 and 6 with hairs largely brown; sternal hairs brown; tibial scopal hairs and outer surfaces hind basitarsi with hairs dark ochraceous to pale brown.

Type Material. The holotype female (USU) and one female paratype (INHS) were taken at Las Estacas, Morelos, México on November 8, 1941. An additional female paratype (MSU) was taken at Río Blanco, Veracruz, México, November 13, 1957, by R. and K. Dreisbach.

Remarks. It is possible that these females represent merely a geographical race of *A. helianthi*. The characters by which *parilis* differs from *helianthi* make such an hypothesis doubtful and, therefore, it seems best to recognize these as a distinct species at this time.

Andrena (Callandrena) braccata Viereck

Andrena braccata Viereck, 1907, Ent. News, vol. 18, pp. 284, 286, 287; 1920, Connecticut St. Geol. Nat. Hist. Surv. Bull. 31, p. 343; Clements and Long, 1923, Carnegie Inst. Washington Pub., vol. 336, p. 249.

Andrena (Pterandrena) braccata: Lanham, 1949, Univ. California Pub. Ent., vol. 8, p. 200; Mitchell, 1960, North Carolina St. Col. Tech. Bull. No. 141, pp. 141–142.

This large eastern species is closely related to *A. helianthi*. The female of *braccata* can be told from that of *helianthi* by the large rhomboidal clypeal process, the tessellate terga, and the hairless, or almost hairless, interior of the propodeal corbicula. The male of *braccata* can be separated from the male of *helianthi* by the larger

clypeal process, the more tessellate terga, the darker tibiae, the darker wing veins, and the usually more coarsely sculptured propodeal enclosure as is described below.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 10.5–14.0 mm; width, 3.5–5.0 mm; wing length, $M = 4.68 \pm 0.185$ mm; FL/FW, $M = 0.94 \pm 0.003$; FOVL/FOVW, $M = 2.73 \pm 0.041$.

INTEGUMENTAL COLOR: Black except as follows: flagellar segments 3–10 usually slightly rufescent below; mandible with apical third rufescent; tegulae rufescent; wing membranes slightly infumate in outer fourths, veins dark brown to black; tergal apices rufescent; sternal apical areas hyaline, yellow; distitarsi rufescent; tibial spurs yellow.

STRUCTURE: Scape as in *helianthi*; flagellar segment 1 equal in length to segments 2 plus 3 or slightly longer, segment 2 subequal to 3 and shorter than segment 4. Eye about three and one-half times as long as broad, inner margins converging slightly toward mandibles. Malar space linear, from five to six times as broad as long. Mandible as in *helianthi*. Galea and maxillary palpus as in *helianthi* but palpal segments in ratio of about 1.8:1.6:1.0:1.0:1.3. Labial palpus as in *helianthi* but segments in ratio of about 1.8:1.0:0.5:5.7. Labral process large, rhomboidal in outline, apicomedial shallow emargination usually present, occasionally almost rectangular. Clypeus not much flattened medially; protruding beyond ends of eyes by about one-third median clypeal length; punctures round, mostly shallow, laterally separated by one-half to one puncture width, sparser towards midline which is broadly impunctate, surface dulled by coarse reticulotransverse shagreening. Supraclypeal area dulled by fine, shallow, crowded punctures and coarse reticular shagreening. Genal area broader than eye as in *helianthi*, punctures sparse, separated mostly by 2 to 3 puncture widths except near eye margin more crowded, surface dulled by fine reticular shagreening. Vertex short, above lateral ocellus equals about one and one-half ocellar diameters, largely impunctate but dulled by coarse tessellation. Face above antennal fossae as in *helianthi* but moderately shiny and some longitudinal rugulae between facial fovea and lateral ocellus to dissuate above apex of fovea. Facial fovea as in *helianthi* but upper end separated from lateral ocellus by about three-fourths ocellar diameter.

Pronotum normal, surface tessellate, punctures minute, sparse, obscure. Mesoscutum, scutellum and metanotum with large, shallow, sparse punctures obscured by regular, coarse tessellation dulling surfaces. Propodeum with enclosure as in *helianthi* but irregular fine rugulae at base more extensive, may cover basomedial fourth of enclosure; dorsolateral and posterior surfaces with large, shallow

punctures mostly separated by one to two puncture widths and mostly interconnected by extremely fine, irregular rugulae, surface dulled by tessellation; corbicular area moderately shiny, regularly and coarsely tessellate. Mesepisternum similar to posterior propodeal surface but punctures closer and more distinct. Metepisternum like corbicular area below. Middle basitarsus not markedly expanded medially, with evenly curved sides and slightly narrower than hind basitarsus. Tibial spurs and claws normal. Front wing with venation as in *helianthi*.

Metasomal terga 1-4 with minute, widely separated, indistinct punctures, surfaces regularly and finely tessellate, dull, apical areas slightly depressed. Tergum 5 similar but punctures more abundant and distinct. Pygidial plate V-shaped with truncate apex, not narrow. Sterna 2-5 as in *helianthi*.

VESTITURE: Generally pale ochraceous to ochraceous in color, darker above than at sides or below. Tergum 1 without hair except at sides, without apical fascia. Terga 2-4 with apical white fascia usually interrupted medially on tergum 2; basal areas glabrous. Terga 5 and 6 with long yellow to white hairs. Sterna 2-5 with long, suberect, ochraceous hairs somewhat more concentrated and longest near apical hyaline areas. Propodeal corbicula without internal hairs or with only 3 or 4 long hairs internally near dorsal fringe; incomplete anteriorly; dorsal fringe slightly shorter than normal, especially anteriorly. Trochanteral flocculus complete, well developed. Tibial scopal hairs highly plumose throughout, of normal length. Leg hairs ochraceous to pale ochraceous except inner surfaces tarsi yellow.

Male. MEASUREMENTS AND RATIOS: N = 20; length, 9.0-12.0 mm; width, 2.5-3.5 mm; wing length, $M = 4.04 \pm 0.148$ mm; FL/FW, $M = 0.98 \pm 0.006$; FS1/FS2, $M = 1.77 \pm 0.027$.

INTEGUMENTAL COLOR: As in female except as follows: clypeus yellow except brown apical margin and small dark maculae mesad and below tentorial pits; tegula testaceous to rufescent; wing veins dark reddish-brown; terga 1-6 apically hyaline, somewhat rufescent near bases of hyaline areas; sterna 2-6 narrowly hyaline apically, rufescent just basad of hyaline areas; distitarsi dark red to yellowish, middle and hind basitarsi rufescent, apex of hind tibia often rufescent.

STRUCTURE: Antenna in general as in *helianthi*; scape distinctly shorter than segments 1-3; flagellar segment 1 shorter than segments 2 plus 3, segment 2 shorter than 3, and 3 subequal to 4. Eye about three and one-third times as long as broad, inner margins converging distinctly toward mandibles. Malar space, mandibles and galea as in female. Maxillary palpus as in female but segments in ratio of

about 1.4:1.0:0.9:0.9:0.8:1.0. Labial palpus as in female but segments in ratio of about 1.7:1.0:0.6:0.9. Labral process as in female. Clypeus and supraclypeal area as in female but clypeus with punctures smaller, more evenly distributed, medially separated by about 2 to 3 puncture widths, and shagreening often absent medially, although surface dulled peripherally. Genal area, vertex, and face above antennal fossae as in female but vertex usually slightly shorter. Sculpture of thorax as in female except as follows: propodeal enclosure usually with basal half or slightly more roughened by irregular, fine, anastomizing rugulae; lateral propodeal surface with sparse, indistinct, shallow punctures in upper half. Wings, claws and tibial spurs as in female. Terga 1-5 as in terga 1-4 of female but minute punctures slightly more evident in basal areas, separated mostly by 3 to 5 puncture widths, in apical areas by less. Tergum 6 as in female tergum 5. Sterna 2-5 with apical hyaline areas impunctate, basal areas with punctures separated mostly by 2 to 4 puncture widths, sparser at extreme bases, surfaces dulled by regular, reticular shagreening. Tergum 6 flat, not reflexed, with deep, median, V-shaped, apical emargination.

Genital capsule and sterna 7 and 8 (Figs. 74-78) as figured. Note the following structures: gonoforceps blunt; penis valve tips knobbed; volsellae large; sternum 7 with deep, V-shaped, apical emargination; sternum 8 with neck broadened medially, apex narrow and entire.

VESTITURE: White to ochraceous, darker on vertex and dorsum of thorax than sides and below. Terga 1-5 with basal vestiture sparse, pale, with apical white fasciae which is very weak on tergum 1 and often narrowly interrupted on tergum 2. Terga 6 and 7 with long ochraceous hairs. Sterna 2-5 as in female but hairs shorter and less abundant. Leg hairs white to pale ochraceous except inner surfaces tarsi usually golden-yellow.

Type Material. The lectotype female (USNM), here designated, was collected by H. L. Viereck at Rockville, Connecticut, August 23, 1905.

Distribution. *A. braccata* is known from the New England states south to Virginia (Fig. 7). Mitchell (1960, p. 142) states the distribution as west to Colorado, but I have not seen specimens from states west of the Atlantic seaboard. Perhaps misidentification of related species is responsible for this discrepancy. This species has been collected from August 20th through October 11th, chiefly during late August and September. In addition to the type material, 211 females and 46 males have been examined from the localities listed below. This list includes published records.

CONNECTICUT: Branford; Hartford; Lyme; New Canaan;

New London; Rockville; Stafford; Storrs; Westbrook. DISTRICT OF COLUMBIA: Washington. MAINE: Saco. MARYLAND: Bethesda; Cabin John; Glen Echo; Winthrop; Yarrow. MASSACHUSETTS: Beach Bluff; Boston; Bridgewater; Cambridge; Dedham; Dennis; Falmouth; Forest Hills; Framingham; Holliston; Milton; Needham; North Saugus; Reading Highlands; Sherborn; Somerset Heights. NEW HAMPSHIRE: Barnstead; Durham; Meredith; Pelham. NEW JERSEY: Clifton; Englewood; Carret Mts.; Kearny; Ramsey. NEW YORK: Amagan; Babylon, Long Island; Bedford; Fatbush, Long Island; Fleetwood; Long Island; Mosholu; New Rochelle; Nyack; Sea Cliff, Long Island; Tappan; Tuxedo Park; West Farms, New York City; White Plains. RHODE ISLAND: Scituate; Watch Hill. VIRGINIA: Falls Church; Kearny, Arlington Co.; Oakton.

Floral Records. *A. braccata* has been collected from only two genera of plants, *Solidago* and *Aster*, and seems to be an oligolege of the goldenrods (*Solidago*). It has been collected from *Aster* spp. (4 collections, 4 specimens), *Solidago* spp. (17 collections, 28 ♀♀ and 12 ♂♂), *S. nemoralis* (2 collections, 7 ♀♀), and *S. altissima* (1 collection, 2 ♀♀).

Andrena (Callandrena) vulpicolor Cockerell

Andrena vulpicolor Cockerell, 1897, Ann. Mag. Nat. Hist., ser. 6, vol. 20, p. 512; 1898, Bull. Denison Univ. Sci. Lab., vol. 11, p. 49; 1931, American Mus. Nov. No. 458, p. 13.

Andrena nubilipennis Viereck, 1904, Canada. Ent., vol. 36, p. 193 (new synonymy).

Andrena (Pterandrena) nubilipennis: Lanham, 1949, Univ. California Publ. Ent., vol. 8, p. 200.

Andrena (Pterandrena) vulpicolor: Lanham, 1949, Univ. California Publ. Ent., vol. 8, p. 200.

This is a large western species which is closely related to *A. helianthi*. The female *vulpicolor* is distinguished from that of *helianthi* by the large rectangular labral process and the more dense tergal fasciae. The male of *vulpicolor* differs from that of *helianthi* in the shape of the labral process, by having an apical pale fascia on tergum 1 as well as the succeeding terga, and by the usually darker flagellar segments.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 12–15 mm; width, 3.5–4.5 mm; wing length, $M = 4.25 \pm 0.213$ mm; FL/FW, $M = 1.02 \pm 0.007$; FOVL/FOVW, $M = 2.75 \pm 0.034$.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical third rufescent; flagellar segments 3–10 slightly reddened

below; tegulae dark rufescent; wing membranes hyaline, infumate near tips, veins reddish-brown; terga 1-5 with apical areas rufescent; sterna 2-5 with narrow hyaline apices yellow, rufescent just basad of hyaline area; distarsi rufescent; hind basitarsi often rufescent (as in lectotype); tibial spurs yellow.

STRUCTURE: Antennae as in *helianthi*. Eye about four times as long as broad, inner margins slightly curved, converging slightly towards mandibles. Malar space linear, minimum length less than one-sixth basal width of mandible. Mandible and galea as in *helianthi*. Maxillary palpus short, barely reaching tip of galea in repose, segmental ratio about 1.1:1.0:0.7:0.7:0.6:0.7; segments 1-5 flattened, elongated triangles. Labial palpus with segment 1 strongly curved along inner margin, almost straight along outer margin, flattened, segmental ratio about 1.7:1.0:0.6:0.7. Labral process large, rectangular, about twice as broad as long, not emarginate. Clypeus evenly rounded from side to side, protruding beyond ends of compound eyes by about one-third its median length; impunctate along midline, punctures round, separated mostly by half a puncture width (much less in some specimens), smaller peripherally, surface shiny to moderately shiny, and in most specimens shagreening restricted to peripheral areas, in some clypeus moderately dulled by fine transverse shagreening throughout. Supraclypeal area minutely punctate, shagreened, moderately shiny. Genal area slightly less than one and one-half times as broad as eye in profile, with minute punctures separated mostly by two puncture widths and fine reticular shagreening dulling surface. Vertex moderate, above lateral ocellus equals slightly more than one ocellar diameter, sculptured as in *helianthi*. Facial fovea shallow, extends to below lower margin of antennal fossa, rounded below, broader and rounded above, separated from lateral ocellus by almost one ocellar diameter.

Pronotum as in *helianthi*. Mesoscutum and scutellum with extremely shallow, obscure punctures separated medially by three to four puncture widths, peripherally by one to two puncture widths, surfaces dulled by coarse regular tessellation; parapsidal line moderate in length, almost as long as from anterior end to margin of scutum. Tegula normal, impunctate. Metanotum with shallow crowded punctures and coarse tessellation dulling surface. Propodeum as in *helianthi* but dorsal enclosure with internal basal triangular area finely roughened in addition to coarse tessellation dulling surface. Mesepisternum with small round punctures separated mostly by two puncture widths except in ventroposterior quarter which is almost impunctate, surface tessellate. Metepisternum sculptured as in corbicular area except punctate upper third.

Middle basitarsus as in *helianthi*. Tibial claws and spurs normal. Front wing with three submarginal cells; vein 1st m-cu meets second cell at or slightly beyond middle of cell; second submarginal cell along posterior margin equals half of first cell; pterostigma as in *helianthi*.

Metasomal terga 1-4 with basal areas almost impunctate, with shallow sparse minute punctures obscured by fine dense tessellation (punctures more distinct in a few specimens) dulling surfaces. Terga 2-4 with apical areas with minute crowded punctures. Pygidial plate V-shaped with apex relatively sharply pointed. Sterna 2-5 with apical areas impunctate, basal areas with small punctures separated by two to four puncture widths, sparser basally and more crowded near impunctate margins, surfaces shiny, reticular shagreening extremely delicate.

VESTITURE: Generally white to dull ochraceous, occasionally bright fox-red (as in lectotype), thoracic dorsum and vertex brighter and darker than sides or below. Tergum 1 with lateral patches of apical white fascia about one-fifth width of tergum or less. Terga 2-4 with apical fasciae of thick, decumbent, white hairs, usually extremely narrowly interrupted on tergum 2. Terga 5 and 6 with long white hairs, often golden medially. Sterna 2-5 with sparse, short, erect hairs basally becoming long and semidecumbent near apical margin to form weak subapical fimbriae which are interrupted medially. Propodeal corbicula incomplete anteriorly, with long internal hairs in anterodorsal third or less. Trochanteral floculus and tibial scopa as in *helianthi*. Legs pale ochraceous to white except inner surfaces tarsi pale golden.

Male. MEASUREMENTS AND RATIOS: N = 20; length, 11-14 mm; wing length, 3-4 mm; wing length, $M = 3.80 \pm 0.131$ mm; FL/FW, $M = 1.09 \pm 0.005$; FS1/FS2, $M = 1.90 \pm 0.026$.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical third rufescent; clypeus pale yellow except small maculae mesad and below tentorial pits and brown apical margin; flagellar segments 2-11 brown (allotype) to dark reddish-brown below; tegulae testaceous to rufescent; wing membranes hyaline, colorless or slightly infumate apically, veins yellow to dark red; terga 1-5 hyaline apically and rufescent just basad of hyaline areas; sterna narrowly hyaline apically, yellow, rufescent just basad of hyaline areas; distitarsi rufescent; hind basitarsi dark reddish-brown to red.

STRUCTURE: Antennae surpassing tegulae in repose; scape and flagellar segments as in *helianthi*. Eyes as in *helianthi* but inner margins converging towards mandibles. Malar space, mandible and galea as in female. Maxillary palpus as in female but ratio about 1.0:1.0:0.9:0.8:0.6:0.9. Labial palpus as in female but ratio about

1.7:1.0:0.6:0.7. Labral process about twice as broad as long, rectangular, shallowly and broadly emarginate apically, not at all bidentate. Clypeus as in female but median longitudinal impunctate area usually absent or narrow, surface shiny, unshagreened or only slightly so. Supraclypeal area, genal area and vertex as in female. Face above antennal fossae as in female but longitudinal rugulae usually less well developed. Sculpturing of thorax as in female except as follows: mesoscutal and scutellar punctures slightly more evident and tessellation less coarse, shinier; dorsal enclosure of propodeum with basomedian internal area of weak rugulae slightly more coarsely sculptured; lateral propodeal areas with scattered punctures throughout and duller. Sculpturing of abdomen as in female except as follows: terga 1-5 with basal area punctures deeper, larger and usually more abundant. Sternum 6 not reflexed, apical emargination deep, U-shaped but with sides diverging laterally, forming two long apical rounded teeth.

Genital capsule and sterna 7 and 8 (Figs. 79-83) similar to those of *braccata*.

VESTITURE: In general white to pale ochraceous, vertex and thoracic dorsum slightly brighter or darker than sides or below. Terga 1-5 with distinct, uninterrupted, apical, pale fasciae, basally with abundant, erect, short, white hairs. Terga 6 and 7 with long white hairs. Sterna 2-5 with short, erect, sparse hairs basally, with weak subapical fimbriae of decumbent hairs. Leg hairs white to pale ochraceous except inner surfaces tarsi pale golden.

Type Material. The lectotype (PANS) female (here designated) of *vulpicolor*, was collected by T. D. A. Cockerell in September at Embudo, New Mexico. The holotype female of *nubilipennis* Viereck (PANS) is without data.

Distribution. *A. vulpicolor* appears to be distributed from Wyoming and New Mexico west to Oregon and California (Fig. 6) chiefly in arid and semiarid mountainous regions. It has been collected from July through October 25th but chiefly during September and early October. In addition to the types listed above, 75 females and 39 males have been examined from localities listed below.

ARIZONA: Rustlers Park, Chiricahua Mts. **CALIFORNIA:** Baldwin Park; Barton Flats; Bentons Crossing, Mono Co.; Bridgeport; Deep Creek (mouth of), San Bernardino Co.; Deep Springs, Inyo Co.; Doyle (5 miles S.); Fort Tejon; Hallelujah Junction, Lassen Co.; Lava Beds National Monument, Siskiyou Co.; Rock Creek (1 mile W. of Tom's place), Mono Co.; Sierraville; South Fork Camp, San Bernardino Mts.; Upper Santa Ana River, San Bernardino Co.; Walker Pass, Kern Co. **COLORADO:** Great Sand

Dunes. IDAHO: Brunneau (8 miles W.). NEVADA: Carson City; Ely (9 miles S.); Washoe Co. NEW MEXICO: Embudo; Quemado; Torrance Co. OREGON: Hermiston (6 miles E.), Umatilla Co. UTAH: Blue Creek, Box Elder Co.; Cliff; Moab; Monticello; Pahvant; Pine Mts., Washington Co. WYOMING: Jackson, Teton Co.

Floral Records. Except for one male taken on *Erigeron*, all records of *vulpicolor* on flowers are for some species of *Chrysothamnus* (rabbitbush). It is, therefore, assumed that *A. vulpicolor* is an oligo-lege of *Chrysothamnus*. Flowers from which this bee has been taken are listed below.

Chrysothamnus sp., *C. nauseosus*, *C. nauseosus albicaulis*, *C. n. consimilis*, *C. parryi*, *C. viscidiflorus pumilis*, *C. v. stenophyllus*, *Erigeron neomexicana*.

Remarks. Cockerell (1897) named *A. vulpicolor* from a series of females which represent an extreme in color, that is the vestiture being bright fox-red. This variant appears relatively rarely in populations from New Mexico, Colorado and Utah. The California, Oregon and Nevada populations appear to average slightly smaller and are considerably paler in color than the more eastern populations. There is a continuous gradation in color and size from the typical *vulpicolor* form to the pale California type.

Andrena (Callandrena) sonorensis, n. sp.

This is a small species related to *A. helianthi*. Both sexes of *sonorensis* differ from those of *helianthi* in lacking an impunctate median longitudinal line on the clypeus, having the terga and sterna with broad reddish-orange bands, the posterior pronotal lobes reddish-orange, the wing tips deeply infumate, and the labral process long and scarcely emarginate medially. *A. sonorensis* is known from only two specimens, a male and a female, collected separately. It is possible that these are incorrectly associated as the two sexes of the same species, but this seems unlikely due to the close correspondence of both structural and color characteristics. This species is named here, despite the paucity of material, because its distinctiveness makes the possibility of its being a race or a variety of any other known form extremely doubtful.

Female. MEASUREMENTS AND RATIOS: N = 1; length, about 12 mm; width, 3.5 mm; wing length, about 4.83 mm; FL/FW, about 1.00; FOVL/FOVW, about 2.88.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical third rufescent; labral process rufescent; scape orange except brown tip; flagellar segments 3-10 dark reddish-brown below; posterior pronotal lobe reddish-orange; tegulae testaceous; wing mem-

branes with apical third or less deeply infumate, brown, only slightly infumate basally, veins dark reddish-brown; tergal apices hyaline, yellowish, subapical and basal bands (including terga 1 and 5) reddish-orange leaving irregular piceous median bands; sterna rufescent with hyaline yellow apices; legs orange to reddish-orange except brown coxae and trochanters; tibial spurs testaceous.

STRUCTURE: Scape subequal to flagellar segments 1-3; flagellar segment 1 slightly longer than segments 2 plus 3, segment 2 subequal to 3 or 4. Eye slightly more than four times as long as broad, inner margins converging slightly toward mandibles. Malar space, mandible, galea as in *helianthi*. Maxillary palpus as in *helianthi* but segmental ratio about 1.0:1.0:0.7:0.8:0.8:0.9. Labial palpus as in *helianthi* but segmental ratio about 1.7:1.0:0.7:0.8. Labral process trapezoidal, less than twice as broad as long, extremely slightly emarginate medially. Clypeus not much flattened medially, protruding beyond lower ends of eyes by one-third its median length; punctures round, small, separated mostly by half to one puncture width, slightly sparser medially but not with impunctate median longitudinal area, surface shiny except posteriorly finely shagreened. Supraclypeal area moderately shiny, with minute close-set punctures. Genal area slightly broader than eye in profile, with minute punctures separated by one to two puncture widths, surface shiny near eye, moderately dulled posteriorly by fine reticular shagreening. Vertex as in *helianthi* but fine rugulae between facial fovea and lateral ocellus longitudinal, not following contour of fovea above. Face above antennal fossae as in *helianthi* but interrugal punctures crowded. Facial fovea shallow, reaching below to level of lower margins antennal fossae, narrow, separated from lateral ocellus by about one ocellar diameter.

Pronotum as in *helianthi*. Mesoscutum, scutellum and metanotum as in *helianthi* but punctures shallower, indistinct and sparser. Tegulae normal, impunctate. Propodeum as in *helianthi* but dorso-lateral and posterior areas with punctures indistinct and crowded. Mesepisternum and metepisternum as in *helianthi*. Middle basitarsus distinctly narrower than hind. Tibial spurs and claws normal. Wing venation as in *helianthi*.

Metasomal terga and sterna sculptured as in *helianthi* but terga 1-4 with minute basal area punctures indistinct and slightly sparser. Pygidial plate V-shaped, apex narrowly rounded, not truncate.

VESTITURE: Generally pale ochraceous to yellow. Tergum 1 lacks pale apical fascia, terga 2-5 with well-developed pale apical fasciae, although weak medially on tergum 2. Sterna 2-5 with subapical fimbriae of long suberect hairs. Pollen collecting hairs as in *helianthi* but internal propodeal corbicular hairs barbed. Legs as in *helianthi*.

Male. MEASUREMENTS AND RATIOS: N = 1; length, about 12 mm; width, about 3 mm; wing length, about 4.51 mm; FL/FW, about 1.00; FS1/FS2, about 1.89.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical half rufescent; scape orange-red with brownish tip; flagellar segments 2-11 brown below, 2-8 with pale apical rims; posterior pronotal lobes orange-red; tegulae testaceous; wing membranes deeply infumate apically, brown, basally hyaline, veins reddish-brown; terga 1-6 with apices hyaline, yellowish, 1-3 red basally and subapically with median transverse piceous bands of increasing size posteriorly, 4 with median piceous bands extending from side to side and almost obliterating subapical and basal red areas, 5 and 6 piceous basally; sterna 2-5 red with hyaline apical areas, 6 piceous with orange apex; legs orange-red except piceous coxae and trochanters. Tibial spurs testaceous.

STRUCTURE: Antenna as in *helianthi* but segments 2-4 subequal in length to each other. Eye about three and one-half times as long as broad, inner margins converging towards mandibles. Malar space, mandible, galea as in female. Maxillary palpus as in female but segmental ratio about 1.2:1.0:0.9:0.8:0.7:0.9. Labial palpus as in female but segmental ratio about 1.9:1.0:0.7:0.7. Labral process as in female but median emargination slightly deeper. Clypeus, vertex, genal area, and face above antennal fossae as in female. Thoracic sculpturing and venation as in female but with propodeal lateral surfaces duller. Tibial spurs and claws normal. Tergal and sternal sculpturing as in female but tergal basal area punctures slightly more abundant. Basitibial plate U-shaped, small.

Genital capsule and sterna 7 and 8 (Figs. 99-103) similar to those of *braccata* but note shorter gonoforceps and shorter apical area of sternum 8.

VESTITURE: Generally pale ochraceous to yellow. Tergum 1 with complete but weak apical pale fascia. Terga 2-5 with complete apical pale fasciae. Sterna 2-5 with subapical fimbriae of moderately long, suberect, pale hairs.

Type Material. The holotype (UCB) male was collected by P. D. Hurd, at Carizozo, Lincoln Co., New Mexico, September 10, 1961, on *Gutierrezia microcephala*. The allotype (PHT) female was collected by P. H. Timberlake, 29 miles S. W. of Show Low, Gila Co., Arizona, September 12, 1957, on *G. microcephala*.

Andrena (Callandrena) pecosana Cockerell

Andrena pecosana Cockerell, 1913, Ann. Mag. Nat. Hist., ser. 8, vol. 12, p. 104.

A Revision of the Bees of the Genus Andrena

- Andrena (Pterandrena) pecosana*: Lanham, 1949, Univ. California Publ. Ent., vol. 8, p. 200.
- Andrena townsendi* Viereck and Cockerell, 1914, Proc. United States Nat. Mus., vol. 48, p. 49 (new synonymy); Cockerell, 1931, Amer. Mus. Nov., No. 458, p. 14.
- Andrena colletoides* Viereck and Cockerell, 1914, Proc. United States Nat. Mus., vol. 48, p. 27 (new synonymy); Lanham, 1941, Ann. Ent. Soc. Amer., vol. 34, p. 707.
- Andrena (Pterandrena) townsendi*: Lanham, 1949, Univ. California Publ. Ent., vol. 8, p. 200.

This medium-sized species is similar to *A. vulpicolor* in several respects and belongs near the *helianthi* group of species although it is not closely related to any one of these. The female of *pecosana* can be distinguished from that of *vulpicolor* by the smaller trapezoidal emarginate labral process, the distinct apical fascia on the first tergum and the dark legs. The male of *pecosana* is easily separated from that of *vulpicolor* by the bidentate labral process and the distinct parocular yellow maculae.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 11–13 mm; width, 3–4 mm; wing length, $M = 3.77 \pm 0.165$ mm; FL/FW, $M = 1.04 \pm 0.009$; FOVL/FOVW, $M = 3.32 \pm 0.057$.

INTEGUMENTAL COLOR: Black except as follows: mandible with at least apical half rufescent; flagellar segments 2–10 rufescent below; tegulae testaceous; wing membranes hyaline, colorless, veins red; terga 1–4 extremely narrowly hyaline apically; sterna 2–5 narrowly hyaline apically, yellowish; tarsi rufescent, occasionally hind tibiae and femora dark rufescent.

STRUCTURE: Scape length subequal to flagellar segments 1–3 or slightly longer; flagellar segment 1 longer than segments 2 plus 3; segment 2 subequal to 3 and 3 distinctly shorter than segment 4; segments 4–10 longer than broad. Eye about four times as long as broad, inner margins parallel. Malar space, mandibles and galeae as in *helianthi*. Maxillary palpus as in *helianthi* but segmental ratio about 1.0:0.7:0.6:0.6:0.5:0.7. Labial palpus as in *helianthi* but segmental ratio about 2.5:1.0:0.9:1.1. Labral process long, about twice as broad as long, trapezoidal, apex emarginate, often strongly bidentate. Clypeus evenly rounded from side to side, produced beyond ends of eyes by less than half to about one-third its median length; punctures of moderate size, round, usually absent or sparse along midline, laterally separated by one-half to one puncture width, surface shiny, shagreened only peripherally. Supraclypeal area with minute punctures and reticular shagreening dulling surface. Genal area in profile slightly broader than eye; with minute to small

punctures separated mostly by one-half to one puncture width, more crowded near eye margin, surface moderately shiny and shagreened posteriorly, shiny near eye. Vertex above lateral ocellus equals about one and one-half ocellar diameters; with crowded round punctures above ocelli, compound eyes and facial fovea, sparse in small area laterad of lateral ocelli, with a few rugulae entering from facial area to end above foveae on vertex, surface dulled by fine reticular shagreening. Face above antennal fossae with longitudinal rugulae, interrugal spaces with crowded punctures. Facial fovea extending below to or almost to level of posterior margin of clypeus, rounded above, shallow, separated from lateral ocellus by three-fourths to almost one ocellar diameter.

Pronotum normal, with minute, sparse, indistinct punctures and coarse reticular shagreening dulling surface. Mesoscutum and scutellum opaque, with round shallow punctures separated by one to two puncture widths, barely discernible, obscured by coarse dense tessellation. Tegulae impunctate. Metanotum like scutellum but punctures more crowded. Propodeum with dorsal enclosure irregularly and finely rugulose basally, tessellate; dorsolateral and posterior surfaces sculptured like scutellum but tessellae coarser, longitudinal sulcus of posterior surface narrow, margins not carinate; corbicular surfaces moderately shiny, with small punctures scattered throughout but crowded anterodorsally, with coarse reticular shagreening. Mesepisternum with small shallow punctures separated mostly by two puncture widths, surface dulled by tessellation. Metepisternum with upper third finely punctate and tessellate, lower portion as in corbicular area. Middle basitarsus slightly broader than hind basitarsus medially, with evenly curved sides. Tibial spurs and claws normal. Front wing venation as in *helianthi*.

Metasomal terga 1-4 with narrow apical areas impunctate; subapical areas (beneath pale fasciae) with minute crowded punctures; basal areas with minute sparse punctures obscured by fine, regular tessellation dulling surfaces. Pygidial plate V-shaped, broad basally, with narrow, rounded apex. Sterna 3-5 with apical areas impunctate, basal areas with abundant punctures somewhat sparser posteriorly, surfaces shiny to moderately shiny, delicately shagreened.

VESTITURE: Generally pale ochraceous to white, darker on vertex and thoracic dorsum. Terga 1-4 with apical fasciae, often eroded on tergum 1 medially, but subapical band of punctures present; basally with short suberect pale hairs scarcely hiding surfaces; terga 5 and 6 with long white to ochraceous hairs. Sterna 3-5 with subapical fimbriae of long suberect hairs, basally with short erect hairs. Pollen collecting hairs as in *helianthi* but internal corbicular hairs plumose. Inner surfaces tarsi golden-yellow.

Male. MEASUREMENTS AND RATIOS: N = 20; length, 10–13 mm; width, 2.5–3.5 mm; wing length, M = 3.53 ± 0.046 mm; FL/FW, M = 1.09 ± 0.007 ; FS1/FS2, M = 1.84 ± 0.024 .

INTEGUMENTAL COLOR: Black except as follows: mandible with apical half or more rufescent; flagellar segments 2–11 and often apex of 1 red below; clypeus yellow except testaceous apical margin and usually small dark maculae below and mesad of tentorial pits; parocular area with small yellow macula extending up no further than to level of lower margin of tentorial pit; supraclypeal area occasionally with small yellow macula; tegulae testaceous; wing membranes hyaline, colorless, veins dark red; terga 1–5 with apices hyaline, narrowly rufescent just basad of hyaline margins; sterna 2–5 rather broadly hyaline apically, yellow; tarsi orange to red; tibiae often and femora occasionally dark rufescent.

STRUCTURE: Antennae short, extending back to scutellum in repose; scape length equals first two and one-half flagellar segments; flagellar segment 1 slightly shorter than segments 2 plus 3, segment 3 longer than 2 and shorter than segment 4; segments 4–10 subequal in length, slightly longer than broad. Eye about three times as long as broad, inner margins converging slightly towards mandibles. Malar space, mandible, galea and labral process as in female. Clypeus as in female but punctures slightly coarser. Supraclypeal area and genal area as in female but genal area duller. Vertex and face above antennal fossae as in female. Thoracic sculpturing as in female except as follows: propodeal dorsal enclosure usually more extensively rugulose, often with a single median longitudinal ruga; lateral propodeal surfaces duller, tessellate. Wing venation and tegulae as in female. Tergal sculpturing as in female except as follows: tergum 5 like terga 1–4; basal area punctures more distinct and separated mostly by one to two puncture widths; surfaces dulled by fine reticular tessellation. Pseudopygidial area not apparent. Sterna as in female but surfaces often dulled by coarse, dense, reticular shagreening. Sternum 6 flat, with apex with broad, shallow, V-shaped emargination.

Genital capsule and sterna 7 and 8 (Figs. 84–88) similar to those of *braccata*.

VESTITURE: Generally white to pale ochraceous with vertex and thoracic dorsum darker ochraceous. Terga 1–5 with dense apical fasciae of white pubescence. Sterna 2–5 with weak subapical fimbriae of decumbent, moderately long hairs. Inner surfaces tarsi golden-yellow.

Type Material. The holotype female of *pecosana* from Pecos, New Mexico, collected by T. D. A. Cockerell on August 31st (USNM No. 21, 822). The holotype female (PHT) of *townsendi*

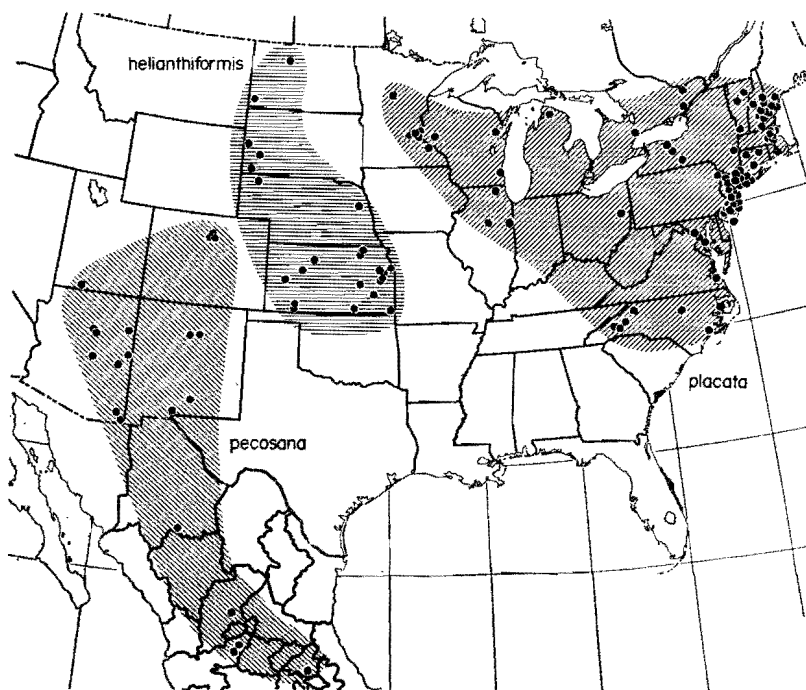


FIG. 9. Map showing the known distributions of *A. (Callandrena) placata* Mitchell, *A. (Callandrena) pecosana* Cockerell and *A. (Callandrena) helianthiformis* Viereck and Cockerell.

from Dripping Springs, Organ Mountains, New Mexico, was collected August 10th by C. H. Townsend.

Distribution. *A. pecosana* is known from central and northern Mexico north to Colorado and west to Utah and Arizona (Fig. 9). It has been collected from July 28th through September 28th but chiefly during late August and September. In addition to the type material, 60 females and 30 males have been examined from the localities listed below.

ARIZONA: Chiricahua Mts.; Chambers; Flagstaff (and 7 miles S.); McNary Junction, Apache Co.; Payson; Rustlers Park, Chiricahua Mts.; Sanders (2 miles W.); Springerville (32 miles W.). COLORADO: Boulder; Coal Creek, Boulder Co.; Deer Creek Canyon; Glen Park; Marshal; Niwot, Boulder Co. NEW MEXICO: Dripping Springs, Organ Mts.; Hollywood; Pecos; Rowe; Santa Fe. UTAH: Kaibab Forest. México. CHIHUAHUA: Santa Barbara. HIDALGO: Pachuca. JALISCO: Guadalajara (8 miles S.); Lagos de Moreno (13 miles S.W.); San Juan de los Lagos (8 miles S.W.). ZACATECAS: Fresnillo (9 miles S.E.).

Flower Records. Not enough records are available to state definite flower preferences for *A. pecosana* beyond that it is an oligolege of composites. It has been collected from flowers of the following plants.

Aster sp., *Grindelia* sp., *Gutierrezia sarothrae*, *Helianthus* sp., *Heliopsis* sp., *Viguiera annua*.

Andrena (Callandrena) fumosa, n. sp.

Andrena fumosa is a medium-sized bee known only from Mexico. It is closely related to *A. pecosana* from which it can be told by the lack of an apical pale fascia on the first tergum of both sexes and by the lack of parocular maculae in the male. Both sexes can be readily separated from those of *A. helianthi* by the larger labral process.

Female. MEASUREMENTS AND RATIOS: N = 5; length, 12–13 mm; width, 3.5–4.0 mm; wing length, M = 4.04 ± 0.178 mm; FL/FW, M = 1.00 ± 0.016; FOVL/FOVW, M = 3.05 ± 0.064.

INTEGUMENTAL COLOR: As in *pecosana* except as follows: flagellar segments 2–10 dark reddish-brown below; tegulae translucent reddish-brown to piceous; wing membranes slightly infumate, veins dark reddish-brown; tarsi dark rufescent to piceous; hind tibiae and femora piceous.

STRUCTURE: Generally as in *pecosana* with the following exceptions: maxillary palpal ratio about 1.1:1.1:1.0:0.8:0.8:1.0; labial palpal ratio about 1.5:1.0:0.6:0.7; metasomal tergum 1 with subapical area impunctate or with minute punctures separated mostly by 2 to 4 puncture widths in at least median third of tergum.

VESTITURE: Generally as in *pecosana* but vertex and dorsum of thorax with hairs bright ochraceous; tergum 1 without pale fimbria, occasionally small lateral patches of pale pubescence present; terga 5 and 6 ochraceous medially to white laterally.

Male. MEASUREMENTS AND RATIOS: N = 5; length, 11–12 mm; width, about 3 mm; wing length, M = 3.67 ± 0.178 mm; FL/FW, M = 1.04 ± 0.018; FS1/FS2, M = 1.86 ± 0.047.

INTEGUMENTAL COLOR: As in *pecosana* except as follows: flagellar segments below dark reddish-brown; parocular areas without pale maculae, black; supraclypeal area black; wing membranes slightly infumate, veins dark reddish-brown; tibiae with extreme apex occasionally rufescent; femora piceous.

STRUCTURE: Generally as in *pecosana* with the following differences: maxillary palpal ratio about 1.0:1.0:0.8:0.8:0.7:1.0; labial palpal ratio about 2.3:1.0:0.7:0.8; tergum 1 with subapical punctures separated mostly by 2 to 3 puncture widths at least in median third of tergum.

Genital capsule and sterna 7 and 8 (Figs. 104–108) similar to those of *pecosana*, but note the following: gonocoxites with dorsal lobes long, broad, blunt; volsellae larger; sternum 8 with coarse hairs in broadened neck region, fine hairs subapically.

VESTITURE: Generally as in *pecosana* but slightly darker, generally ochraceous, and tergum 1 without distinct apical pale fascia at least medially.

Type Material. Holotype female (MSU), allotype male (MSU) and three male paratypes (MSU, INHS) were collected by R. and K. Dreisbach at Pachuca, Hidalgo, México, October 30, 1957. Four additional female and one male paratype from México are as follows (MSU, INHS, RBR): HIDALGO: *Ozumbilla*, 1 ♀, October 30, 1957, R. and K. Dreisbach. VERACRUZ: *Perote* (4 miles S.), 2 ♀♀ and 1 ♂, D. H. Janzen, August 9, 1964. *Rio Blanco*, 1 ♀, R. and K. Dreisbach, November 13, 1957.

Remarks. This species is exceedingly close to *A. pecosana*, differing primarily in integumental and hair coloring and the lack of the first tergal apical hair band. These characters could indicate merely a geographical race of *pecosana*. However, typical *pecosana* is known from the same area of Hidalgo, México, as is *fumosa* and the tergal hair band is considered to be a more stable character than, perhaps, it ought to be. Also, the male terminalia are quite different in the two species. At any rate, the fact that a distinctive race does occur, if it proves to be merely a race, will not be lost if the form is given specific status until more evidence becomes available.

Andrena (Callandrena) barberi Cockerell

Andrena barberi Cockerell, 1898, Ann. Mag. Nat. Hist., ser. 7, vol. 2, p. 448; 1931, American Mus. Nov., No. 458, p. 14.

Andrena (Pterandrena) barberi: Lanham, 1949, Univ. California Publ. Ent., vol. 8, p. 200.

This large species is the first of a series of species in which the propodeal corbicula is without an anterior fringe of hairs, with a long dorsal fringe and with the interior completely free of hairs except occasionally for a few near the dorsal margin in the posterior half. *A. barberi* is distinctive within this group in both sexes by the large size of the longitudinal posterior propodeal sulcus as described below.

Female. MEASUREMENTS AND RATIOS: N = 17; length, 12.5–14.0 mm; width, 3.0–4.5 mm; wing length, M = 4.30 ± 0.127 mm; FL/FW, M = 1.04 ± 0.005; FOVL/FOVW, M = 3.32 ± 0.035.

INTEGUMENTAL COLOR: Black except as follows: mandibles with

apical thirds rufescent; flagellar segments 3 or 4 dark reddish-brown below; wing membranes slightly infumate apically, veins brownish-black to dark reddish-brown; terga 1-4 occasionally extremely narrowly hyaline apically; sterna 2-5 usually extremely narrowly hyaline apically, just basad of hyaline margins dark rufescent; distitarsi usually rufescent; tibial spurs yellow.

STRUCTURE: Scape length equal to flagellar segments 1-3; flagellar segment 1 slightly longer than segments 2 through 4, segments 2 and 3 subequal in length and slightly shorter than 4. Eye about three and one-half times as long as broad; inner margins parallel. Malar space linear. Mandibles short, outer mandible in repose extends beyond middle of labrum by about one-fourth mandibular length or slightly more, bidentate apically; ventrobasal lamella absent; subgenal coronet present. Galea as in *helianthi*. Maxillary palpus as in *helianthi* but segmental ratio about 1.0:0.9:0.7:0.7:0.7:0.9. Labial palpus as in *helianthi* but segmental ratio about 2.1:1.0:0.8:1.0. Labral process about half as long as wide at base or longer, distinctly emarginate apically, almost bidentate. Clypeus evenly rounded from side to side, extending beyond ends of eyes by about one-third its length; punctures round, small, absent or sparse along midline, laterally irregularly spaced but separated by half to one puncture width, surface dulled by reticular shagreening. Supraclypeal area dulled by minute crowded punctures and fine shagreening. Genal area slightly broader than eye in profile, with small to minute punctures crowded near eye margin, posteriorly separated by one to two puncture widths, surface shiny near eye, dulled posteriorly by reticular shagreening. Vertex above lateral ocellus equals one ocellar diameter or slightly more; with crowded punctures above ocelli sparse laterally, with several minute rugulae following contour of upper end of foveae, surface dulled by fine tessellation. Face above antennal fossae with longitudinal rugulae reaching ocelli and between lateral ocellus and facial fovea, inter-rugal spaces with punctures abundant below, sparse above, surface dull to moderately shiny, finely shagreened. Facial fovea shallow, long, extending below at least to upper margin of clypeus, rounded below, rounded above and separated from lateral ocellus by more than half diameter of lateral ocellus.

Pronotum normal, with small punctures separated mostly by one to two puncture widths, sparser anteriorly, surface dulled by coarse reticular shagreening. Mesoscutum opaque, finely and densely tessellate, punctures obscure, sparse, extremely shallow, small. Scutellum similar but punctures slightly more distinct. Metanotum similar but tessellation coarser. Propodeum with dorsal enclosure with sides straight, tessellate with fine irregular rugulae mediobasally; dorso-

lateral and posterior surfaces with minute shallow punctures separated mostly by two to three puncture widths, tessellate, median longitudinal sulcus large, deep, with almost carinate lateral borders, at least half as broad as long; corbicular surface moderately shiny, coarsely and regularly tessellate. Mesepisternum with minute round punctures separated mostly by two puncture widths, sparser posteriorly, surface opaque, tessellate. Metepisternum shiny and coarsely tessellate below, upper third finely tessellate with minute crowded punctures. Tegulae impunctate. Fore wing venation as in *helianthi*. Middle basitarsus narrower than hind medially, parallel-sided. Claws and tibial spurs normal but posterior hind spur with posterior flange slightly expanded.

Metasomal terga 1-4 opaque, densely and finely tessellate, apical areas with minute crowded obscure punctures, basally with sparse, extremely shallow and obscure punctures. Pygidial plate V-shaped with apex truncate (rounded when eroded), without raised internal triangle. Sternum 2 with scattered punctures except in narrow apical area. Sterna 3-5 with basal halves impunctate, apical halves with small punctures separated mostly by one to two puncture widths except narrow impunctate apical margins.

VESTITURE: Ochraceous except as follows: vertex with dark brown hairs; mesoscutum and scutellum with dark brown medially, mesoscutal dark patch extending anteriorly beyond level of anterior margins of tegulae and laterally to parapsidal lines; terga 5 and 6 with brown hairs; sterna 3-6 with brown hairs basally, 3-5 with subapical fimbriae white; inner surfaces tarsi pale yellow. Metasomal tergum 1 with sparse long white hairs; terga 2-4 with apical fasciae of sparse white decumbent pubescence, usually broadly interrupted medially on tergum 2 and narrowly interrupted or weak medially on tergum 3. Propodeal corbicula without anterior fringe, with dorsal fringe of long plumose hairs, without interior hairs except, occasionally, a few long plumose hairs near dorsal fringe in posterior half. Trochanteral flocculus and scopal hairs as in *helianthi*.

Male. MEASUREMENTS AND RATIOS: N = 8; length, 10-13 mm; width, 2.5-3.5 mm; wing length, $M = 3.87 \pm 0.183$ mm; FL/FW, $M = 1.08 \pm 0.007$; FS1/FS2, $M = 2.01 \pm 0.026$.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical third rufescent; clypeus yellow except dark apical margin, dark maculae below and mesad of tentorial pits, extreme lateral angles and often extremely narrow posterior margin black; flagellar segments 3-11 dark red below; wing membranes hyaline, moderately infumate apically, veins dark reddish-brown to black; terga 1-5 slightly rufescent apically; sterna 2-5 rufescent to black, translu-

cent red to yellow apically; distitarsi dark rufescent; tibial spurs testaceous.

STRUCTURE: Antennae short, in repose extending back just beyond tegulae; scape length equals slightly less than first two flagellar segments; flagellar segment 1 slightly shorter than segment 2 plus 3; segment 2 distinctly shorter than 3 which is slightly shorter than 4; segments 3–11 longer than broad. Eye slightly longer than three times as long as broad, inner margins parallel or converging slightly towards mandibles. Malar space, mandible and galea as in female. Maxillary palpus as in *helianthi* but segmental ratio about 1.0:0.9:0.8:0.7:0.7:1.0. Labial palpus as in *helianthi* but segmental ratio about 2.7:1.0:0.9:1.5. Labral process, clypeus, supraclypeal area and genal area as in female. Vertex and face above antennal fossae as in female but facial rugulae fill space between lateral ocellus and eye.

Thoracic sculpturing as in female except as follows: mesoscutal and scutellar punctures slightly larger and more distinct; propodeum with dorsal enclosure with basal rugulae slightly more extensive and with lateral surface dull, with sparse punctures throughout. Wing venation as in *helianthi*. Claws and tegulae normal. Tibial spurs as in female.

Terga 1–5 sculptured as in female terga 1–4 but basal areas with distinct minute punctures separated irregularly by two to five puncture widths. Pseudopygidial area evident, extremely narrow. Sterna 2–5 sculptured as in female but tessellation denser, dull. Sternum 6 flat, with a deep apical V-shaped emargination.

Sternum 7 (Fig. 113) similar to that of *braccata* but median emargination much deeper. Sternum 8 (Fig. 112) much as in *braccata*. Genital capsule (Figs. 109–111) as in *helianthi* but note knobbed and extremely long gonoforceps, the extremely slender penis valves, the long pointed dorsal lobes of gonocoxites and the relatively sparse hairs.

VESTITURE: Generally as in female with the following differences: mesoscutal and scutellar dark patches reduced in size; terga 2 and 3 with apical fasciae complete but weak medially or narrowly interrupted; terga 6 and 7 with golden-brown to dark brown hairs, paler laterally; sterna 3–5 without clear subapical fimbriae, subapical hairs decumbent, about same length as more basal hairs; inner tarsal hairs orange to yellow; outer tarsal and tibial hairs often golden.

Type Material. The holotype female of *A. barberi* from Ruidoso Forks, New Mexico was collected by C. M. Baker, July 30, 1898, on *Prunus* sp. (USNM No. 4334).

Distribution. *A. barberi* is known from New Mexico and Mexico. It has been collected from June 29th through November 13th, but

chiefly during August. In addition to the holotype, 26 females and 26 males have been examined from the localities listed below.

NEW MEXICO: Eagle Creek (South Fork), White Mts.; Ruidoso Forks; White Mts. *México*. DURANGO: Coyotes; Otinapas; Palos Colorados. GUADALAJARA: Guadalupe. GUANAJUATO: Guanajuato (8 miles N.). HIDALGO: Pachuco; Tulancingo (4 miles E. and 7 miles S.). MÉXICO: Atlacomulco (22 miles N.); Toluca (25 miles N.W.). PUEBLA: Huachinango (8 miles W.); Zacatlan (6, 20 & 23 miles N.W.). TLAXCALA: Apizaco (10 miles N.). VERA CRUZ: Jalapa (13 miles N.W.); Rio Blanco.

Floral Records. The records of flower visits for *A. barberi* are scarce. The holotype was taken on *Prunus* sp., but, due to the lateness of the season that it was collected, one wonders whether the specimen was correctly labeled or not. Other flower data indicate that *barberi* is an oligolege on flowers of the family Compositae, although a single male was taken on *Argemone* (Papaveraceae). Flowers from which *barberi* has been collected are listed below.

Argemone sp., *Bidens triplinervia* var. *macrantha*, *Heterotheca* sp., *Prunus* sp. (?), *Rudbeckia laciniata*, *Solidago trinervata*.

Andrena (Callandrena) rava, n. sp.

This is a large Mexican species closely related to *A. barberi*. The female of *rava* differs from that of *barberi* in the paler vestiture (without brown hairs on vertex, dorsum of thorax or apical terga) and the pale hind basitarsi. The male of *rava* differs from that of *barberi* in that terga 1-5 are broadly hyaline apically and the basitarsi and often the tibiae are pale. The female of *rava* is similar to that of *barberi* and differs from *helianthi* and its relatives in the form of the propodeal corbicula as described below.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 12-15 mm; width, 3.0-4.5 mm; wing length, M = 4.75 ± 0.137 mm; FL/FW, M = 1.02 ± 0.005; FOVL/FOVW, M = 2.88 ± 0.023.

INTEGUMENTAL COLOR: Black except as follows: mandible with at least apical half dark rufescent; flagellum dark brownish-black below; tegulae testaceous; wing membranes infumate apically, yellowish-brown, basal two-thirds moderately infumate, veins dark brown to black; terga 1-4 narrowly hyaline apically, narrowly rufescent basad of hyaline margins; sterna 2-5 narrowly hyaline apically, yellowish, slightly rufescent basally; distarsi and basitarsi red to orange, hind tibiae usually and occasionally apex of middle tibiae red to orange.

STRUCTURE: Scape length distinctly longer than flagellar segments 1-3; flagellar segment 1 about as long as segments 2 and 3 plus

half of 4; segment 2 subequal to 3, each shorter than segment 4; segments 6-10 longer than broad. Eye almost four times as long as broad, inner margins parallel. Malar space, mandible and galeae as in *barberi*. Maxillary palpus as in *helianthi* but segmental ratio about 1.1:1.0:0.9:0.7:0.6:0.7. Labial palpus as in *helianthi* but segmental ratio about 2.3:1.0:0.7:1.0. Labral process as in *barberi*. Clypeus as in *barberi* but somewhat flattened medially or apicomediaally (occasionally slightly depressed) and shiny, unshagreened except near extreme posterior margin. Supraclypeal and genal areas as in *barberi* but slightly shinier. Vertex as in *barberi*. Face above antennal fossae as in *barberi* but rugulae weak especially medially and not always extending between lateral ocelli and foveae (not in holotype). Facial fovea as in *barberi* but extending below to level of posterior margin of clypeus medially and separated from lateral ocellus by two-thirds to almost one ocellar diameter.

Thoracic structure as in *barberi* but propodeal posterior surface impunctate medially and propodeal posterior longitudinal sulcus narrow, several times as long as broad, although with distinct lateral margins. Tegulae and wing venation as in *barberi*. Middle basitarsus slightly narrower than hind basitarsus medially, parallel-sided. Claws and tibial spurs normal. Metasomal sculpturing and pygidial plate as in *barberi*.

VESTITURE: Generally pale ochraceous below and at sides and bright ochraceous above. Mesoscutum posteromedially, scutellum medially, metanotum medially and propodeum medially usually bare or almost so. Metasomal vestiture as in *barberi* but terga 5 and 6 with hairs white to golden. Inner surfaces tarsi pale yellow. Pollen-collecting hairs as in *barberi* except scopal hairs only moderately plumose throughout.

Male. MEASUREMENTS AND RATIOS: N = 14; length, 11-13 mm; width, 2.5-3.5 mm; wing length, $M = 4.46 \pm 0.156$ mm; FL/FW, $M = 1.08 \pm 0.005$; FS1/FS2, $M = 1.85 \pm 0.038$.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical third or more dark rufescent; flagellar segments 3-11 dark brownish-black below; tegulae testaceous; wing membranes infumate apically, veins dark reddish-brown to black; terga 1-5 with apical margins broadly hyaline, colorless, with narrow area adjacent to hyaline margins rufescent; sterna 2-5 narrowly hyaline apically, yellowish; tarsi, hind tibiae, apex of middle and usually front tibiae orange to red.

STRUCTURE: Antennae short, in repose extending back just beyond tegulae; scape length equals flagellar segments 1 plus 2; flagellar segment 1 about equal in length to segments 2 plus 3; segment 2 slightly shorter than 3 which is subequal to 4; segments

5-11 longer than broad. Eye about three and one-half times as long as broad, inner margins converging slightly toward mandibles. Malar space, mandible and galea as in female. Maxillary palpus as in *helianthi* but segmental ratio about 1.2:1.0:1.0:0.9:0.8:0.8. Labial palpus as in *helianthi* but segmental ratio about 1.8:1.0:0.8:0.9. Labral process, clypeus, supraclypeal area, genal area, vertex and face above antennal fossae as in female.

Thoracic structure and sculpturing as in female, but mesoscutal and scutellar punctures slightly more evident; propodeal posterior longitudinal sulcus narrow as in female. Metasomal terga sculptured as in female but basal area punctures slightly more evident although only barely discernible. Sternum 6 flat with deep apical V-shaped emargination.

Genitalia and sterna 7 and 8 (Figs. 114-118) similar to those of *barberi* but note the following: penis valves very broad basally; volsellae smaller; dorsal lobes gonocoxites extremely short; sternum 7 with apicolateral lobes with apices obliquely flattened; sternum 8 broad and emarginate at apex.

VESTITURE: Generally as in female except as follows: dorsum of thorax not bare; terga 2-5 with apical fasciae complete, composed of long weak pale ochraceous pubescence; sterna 3-5 with subapical fimbriae indistinct of moderately short, decumbent hairs; inner surfaces tarsi golden.

Type Material. The holotype (SECK) female and the allotype (SECK) male were collected by the University of Kansas Entomological Expedition in Mexico. The holotype female was taken four miles west of Ciudad Hidalgo, Michoacán, April 19, 1953, and the allotype male at Pachuca, Hidalgo, April 24, 1953.

Twenty female and thirteen male paratypes were collected as listed below (SECK; INHS; AMNH; UCB; USNM). In the list below the University of Kansas Entomological Expedition is abbreviated to UKEX.

DURANGO: *Encino.* 3 females, 1 male, July 27, 1947, W. Gertsch and H. Spieth. **HIDALGO:** *Pachuca.* 1 female, 1 male, April 24, 1953, UKEX. **JALISCO:** *Lagos de Moreno.* 4 females, 3 males, on composites, August 4, 1954, R. F. Smith, E. G. Linsley; 4 females, August 4, 1954, J. W. MacSwain; 1 male, July 27, 1962, UKEX. *Ojuelos* (6 miles S.). 1 male on *Heterotheca* sp., July 25, 1962, UKEX. **NUEVO LEON:** *Saltillo* (41 miles S.). 1 female on *Encelia farinosa*, September 7, 1962, UKEX. **SAN LUIS POTOSÍ:** *San Luis Potosí* (29 miles S.W.). 2 males, July 25, 1962, UKEX. **TLAXCALA:** *Apizaco* (10 miles N.), August 19, 1962, R. B. Roberts. **ZACATECAS:** *Fresnillo* (9 miles S.). 3 females, August 7-14, 1954, E. G. Linsley, J. W. MacSwain, R. F. Smith.

Andrena (Callandrena) monticola, n. sp.

This medium-sized bee from Arizona and Mexico is very similar and closely related to *A. barberi* Cockerell. *A. monticola* can be readily distinguished from *barberi* in both sexes by the short narrow sulcus on the posterior surface of the propodeum. *A. monticola* is similar to *barberi* but differs from *rava* in having dark hairs on the vertex, mesoscutum, scutellum and last two metasomal terga of both sexes and in having dark basitarsi and tibiae. As in *rava*, the tibial scopal hairs are only weakly plumose in the female and the propodeal corbicula is formed as in both *rava* and *barberi*.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 11–13 mm; width, 3–4 mm; wing length, M = 3.59 ± 0.068 mm; FL/FW, M = 0.99 ± 0.014 ; FOVL/FOVW, M = 2.82 ± 0.102 .

INTEGUMENTAL COLOR: Black except as follows: mandible dark rufescent; flagellum below dark brownish-black; tegulae piceous; wing membranes hyaline, colorless or slightly infumate apically and along veins, veins dark brown to black; terga 1–4 extremely narrowly hyaline apically; sterna 2–5 narrowly hyaline apically, somewhat rufescent basally; distitarsi dark rufescent; basitarsi piceous; tibial spurs yellow.

STRUCTURE: Scape length and flagellar segments as in *rava*. Eye almost four times as long as broad, inner margins parallel. Malar space, mandibles and galeae as in *barberi*. Maxillary palpus as in *helianthi* but segmental ratio about 1.2:1.0:0.9:0.8:0.6:0.9. Labial palpus as in *helianthi* but segmental ratio about 2.7:1.0:0.9:1.2. Labral process as in *barberi*. Clypeus as in *barberi* but usually not dulled except at extreme base (not dulled in holotype) and with sparse irregular transverse weak rugulae often present. Supraclypeal and genal areas as in *barberi*. Vertex above lateral ocellus equal to about one ocellar diameter, sculptured as in *barberi*. Face above antennal fossae and facial foveae as in *rava*.

Thoracic structure and sculpturing as in *barberi* except propodeum with posterior longitudinal sulcus narrow, short, with distinct lateral margins. Wing venation, tibial spurs, middle basitarsi as in *barberi*. Metasomal terga 1–4 sculptured as in *barberi* but basal area punctures slightly more distinct. Pygidial plate V-shaped, apex rounded, without raised internal triangular area. Sterna 2–5 sculptured as in *barberi*.

VESTITURE: Generally as in *barberi* with the following differences: terga 1–4 with apical fasciae white; tergum 1 with a complete but weak apical fascia or fascia interrupted medially and weak at sides; tergum 2 with apical fascia weak or narrowly interrupted

medially; scopal hairs weakly plumose throughout, an occasional hair simple.

Male. MEASUREMENTS AND RATIOS: N = 20; length, 10–12 mm; width, 2.5–3.0 mm; wing length, $M = 3.37 \pm 0.115$ mm; FL/FW, $M = 1.02 \pm 0.005$; FS1/FS2, $M = 1.93 \pm 0.029$.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical half rufescent; flagellar segments 2–11 dark brownish-black below; clypeus yellow except apical margin, dark maculae below and mesad of tentorial pits, lateral angles and narrow basal margin dark; tegulae piceous; wing membranes hyaline, slightly infumate apically, veins dark brown to black; terga 1–5 extremely narrowly hyaline apically, occasionally slightly rufescent basad of hyaline margins (allotype); sterna 2–5 narrowly hyaline, yellowish apically; distitarsi dark rufescent; basitarsi and tibiae piceous; tibial spurs yellow.

STRUCTURE: Antennae short, in repose extending back to just beyond tegulae; scape length equals flagellar segments 2 and 3 plus half of 4; flagellar segment 1 subequal to segments 2 plus 3; segment 2 shorter than 3 which is shorter than segment 4; segments 4–11 longer than broad. Eye about three and three-fourths as long as broad, inner margins converging slightly towards mandibles. Malar space, mandible and galea as in female. Maxillary palpus as in *helianthi* but segmental ratio about 1.3:1.0:1.0:0.8:0.6:0.9. Labial palpus as in *helianthi* but segmental ratio about 1.9:1.0:0.7:1.0. Labral process, clypeus, supraclypeal area, and the genal area as in female. Vertex and face above antennal fossae as in female but weak facial rugulae between lateral ocellus and eye.

Thoracic sculpturing and structure as in female except as follows: mesoscutal and scutellar punctures slightly more distinct; propodeum with lateral surface coarsely tessellate, opaque. Wing venation as in *helianthi* but one specimen with only two submarginal cells in both wings and one specimen with two submarginal cells in left wing. Claws, tegulae and tibial spurs normal.

Tergal sculpturing as in female except terga 1–5 like female terga 1–4 but basal area punctures slightly larger. Pseudopygidial area scarcely discernible, extremely narrow. Sternum 6 flat with deep apical V-shaped emargination.

Genitalia and sterna 7 and 8 (Figs. 119–123) similar to those of *rava* but note the following: penis valves with sharp apices but greatly expanded near tip, narrow basally; dorsal lobes gonocoxites large, rounded apically; sternum 7 with apicolateral lobes large, horizontal at apices, with short stout hairs; sternum 8 more as in *barberi* than *rava*.

VESTITURE: Generally white to pale ochraceous but vertex, meso-

cutum, scutellum and terga 6 and 7 with sparse brown hairs; inner surfaces tarsi golden. Terga 2-5 with complete weak apical fasciae of white pubescence. Sterna 3-5 without distinct subapical fimbriae, subapical hairs of moderate length or short and decumbent.

Type Material. The holotype (UCB) female and allotype (UCB) male from Rustlers Park, Chiricahua Mts., Arizona, were collected on *Cirsium* sp., August 26, 1959, by E. G. Linsley. Three female and twenty-six male paratypes were collected with the holotype and allotype. In addition, fifty-four female and twenty male paratypes (UAT; UCB; CAS; USU; SECK; INHS; AMNH; USNM) from the Chiricahua Mts., Arizona, are as follows:

BARFOOT CAMP GROUNDS: 2 ♀♀, September 13, 1955, C. and M. Cazier. CHIRICAHUA MTS.: 2 ♀♀ on *Solidago* sp., September 6, 1953, G. D. Butler; 12 ♀♀ on *Heliopsis* sp., September 28, 1960, G. E. Bohart. ONION SADDLE: 1 ♀, September 13, 1955, C. and M. Cazier; 4 ♀♀, September 15, 1955, G. E. Bohart; 2 ♀♀, 7 ♂♂, September 3, 1959, J. R. Powers; 2 ♀♀, 2 ♂♂, September 4, 1959, P. H. Arnaud; 1 ♀, September 4, 1959, J. M. Burns; 7 ♀♀, 2 ♂♂, September 5, 1962, J. G. Rozen, M. Statham, S. J. Hessel. PINERY CANYON: 1 ♂, September 8, 1950, T. Cohn, P. Boone, M. Cazier; 15 ♀♀, 2 ♂♂, September 5, 1952, J. G. Rozen, M. Statham, S. J. Hessel; 1 ♂, September 8, 1959, D. D. Linsdale. RUSTLERS PARK: 1 ♂, August 27, 1958, J. M. Marston; 2 ♀♀, 3 ♂♂, September 3, 1959, J. R. Powers; 1 ♀, 1 ♂, September 4, 1959, D. D. Linsdale; 1 ♀, September 4, 1959, J. M. Burns; 1 ♀, on *Aster* sp., August 31, 1964, C. D. Michener.

Distribution. *A. monticola* is known to range from the state México in México north to the Chiricahua Mts. in Arizona. It has been collected from April 20th (in Mexico) through September 28th. In addition to the type material listed above, 4 females and 5 males from the following localities in México have been examined:

CHIHUAHUA: Santa Barbara. DURANGO: Palos Colorados. GUANAJUATO: Guanajuato. MÉXICO: Texcoco; Meadow Valley.

Andrena (Callandrena) helianthiformis Viereck and Cockerell

Andrena helianthiformis Viereck and Cockerell, 1914, Proc. United States Nat. Mus., vol. 48, p. 26.

Andrena (Pterandrena) helianthiformis: Lanham, 1949, Univ. California Pub. Ent., vol. 8, p. 200.

This is a large early summer species of the western great plains and is not related closely to any of the foregoing species. It is, perhaps, related to *A. helianthi* which it resembles in its shiny and

flattened clypeus and its relatively short, rounded, labral process. It differs from *helianthi* in its dark wing membranes, short facial foveae in the female, dark tarsi and basitarsi, and sculpturing of the head and terga as described below. In its tergal sculpturing and short facial foveae of the females *helianthiformis* resembles *aliciae* and can be distinguished from *aliciae* by the dark wing membranes, the shiny clypeus, and the shape of the basitarsus of the female.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 12–16 mm; width, 3.5–5.0 mm; wing length, $M = 5.52 \pm 0.468$ mm; FL/FW, $M = 1.06 \pm 0.005$; FOVL/FOVW, $M = 2.45 \pm 0.034$.

INTEGUMENTAL COLOR: Black except as follows: flagellar segments 4–10 below and mandibles slightly rufescent; tegulae bright rufescent to testaceous, translucent; wing membranes deeply infumate, brown, veins, dark-brown to black; tergal apices extremely narrowly hyaline, brownish; sternal apices hyaline, yellow.

STRUCTURE: Scape equal in length to slightly more than flagellar segments 1–3; flagellar segment 1 slightly shorter than segments 2–4, segments 2–4 subequal in length to each other. Eye about three and one-half times as long as broad, inner margins parallel or extremely slightly converging toward mandibles. Malar space and mandible as in *helianthi*. Galea and maxillary palpus as in *helianthi*, but palpal segments in ratio of about 1.8:2.0:1.3:1.3:1.0:1.4. Labial palpus as in *helianthi* with segments in ratio of about 3.7:1.7:1.2:1.0. Labral process short and evenly rounded as in *helianthi* but distinctly emarginate medially although emargination usually shallow. Clypeus protruding beyond ends of eyes by about one-third its median length, flattened, sculptured much as in *helianthi*. Supraclypeal area with crowded punctures, usually with fine longitudinal rugulae converging dorsally, surface shiny, unshagreened. Genal area broader than eye in profile, eye equals about three-fourths of genal area, with small to minute punctures near eye margin crowded in a zone of about four to five puncture widths, posteriorly separated by one to two puncture widths, surface moderately dulled by fine reticular shagreening. Vertex of moderate height, above lateral ocellus equals about two ocellar diameters, above ocelli with distinct crowded punctures, laterally punctures distinctly separated but yet abundant, surface dulled by fine tessellation. Face above antennal fossae with extremely weak longitudinal rugulae not extending more than about half distance from fossae to ocelli, with abundant, close-set, round punctures, surface shiny. Facial fovea short, extending about to level of middle of antennal fossa or shorter, rounded to slightly flattened above and separated from lateral ocellus by slightly less than one ocellar diameter, narrowly rounded below near eye margin.

Pronotum normal, with abundant, small punctures crowded above and well-separated at sides, surfaces dulled by fine reticular shagreening. Mesoscutum, scutellum and metanotum with moderate-sized, crowded punctures separated mostly by half a puncture width or less, surface dulled by fine reticular shagreening. Propodeum opaque, dulled by extremely fine, irregular rugulae and fine tessellation; dorsolateral and posterior surface with distinct punctures separated by half to one puncture width or slightly more, surface dulled by fine tessellation; corbicular area moderately shiny with small scattered punctures throughout, surface reticularly shagreened. Mesepisternum with small shallow punctures separated mostly by half to one puncture width, surface opaque, densely and finely tessellate. Metepisternum below similar to corbicular area but impunctate. Middle basitarsus not markedly expanded medially, with evenly curved sides, equal in width to hind basitarsus. Claws and tibial spurs normal. Wing venation as in *helianthi*.

Metasomal tergum 1 with narrow apical area impunctate; reticulotransversely shagreened, basad of this apical area with crowded round deep punctures; basal area with sparser punctures separated by two to three puncture widths; surfaces finely tessellate. Terga 2-5 with extremely narrow apical margins impunctate, apical areas with crowded deep round punctures, basal area with deep round punctures separated mostly by one to two punctures widths; surfaces finely tessellate, opaque. Tergum 5 with basal area with coarse punctures separated mostly by one to three puncture widths, surface opaque, finely tessellate. Pygidial plate V-shaped with small rounded apex. Sterna 2-5 with narrow apical margins impunctate, with basal areas with well-separated, round punctures near apical areas, punctures becoming sparser basad; surfaces dulled by reticular shagreening.

VESTITURE: In general pale ochraceous to bright yellow; vertex and dorsum of thorax usually dark ochraceous to yellow, paler at sides and below. Tergum 1 without apical fascia, basal area with short, erect, pale ochraceous hairs. Terga 2-4 with weak, white, apical fasciae; basal areas with short, erect, pale ochraceous hairs. Terga 5 and 6 with long golden-yellow to brownish hairs. Sterna 2-5 with long erect to suberect hairs along apical hyaline margins, hairs becoming shorter posteriorly, ochraceous. Propodeal corbiculum incomplete anteriorly, with long dorsal fringe, with long internal hairs scattered throughout. Trochanteral flocculus complete, thick. Tibial scopal hairs plumose throughout, each with several branches in apical half, hairs short along posterior margin, long and normal medially and anteriorly. Leg hairs pale ochraceous to white except as follows: inner surfaces tarsi usually yellow,

outer surfaces middle and hind basitarsus often brownish.

Male. MEASUREMENTS AND RATIOS: N = 6; length, 12–14 mm; width, 3.0–3.5 mm; wing length, $M = 4.92 \pm 0.375$ mm; FL/FW, $M = 1.08 \pm 0.004$; FS1/FS2, $M = 2.38 \pm 0.069$.

INTEGUMENTAL COLOR: As in female except as follows: clypeus yellow except brown apical margin and lateral angles and small, triangular maculae below and mesad of tentorial pits; tegulae testaceous; wing membranes infumate, yellowish-brown to brown; distitarsi rufescent.

STRUCTURE: Antennae short, just reaching tegulae in repose; scape subequal to flagellar segments 1–3; flagellar segment 1 slightly shorter than segments 2–4, segment 2 subequal to 3 and each shorter than segment 4. Eye about three and one-half times as long as broad or slightly less; inner margins converging slightly towards mandibles. Malar space, mandibles and galea as in female. Maxillary palpus as in female but segments in ratio of about 1.8:2.0:1.3:1.3:1.0:1.4. Labial palpus as in female but segments in ratio of about 3.7:1.7:1.2:1.0. Clypeus as in female but less flattened medially and punctures slightly coarser, medially separated mostly by half to one puncture width or slightly more. Genal area, vertex and face above antennal fossae as in female except genal area not much broader than eye. Sculpturing of thorax as in female except as follows: propodeum with lateral surfaces with more abundant punctures and surface dulled by tessellation at least above. Wings, claws and tibial spurs as in female.

Terga 1–5 as in female terga 1–4. Sterna 2–5 with apical areas impunctate; basal areas with small, well-separated punctures, separated mostly by two to three puncture widths; surfaces moderately shiny, reticularly shagreened. Sternum 6 strongly reflexed apically, with extremely broad, shallow, median emargination.

Genitalia and sterna 7 and 8 (Figs. 124–128) as figured. Note especially the following structures: gonoforceps slightly upturned near apices; penis valve expanded near base with distinct lateral lamellae in expanded area; sternum 7 with apical emargination V-shaped, apicolateral lobes pointed; sternum 8 without expansion in neck region, apex broadened and shallowly emarginate, almost entire neck region hairy.

VESTITURE: In general pale ochraceous to yellow, slightly darker on vertex of head and thoracic dorsum. Tergum 1 without apical pale fascia. Terga 2–5 with weak apical white fimbriae. Terga 1–5 with basal areas with erect, abundant, white to pale ochraceous hairs. Terga 6 and 7 with yellow to brownish hairs. Sternal hairs pale ochraceous, suberect to erect, forming weak bands near apical

hyaline zones. Leg hairs white to ochraceous except inner surfaces tarsi yellow.

Type Material. The holotype female of *helianthiformis* is from Montana (PANS No. 4084).

Distribution. *A. helianthiformis* ranges from Kansas north to Montana and North Dakota. It has been collected from June 1st to July 21st, chiefly during June. In addition to the holotype 58 females and 20 males have been examined. Locality records are listed below.

KANSAS: Baldwin; Baxter Springs (5 miles S. and 5 miles E.); Blue Rapids; Cottonwood Falls, Chase Co.; Cowley County; Douglas County; Franklin County; Kansas City; Marysville; Meade; Meade County State Park; Ottawa; Scott State Park, Scott Co.; Stockton; Trego County; Yates Center (3 miles E.). MONTANA: "Montana" NEBRASKA: Carns; Pine Ridge, Dawes Co.; West Point. NORTH DAKOTA: Marmarth; Minot. SOUTH DAKOTA: Hot Springs; Key Stone; Whitewood.

Floral Records. This species seems to be an oligolege of the genus *Echinacea* (Compositae). Of a total of 38 specimens bearing floral data 33 (28 females, 5 males) have been taken from *Echinacea*. *A. helianthiformis* has been collected from flowers of the following plants:

Amorpha canescens, *Echinacea augustifolia*, *E. pallida*, *Gailardia* sp., *Heliopsis helianthioides*, *Melilotus officinalis*.

Andrena (Callandrena) irrasus, n. sp.

Andrena lincolnella: Viereck and Cockrell, 1914, Proc. U.S.N.M., vol. 48, p. 46 (misdetermination in part).

A. irrasus is medium-sized species from the Great Plains and eastern Rocky Mountain area. It is closely related to *A. braccata* Viereck. The female of *irrasus* can be distinguished from that of *braccata* by the short, shiny, coarsely punctate clypeus, the narrow short facial foveae, and the slightly more punctate terga. The female of *irrasus* differs from that of *helianthi* by the broader area between the facial fovea and the lateral ocellus, in sculpturing of the propodeum and terga, and in the sculpturing and hairs of the mesonotum as described below. The male of *irrasus* is very similar to that of *braccata* but can be differentiated by the more coarsely punctate clypeus and metasomal terga and by the basitarsus being piceous, or at most dark reddish-brown.

Female. MEASUREMENTS AND RATIOS: N = 5; length, 11.0–13.0 mm; width, 3.5–4.5 mm; wing length, M = 3.91 ± 0.284 mm; FL/FW, M = 0.97 ± 0.035; FOVL/FOVW, M = 2.98 ± 0.142.

INTEGUMENTAL COLOR: Black except as follows: flagellar segments 3-10 slightly rufescent below; mandibles rufescent; tegulae slightly rufescent; wing membranes slightly infumate, yellowish; tergal apical areas slightly rufescent; sternal apical areas hyaline, yellow; distitarsi rufescent, basitarsi slightly rufescent; tibial spurs yellow.

STRUCTURE: Scape distinctly longer than flagellar segments 1-3; flagellar segment 1 equal in length to segments 2 plus 3 plus half of 4, segments 2 slightly shorter than 3, each shorter than segment 4. Eye narrow, about four times as long as broad, inner margins converging slightly toward mandibles. Malar space linear, more than six times broader than long. Outer mandible in repose exceeding middle of labrum by about one-fourth its own length, bidentate, ventrobasal lamella poorly developed. Galea and maxillary palpus as in *helianthi* but galea shorter and palpal segments in ratio of about 1.3:1.2:1.0:1.0:0.8:1.9. Labial palpus as in *helianthi* but segments in ratio of about 2.0:1.0:1.0:1.2. Labral process subrhomboidal in outline, usually entire, occasionally extremely shallowly emarginate. Clypeus gently rounded; protruding beyond ends of eyes by about one-third median clypeal length; punctures coarse, round, separated mostly by one-half puncture width except in median impunctate area which is about 3 to 4 punctures wide, surface shiny, unshagreened except peripherally. Supraclypeal area with rounded, deep punctures, surface moderately shiny, finely shagreened. Genal area broader than eye as in *helianthi*, punctures near eye margin small, separated mostly by one to two puncture widths, posteriorly larger but sparser, surface moderately shiny, reticularly shagreened. Vertex as in *braccata* except punctures more abundant, tessellation fine, punctures especially crowded and distinct just above facial foveae. Face above antennal fossae with fine, irregular, longitudinal rugulae, reaching ocelli and extending above facial foveae laterally. Facial fovea short, extending below to about middle of antennal fossa, upper end rounded, separated from lateral ocellus by about one ocellar diameter, lower end narrower, rounded.

Pronotum normal, with minute punctures, dorsally separated by one to two puncture widths, sparser laterally, surface dull, tessellate. Mesoscutum with coarse round punctures, medially separated mostly by two to three puncture widths, crowded peripherally, surface shiny posteromedially, dulled by coarse tessellation elsewhere. Mesoscutum similar, punctures somewhat more abundant medially, moderately shiny. Metanotum similar, punctures crowded, completely dulled. Propodeal enclosure as in *braccata*; dorsolateral and posterior surface as in *braccata* but rugulae less evident; corbicular area with abundant small punctures in upper half or slightly more, surface moderately dulled by coarse reticular shagreening.

Mesepisternum with small, shallow punctures separated mostly by two to three puncture widths, surface opaque, finely tessellate. Mesepisternum below impunctate, surface shiny, coarsely reticularly shagreened. Middle basitarsus not markedly expanded medially, with evenly curved sides, slightly narrower than hind basitarsus. Tibial spurs and claws normal. Front wing with venation as in *helianthi*.

Metasomal tergum 1 with apical area except narrow apical margin with distinct, round, deep, punctures separated by one to two puncture widths; basal area with similar punctures separated mostly by three to four puncture widths or more; surface dull, tessellate. Terga 2 and 3 similar but apical areas with punctures more crowded. Tergum 4 similar but basal area with punctures sparser. Tergum 5 with basal area with coarse punctures separated by one to four puncture widths. Pygidial plate V-shaped with narrow rounded apex. Sterna 2-5 with apical area impunctate, moderately shiny, extremely finely shagreened; basal areas with abundant punctures, near apical areas separated mostly by one to two puncture widths becoming sparser basally, surface dulled by tessellation.

VESTITURE: Generally pale ochraceous to ochraceous in color, vertex and dorsum of thorax dark ochraceous to yellowish, paler at sides and below. Tergum 1 without apical fascia. Terga 2-4 with apical fasciae of white hairs, that of tergum 2 generally narrowly interrupted medially. Terga 1-4 with basal areas with hairs sparse, short, pale, suberect. Terga 5 and 6 with long golden to white hairs. Sterna 2-5 with long pale ochraceous suberect hairs. Propodeal corbicula incomplete anteriorly, with abundant, long, plumose, internal hairs in upper half or more. Trochanteral flocculus complete, well developed. Tibial scopal hairs highly plumose throughout, of moderate length. Leg hairs pale ochraceous to ochraceous except inner surfaces tarsi golden-yellow.

Male. MEASUREMENTS AND RATIOS: N = 20; length, 8-10 mm; width, 2.5-3.5 mm; wing length, 3.48 ± 0.175 mm; FL/FW, M = 0.98 ± 0.007 ; FS1/FS2, M = 2.09 ± 0.033 .

INTEGUMENTAL COLOR: As in female except as follows: clypeus yellow except brown apical margin and small dark maculae below and mesad of tentorial pits; tegula usually rufescent; terga 1-5 narrowly hyaline apically.

STRUCTURE: Antennae in repose reach posterior margins of tegulae or slightly more; scape in length equals first $2\frac{1}{2}$ flagellar segments; flagellar segment 1 slightly shorter than segments 2 plus 3, segment 2 shorter than 3, segment 3 subequal to 4. Eye about three and one-half times as long as broad, inner margins converging slightly toward mandibles. Malar space, mandibles and galea as in

female. Maxillary palpus as in female but segments in ratio of about 1.1:1.0:1.0:0.7:0.6:0.8. Labial palpus as in female but segments in ratio of about 1.8:1.0:0.7:0.8. Labral process as in female but often shallowly emarginate medially. Clypeus and supraclypeal area as in female but clypeus with punctures slightly smaller and usually sparser, separated by half to one puncture width, usually without median impunctate area. Genal area, vertex and face above antennal fossae as in female but vertex usually shorter, above lateral ocellus equal to about one ocellar diameter and genal area subequal or slightly narrower than eye. Thorax sculptured as in female except as follows: mesoscutum usually evenly dulled by tessellation; lateral propodeal surface with scattered punctures in upper half, surface dull, tessellate. Wings, tibial spurs and claws as in female. Terga 1-5 as in terga 1-4 of female but punctures slightly more evident in basal areas. Tergum 6 as in female tergum 5. Sterna 2-5 with apical areas impunctate; basal areas with sparse distinct punctures separated by two to four puncture widths; surface dulled by coarse reticular shagreening. Sternum 6 shallowly emarginate apically, flat.

Genital capsule and sternum 8 (Figs 129-133) similar to those of *helianthi*. Note penis valve tips broad; gonoforceps with short hairs; sternum 8 much as in *barberi*.

VESTITURE: White to ochraceous, darker on vertex and dorsum of thorax than at sides and below. Tergum 1 with apical band of sparse long suberect hairs usually interrupted medially. Terga 2-5 with distinct apical pale fasciae. Terga 1-5 with basal vestiture sparse, pale, suberect, short. Terga 6 and 7 with long pale ochraceous to white hairs. Sterna 2-5 with long, sparse, ochraceous, suberect hairs, not forming distinct subapical bands. Leg hairs white to pale ochraceous except inner surfaces tarsi golden-yellow.

Type Material. Holotype female and allotype male (SECK), were collected by C. D. Michener and R. H. Beamer, at Yates Center, Kansas, September 7, 1949, on *Amphiachyris dracunculoides*. Forty-five male and five female paratypes (USNM; CMP; INHS; SECK) are as follows:

ILLINOIS: Carlinville, 1 ♀, Charles Robertson. KANSAS: Eureka: 1 ♀, September 7, 1949, C. D. Michener and R. H. Beamer, on *Amphiachyris* sp. Lawrence: 1 ♀, September 30, 1951, C. D. Michener, on *Aster* sp. Reece: 43 ♂♂, September 7, 1949, C. D. Michener and R. H. Beamer, on *Amphiachyris dracunculoides*. Riley County: September, Marlatt. NEBRASKA: Crawford (5 miles W.): 1 ♂, August 30, 1959, University of Nebraska State Museum Entomological Expedition, on *Chrysothamnus* sp. NEW MEXICO: Snow Hill (W. of): 1 ♀, October 6, 1895, on *Aster* sp. WYOMING:

Gillette (12 miles E.): 1 ♂, August 29, 1962, O. W. Isakson, on *Chrysothamus* sp. A single female paratype of *A. lincolnella* Viereck and Cockerell in the U.S. National Museum, Washington, D.C., is also *A. irrasa*.

Andrena (Callandrena) beameri, n. sp.

This species is known only in the female sex. The females of *beameri* are very similar to and this species is closely related to *A. irrasus*. The female of *beameri* can be told from that of *irrasus* by the mesocutal punctures being more abundant, the posterior surface of the propodeum with sparser punctures, and the metasomal terga being dulled, more coarsely tessellate. *A. beameri* also closely resembles *A. rudbeckiae* rather closely. The female of *beameri* differs from that of *rudbeckiae* by the tergal punctation being much sparser.

Female. MEASUREMENTS AND RATIOS: N = 16; length, 11.0–13.0 mm; width, 2.5–3.5 mm; wing length, M = 4.05 ± 0.177 mm; FL/FW, M = 1.05 ± 0.005 ; FOVL/FOVW, M = 2.61 ± 0.036 .

INTEGUMENTAL COLOR: Black except as follows: lower surfaces flagellar segments 4–10 slightly reddened; mandibles with apical halves rufescent; tegulae testaceous, yellowish; wing membranes slightly infumate, especially apically, veins dark reddish-brown; terga 1–4 narrowly hyaline apically, reddened in narrow zone basad of hyaline area; sterna hyaline apically; distitarsi rufescent.

STRUCTURE: Scape equal to flagellar segments 1–4 or slightly shorter; flagellar segment 1 equal in length to succeeding $2\frac{1}{2}$ segments, segment 2 equals segment 3, segments 2 and 3 equal to or extremely slightly shorter than segment 4. Eye about three and one-third times as long as broad, inner margins converging slightly toward mandibles. Malar space, mandibles, and galea as in *irrasus*. Maxillary palpus as in *irrasus* but segments in ratio of about 1.3:1.5:1.0:1.0:0.6:0.8. Labial palpus as in *irrasus* but segments in ratio of about 2.1:1.0:0.6:0.7. Labral process bidentate. Clypeus evenly rounded, protruding beyond ends of eyes by slightly less than half median length, with round deep punctures separated mostly by half a puncture width or slightly more, without distinct longitudinal median impunctate area, surface moderately dulled by reticular shagreening. Supraclypeal area with minute crowded punctures and minute longitudinal rugulae, moderately dulled by fine irregular shagreening. Genal area slightly broader than eye in profile, with minute crowded punctures near eye margin separated mostly by one-half puncture width or slightly more, posteriorly punctures slightly larger and sparser, surface dulled by reticular shagreening.

Vertex above lateral ocellus equals about one and one-half ocellar diameter, with small punctures crowded above median ocellus, sparse laterally except very crowded just above facial foveae, surface dulled by tessellation. Face above antennal fossae with longitudinal rugulae not quite or barely reaching ocelli, not extending above facial foveae laterally, interrugal spaces punctate, moderately dulled by reticular shagreening. Facial fovea extends down to about middle of antennal fossa, upper end rounded, separated from lateral ocellus by one ocellar diameter or slightly less, narrowed and rounded below.

Pronotum normal, with small round punctures dorsally separated mostly by half to one puncture width, sparser laterally, dulled by coarse reticular shagreening. Mesoscutum, scutellum and metanotum with round punctures separated mostly by half to one puncture width, slightly sparser medially on mesoscutum and scutellum, surfaces dulled by fine tessellation. Propodeum with enclosure with short fine longitudinal rugulae basally, elsewhere coarsely punctate to very finely areolate; dorsolateral surface with round punctures separated by half to one puncture width, surface tessellate; posterior surface with similar punctures separated by one to two puncture widths or more, surface tessellate; corbicular area with scattered punctures throughout, surface moderately shiny, coarsely shagreened. Mesepisternum sculptured like posterior propodeal surface. Metepisternum sculptured like corbicular area but without punctures. Wing venation as in *helianthi* except vein 1st m-cu meets second submarginal cell at or slightly beyond middle of cell. Middle basitarsus as in *irrasus*. Tibial spurs and claws normal.

Metasomal terga sculptured as in *irrasus* except tessellation somewhat deeper making surfaces opaque. Pygidial plate V-shaped with rounded apex. Sterna sculptured as in *irrasus*.

VESTITURE: In general vestiture as in *irrasus* except tergum 2 with apical pale band uninterrupted medially, propodeal corbicular area with long simple internal hairs throughout; trochanteral flocculus complete, weak; tibial scopal hairs plumose throughout but rather weakly.

Type Material. Holotype female (SECK) from 8 miles southwest of Ottawa, Kansas, June 6, 1950, was collected by C. D. Michener. Fifteen female paratypes (SECK; INHS; MSU; KSU; USNM) are as follows: Baxter Springs, Kansas: 7 ♀♀, June 12, 1951, Roland L. Fischer; 1 ♀, June 12, 1951, C. D. Michener and R. L. Fischer, on *Coreopsis grandiflora*; 2 ♀♀, June 26, 1951, C. D. Michener, on *Helenium nudiflora*; 1 ♀, June 26, 1951, C. D. Michener, on *Echinacea augustifolia*. Boles, Arkansas: 2 ♀♀, May 27, 1950, R. H. Beamer. Washington County, Arkansas: 2 ♀♀, June 12, 1951, P.

Boles. This species is named *A. beameri* in honor of the late R. H. Beamer of the University of Kansas.

Andrena (Callandrena) simplex Smith

Andrena simplex Smith, 1853, Cat. Hymen. in the British Mus., vol. 1, p. 114; Provancher, 1882, Nat. Canada, vol. 13, p. 197; 1883, Faun. Entom. du Canada, p. 697; Morice and Cockerell, 1901, Canadian Ent., vol. 33, p. 124; Cockerell, 1906, Psyche, vol. 13, p. 8.

Andrena (Pterandrena) simplex: Mitchell, 1960, North Carolina Agr. Exp. Sta. Tech. Bull. No. 141, p. 151.

Andrena solidaginis Robertson, 1891, Trans. American Ent. Soc., vol. 18, p. 55 (*new synonymy*); Graenicher, 1905, Trans. Wisconsin Acad. Sci., vol. 15, p. 91; Viereck, 1907, Ent. News, vol. 18, p. 282; Pierce, 1909, Bul. United States Nat. Mus., vol. 66, p. 690; Graenicher, 1911, Bul. Pub. Mus. Milwaukee, vol. 1, pp. 226, 237; Lovell, 1913, Ent. News, vol. 24, pp. 106, 110; Pierce, 1918, Proc. United States Nat. Mus., vol. 54, p. 442; Britton, 1920, Connecticut St. Geol. Nat. Hist. Surv. Bul., vol. 31, p. 344; Salt, 1927, Jour. Exp. Zool., vol. 46, p. 246; Brimley, 1938, Insects of North Carolina, p. 453.

Pterandrena solidaginis: Robertson, 1902, Trans. American Ent. Soc., vol. 28, p. 194; 1910, Canadian Ent., vol. 42, pp. 325, 328; 1914, Ent. News, vol. 25, p. 69; 1925, Ecology, vol. 6, p. 426; 1926, Ecology, vol. 7, p. 379; Flowers and Insects, p. 10; Pearson, 1933, Ecol. Monogr., vol. 3, p. 384.

Andrena (Pterandrena) solidaginis: Lanham, 1949, Univ. California Pub. Ent., vol. 8, p. 200; Mitchell, 1960, North Carolina Agr. Exp. Tech. Bul. No. 141, pp. 151-154; Knerer and Atwood, 1964, Proc. Ent. Soc. Ontario, vol. 94, p. 46.

Andrena radmitricha Viereck and Cockerell, 1914, Proc. United States Nat. Mus., vol. 48, p. 51 (*new synonymy*); Lanham, 1949, Univ. California Pub. Ent., vol. 8, p. 200.

Andrena determinata Viereck, 1917, Trans. American Ent. Soc., vol. 43, p. 394; Mitchell, 1960, North Carolina Agr. Exp. Sta. Tech. Bul. No. 141, p. 151 (*synonymy*).

This is a small bee ranging from the plains states to the eastern seaboard. The males of *A. simplex* are distinctive in having a yellow clypeus, short antennae with the second and third flagellar segments subequal in length and together shorter than the first segment, the sixth sternal plate strongly reflexed apically, the metasomal terga dulled by coarse reticular shagreening and impunctate, and the vestiture pale in color. The females of *A. simplex*

can be recognized by their small size, the second and third flagellar segments being subequal to one another, the facial foveae being short and broad, the terga being dulled by reticular shagreening and the middle basitarsus being distinctly broader than the hind basitarsus medially. Both sexes are distinctive in having the pterostigma at least as broad as from the inner margin of the prestigma to the wing margin and in occasional specimens slightly broader.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 9.0–10.0 mm; width, 2.5–3.0 mm; wing length, $M = 2.79 \pm 0.139$ mm; FL/FW, $M = 0.99 \pm 0.004$; FOVL/FOVW, $M = 2.47 \pm 0.037$.

INTEGUMENTAL COLOR: Black except as follows: mandible rufescent at least in apical half; tegulae often slightly rufescent; wing membrane hyaline, slightly infumate, veins dark brown to black; terga extremely narrowly hyaline apically; sterna 2–5 hyaline apically, often rufescent medially; distitarsi often rufescent; tibial spurs yellow.

STRUCTURE: Scape equal in length to flagellar segments 1–4 or slightly shorter; flagellar segment 1 longer than segments 2 plus 3, segment 2 subequal in length to segment 3 or extremely slightly shorter, segments 4–9 longer than either 2 or 3. Eye about four times as long as broad, inner margins strongly converging towards mandibles. Malar space linear, at least six times as broad as long. Mandibles short, outer mandible in repose extends about one-fourth its own length beyond middle of labrum, bidentate; ventrobasal lamella present but poorly developed. Galea dulled by fine regular tessellation, lateral surface equal in width to about half dorsal surface, curved evenly from dorsum to side. Maxillary palpus short, not reaching tip of galea, segments in ratio of about 0.8:1.0:0.6:0.5:0.4:0.7. Labial palpus with first segment flat, strongly curved, broadest near apex, segments in ratio of about 1.5:0.7:0.6:0.8. Labral process short, about three times as broad as long, strongly bidentate. Clypeus flattened slightly, protruding beyond eyes by about one-third of its own median length or less; punctures round, small, indistinct, irregular in size, coarser near apex; apical area gibbous; surface opaque, dulled by coarse reticular shagreening. Supraclypeal area with minute punctures and longitudinal shagreening moderately dulling surface. Genal area about equal in eye in width, with minute punctures crowded near eye margin, sparser posteriorly, surface moderately dulled by reticular shagreening especially posteriorly. Vertex short, above lateral ocelli equals slightly less than one ocellar diameter, with minute punctures separated mostly by one puncture width or more above ocelli, sparser laterally, surface dulled by coarse, dense tessellation. Face above antennal fossae with longitudinal rugulae extending to ocelli, interrugal spaces punctate,

reticularly shagreened at least below, moderately shiny. Facial fovea relatively deep, short, not extending below middle of antennal fossa, upper end broad, separated from lateral ocellus by about three-fourths an ocellar diameter, lower end narrow.

Pronotum normal, with minute indistinct punctures and fine reticular shagreening dulling the surface. Mesoscutum with small to minute, irregularly spaced punctures separated mostly by two to three puncture widths, surface shiny to moderately shiny, with reticular shagreening dulling surface, shinier medially. Scutellum similar but punctures larger. Metanotum dulled by fine punctures and dense coarse tessellation. Propodeum with enclosure with sides slightly concave, surface regularly tessellate, slightly more coarsely sculptured at extreme base; dorsolateral and posterior areas with small round punctures separated by two to three puncture widths, dulled by coarse tessellation; corbicular surface moderately shiny, with small scattered punctures, surface coarsely and reticularly shagreened. Mesepisternum sculptured like mesoscutum but punctures slightly more abundant. Metepisternum with lowest part sculptured like corbicular area but punctures sparse or absent. Middle basitarsus expanded slightly medially, sides evenly rounded, slightly but distinctly broader than hind basitarsus medially. Tibial spurs and claws normal. Front wing with three submarginal cells; vein 1st m-cu meets second submarginal cell near middle or slightly beyond middle of cell; pterostigma usually about as broad as from inner margin of prestigma to wing margin, occasionally slightly broader.

Metasomal terga 1-5 appear almost impunctate, punctures minute, separated mostly by three to five puncture widths, surfaces opaque, dulled by coarse reticular shagreening of about same diameter as punctures; narrow apical hyaline areas finely shagreened; apical areas basal to hyaline areas more densely punctate beneath hair bands. Pygidial plate V-shaped with apex slightly blunted. Sterna 2-5 with crowded punctures near apical areas separated mostly by two puncture widths and sparser basad, surfaces dulled by coarse reticular shagreening.

VESTITURE: Generally white except as follows: mesoscutum and scutellum medially with hairs sparse and cinereous; terga 5 and 6 often brown; hind tibia with dark brown hairs on basitibial plates and washed with brown along posterior margin; inner surfaces tarsi yellow to reddish-brown. Terga 2-4 with well-developed white apical fimbriae; tergum 1 with short lateral apical fimbriae. Sternal hairs forming weak apical suberect bands. Propodeal corbicula incomplete anteriorly, with abundant long simple internal hairs.

Trochanteral flocculus complete. Tibial scopal hairs highly plumose throughout, of normal length.

Male. MEASUREMENTS AND RATIOS: N = 20; length, 8.0–10.0 mm; width, 2.0–2.5 mm; wing length, M = 2.63 ± 0.149 mm; FL/FW, M = 1.03 ± 0.007 ; FS1/FS2, M = 2.25 ± 0.054 .

INTEGUMENTAL COLOR: As in female except as follows: clypeus yellow except brown apical margin and dark spots mesad and below tentorial pits; tergal apical hyaline areas slightly broader.

STRUCTURE: Antennae short, not extending back beyond tegulae in repose, scape slightly longer than flagellar segments 1–3; flagellar segment 1 distinctly longer than 2 plus 3, segment 2 equal in length to 3 or extremely slightly shorter, 3 distinctly shorter than 4. Eye about three and one-half times as broad or slightly longer, inner margins strongly converging towards mandibles. Malar space, mandibles, and galea as in female. Maxillary palpus as in female but segments in ratio of about 0.8:1.0:0.6:0.5:0.5:0.8. Labial palpus as in female but ratio of about 1.4:0.7:0.6:0.8. Labral process as in female. Clypeus and supraclypeal area as in female but clypeus slightly more shiny medially, shagreening finer. Genal area, vertex, and face above antennal fossae as in female.

Sculpturing of thorax as in female except as follows: propodeum with dorsal area slightly shorter. Wings, claws and tibial spurs as in female. Terga 1–5 as in female terga 1–4 but often moderately shiny, shagreening finer and reticulations coarser, punctures slightly more distinct. Tergum 7 with distinct median longitudinal glabrous area. Sterna 2–5 as in female but punctures coarser and surface slightly shinier. Sternum 6 with apical margin strongly reflexed.

Genitalia and sterna 7 and 8 as figured (Figs. 134–138). Note especially the following structures: gonoforceps with inner-dorsal ridge forming large, blunt, inwardly directed process; penis valve tips slightly knobbed, near base slightly expanded by lamellae; dorsal lobes gonocoxites short; sternum 7 with relatively shallow, V-shaped emargination; sternum 8 not expanded in neck region, tips broad, entire.

VESTITURE: In general white; terga 1–5 with weak apical hair bands, especially strong on 2 and 3, on tergum 1 usually interrupted medially by half tergum width or more; sternal hairs forming apical bands of relatively short suberect white hairs; inner surfaces tarsi yellow.

Type Material. The holotype female of *A. simplex* from the United States is in the British Museum (Natural History) in London (No. 17a1369). The lectotype (INHS) female (Robertson No. 8665) and the lectoallotype (INHS) male (Robertson No. 8655) of *A. solidaginis* from Carlinville, Illinois, September 1888, were col-

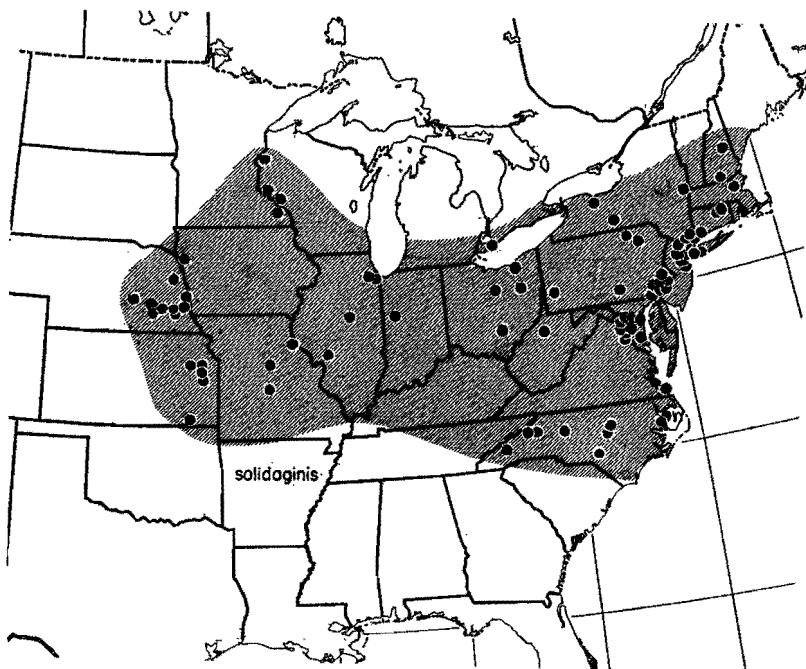


FIG. 10. Map showing the known distribution of *A. (Callandrena) simplex* Smith (= *solidoginis* Robertson).

lected by Charles Robertson. Six female and one male paratypes taken at Carlinville by Robertson are also at Urbana. The holotype (NSM) female of *A. radmitricha* Viereck and Cockerell was taken in October in Lincoln, Nebraska. The female holotype (PANS No. 4070) of *A. determinata* Viereck, was collected on August 18, 1865, at North Andover, Connecticut.

Distribution. The known distribution of *A. simplex* includes the region from Kansas, Nebraska and Minnesota in the west to New Hampshire, Massachusetts and North Carolina in the east (Fig. 10). This species has been taken from August 17th through November 8th but chiefly during September. A total of 292 females and 111 males have been examined in addition to the type material listed above. The localities of these specimens are listed below together with all published records.

CONNECTICUT: North Andover; Stafford; Stamford. ILLINOIS: Carlinville; Matteson; Macomb; Normal; Urbana; Willow Springs. INDIANA: Lafayette. IOWA: Sioux City. KANSAS: Douglas County; Garnet; Independence (3 miles E.); Lawrence; Ottawa; Topeka. MARYLAND: Beltsville; Bethesda; Cabin John; Chesapeake Beach; Glen Echo; Great Falls; Lakeland; Laurel;

Plummers Island; Yarrow. MASSACHUSETTS: Sherborn. MINNESOTA: Winona County. MISSOURI: Columbia; Hannibal; Ozark Lake. NEBRASKA: Broken Bow; Cedar Bluffs; Lincoln; Malcom; McCool; Omaha; Wabash; West Point; York County. NEW HAMPSHIRE: Meredith; Pelham. NEW JERSEY: Clifton; Englewood; Kearny; Moorestown; Palisades; Ramsey; Watchung Reservoir, Union Co.; Westfield. NEW YORK: Bay Shore; Copake Falls; Lynbrook; New Rochelle; Nyack; Rochester; Tappan; Tompkins County; West Point. NORTH CAROLINA: Crabtree Creek State Park; Davie Co.; Grandfather Mountain; Lakeview; Linville; Raleigh; Umstead State Park; Washington County. OHIO: Hocking County; Mansfield; Shaker Heights; Stark County. PENNSYLVANIA: Braddock; Bryn Mawr (5 miles S.); Darby; Delaware County; Devon; Lake Winola; Lawnsdale; Manayunk; Mt. Airy; Mt. Holly Springs; Philadelphia; Westview; Wilawana. VIRGINIA: Alexandria; Falls Church; Four-mile Run; Hunting Creek; New Alexandria; Rosemont. WEST VIRGINIA: Smithburg. WISCONSIN: Burnett County (mouth of Yellow River); Maiden Rock; Pierce Co.; Fountain City, Buffalo Co. Canada. ONTARIO: Toronto.

Floral Records. *Andrena simplex* is an oligolege of the Compositae and seems to prefer flowers of the genera *Solidago* and *Aster*. This statement is supported by Robertson's work in southern Illinois (Robertson, 1925 and 1926). Table 4 summarizes the floral data available to the author. Plants from which this species has been collected are listed below (including previously published records).

Amphiachyris sp., *A. dracunculoides*, *Aster* sp., *A. anomalus*, *A. azureus*, *A. commutatus*, *A. ericoides*, *A. ericoides vilosus*, *A. lateriflorus*, *A. multiflorus*, *A. novaeangliae*, *A. paniculatus*, *A. praelatus*, *Boltonia asteroides*, *Eupatorium perfoliatum*, *Euthamia graminifolia*, *Gnaphalium polycephalum*, *Grindelia* sp., *Helianthus tuberosus*, *Polygonum hydropiperoides*, *P. scandens*, *Solidago* sp.,

TABLE 4. Summary of floral records for *Andrena simplex* Smith.

| Family | Plant Data | | | Records of <i>A. simplex</i> | | |
|----------------------|------------------|-------------------|-----------------------|------------------------------|-----------------|----------------------|
| | Number of Genera | Number of Species | Number of Collections | Number of Females | Number of Males | Total Number of Bees |
| <i>Solidago</i> spp. | 1 | 6 | 42 | 82 | 34 | 116 |
| <i>Aster</i> spp. | 1 | 7 | 22 | 46 | 7 | 53 |
| Other genera | 4 | 4 | 4 | 1 | 2 | 6 |
| Totals | 6 | 17 | 68 | 132 | 43 | 175 |

S. altissima, *S. canadensis*, *S. graminifolia*, *S. lanceolata*, *S. nemoralis*,
S. rigida, *S. serotina*.

Andrena (Callandrena) placata Mitchell

Andrena (Pterandrena) placata Mitchell, 1960, North Carolina Agr.
Exp. Sta. Tech. Bull. No. 141, pp. 148-149.

This is a small bee ranging from southern Canada to North Carolina and from Minnesota to the eastern seaboard. Both sexes of *A. placata* are very similar to *A. simplex*. The female of *placata* can be distinguished from that of *simplex* by the third flagellar segment being slightly longer than the second, the facial foveae extending down to the level of the lower margins of the antennal fossae, and the metasomal terga being shinier and finely but distinctly punctate. The male of *placata* can be distinguished from that of *simplex* by the third flagellar segment being distinctly longer than the second and the metasomal terga being shinier and more distinctly punctate. Mitchell (1960) described only the male of this species and had confused the females with those of *simplex*. Previous authors had confused both sexes of *placata* with those of *simplex*. Therefore, at least some of the references given under *simplex* should refer to *placata*. It is not possible, however, to disentangle the misidentifications resulting from this confusion.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 9.0-10.0 mm; width 2.5-3.5 mm; wing length, M = 3.25 ± 0.025 mm; FL/FW, M = 0.95 ± 0.004 ; FOVL/FOVW, M = 2.42 ± 0.039 .

INTEGUMENTAL COLOR: Black except as follows: mandible rufescent in apical half; wing membrane moderately infumate, veins black to dark brown; terga with apices extremely narrowly hyaline, slightly reddened posterior to hyaline apices; sterna with apices hyaline, yellow, slightly rufescent basally; distitarsi often rufescent; tibial spurs yellow.

STRUCTURE: Scape as in *simplex*; flagellar segment 1 slightly longer than segments 2 plus 3, segment 3 distinctly longer than segment 2, shorter than segments 4-9. Eye about three and one-half times as long as broad, inner margins strongly converging towards mandibles. Malar space, mandible and galea as in *simplex*. Maxillary palpus reaching tips of galeae or very slightly beyond, segments in ratio of about 0.7:1.0:0.5:0.5:0.5:0.6. Labial palpus as in *simplex* but segments in ratio of about 1.6:0.8:0.7:0.8. Clypeus, supraclipeal area, and genal area as in *simplex* but genal area usually slightly broader than eye in profile. Vertex as in *simplex* but above lateral ocellus equals about one ocellar diameter. Face above antennal fossae as in *simplex*. Facial fovea relatively deep, extending down

to level of lower margin of antennal fossa or almost so, upper end broad, separated from lateral ocellus by about half of an ocellar diameter, lower end rounded.

Pronotum, mesoscutum, scutellum, and metanotum as in *simplex*. Propodeum with enclosure with sides straight, surface finely areolate, moderately shiny; dorsolateral and posterior surfaces with small punctures separated by one to three puncture widths, surface dulled by reticular shagreening; corbicular surface moderately shiny, with small punctures scattered throughout, with coarse reticular shagreening. Metepisternum and mesepisternum as in *simplex*. Middle basitarsus broadened medially, sides evenly rounded, distinctly broader than hind basitarsus. Tibial spurs and claws normal. Front wing with three submarginal cells, vein 1st m-cu meets second submarginal cell at about two-thirds distance from base of cell; pterostigma usually about as broad as from inner margin prestigma to wing margin, occasionally slightly broader.

Metasomal terga 1-5 with small, round, distinct punctures, sparse on tergum 1, on terga 2-4 separated mostly by two to three puncture widths, surfaces shiny to moderately shiny, with fine reticular shagreening. Pygidial plate strongly V-shaped, apex rather sharp. Sterna 2-5 with crowded punctures near apical hyaline areas, punctures separated mostly by one puncture width next to hyaline area, becoming sparser basally, surfaces moderately dulled by coarse reticular shagreening.

VESTITURE: As in *simplex* except as follows: often apex of clypeus and labrum with brown hair, vertex often with a few brown hairs, mesoscutum and scutellum often with brown hairs medially, terga 5 and 6 with dark brown hairs, tarsi usually with brown hairs, fore and middle tibiae usually with brown hairs, scopal hairs washed with brown posteriorly. Pollen collecting hairs as in *simplex*.

Male. MEASUREMENTS AND RATIOS: N = 20; length, 8.0-10.0 mm; width, 2.0-3.0 mm; wing length, $M = 2.91 \pm 0.112$ mm; FL/FW, $M = 0.99 \pm 0.006$; FS1/FS2, $M = 1.88 \pm 0.035$.

INTEGUMENTAL COLOR: As in female except as follows: clypeus yellow except brown apical margin and dark spots mesad and below tentorial pits; flagellar segments 3-11 slightly reddened below; tergal apices with hyaline areas often slightly broader.

STRUCTURE: Antennae short, extending to posterior margin of tegulae in repose; scape slightly longer than flagellar segments 1-2, flagellar segment 1 distinctly shorter or no longer than segments 2 plus 3, segment 3 distinctly longer than segment 2 and subequal to 4. Eye about three and one-fourth times as long as broad or slightly longer, inner margins strongly converging towards mandibles. Malar space, mandible, and galea as in female. Maxillary palpus as in

female but segments in ratio of about 0.9:1.0:0.7:0.7:0.6:0.8. Labial palpus as in female but ratio of about 1.4:0.7:0.5:0.7. Labral process small, bidentate. Clypeus and supraclypeal area as in female but clypeal punctures slightly more distinct. Genal area, vertex and face above antennal fossae as in female.

Sculpturing of thorax as in female except as follows: mesoscutum and scutellum with medial areas shinier, punctures sparser. Wings, claws, and tibial spurs as in female. Terga 1-5 as in female terga 1-4, often shinier, shagreening finer and reticulations coarser and puncture more distinct. Tergum 7 with median longitudinal glabrous area indistinct. Sterna 2-5 as in female but punctures sparser and surfaces shinier. Sternum 6 with apical margin only slightly reflexed, broadly and shallowly emarginate medially.

Genitalia and sterna 7 and 8 (Figs. 139-143) similar to those of *simplex* but note following: gonoforceps with inner-dorsal ridge not enlarged; penis valves broad near base; dorsal lobe gonocoxites longer; sternum 7 with apicolateral lobes shorter; sternum 8 with tip broader and often extremely shallowly emarginate apically.

VESTITURE: In general white; terga 1-5 with weak apical hair bands, that on tergum 1 interrupted medially by more than half width of tergum, that on tergum 2 interrupted medially by about half width of tergum; sternal hairs forming distinct apical bands of relatively short suberect white hairs just basad of apical hyaline areas; inner surfaces tarsi pale yellow.

Type Material. The holotype (NCSU) male from Needham, Massachusetts, August 13, 1936, was collected by T. B. Mitchell.

Distribution. *Andrena placata* ranges from Quebec and Ontario south to North Carolina and west through Ohio and Michigan to Minnesota (Fig. 9). This species has been taken from August 2nd through October 10th but chiefly during August and early September. A total of 237 females and 67 males have been examined in addition to the holotype. The localities of these are listed below.

CONNECTICUT: Colebrook; New Haven; Stafford; Stores. DISTRICT OF COLUMBIA: Anacostia. IOWA: Ledges State Park. ILLINOIS: McHenry. MAINE: Biddleford Pool; Casco Bay; Kezar Falls; Seco. MARYLAND: Chesapeake Beach; Glen Echo. MASSACHUSETTS: Arlington; Boston; Brookline; Forest Hills; Framingham; Holliston; Hopkinton; Waltham. MICHIGAN: Ocama Co.; Cheboygan Co. MINNESOTA: Cannon Falls; Fort Snelling; Hastings; Hennepin Co.; Pine River; Ramsey Co.; St. Anthony Park; St. Paul. NEW HAMPSHIRE: Alton Bay, Belknap Co.; Belknap Co.; Conway; Carrol Co.; Farmington; Grafton Co.; Meredith Center; New Durham; Pelham; Webster. NEW JERSEY: Big Timber Creek; Camden Co.; Cape May; Clementon; Clifton;

Englewood; Lakehurst; Lucaston; Marlton; Montclair; Montvale; Moorestown; New Albany; New Egypt; Onga Hat (2 miles E.); Ramsey; Riverton; Union; Watchung Reservation, Union Co.; Westfield; Whitesville. NEW YORK: Amagon; Bedford; Cold Spring Harbor, Long Island; Copake Falls; Flatbush, Long Island; Geneva; Hartsdale; Ithaca; Lynbrook; Moshalu; New Rochelle; New York City; Nyack; Poundridge; Rochester; Suffolk Co.; Tappan; Tompkins Co.; Tuxedo; White Plains. NORTH CAROLINA: Black Mountains (valley of); Blowing Rock; Marion; New River; Raleigh; Swannanoa; Washington Co. OHIO: Stark Co. PENNSYLVANIA: Fern Rock; Milford. VERMONT: Bennington Co.; Montpelier; Lyndon. VIRGINIA: Camp Perry; Hunting Creek. WISCONSIN: Menomonie; Milwaukee; Oconto Falls. *Canada*. ONTARIO: Ottawa; Spencerville; Toronto. QUEBEC: La Trappe.

Remarks. *A. placata* evidently hybridizes occasionally throughout its range with the closely related *A. simplex*. The hybrid specimens seem to be exactly intermediate between the two species, even to details of the male terminalia, therefore, backcrossing must occur infrequently, if at all. Several of the hybrid females had been gathering pollen when killed, thus probably had mated and were nesting. If these females mated with either parent or with hybrid males, presumably their eggs were infertile, as no second generation hybrids were discovered among the aggregate 618 specimens available of the two species. The collection data of the 22 female and 25 male hybrids are given below.

CONNECTICUT: *Hartford*. 1 ♀, August 29, 1897, on *Solidago*. MARYLAND: *Laurel*. 1 ♀, September 17, 1916, J. Silver. *Plummers Island*. 1 ♂, September 16, 1906, A. K. Fisher. 1 ♀, 1 ♂ from the T. Pergande collection. MASSACHUSETTS: *Greenfield*. 1 ♀, 1 ♂, August 11, 1916, I. N. Gabrielson. NEW JERSEY: *Clementon*. 1 ♀, October 4, 1904. *Englewood*. 1 ♀, October 7, 1942, on *Solidago*, C. D. Michener. NORTH CAROLINA: *Bryson City*. 1 ♀, September 22, 1922, T. B. Mitchell; 2 ♀♀, 1 ♂, September 7, 1923, on *Solidago*, J. C. Crawford; 1 ♂, September 25, 1923, on *Aster ericoides*, J. C. Crawford; 2 ♀♀, 1 ♂, September 26, 1923, on *Aster paniculatus*, J. C. Crawford. *Raleigh*. 1 ♀, late September, 1921, T. B. Mitchell. VIRGINIA: *Black Pond*. 1 ♀, September 13, 1916, H. L. Viereck. *Chain Bridge*. 1 ♂, September 18, 1921, J. R. Malloch. *Four-mile Run*. 1 ♂, October 8, 1916, on *Aster*, W. L. McAtee. *Hunter*. 5 ♂♂, September 12, 1918, R. A. Cushman. *Hunting Creek*. 2 ♂♂, September 23, 1917, on *Aster*, W. L. McAtee.

Floral Records. *Andrena placata* is an oligocele of the composite genus *Solidago*. It has been collected on other flowers only a few times. Out of 37 collections (93 females and 20 males), 31 col-

A Revision of the Bees of the Genus Andrena

lections (88 females, 19 males) were taken from flowers of the genus *Solidago*. Plants from which this species has been collected are listed below.

Aster sp., *A. lateriflorum*, *A. macrophyllum*, *Eupatorium serotinum*, *Fagopyrum esculentum*, *Solidago* sp.

Andrena (Callandrena) asteris Robertson

Andrena asteris Robertson, 1891, Trans. American Ent. Soc., vol. 18, p. 56; Cockerell, 1900, Ann. Mag. Nat. Hist., ser. 7, vol. 5, p. 404; Bruner, 1903, Trans. American Ent. Soc., vol. 29, p. 243; Graenicher, 1905, Trans. Acad. Sci. Wisconsin, vol. 15, p. 92; Smith, 1910, Ann. Rept. New Jersey St. Mus., 1909, p. 690; Viereck, 1916, Connecticut Geol. Nat. Hist. Surv., Bull. 22, p. 719; Pierce, 1918, Proc. United States Nat. Mus., vol. 54, p. 441; Britton, 1920, Connecticut Geol. Nat. Hist. Surv., Bull. 20, p. 344; Salt, 1927, Jour. Exp. Zool., vol. 48, p. 251; Leonard, 1928, Cornell Univ. Agr. Exp. Sta. Mem. 101, p. 1022; Brimley, 1938, Insects of North Carolina, p. 452; Proctor, 1946, Mt. Desert Region Survey, p. 503; Stevens, 1949, North Dakota Agr. Exp. Sta., Bimo. Bul. 12, p. 22.

Pterandrena asteris: Robertson, 1902, Trans. American Ent. Soc., vol. 28, p. 194; 1910, Canadian Ent., vol. 42, pp. 324-328; 1914, Ent. News, vol. 25, p. 69; 1925, Ecology, vol. 6, p. 426; 1926, Ecology, vol. 7, p. 379; 1929, Flowers and Insects, p. 9.

Andrena (Pterandrena) asteris: Lanham, 1949, Univ. California Pub. Ent., vol. 8, p. 200; Mitchell, 1960, North Carolina Agr. Exp. Sta. Tech. Bull. 141, pp. 139-140; Knerer and Atwood, 1964, Proc. Ent. Soc. Ontario, vol. 94, p. 46.

This medium-sized *Callandrena* is closely related to *A. simplex*. The female of *asteris* can be told from that of *simplex* by its larger size, longer facial fovea, medially flattened (or even slightly depressed) clypeus, more complete propodeal corbicula and hairier thorax. The male is readily distinguished from that of *simplex* by the small yellow parocular maculae (rare in *simplex*), its larger size and hairier thorax.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 12-14 mm; width, 3.5-4.5 mm; wing length, $M = 4.15 \pm 0.229$ mm; FL/FW, $M = 0.96 \pm 0.004$; FOVL/FOVW, $M = 2.62 \pm 0.032$.

INTEGUMENTAL COLOR: Black except as follows: flagellar segments 4-10 often dark red below; tergal apices slightly translucent, rufescent; wing membranes slightly infumate; tegulae piceous.

STRUCTURE: Scape equal in length to flagellar segments 1-4; flagellar segment 1 subequal to segments 2 plus 3 or slightly shorter,

segment 2 subequal to segment 3 and both shorter than 4. Eye, malar space, mandibles, and galeae as in *simplex*. Maxillary palpus barely reaching tip of galea, segments in ratio of about 1.3:1.3:1.0:0.8:0.8:1.1. Labial palpus as in *simplex* but segments in ratio of about 1.9:1.0:0.8:0.8. Labral process as in *simplex*. Clypeus flattened to slightly depressed medially, protruding beyond eyes by somewhat more than one-third its own length (less than half); punctures round, small, becoming smaller peripherally and sparse medio-basally, in median flattened area separated mostly by one puncture width or slightly less; surface moderately shiny to dull, with regular, rather coarse tessellation. Supraclypeal area with indistinct minute punctures and coarse, irregular tessellation dulling surfaces. Genal area equals about one and one-half times width of eye, with minute to small punctures separated by one to two puncture widths (smaller near eye), surface shiny near eye, dulled posteriorly by coarse reticulotransverse shagreening. Vertex above lateral ocellus equal to about one ocellar diameter, tessellate, dull. Face above antennal fossae with longitudinal rugulae, a few fine rugulae extend between lateral ocellus and facial fovea to area above fovea; inter-rugal spaces punctate, tessellate, dull. Facial fovea shallow, broad, extending down to almost level of lower margin of antennal fossae, upper end separated from lateral ocellus by about three-fourths an ocellar diameter. Lateral ocellus separated from occipital margin by about one ocellar diameter.

Thoracic sculpturing as in *simplex* but shagreening and tessellation everywhere slightly finer and punctation slightly less evident. Middle basitarsus expanded medially, broadest near middle, sides evenly curved, broader than hind basitarsus. Tibial spurs and claws normal. Front wing usually with three submarginal cells (in less than 5% of specimens one or both wings with only two submarginal cells), vein 1st m-cu meets second submarginal cell near middle of cell; pterostigma about as broad as from inner margin of prestigma to wing margin.

Metasomal terga sculptured as in *simplex*. Pygidial plate with apex rounded, broad, almost U-shaped, but sides diverge anteriorly. Sterna as in *simplex* but punctures smaller and more crowded.

VESTITURE: Generally ochraceous except as follows: lower areas of head, lower pleural areas and pale apical tergal bands almost white; terga 5 and 6 with long dark brown hairs; tarsi and fore and middle tibiae with brown hairs. Tergum 1 with lateral remnants of an apical pale pubescent band but not occupying more than one-fourth width of tergum; tergum 2 with apical pale band usually narrowly interrupted medially; terga 3 and 4 with complete apical pale bands. Sterna 2-5 with subapical bands of sparse, suberect hairs

of medium length. Propodeal corbicula complete anteriorly, with few internal hairs except anteriorly. Trochanteral flocculus complete, long, thick. Tibial scopal hairs highly plumose throughout, of normal length.

Male. MEASUREMENTS AND RATIOS: N = 20; length, 9–11 mm; width, 3–4 mm; wing length, $M = 3.57 \pm 0.190$ mm; FL/FW, $M = 0.96 \pm 0.004$; FS1/FS2, $M = 2.62 \pm 0.030$.

INTEGUMENTAL COLOR: As in female except as follows: clypeus yellow except brown anterior margin and dark spots mesad and below tentorial pits; parocular areas yellow up to level of tentorial pits or less; flagellar segments 2–11 dark red below; tergal apical hyaline areas often slightly broader.

STRUCTURE: Antennae short, not extending back beyond tegulae in repose; scape subequal to flagellar segments 1–3 or slightly longer; flagellar segment 1 equal to 2 plus 3 in length or slightly longer and shorter than 4. Eye about three times as long as broad, inner margins converging towards mandibles. Malar space, mandibles, and galeae as in female. Maxillary palpus as in female but ratio of about 1.0:1.1:0.7:0.7:0.7:0.9. Labial palpus as in female but ratio of about 1.9:1.0:0.8:0.9. Labral process as in female. Clypeus as in female but medially less flattened, punctures sparser, somewhat shinier. Supraclypeal area and face sculptured as in female but rugulae of face somewhat coarser and ending laterally at about level of middle of lateral ocelli. Genal areas and vertex as in female.

Sculpturing of thorax as in female but mesoscutum and scutellum somewhat shinier medially and dorsal area of propodeum often with fine irregular rugulae dulling surface. Wings, claws and tibial spurs as in female. Terga 1–5 as in female terga 1–4 but often slightly shinier. Tergum 7 with distinct median, glabrous, shiny area. Sterna 2–5 as in female. Sternum 6 with apical margin strongly reflexed.

Genitalia and sterna 7 and 8 (Figs. 144–148) much as in *placata*. Note the following structures: gonoforceps with inner-dorsal ridge strong, angulate, but not forming a blunt process as in *simplex*; penis valve tips elongate, pointed, enlarged; sternum 7 with apicodorsal lobes long; sternum 8 with neck region long, tip only slightly expanded and shallowly emarginate.

VESTITURE: In general ochraceous to white, generally paler than female, vertex of head and dorsum of thorax usually ochraceous to pale ochraceous. Terga 1–3 usually with apical white pubescent bands interrupted medially, usually broadly so on tergum 1; tergum 4 with apical band complete; terga 5 and 6 without apical pale bands. Sterna 2–5 without distinct subapical bands, hairs sparse,

mostly appressed. Legs and apical abdominal terga without brown hairs as in female; inner surfaces tarsi pale yellow.

Type Material. The lectotype (INHS) female, here designated, of *Andrena asteris* Robertson (Robertson No. 9877) and lectoallotype (INHS) male, here designated (Robertson No. 9876), were collected by Charles A. Robertson at Carlinville, Illinois, October 8th and 11th, on flowers of *Aster* sp.

Distribution. *A. asteris* is known to occur from North Dakota, Nebraska, and Missouri in the west to Quebec, Maine, and Georgia in the east (Fig. 6). This species has been taken from July 23rd through November 8th, but chiefly during September and early October. A total of 185 females and 82 males have been examined in addition to the types. The localities of these are listed below together with records from the literature.

CONNECTICUT: Hartford; Westbrook; West Haven. DISTRICT OF COLUMBIA: Washington. GEORGIA: Athens; Atlanta. ILLINOIS: Carlinville; Chicago; Evanston; Little Grass Lake, Williamson Co.; Olive Branch; Volo; Wilmette. IOWA: Mt. Pleasant (6 miles S.W.). MAINE: Mt. Desert Island; Saco. MARYLAND: Bethesda; Cabin John; Glen Echo; Great Falls; Lakeland; Plimmers Island. MASSACHUSETTS: Forest Hills; Hopkinton; Needham; Sherborn. MICHIGAN: Gladwin Co.; Grand Rapids; Midland Co.; Montmouncy Co.; Upper Manistee River, Crawford Co. MINNESOTA: Big Stone Co.; Lanesboro; St. Anthony Park; St. Paul; Washington Co. MISSOURI: Nevada; Ozark Lake. NEBRASKA: West Point. NEW HAMPSHIRE: Durham. NEW JERSEY: Englewood; Haddenfield; Moorestown. NEW YORK: Lancaster; East Marion, Long Island; Flatbush; Larchmont; Mosholu; New Rochelle; Nyack; Oswego; Pine Island; Suffern; Tappan; Tompkins Co.; Washington Heights; White Plains. NORTH CAROLINA: Black Mts.; Bryson City; Church Island; Linville; Raleigh; Ulmstead State Park. NORTH DAKOTA: Mandan; Medora; Sheldon (7 miles S.E.); Slope Co. PENNSYLVANIA: Bloomsburg; Bryn Mawr (5 miles S.); Delaware Co.; New Galilee; Philadelphia. TENNESSEE: Knox Co. (University Farm). VIRGINIA: Rosemont; Vienna (3 miles W.). WEST VIRGINIA: Charleston; Smithville. WISCONSIN: Cranmoor; Milwaukee. MANITOBA: Aweme. NEW BRUNSWICK: St. Johns. ONTARIO: Dunnville; Grimsby; Porkhill; Spencerville; Toronto. QUEBEC: Lanordia.

Floral Records. *Andrena asteris* is an oligolege of the Compositae with a strong preference shown for plants of the genus *Aster*. Of the 60 specimens (28 collections) with floral data available to the author for study, 52 (40 ♀ and 12 ♂) were taken on flowers of *Aster* and 8 (5 ♀ and 3 ♂) were from flowers of *Solidago*. A few

other plants have been recorded as being hosts of this species, but the bees were not collecting pollen from these flowers. Listed below are all known host-plant records for *A. asteris*, including the few published reports.

Aster sp., *A. ericoides*, *A. paniculatus*, *Echinacea* sp., *Eupatorium altissimum*, *Polygonum pennsylvanicum*, *Solidago* sp., *S. nemoralis*, *S. puberula*, *S. rigida*, *S. ulmifolia*.

Andrena (*Callandrena*) *asteroides* Mitchell

Andrena (*Pterandrena*) *asteroides* Mitchell, 1960, North Carolina St. Agr. Exp. Sta., Tech. Bull. 141, pp. 140-141.

Andrena (*Pterandrena*) *asteris* Michener, 1947, The American Midland Nat. 38:445 (misdetermination).

This is a small to medium-sized bee closely related to *A. asteris* Robertson. The female of *asteroides* can be distinguished from that of *asteris* by the short vertex, less complete propodeal corbícula, lack of rugulae on the face above the facial foveae, and slightly smaller size. The male of *asteroides* differs from that of *asteris* by the shorter vertex, the lack of yellow parocular maculae, the longer second and third flagellar segments, and the slightly smaller size.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 10-11 mm; width, 3-4 mm; wing length, M = 3.62 ± 0.114 mm; FL/FW, M = 1.03 ± 0.008 ; FOVL/FOVW, M = 2.53 ± 0.063 .

INTEGUMENTAL COLOR: Black except as follows: flagellar segments 3-10 dark reddish-black below; tegulae translucent, dark red; wing membranes moderately infumate, brownish, veins black; terga hyaline apically, colorless or rufescent; sterna narrowly hyaline apically; tibial spurs yellow; tarsi rufescent.

STRUCTURE: Scape slightly longer than flagellar segments 1-3; flagellar segment 1 subequal in length to segments 2 plus 3 or slightly shorter, segment 2 subequal to 3 and shorter than segment 4. Eye three and one-half times as long as broad or slightly longer, inner margins converging strongly towards mandibles. Malar space, mandibles, and galeae as in *simplex*. Maxillary palpus short, just reaching tip of galea, segments in ratio of about 1.0:1.3:0.7:0.7:0.5:0.7. Labial palpus as in *simplex* but ratio about 1.9:1.0:0.7:0.8. Labral process as in *simplex*. Clypeus rather flat, not markedly flattened or depressed medially as in *asteris*, punctures small, round, separated by one to three puncture widths, surface dulled by regular, fine tessellation. Supraclypeal area and face above antennal fossae as in *asteris* but fine facial rugulae often not extending up between lateral ocellus and facial fovea and never above fovea. Genal area as in *asteris*. Vertex short, above lateral ocellus

equals less than one ocellar diameter, tessellate with sparse, minute, obscure punctures. Facial fovea rather shallow, extending to lower margin of antennal fossa below, broad above and separated from lateral ocellus by about half an ocellar diameter.

Thoracic sculpturing as in *simplex* but propodeum with dorsal area usually with fine, irregular rugulae over entire surface. Middle basitarsus expanded, broader than hind basitarsus, with evenly rounded sides. Front wing usually with three submarginal cells, rarely with two in one or both wings, vein 1st m-cu meets second submarginal cell beyond middle of cell. Pterostigma as in *simplex*. Claws and tibial spurs normal.

Metasomal terga sculptured as in *simplex* but sparse punctures slightly more evident and surface slightly shinier. Pygidial plate rounded as in *asteris*. Sterna 2-5 shiny, with only coarse reticular shagreening, punctate as in *asteris*.

VESTITURE: Generally ochraceous or pale ochraceous with the exceptions as in *asteris* but metasomal tergum 1 with weak apical band usually almost complete and tibial scopal hairs usually washed with brown posteriorly. Propodeal corbicula incomplete anteriorly, with abundant, long, plumose, internal hairs; trochanteral flocculus complete, thick.

Male. MEASUREMENTS AND RATIOS: N = 8; length, 9-10 mm; width, 2.5-3.0 mm; wing length, M = 3.26 ± 0.217 mm; FL/FW, M = 1.06 ± 0.014 ; FS1/FS2, M = 1.27 ± 0.087 .

INTEGUMENTAL COLOR: As in female except as follows: clypeus yellow except narrow brown apical margin and dark maculae below and mesad of tentorial pits; wing veins dark red; tarsi and often tips of hind tibiae red to yellowish.

STRUCTURE: Antennae in repose reaching posterior margin of tegulae; scape subequal in length or slightly shorter than segment 3, slightly longer than segment 2, segment 3 equal to segment 4 in length. Eye about three times as long as broad or slightly longer, inner margins strongly converging towards mandibles. Malar space, mandibles, and galea as in female. Maxillary palpus as in female but segments in ratio of about 1.0:1.2:0.7:0.7:0.6:1.0. Labial palpus as in female but ratio about 1.9:1.0:1.0:1.9. Labral process as in female. Clypeus and supraclypeal area as in female but clypeus slightly shinier towards apex, tessellation finer. Genal area, vertex and face above antennal fossae as in female.

Sculpturing of thorax as in female except as follows: propodeum with dorsal area less coarsely rugulose. Wings, claws and tibial spurs as in female. Terga 1-5 as in female terga 1-4. Tergum 7 with distinct median longitudinal glabrous area. Sterna 2-5 as in female

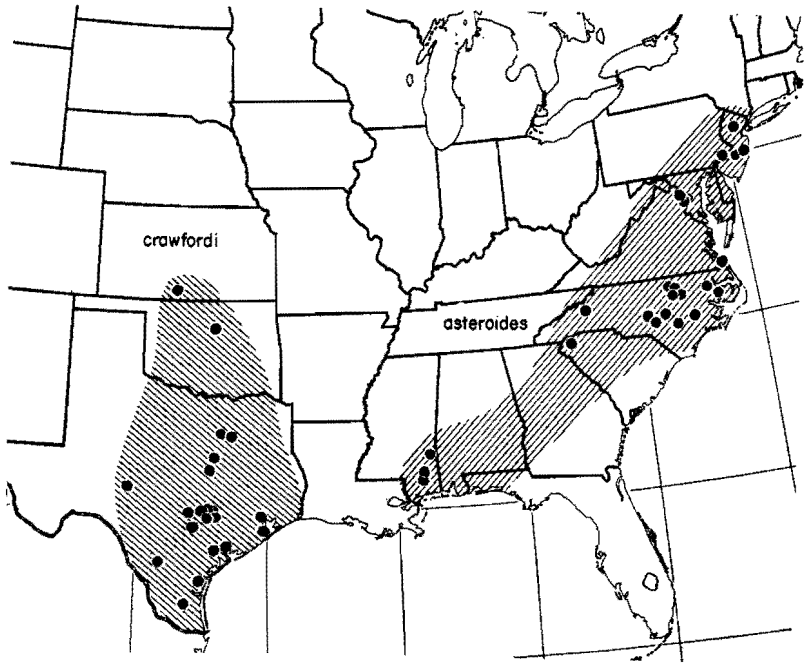


FIG. 11. Map showing the known distributions of *A. (Callandrena) asteroides* Mitchell and *A. (Callandrena) crawfordi* (Viereck).

but punctures sparser and coarser. Sternum 6 with apical margin strongly reflexed.

Genitalia and sterna 7 and 8 (Figs. 149–153) as in *asteris* but note following differences: short blunt penis valves; sternum 7 with apicolateral lobes short, median emargination shallow; sternum 8 with apical margin sinuous.

VESTITURE: Ochraceous to pale ochraceous; terga 1–5 with apical pale bands, that on tergum 1 weak and on terga 1 and 2 interrupted medially; terga 5 and 7 with brown hairs; sternal hairs not forming distinct subapical bands, inner surfaces tarsi pale yellow.

Type Material. The holotype (NCSU) female and allotype (NCSU) male were collected at the Cliffs State Park, North Carolina, October 14, 1955, on *Aster* and *Haplopappus*, respectively, by T. B. Mitchell.

Distribution. This species is known from Alabama and Mississippi in the south to New Jersey in the east (Fig. 11). It has been collected from September 24th through November 10th, but chiefly in October. A total of 150 females, 11 males have been examined. The localities are listed below with asterisks marking those localities not reported in the original description of the species.

ALABAMA: *Kushla. GEORGIA: *Clayton. MARYLAND: *Bethesda; *Great Falls. MISSISSIPPI: Camp Shelby (near Hattiesburg); Hattiesburg. NEW JERSEY: *Hammonton; Lakehurst; *Manumuskin; *Moorestown. NORTH CAROLINA: *Black Mts.; *Church Island; Clayton; Cliffs State Park; Harnett Co.; Lakeview; Raleigh; Sampson Co.; Southern Pines; Tarboro; Umstead State Park; Wake Co.; Washington Co. PENNSYLVANIA: *Philadelphia. SOUTH CAROLINA: *Greenville. VIRGINIA: *Rosemont.

Floral Records. *A. asteroides* seems to be an oligolege of plants of the genus *Aster*, although it has been collected visiting a few other Compositae. The records are too few at present to justify a meaningful statement on flower preferences. The flowers from which *asteroides* has been collected are listed below.

Aster sp., *A. ericoides*, *A. dumosus*, *A. paniculatus*, *Chrysopsis* sp., *Haplopappus* sp.

Adrena (Callandrena) bullata, n. sp.

This is a medium-sized species known only from Texas and related to *asteris* but not closely. It shares characteristics with *irrasa* (sculpture characters) and *gardineri* (sculpture and pale band of first tergum) and seems to tie these three species groups together. The female of *bullata* can easily be distinguished from that of *asteris* by the punctate terga. It can be told from the female of *irrasa* by the presence of a weak but distinct fascia on the first tergum and the more crowded tergal punctures. The female differs from that of *gardineri* by the larger facial foveae, the orange-red tibiae, the infumate wings and the plumose internal corbicular hairs. The male of *bullata* differs from the males of *gardineri* and *asteris* by the short first flagellar segment and the longer third flagellar segment as described below. In addition, the male has punctate, shagreened terga, yellow clypeus and parocular areas, deflexed apical margin of the sixth sternum, finely rugulose propodeal dorsal enclosure and the first tergum with a weak apical pale fascia.

Female. MEASUREMENTS AND RATIOS: N = 9; length, 10–12 mm; width, 2.5–4.0 mm; wing length, M = 4.04 ± 0.194 mm; FL/FW, M = 0.98 ± 0.008 ; FOVL/FOVW, M = 2.40 ± 0.035 .

INTEGUMENTAL COLOR: Black except as follows: mandible with apical third rufescent; flagellar segments 3–10 brown below; tegulae translucent reddish-brown; wing membranes infumate, brownish, veins dark reddish-brown; terga 1–4 narrowly hyaline apically, slightly reddened basad of hyaline margins; sterna 2–5 with apices hyaline, rufescent just basad of hyaline margins; hind basitarsi

usually orange at least mediobasally; hind tibiae orange-red; distitarsi often dark rufescent.

STRUCTURE: Antennae of moderate length, scape length equals first three and one-half flagellar segments; flagellar segment 1 equal in length to segments 2 plus 3, segment 2 distinctly shorter than 3, segment 3 slightly shorter than 4, segments 4–8 quadrate, 9–10 longer than broad. Eye about four times as long as broad, inner margins distinctly converging toward mandibles. Malar space linear. Mandible bidentate, angulate basoventrally but not lamellate; subgenal coronet present, well developed. Galea as in *asteris*. Maxillary palpus as in *asteris* but segmental ratio about 0.9:1.0:0.7:0.5:0.4:0.7. Labial palpus as in *asteris* but segmental ratio about 1.9:1.0:0.8:0.9. Labral process about twice as broad as long, bidentate. Clypeus evenly rounded from side to side; punctures round, small, separated mostly by one-half to one puncture width, surface dulled by delicate tessellation except apicomediaally. Supraclypeal area with minute crowded punctures and fine shagreening dulling surface. Genal area in profile about as wide as eye; punctures small, separated mostly by one to two puncture widths or more; surface shiny, unshagreened or delicately so especially posteriorly. Vertex above lateral ocellus equals one ocellar diameter or slightly more; punctures crowded above ocelli and in narrow band above facial fovea, sparse elsewhere; surface moderately dulled by reticular shagreening. Facial fovea large, extending down to level of middle of antennal fossae or lower, flattened above, separated from lateral ocellus by half a puncture width or slightly more. Face above antennal fossae with longitudinal rugulae extending up between lateral ocellus and facial fovea; interrugal punctures crowded.

Pronotum as in *asteris*. Mesoscutum with shallow, round punctures, crowded peripherally, separated by one puncture width or more posteromedially, surface dulled by fine tessellation except moderately shiny posteromedially; parasidal line as long as from its posterior end to margin of scutum. Tegulae normal, impunctate. Scutellum similar to mesoscutum but shinier. Metanotum opaque, with crowded punctures and fine tessellation. Propodeum with dorsal enclosure with sides straight to slightly concave, surface roughened by fine irregular rugulae and coarse tessellation; dorso-lateral and posterior surfaces with large, shallow, contiguous punctures and fine tessellation; corbicular surface moderately shiny, with scattered punctures in upper two-thirds and coarse tessellation. Mesepisternum with large shallow irregular punctures crowded anteriorly, sparse posteriorly, surface dulled by fine tessellation. Metepisternum punctate in upper third, surface moderately shiny, reticularly shagreened. Middle basitarsus broad, sides evenly curved,

broader than hind basitarsus. Wing venation as in *asteris*. Claws and tibial spurs normal.

Metasomal terga 1-4 with extremely narrow apical margins impunctate, apical areas otherwise with crowded coarse punctures; basally with round punctures separated by half to one puncture width, slightly sparser at extreme base of tergum 1 and more crowded on terga 3 and 4; surfaces moderately shiny, somewhat dulled by delicate reticular shagreening. Pygidial plate exceptionally broad basally, V-shaped with rounded apex. Sterna 2-5 with apices impunctate, basal area punctures separated mostly by two puncture widths, surfaces shiny, with delicate, coarsely reticular shagreening.

VESTITURE: Generally ochraceous except as follows: vertex of head and thoracic dorsum somewhat darker; terga 2-4 with basal area hairs fuscous; basitibial plate and scopal hairs just below plate dark brown; basitarsi and fore and middle tibiae with outer surfaces dark brown; inner surfaces basitarsi yellow to reddish-brown. Tergum 1 with complete, weak, apical, pale fascia. Terga 2-4 with pale apical fasciae weak and often narrowly interrupted medially on tergum 2. Propodeal corbicula incomplete anteriorly, with numerous internal plumose hairs. Scopal hairs plumose throughout. Coxal and trochanteral flocculi complete, well developed.

Male. **MEASUREMENTS AND RATIOS:** N = 2; length, 10-11 mm; width, 3.0-3.5 mm; wing length, 3.68-4.22 mm; FL/FW, 0.97-1.01; FS1/FS2, 1.30-1.60.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical third rufescent; clypeus yellow except small maculae mesad and below tentorial pits and dark brown apical margin; parocular area with large yellow macula but not extending to rear margin of clypeus; flagellar segments 2-11 dark reddish-brown below; tegulae translucent reddish-brown, veins reddish-brown; terga 1-5 with extremely narrow hyaline apical margins, slightly rufescent just basad of hyaline margins; sterna 2-5 with hyaline, yellowish apical margins; distitarsi, basitarsi and hind tibiae rufescent to orange-red.

STRUCTURE: Antennae of moderate length, slightly exceeding tegulae in repose; scape length equals first two and one-half flagellar segments; flagellar segment 1 longer than segment 2 and subequal in length to 3; segments 3-11 longer than broad. Eye one and one-third times as long as broad, inner margins strongly converging towards mandible. Malar space, galea and mandible as in female but mandibular basoventral angle and subgenal coronet absent. Maxillary palpus as in female but segmental ratio about 0.9:1.0:0.8:0.7:0.6:0.9. Labial palpus as in female but segmental ratio about

2.0:1.0:0.8:1.1. Labral process as in female but slightly deflected apically. Clypeus as in female but shinier, shagreening delicate, and punctures slightly sparser. Supraclypeal area, genal area, vertex and face above antennal fossae as in female.

Thoracic sculpturing and structure as in female except as follows: propodeal dorsal enclosure with rugulae slightly coarser and lateral surfaces dulled by coarse reticular shagreening. Terga 1-5 as in female terga 1-4. Pseudopygidial area present, narrow, distinct. Sterna 2-5 sculptured as in female but basal area punctures slightly sparser. Sternum 6 reflexed apically, apicolateral angles only slightly enlarged.

Genital capsule and sterna 7 and 8 (Figs. 154-158) similar to those of *asteroides* but note sternum 7 with extremely shallowly emarginate apex and sternum 8 with much expanded, essentially entire apex.

VESTITURE: Generally ochraceous except as follows: vertex and thoracic dorsum slightly darker ochraceous; terga 2-5 with basal areas with hairs short, suberect to erect, at least partly black; terga 6 and 7 pale ochraceous; sterna 3-5 with subapical fimbriae of long, suberect, pale ochraceous hairs; inner surfaces basitarsi golden-yellow.

Type Material. The holotype (PHT) female and three female paratypes (PHT; INHS) were collected in Brazos County, Texas, November 12, 1954, on *Heterotheca subaxillaris*, by A. H. Alex. The allotype (PHT) male was collected in the same place at the same time as the holotype female but on *Gutierrezia texana*. Five additional female and one male paratypes (INHS; USNM; SECK) from Texas are as follows: 1 ♀ labeled "TEX, Birkmann." *Lee County*. 1 ♀, October, 1908. *Fedor, Lee County*. 3 ♀♀, 1 ♂, Birkmann.

Andrena (Callandrena) krigiana Robertson

Andrena krigiana Robertson, 1901, Canadian Ent., vol. 33, p. 229; Cockerell, 1906, Ann. Mag. Nat. Hist., ser. 7, vol. 17, p. 308; Viereck, 1916, Connecticut St. Geol. Nat. Hist. Surv. Bull. 22, p. 777; Britton, 1920, Connecticut St. Geol. Nat. Hist. Surv. Bull. 31, p. 343; Brimley, 1938, Insects of North Carolina, p. 453.

Pterandrena krigiana: Robertson, 1902, Trans. American Ent. Soc., vol. 28, p. 194; 1914, Ent. News, vol. 25, p. 69; 1925, Ecology, vol. 6, p. 426; 1926, Ecology, vol. 7, p. 379; 1929, Flowers and Insects, p. 9; Pearson, 1933, Ecol. Monogr., vol. 3, p. 383.

Andrena (Pterandrena) krigiana: Lanham, 1949, Univ. California Publ. Ent., vol. 8, p. 200.

Andrena (Ptilandrena) krigiana: Mitchell, 1960, North Carolina Agr. Exp. Sta. Tech. Bull. No. 141, p. 156.

Andrena (Ptilandrena) parakrigiana Mitchell, 1960, North Carolina Agr. Exp. Sta. Tech. Bull. No. 141, p. 157 (new synonymy).

Andrena krigiana is one of the smallest species of *Callandrena* known. It is not closely related to any of the foregoing species but might be confused with *A. simplex*, another small eastern species. *A. krigiana* is distinctive in both sexes because of the relatively small second submarginal cell which along its posterior margin equals less than one-third the length of the first submarginal cell and along its anterior margin is about equal to the length of vein R_s between the cell and the pterostigma. Both sexes are also marked by the relatively large pterostigma and the relatively long maxillary palpa. In addition, the female of *krigiana* has short facial foveae, a dull clypeus and incomplete propodeal corbicula. The male has the clypeus usually with a median yellow macula, but more or less infuscated peripherally and occasionally entirely black.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 8–9 mm; width, 2.0–2.5 mm; wing length, $M = 2.79 \pm 0.651$ mm; FL/FW, $M = 1.12 \pm 0.010$; FOVL/FOVW, $M = 2.57 \pm 0.015$.

INTEGUMENTAL COLOR: Black except as follows: mandibles rufescent; flagellum dark brown below; tegulae hyaline, yellowish-brown; tergal apices narrowly hyaline, clear at apex to rufescent; sterna hyaline apically; legs dark rufescent, tibial spurs yellow.

STRUCTURE: Antennae short, scape longer than segments 1–4; flagellar segment 1 longer than segments 2 plus 3, often equal to segments 2–4, segments 2 and 3 subequal in length, shorter than segment 4. Eye about three and one-half times as long as broad or slightly longer, inner margins converging slightly toward mandibles. Malar space linear. Mandible short, outer mandible extends about one-fifth its length beyond middle of labrum in repose, bidentate; ventrobasal lamella weakly developed. Galea evenly rounded from dorsum to side, lateral portion about one-third as broad as upper; surface dulled by fine regular tessellation, without distinct punctures, with few scattered minute hairs. Maxillary palpus long, extends forward beyond tip of galea by length of last palpal segment or slightly more; segments in ratio of about 1.0:1.2:0.7:0.7:0.5:0.7. Labial palpus with first segment long, strongly curved, terete basally, flattened and broadened apically; segments in ratio of about 1.2:0.5:0.5:0.6. Labral process trapezoidal with weak apical emargination, not bidentate. Clypeus rounded, with small round obscure punctures, surface dulled by coarse tessellation. Supraclypeal area similar. Genal area no broader than eye in profile,

with round punctures separated by one to two puncture widths, surface moderately shiny, with coarse reticular shagreening especially posteriorly. Vertex above lateral ocellus equals about one ocellar diameter, occasionally slightly less, punctures obscured by dense, coarse tessellation. Face above antennal fossae with weak longitudinal rugulae ending between lateral ocellus and facial foveae and coarse irregular punctures. Facial fovea short, broad above, pointed on eye margin below, separated from lateral ocellus by one ocellar diameter, extending below to about level of upper margin of antennal fossa.

Pronotum normal, dulled by fine reticular shagreening. Mesoscutum dull, with small dense obscure punctures and coarse tessellation; parapsidal line shorter than from upper end of line to lateral margin of scutum. Tegulae normal. Scutellum sculptured as in mesoscutum but punctures somewhat denser. Propodeum with enclosure triangular, lateral margins straight, rather coarsely and irregularly rugulose; posterior and dorsolateral areas with coarse shallow punctures and dense coarse tessellation dulling surfaces; corbicular area moderately shiny, with coarse reticular shagreening and few scattered punctures. Mesepisternum sculptured as in mesoscutum but punctures less obscure, separated by one or more puncture widths. Metepisternum sculptured as in corbicular area. Middle basitarsus not at all expanded, parallel-sided, narrower than hind basitarsus. Wings with three submarginal cells, rarely with two in one wing; second cell receives vein 1st m-cu near or before middle of cell, cell short, more or less rectangular, along posterior margin equals one-third of first submarginal cell in length of vein r between pterostigma and cell; pterostigma large, broader than from inner margin of prestigma to wing margin and about three times as long as prestigma. Claws and tibial spurs normal.

Metasomal terga shiny to moderately shiny; terga 2-4 punctate, punctures round, small, separated mostly by one puncture width or slightly more, surfaces reticularly shagreened, occasionally somewhat dulled. Pygidial plate V-shaped with small rounded apex. Sterna 2-5 shiny, with narrow apical areas impunctate, basally with round punctures separated by two puncture widths apically, sparser towards base.

VESTITURE: Generally pale ochraceous to ochraceous, darker on vertex and dorsum of thorax. Terga 2-4 with weak apical pale bands often broadly interrupted medially; terga 5 and 6 with long pale ochraceous hairs. Sterna 2-5 with subapical fimbriae of long suberect hairs, shorter medially. Propodeal corbicula incomplete, without anterior hairs, dorsal hairs relatively short and sparse, internal hairs absent save a few long hairs adjacent to dorsal

hairs. Trochanteral flocculus complete but sparse. Tibial scopa plumose throughout, of normal length. Inner surfaces tarsi golden-yellow.

Male. MEASUREMENTS AND RATIOS: $N = 20$; length, 7.5–9.0 mm; width, 1.6–2.5 mm; wing length, $M = 2.47 \pm 0.621$ mm; FL/FW, $M = 1.13 \pm 0.012$; FS1/FS2, $M = 2.93 \pm 0.068$.

INTEGUMENTAL COLOR: As in female except as follows: clypeus usually yellow medially between maculae below tentorial pits, usually infuscated around entire periphery and lateral areas entirely black, occasionally entire clypeus black (as in *parakrigiana* Mitchell); flagellar segments 4–11 reddened below; terga more broadly hyaline apically.

STRUCTURE: Antennae short, not extending back beyond middle of tegulae in repose; scape equal in length to flagellar segments 1–4; flagellar segment 1 about equal in length to segments 2–4, segments 2–4 short, subequal, shorter than segment 5, segment 4 often slightly longer than 2 or 3; segments 5–10 about as broad as long. Eye three times as long as broad or slightly longer, inner margins strongly converging towards mandibles. Malar space, mandible and galea as in female. Maxillary palpus as in female but ratio about 1.0:1.5:1.1:0.8:0.8:0.9. Labial palpus as in female but ratio about 1.1:0.6:0.5:0.6. Labrum, clypeus and supraclypeal area as in female. Genal area subequal to eye in width, sculptured as in female. Vertex short, above lateral ocellus usually slightly less than diameter of ocellus; sculptured as in female. Face above antennal fossae as in female but rugulae often less evident.

Thoracic and metasomal sculpturing generally as in female except as follows: tergal punctures slightly sparser and terga generally shinier; sterna 2–5 with punctures sparse, surfaces moderately dulled by reticular shagreening; sternum 6 gently turned down in apical half, apically with broad V-shaped emargination.

Genitalia and sterna 7 and 8 (Figs. 159–163) similar to those of *bullata* but note following differences: penis valves shorter; sternum 7 with deep apical emargination; sternum 8 with neck region more slender.

VESTITURE: Generally pale ochraceous to ochraceous, darker on vertex and dorsum of thorax. Terga 2–5 with weak apical pale bands usually broadly interrupted medially especially on terga 2 and 3. Sterna with weak subapical fimbriae of long sparse suberect hairs. Inner surfaces tarsi golden-yellow.

Type Material. The lectotype (INHS) female, here designated, of *krigiana* from Carlinville, Illinois, June 15, 1901, was collected by Charles A. Robertson. The holotype (NCSU) male of *para-*

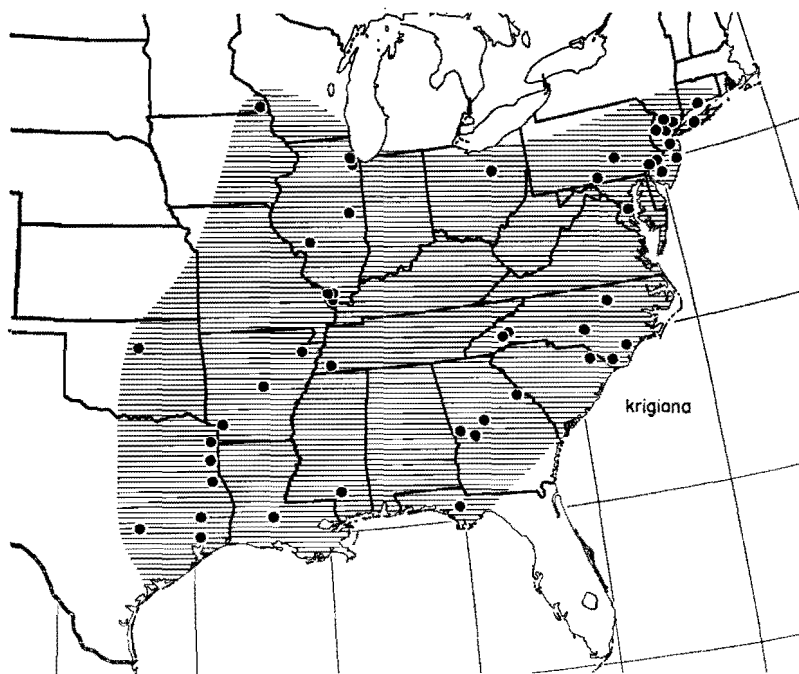


FIG. 12. Map showing the known distribution of *A. (Callandrena) krigiana* Robertson.

krigiana from Butler, Georgia, March 29, 1938, was collected by P. W. Fattig.

Distribution. *A. krigiana* is rather widely distributed from Minnesota, Oklahoma and Texas in the west to the Atlantic seaboard and north to New York (Fig. 12). It has been taken from March 16th through June 20th, but chiefly in April in the southern areas and May or June in the northern parts of its range. In addition to the type material, 74 females and 48 males have been examined from the localities listed below. This list includes localities reported in the literature.

ARKANSAS: Fulton; Jonesboro (2 miles E.); Lonoke. CONNECTICUT: New Haven. FLORIDA: Torreya State Park, Liberty Co. GEORGIA: Butler; Ft. Gordon; Roosevelt State Park, Harris Co. ILLINOIS: Alto Pass; Carlinville; Cobden; Dongola; Palos Park; Urbana; Willow Springs. LOUISIANA: Opelousas. MARYLAND: Chesapeake Beach. MINNESOTA: Houston Co. MISSISSIPPI: Hattiesburg. NEW JERSEY: Great Piece Meadow; Hewitt; Utona; Jamesburg; Newfoundland; Ocean Co.; Ramsey. NEW YORK: Huntington. NORTH CAROLINA: Aberdeen; Black Mts.; Lake Waccamaw; Raleigh; Swannanoa; Willard. OHIO: Wooster.

OKLAHOMA: Stillwater. PENNSYLVANIA: Ashbourne; Hecton Mills; Philadelphia; Roxborough. SOUTH CAROLINA: Dillon. TENNESSEE: Oakland. TEXAS: Carthage; Eldora; Fedor, Lee Co.; Jefferson; Liberty; Livingston; Tanana, Shelby Co. VIRGINIA: Beverly Hills.

Floral Records. This species is an oligolege of *Krigia* (Compositae) after which it was named. Robertson (1929) collected it only from *Krigia biflora* (= *K. amplexicaulis*). From the specimens before me, it has been collected only five times with floral data and one of these collections (13 females) was from *K. virginia*. The flowers from which it has been taken are listed below.

Cornus sp., *Hieracium venosum*, *Krigia* sp., *K. biflora*, *K. virginia*, *Ranunculus acris*.

Andrena (Callandrena) verecunda Cresson

Andrena verecunda Cresson, 1872, Trans. American Ent. Soc., vol. 4, p. 257; 1916, Mem. Amer. Ent. Soc., vol. 1, p. 109.

Andrena (Pterandrena) verecunda: Lanham, 1949, Univ. California Publ. Ent., vol. 8, p. 200.

This is a large species of *Callandrena* known only from Texas. It is related to *A. krigiana*, as shown by the form of the antennae, the dark male clypeus, the long maxillary palpi and other characters. It is the first of a series of closely related forms described below in which the males have entirely black clypei. The female of *verecunda* is marked by an incomplete propodeal corbicula consisting of long dorsal hairs, no anterior hairs and sparse internal hairs. Both sexes are marked by the high vertex and by the weak apical fasciae present on terga 2 through 4. The male is distinctive in having dense subapical fimbriae of moderately long hairs on sterna 2-5 and having sternum 6 strongly reflexed apically.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 13.5-15.0 mm; width, 3.5-4.0 mm; wing length, $M = 4.24 \pm 0.083$ mm; FL/FW, $M = 1.04 \pm 0.006$; FOVL/FOVW, $M = 2.28 \pm 0.039$.

INTEGUMENTAL COLOR: Black except as follows: flagellar segments 4 or 5 to 10 red beneath; mandible dark rufescent; tegulae dark rufescent to piceous; wing membranes hyaline, colorless, veins dark red to black; tergal apices narrowly hyaline; sternal apices hyaline; distitarsi often dark rufescent.

STRUCTURE: Antennae short, scape subequal to flagellar segments 1-4; flagellar segment 1 about equal to segments 2-4, segment 2 about equal in length to segment 4 and both slightly longer than segment 3. Eye about three and one-half times as long as broad, inner margins parallel or converging slightly towards vertex. Malar

space linear. Mandible moderately long, outer mandible extends about one-fourth its length beyond middle of labrum in repose; subgenal coronet well developed; ventrobasal angle not developed. Galea evenly rounded from dorsum to side, lateral portion about half as broad as upper; dulled by fine reticular shagreening, impunctate. Maxillary palpus moderately long, extending forward to surpass galea by slightly more than length of last segment, segmental ratio about 1.1:1.5:1.0:0.9:0.7:1.0. Labial palpus with first segment long, curved, flattened and broadened near apex, segmental ratio of about 1.4:1.0:0.6:0.6. Labral process normal in size, trapezoidal, emarginate medially, bidentate but not sharply so. Clypeus flat, extending beyond tips of compound eyes by no more than one-third its length; moderately shiny, especially apicomediaally, with coarse round punctures separated mostly by half a puncture width or less, shagreening fine, irregular, denser peripherally. Supraclypeal area with small round crowded punctures. Genal area in profile slightly less broad than eye, with minute to small round punctures separated mostly by half a puncture width or less, slightly sparser posteriorly, surface shiny. Vertex above lateral ocellus equals one and one-third to one and one-half an ocellar diameter, with small round crowded punctures above compound eyes and in narrow band above facial fovea, surface dulled by dense tessellation. Face above antennal fossae with distinct small contiguous punctures, rugulae absent or extremely weak. Facial fovea short, extends down to level about at middle of antennal fossa, narrow below, broad and flattened above, separated from lateral ocellus by two-thirds of an ocellar diameter or more.

Pronotum normal, dulled by fine reticular shagreening. Mesoscutum dull, with small round punctures separated by half a puncture width peripherally and by about one puncture width posteromedially, surface finely tessellate; parapsidal lines as long as from upper end of line to margin of scutum. Tegulae normal. Scutellum sculptured as in mesoscutum but punctures denser and surface moderately shiny. Propodeum with enclosure densely and regularly tessellate, opaque; dorsolateral and posterior surfaces with small, well-separated, shallow punctures made obscure by dense tessellation; corbicular surfaces moderately shiny, with coarse reticular shagreening, sparse small punctures dorsally. Mesepisternum sculptured as in mesoscutum but punctures obscure, slightly larger and shallower. Metepisternum sculptured as in corbicular area. Wings with three submarginal cells; vein 1st m-cu meets second submarginal cell near middle of cell; second submarginal cell along posterior margin about half as long as first submarginal cell, along dorsal margin short but distinctly longer than vein r from pteros-

tigma to second cell; pterostigma long, narrower than from inner margin prestigma to wing margin. Middle basitarsus narrower than hind, parallel-sided, anterior apical angle not produced. Claws and tibial spurs normal.

Metasomal terga shiny, unshagreened or weakly so; tergum 1 with small sparse punctures separated throughout by 2 to 4 puncture widths; terga 2-4 with punctures crowded, separated mostly by one puncture width or slightly more. Pygidial plate V-shaped with rounded apex. Sterna 2-5 impunctate in apical areas, basal areas with small round punctures separated mostly by two or more puncture widths, crowded in narrow zone near impunctate apical area; surfaces moderately dulled by coarse reticular shagreening.

VESTITURE: Generally white to cinereous. Tergum 1 with long sparse hairs basally and apical area with long decumbent sparse hairs forming an ill-defined band often interrupted medially. Terga 2-4 with basal areas with short erect hairs, apical areas with weak apical fasciae of long sparse decumbent hairs often narrowly interrupted on tergum 2. Terga 5 and 6 with long pale hairs often golden or ochraceous medially. Sterna 2-5 with short suberect hairs basally and long plumose hairs forming a single row subapically, these shorter medially. Propodeal corbicula incomplete, no anterior hairs, dorsal hairs long, internal hairs absent except a few to several long hairs in upper half. Trochanteral flocculus complete but weak. Tibial scopal hairs plumose throughout, of normal length. Inner surfaces tarsi golden yellow; tibial plate with brown hairs and scopa washed with brown posteriorly.

Male. MEASUREMENTS AND RATIOS: N = 17; length, 12.5-13.5 mm; width, 3.0-3.5 mm; wing length, $M = 4.00 \pm 0.102$ mm; FL/FW, $M = 1.07 \pm 0.007$; FS1/FS2, $M = 2.94 \pm 0.150$.

INTEGUMENTAL COLOR: Black except as follows: mandibles dark rufescent; flagellar segments 4 or 5 to 11 dark red below; tegulae dark rufescent to piceous; wing membranes hyaline, veins dark red to black; terga 2-5 often extremely narrowly hyaline apically; sterna 2-5 hyaline apically; distitarsi often rufescent.

STRUCTURE: Antennae short, in repose just reaching middle of tegulae; scape equal in length to segments 1-4 or slightly longer; flagellar segment 1 equal in length to segments 2-4, segments 2-4 subequal in length and shorter than 5, segments 5-10 rectangular or broader than long. Eye about one and one-fourth as long as broad, inner margins converging towards mandibles. Malar space, mandibles and galeae as in female. Maxillary palpus as in female but ratio about 1.0:1.1:1.0:0.9:0.7:0.8. Labial palpus as in female but ratio about 1.5:1.0:0.7:0.7. Labrum, clypeus, supraclypeal area, genal area, vertex and face above antennal fossae as in female.

Thoracic and metasomal sculpturing as in female except as follows: lateral propodeal surfaces similar to posterior surface; tergum 1 with apical area punctures separated mostly by two puncture widths, slightly denser than basal area; terga 2-4 with basal area punctures sparser than in female, separated mostly by one to two puncture widths, apical area with punctures denser, separated by one puncture width or less; sterna 2-5 shinier, shagreening weak. Wing veins and pterostigma as in female. Claws and tibial spurs normal. Sternum 6 strongly reflexed apically, especially apicolaterally where margin is thick and well sclerotized, medially with broad shallow V-shaped emargination.

Genitalia and sterna 7 and 8 as figured (Figs. 164-168). Note the following structure: gonoforceps rather abruptly pointed in outer third; penis valves relatively narrow at tips, with well-developed basolateral lamellae; sternum 7 with apex small, with V-shaped median emargination; sternum 8 with apex broadened, truncate, neck region long, broad and not expanded medially.

VESTITURE: Generally white to ochraceous. Terga 2-5 with banding as in female terga 2-4. Sterna 2-5 with dense subapical fimbriae of moderately long white suberect hairs. Inner surfaces tarsi pale yellow.

Type Material. The female lectotype of *verecunda* is from Texas (PANS No. 2162). This type is a stylized female and, therefore, not perfectly normal in its scopal characteristics. Two females from Texas identified as *verecunda* by Cresson and probably paratypes confirm the use of this name for the species described here.

Distribution. Known only from eastern Texas, *A. verecunda* has been collected from April 3rd through May 31st (one specimen is labeled, "June"). In addition to the lectotype, 25 females and 22 males have been examined from the localities listed below.

TEXAS: Austin; Eldorado; Galveston; Harper; Henly; Kerrville; New Braunfels; San Antonio.

Floral Records. Nothing can be said at this time concerning the floral preferences of *A. verecunda* save that it seems to prefer plants of the family Compositae. It has been collected from the following plants:

Englemannia bipinnatifida (1 collection, 1 ♀), *Gaillardia* sp. (1 collection, 1 ♂), *Pyrrhopappus carolinianus* (1 collection, 6 ♀♀, 11 ♂♂), *Sitilias* (= *Pyrrhopappus*) *grandiflora* (3 collections, 3 ♀♀, 1 ♂).

Andrena (Callandrena) afimbriata, n. sp.

This Texan species is closely related to *A. verecunda* Cresson. The female of *afimbriata* is distinctive in that the posterior hind

tibial spur is bent and somewhat expanded near the base much as in subgenus *Plastandrena*, but not so strongly. The female of *afimbriata* also differs from that of *verecunda* by the facial fovea being nearer to the lateral ocellus, terga 1 and 2 having apical areas with punctures more crowded than in the basal areas and having weaker fasciae apically, and the scopal hairs being entirely white. The male can be readily separated from that of *verecunda* by the lack of dense subapical fimbriae on sterna 2-5.

Female. MEASUREMENTS AND RATIOS: N = 4; length, 14-15 mm; width, about 4.5 mm; wing length, M = 4.47 ± 0.302 mm; FL/FW, M = 1.00 ± 0.008 ; FOVL/FOVW, M = 2.15 ± 0.084 .

INTEGUMENTAL COLOR: Black except as follows: mandibles rufescent near tips; flagellar segments 4-10 dark red below; tegulae dark rufescent; wing membranes slightly infumate near tips, veins dark red to black; tergal apices 2-4 with apical areas slightly translucent, not hyaline; sterna rufescent, apices hyaline, yellow; tibial spurs orange-brown.

STRUCTURE: Antennae short, scape longer than flagellar segments 1-3, shorter than segments 1-4; flagellar segment 1 as long as segments 2-4, segments 2 and 4 almost as long as 5 and slightly longer than 3. Eye longer than three and one-half times breadth, inner margins parallel or slightly converging towards mandibles. Malar space, mandibles and galeae as in *verecunda*. Maxillary palpus extending beyond galea by last palpal segments, segmental ratio about 1.3:1.4:1.0:1.0:0.6:0.6. Labial palpus as in *verecunda* but ratio about 1.5:1.0:0.7:0.6. Labral process, clypeus and supraclypeal area as in *verecunda*. Genal area slightly broader than eye in profile, sculptured as in *verecunda* but dulled by reticular shagreening posteriorly. Vertex above lateral ocellus equals one and one-third ocellar diameter, distinctly punctate except in area extending dorso-laterally from lateral ocellus, surface moderately shiny, coarsely and reticularly shagreened. Face above antennal fossae as in *verecunda*. Facial fovea of moderate length, extends below to about level of lower margin of antennal fossa, narrow below, broad and flattened above, separated from lateral ocellus by half an ocellar diameter or less.

Thoracic sculpturing as in *verecunda* except as follows: propodeal dorsal enclosure slightly roughened; corbicular area less shiny, shagreening slightly denser. Middle basitarsus narrower than hind, with parallel sides, anterior apical angle produced into a sharply pointed spinelike process. Wing venation as in *verecunda*. Claws normal. Posterior hind tibial spur bent near base and with narrow posterior membranous flange slightly expanded in this lower bend, entire spur bent in shallow S-shape.

Metasomal terga sculptured as in *verecunda* except as follows: tergum 1 with basal area punctures separated mostly by 2 to 3 puncture widths and apical area punctures by one puncture width or slightly more; terga 2-4 with apical area punctures distinctly more abundant than basal area punctures. Pygidial plate broad basally, V-shaped with narrowly rounded apex. Sterna as in *verecunda*.

VESTITURE: Generally white to cinereous. Tergum 1 with sparse hairs basally or none, apically without fascia although extremely weak hairs present laterally. Terga 2-5 with short suberect hairs basally; apically with decumbent hairs scarcely any longer or more plumose than basal hairs and not at all hiding surface, best developed on tergum 4. Terga 5 and 6 with long white hairs. Sterna 2-5 with apical fimbriae as in *verecunda*. Propodeal corbicula and trochanteral flocculus as in *verecunda*. Tibial scopal hairs plumose throughout. Inner surfaces tarsi light yellow; scopal hairs entirely white.

Male. MEASUREMENTS AND RATIOS: N = 6; length, 13-14 mm; width, 3.0-3.5 mm; wing length, $M = 4.13 \pm 0.062$ mm; FL/FW, $M = 1.06 \pm 0.010$; FS1/FS2, $M = 2.61 \pm 0.081$.

INTEGUMENTAL COLOR: As in female but flagellar segments 4-11 dark red below; sterna more piceous; ditarsi rufescent; tibial spurs pale yellow.

STRUCTURE: Antennae short, in repose not reaching beyond middle of tegula; scape slightly longer than flagellar segments 1-3; flagellar segment 1 equal in length to segments 2-4, segments 2 and 3 slightly shorter than segment 4 which is slightly shorter than 5, segments 5-10 rectangular. Eye about three and one-half times as long as broad, inner margins converging slightly towards mandibles. Malar space, mandibles and galea as in female. Maxillary palpus as in female but ratio about 1.2:1.1:1.0:0.9:0.6:0.7. Labial palpus as in female but ratio about 1.5:1.0:0.6:0.7. Labrum, clypeus, supra-clypeal area, genal area, vertex and face above antennal fossae as in female.

Thoracic and metasomal sculpturing as in female except as follows: mesoscutum and scutellum slightly shinier; later surfaces of propodeum (= corbicular area) opaque, tessellate. Claws and tibial spurs normal, posterior hind tibial spur not S-shaped, considerably longer than anterior spur. Wing venation as in female. Sternum 6 strongly reflexed apically, especially apicolaterally where margin is thick and well sclerotized, medially with broad shallow emargination.

Genitalia and sterna 7 and 8 (Figs. 169-172) similar to those of *verecunda*.

VESTITURE: Generally white to cinereous. Terga 1-5 with weak apical fasciae usually broadly interrupted medially on terga 1-4. Sterna 2-5 without dense subapical fimbriae, subapical hairs sparse, weak, not strongly barbed. Inner surfaces tarsi pale yellow.

Type Material. The holotype (SECK) female from Eldorado, Texas, was collected by R. H. and L. D. Beamer, C. D. Michener, J. G. Rozen and W. P. Stephen, April 10, 1950. The allotype (SECK) male and one male paratype were collected at the same time and place as the holotype on flowers of *Pyrrhopappus carolinianus*. In addition, 3 female and 3 male paratypes (SECK; INHS) from Texas are as follows: *Giddings*, 1 ♀ and 1 ♂, April 12, 1953, R. H. Beamer, on *Pyrrhopappus* sp.; 1 ♂, April 12, 1953, R. H. Beamer, on *Berlandiera* sp. *Paige*, 2 ♀♀ and 1 ♂, April 24, 1953, R. H. Beamer and L. D. Beamer, on *Polygala alba*.

Andrena (Callandrena) crawfordi Viereck

Andrena crawfordi Viereck, 1909, Proc. Ent. Soc. Washington, vol. 11, p. 143; Pierce, 1909, Bull. United States Nat. Mus., vol. 66, p. 42; 1918, Proc. United States Nat. Mus., vol. 54, p. 456; Hendrickson, 1930, Iowa St. Coll. Jour. Sci., vol. 4, p. 162 (mis-determination).

Andrena (Pterandrena) crawfordi: Lanham, 1949, Univ. California Publ. Ent., vol. 8, p. 200.

This small species is closely related to *A. verecunda* and shows relationship to *A. krigiana*. All three species, as well as the following, are oligoleges of plants of the composite tribe Cichoriae. *A. crawfordi* can be distinguished from *krigiana* by its larger size and black male clypeus. The female of *crawfordi* differs from that of *verecunda* by the shorter vertex, smaller facial fovea and white tibial scopa. It differs from the female of *afimbriata* by the normal posterior hind tibial spur. The male of *crawfordi* differs from that of *verecunda* and *afimbriata* by the unreflexed sixth sternum and from *verecunda* by the lack of subapical fimbriae on sterna 2-5. The male of *crawfordi* is also marked by a shorter vertex than that of *verecunda* or *afimbriata*.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 11-13 mm; width, 2.5-3.5 mm; wing length, $M = 3.38 \pm 0.088$ mm; FL/FW, $M = 1.05 \pm 0.007$; FOVL/FOVW, $M = 2.20 \pm 0.024$.

INTEGUMENTAL COLOR: Black except as follows: mandibles rufescent apically; flagellar segments 5-10 red below; tegulae translucent, dark red to piceous; wing membranes hyaline, colorless, veins red to dark reddish-brown; tergal apices narrowly hyaline, apical area

anterior to hyaline margin often dark rufescent; sterna 2-5 with narrow apical areas hyaline, yellowish; tibial spurs yellow.

STRUCTURE: Antennae short, scape subequal in length to flagellar segments 1-4; flagellar segment 1 subequal to segments 2-4, segments 2-4 subequal in length to each other and shorter than segment 5, segments 6 and 7 quadrate in outline. Eye about three and one-third times as long as broad, inner margins converging slightly toward mandibles. Malar space linear. Mandibles short, outer mandible in repose extends beyond middle of labrum by one-fifth its length or less; subgenal coronet well developed; ventrobasal angle not developed. Galea as in *verecunda*. Maxillary palpus as in *verecunda* but segmental ratio about 1.0:1.1:1.0:1.0:0.7:0.8. Labial palpus as in *verecunda* but segmental ratio of about 1.5:1.0:0.6:0.7. Labral process as in *verecunda*. Clypeus as in *verecunda* but shagreening denser, usually posterior and lateral two-thirds dulled and apicomedial third or slightly less shiny to moderately shiny. Supraclypeal area dulled by minute punctures and irregular shagreening. Genal area in profile slightly broader than eye, sculptured as in *verecunda*. Vertex short, above lateral ocellus equal to slightly less than one ocellar diameter (about as 13:15), sculptured as in *verecunda* but punctures more abundant. Face above antennal fossae with distinct rugulae ending below level of lower margins of ocelli, interrugal spaces punctate. Facial fovea short, extending down to about level of upper margin of antennal fossae, lower end narrow but rounded, upper end rounded, separated from lateral ocellus by length equivalent to height of vertex above lateral ocellus.

Pronotum as in *verecunda*. Mesoscutum as in *verecunda* but parapsidal lines shorter than from their tips to margin of scutum. Remainder of thorax sculptured as in *verecunda* but propodeal dorsal enclosure with granulations basally and medially in addition to tessellation. Wings with three submarginal cells, vein 1st m-cu meets second submarginal cell near middle of cell; second cell short, along posterior margin equal to less than half but more than one-third of first cell, along dorsal margin longer than vein r from pterostigma to second cell; pterostigma as in *verecunda*. Middle basitarsus as in *verecunda*. Claws and tibial spurs normal.

Metasomal terga shiny, unshagreened or delicately so; tergum 1 with basal area punctures separated by 2-4 puncture widths, apical area punctures more crowded and smaller; tergum 2 with basal area punctures separated mostly by 2-3 puncture widths, apical area punctures by 1-2 puncture widths; terga 3 and 4 with basal area punctures separated by 1 to 2 puncture widths, slightly more crowded apically. Pygidial plate V-shaped, broad basally, rounded

apically. Sterna sculptured as in *verecunda* but punctures somewhat denser and surfaces shinier.

VESTITURE: Generally white to cinereous. Terga 1-4 without apical fasciae or these reduced to extremely short, weak fasciae at extreme sides of terga 2-4; terga 5 and 6 with long white hairs; scopal hairs white; otherwise vestiture as in *verecunda*.

Male. MEASUREMENTS AND RATIOS: N = 20; length, 10.0-12.5; width, 2.5-3.0; wing length, M = 3.27 ± 0.110 mm; FL/FW, M = 1.09 ± 0.006 ; FS1/FS2, M = 2.70 ± 0.075 .

INTEGUMENTAL COLOR: As in female except as follows: flagellar segments 5-11 red below; tegulae more often rufescent and translucent; wing veins more often red.

STRUCTURE: Antennae short, in repose just reaching middle of tegulae; scape equal in length or slightly longer than flagellar segments 1-3 (less than segments 1-4); flagellar segment 1 about equal in length to segments 2-4; segments 2-4 equal in length to each other, shorter than segment 5, segments 5-7 quadrate, remaining segments at least slightly longer than broad. Eye about three and one-fourth times as long as broad; inner margins converging slightly towards mandibles. Malar space, mandible and galea as in female. Maxillary palpus as in female but ratio of about 1.0:1.2:1.0:0.8:0.7:0.8. Labial palpus as in female but ratio of about 1.6:1.0:0.9:0.9. Labrum, clypeus, supraclypeal area, genal area, vertex and face above antennal fossae as in female.

Thoracic and metasomal sculpturing as in female except as follows: enclosure of propodeum less granular; lateral propodeal surfaces with minute punctures scattered throughout, surfaces dulled by fine tessellation; tergum 1 with punctures in both basal and apical areas sparser; tergum 2 with sparser punctures; terga 3-5 punctate similar to female terga 2-4; sterna 2-5 with sparser punctures basally. Wing veins and pterostigma as in female. Claws and tibial spurs normal. Sternum 6 only weakly reflexed apically or not at all, not thickened and heavily sclerotized apicolaterally.

Genitalia and sterna 7 and 8 (Figs. 174-178) much as in *verecunda* but note the following difference: gonoforceps not abruptly narrowed apically; sternum 7 broader apically with median emargination larger; sternum 8 with apex more rounded.

VESTITURE: Generally white to cinereous. Terga 2-5 without apical fasciae or these reduced to extremely short fasciae at sides of terga. Sterna 2-5 without apical fimbriae. Inner surfaces tarsi pale yellow.

Type Material. The female (USNM) holotype and male (USNM) allotype were collected by F. C. Bishopp at Dallas, Texas, May 6, 1905, on *Sitilias* (= *Pyrrhoppus*) *grandiflora*.

Distribution. *A. crawfordi* is known from Texas to southern Kansas in the Great Plains (Fig. 11). It has been taken from March 28th through May 23rd. In addition to the type material, a total of 191 females and 94 males have been examined from the localities listed below.

KANSAS: Medicine Lodge, Barber Co. OKLAHOMA: Stillwater (3 miles E.). TEXAS: Ben Bolt; Braunfels; Clifton (3 miles N.E.); Corpus Christi; Cotulla; Crosby; Dallas; Edna; Eldorado; Fedor; Giddings (and 9 miles W. and 17 miles S.W.); Henly; Houston; LaGrange; Mannheim; Paige; Stonewall; Terrell; Victoria; Waco.

Floral Records. *A. crawfordi* is an oligolege of plants of the family Compositae, tribe Cichoriae. It has been collected a few times on other composites or other families of plants, but females almost without exception carried pollen of *Pyrrhopappus*. The exceptions are 2 females (out of 125 with flower data) which were taken on *Englemannia* and carried a different pollen (presumably of the flower from which they were collected). Out of 171 bees with flower data (representing 30 collections) 119 (19 collections) were from *Pyrrhopappus* and 30 (8 collections) were from some other Composite. This leaves only 22 bees (3 collections) from other families. This bee has been collected from flowers of the following plants:

Berlandiera sp., *Coreopsis* sp., *Englemannia bipinnatifida*, *Lindheimeri texana*, *Polygala alba*, *Pyrrhopappus* sp., *P. carolinianus*, *P. geiseri*, *P. grandiflora*, *P. multicaulis*, *Serinea* sp., *S. oppositifolia*.

Andrena (Callandrena) tonkaworum Viereck

Andrena (Ptilandrena) tonkaworum Viereck, 1917, Trans. American Ent. Soc., vol. 43, p. 396.

Andrena (Pterandrena) tonkaworum: Lanham, 1949, Univ. California Publ. Ent., vol. 8, p. 200.

This medium-sized bee is related to *verecunda* but differs in the punctation as described below and in the broadly translucent apical margins of the terga in both sexes. In addition, the female of *tonkaworum* has weak but complete apical pale bands on terga 2-4, entirely pale scopal hairs, a short vertex, and terga 2-4 are duller. The male of *tonkaworum* is distinctive in that flagellar segments 2 and 3 are subequal and each shorter than segment 4, terga 2-5 have weak apical fasciae and sterna 2-5 have well-developed subapical fimbriae.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 12-14 mm; width, 3-4 mm; wing length, M = 4.16 ± 0.158 mm; FL/FW, M = 1.04 ± 0.005; FOVL/FOVW, M = 2.33 ± 0.033.

INTEGUMENTAL COLOR: Black except as follows: mandible in apical half dark rufescent; flagellar segments 4-10 dark red below; tegulae testaceous; wing membranes hyaline, slightly yellowish, veins yellow to dark red; terga 1-4 with apical one-fourth to one-third hyaline, yellow to rufescent; sterna 2-5 hyaline apically, yellow; distitarsi and often basitarsi dark rufescent; tibial spurs yellow.

STRUCTURE: Antennae short, scape equal to flagellar segments 1-3 plus half of 4; flagellar segment 1 equal to segments 2 plus 3 plus half of 4, segments 2 and 3 equal in length and distinctly shorter than 4, segments 4 and 5 quadrate. Eye about three and two-thirds as long as broad; inner margins parallel or almost so. Malar space linear. Mandible short, outer extends in repose beyond middle of labrum by one-fifth or less of its length; subgenal coronet and basoventral angle as in *verecunda*. Galea as in *verecunda*. Maxillary palpus short, barely exceeds galea when stretched forwards, segmental ratio about 1.0:1.2:0.7:0.7:0.6:0.8. Labial palpus as in *verecunda*, first segment with breadth to length about as 4:16, segments in ratio of about 1.6:1.0:0.5:0.9. Labral process as in *verecunda*. Clypeus as in *verecunda* but punctures slightly more crowded, shagreening weak but regular, moderately shiny. Supraclypeal area as in *verecunda*. Genal area in profile slightly broader than eye, with minute round punctures crowded near eye, sparser posteriorly, surface coarsely and reticularly shagreened, dull except narrow zone next to eye. Vertex short, above lateral ocellus equal to slightly more than one ocellar diameter, surface dulled by shallow punctures and coarse tessellation. Face above antennal fossae punctate as in *verecunda*. Facial fovea extends down to about level of middle of antennal fossa, round and extremely shallow below, broader and rounded above, separated from lateral ocellus by somewhat more than half an ocellar diameter.

Pronotum normal. Thoracic sculpturing as in *verecunda* but punctures everywhere shallower and less distinct, slightly sparser, tessellation coarser. Wing with three submarginal cells; vein 1st m-cu received near middle of second cell; second submarginal cell long, along posterior margin equals about half of first cell, along anterior margin longer than vein r from pterostigma to cell; pterostigma long, about as broad as from inner margin of prestigma to wing margin. Middle basitarsus slightly expanded medially, about as broad as hind basitarsus, angulate at apex anteriorly but not produced. Claws and tibial spurs normal.

Metasomal terga opaque, dulled by fine regular tessellation except apically moderately shiny; terga 1-5 basally with minute punctures separated mostly by 2 to 4 puncture widths, apical areas

with minute punctures slightly more crowded. Pygidial plate V-shaped, broad, with blunted apex. Sterna 2-5 as in *verecunda* but less shiny.

VESTITURE: Generally bright ochraceous above to pale ochraceous below. Terga 2-4 with weak but distinct apical fasciae, that on tergum 2 often narrowly interrupted medially. Terga 5 and 6 with pale ochraceous to white hairs. Sternal hairs ochraceous, fimbriae distinct. Propodeal corbicula, trochanteral flocculus and scopa as in *verecunda*. Scopal hairs entirely ochraceous.

Male. MEASUREMENTS AND RATIOS: N = 8; length, 12-13 mm; width, 3-4 mm; wing length, $M = 3.98 \pm 0.099$ mm; FL/FW, $M = 1.10 \pm 0.149$; FS1/FS2, $M = 2.56 \pm 0.063$.

INTEGUMENTAL COLOR: Black except as follows: mandible dark rufescent apically; flagellar segments 4-11 red below; tegulae testaceous; wing membranes hyaline, slightly yellow, veins red to dark red; terga 1-5 broadly hyaline apically; sterna 2-5 narrowly hyaline apically; distitarsi rufescent.

STRUCTURE: Antennae short, in repose extending back to middle of tegulae; scape equals flagellar segments 1-3 or slightly longer; flagellar segment 1 longer than 2 plus 3, segments 2 and 3 equal in length and shorter than segment 4, segments 4-10 slightly longer than broad. Eye about three times as long as broad or slightly longer; inner margins converging slightly towards mandibles. Malar space, mandibles and galea as in female. Maxillary palpus as in female but ratio about 1.2:1.0:0.9:0.8:0.9:0.8. Labial palpus as in female but first segment somewhat broader at apex (breadth is to length about as 7:17) and ratio about 1.4:1.0:0.5:0.7. Labrum, clypeus, supraclypeal area, genal area, vertex and face above antennal fossae as in female.

Thoracic and metasomal sculpturing as in female except as follows: lateral propodeal surfaces dull, tessellate; terga with basal area punctures slightly more distinct; sterna 2-5 shinier. Wing veins and pterostigma as in female. Claws and tibial spurs normal. Sternum 6 reflexed apically but weakly so except laterally.

Genitalia and sterna 7 and 8 (Figs. 184-188) similar to those of *crawfordi* but note broader apex of sternum 8 and narrower apical area of sternum 7.

VESTITURE: Generally pale ochraceous to bright ochraceous, usually brighter on dorsum than laterally or below. Terga 2-5 with weak apical pale fasciae complete except occasionally on tergum 2 narrowly interrupted medially. Sterna 2-5 with distinct subapical fimbriae of pale, moderately short, highly barbed hairs. Inner surfaces tarsi pale yellow.

Type Material. The holotype female of (PANS No. 4074) of *tonkaworum* is from Texas.

Distribution. *A. tonkaworum* is known to occur from Texas and New Mexico north to Colorado and Nebraska. It has been collected from April 6th through July 26th, but chiefly in late May and June. In addition to the holotype listed above, 44 females and 8 males have been examined from the localities listed below.

COLORADO: Regnier. KANSAS: Syracuse (10 miles E.); Wallace Co. NEBRASKA: Alliance. NEW MEXICO: Clovis; Maxwell. TEXAS: Alpine; Canadian; Edna; Eldorado; Ft. Sam Houston; Odessa; Salado Creek, Bexar Co.

Floral Records. *A. tonkaworum* has been collected only on flowers of *Englemannia* spp. and is, perhaps, an oligolege of that plant.

Andrena (Callandrena) sitiliae Viereck

Andrena sitiliae Viereck, 1909, Proc. Ent. Soc. Washington, vol. 11, p. 144.

Andrena (Pterandrena) sitiliae: Lanham, 1949, Univ. California Publ. Ent., vol. 8, p. 200.

A. sitiliae is a medium-sized bee closely related to *A. tonkaworum* and *A. verecunda*. The female of *sitiliae* is easily recognized because the posterior hind tibial spur is modified similar to the spur of a *Plastandrena* or an *Aporandrena*, but more weakly so. The males of *sitiliae*, on the other hand, have normal hind tibial spurs. Both sexes can be distinguished from those of *tonkaworum* by the lack of hyaline apical areas on tergum 1-5. The male of *sitiliae* resembles that of *afimbriata* in lacking subapical sternal fimbriae and in the reflexed sixth sternum but differs in the shiny, unshagreened terga.

Female. MEASUREMENTS AND RATIOS: N = 11; length, 13-14 mm; width, 3.0-4.5 mm; wing length, M = 4.55 ± 0.178 mm; FL/FW, M = 1.04 ± 0.011; FOVL/FOVW, M = 2.13 ± 0.069.

INTEGUMENTAL COLOR: Black except as follows: tips of mandibles and flagellar segments 5-10 dark rufescent below; tegulae slightly rufescent to piceous; wing membranes hyaline, slightly infumate apically, veins dark reddish-brown; terga 2-4 with apices extremely narrowly hyaline, brownish; sterna 2-5 with apices broadly hyaline, colorless to yellowish; distitarsi rufescent; tibial spurs yellow.

STRUCTURE: Antennae short, scape equal in length to flagellar segments 1-3; flagellar segment 1 equal in length to segments 2-4, segment 2 about equal to 5, segments 3 and 4 subequal to each other and slightly shorter than 2. Eye about three times as long as broad, inner margins parallel or converging extremely slightly

towards mandibles. Malar space, mandible and galea as in *verecunda*. Maxillary palpus extended forward surpasses tip of galea by no more than length of last palpal segment, segmental ratio of about 1.4:1.5:1.0:1.0:0.7:0.8. Labial palpus with first segment somewhat broadened and flattened apically, terete basally, curved, ratio of about 1.6:1.0:0.5:0.7. Labral process, clypeus and supraclypeal area as in *verecunda*. Genal area about as broad as eye in profile, with punctures minute and crowded near eye margin, small and sparser posteriorly, surface dulled by fine reticular shagreening. Vertex above lateral ocellus equal one and one-half ocellar diameter or slightly more, sculptured as in *verecunda*. Face above antennal fossae as in *verecunda*. Facial fovea short, extends down to level of upper margin of antennal fossa or slightly beyond, narrowed and rounded below, broad and rounded above, separated from lateral ocellus by about two-thirds an ocellar diameter.

Pronotum, mesoscutum and scutellum as in *verecunda* but mesoscutal punctures somewhat shallower, with bases dulled, more obscure; parapsidal line short, slightly shorter than from its posterior end to margin of scutum. Propodeum as in *verecunda* but corbicular area less shiny. Mesepisternum and metepisternum as in *verecunda*. Fore wing with three submarginal cells, vein 1st m-cu meets second cell at or before middle of cell, second submarginal cell along posterior margin longer than first cell, along anterior margin about twice length vein r from pterostigma to second cell; pterostigma long, about as broad as from inner margin prestigma to wing margin. Middle basitarsus narrower than hind, parallel-sided, anterior apical angle not spinelike. Claws normal; hind tibial spur bent at about one-fourth to one-third distance from base, with posterior internal margin broadened into a slight membranous flange in area of bend.

Metasomal terga dulled by regular fine reticular shagreening except at extreme apices; terga 1-4 with minute round punctures separated mostly by three to four punctures widths, apical area punctures not noticeably more abundant than basal. Pygidial plate with broad, rounded apex, almost U-shaped, but broader basally. Sterna 2-5 as in *verecunda*.

VESTITURE: In general pale ochraceous above to white or cinereous on sides and below. Terga 2-4 without distinct pale apical pubescent fasciae; terga 5 and 6 with hairs yellow medially, white laterally. Sterna 2-5 with long suberect hairs apically as in *verecunda*. Propodeal corbicula, trochanteral flocculus and tibial scopa as in *verecunda*; scopal hairs yellow to ochraceous, not washed with brown posteriorly.

Male. MEASUREMENTS AND RATIOS: N = 20; length, 11-13 mm;

width, 2.5–3.5 mm; wing length, $M = 4.08 \pm 0.115$ mm; FL/FW, $M = 1.09 \pm 0.005$; FS1/FS2, $M = 2.69 \pm 0.043$.

INTEGUMENTAL COLOR: Black except as follows: mandibular apical fourth and flagellar segments 5–11 below dark rufescent; tegulae translucent, rufescent; wing membranes hyaline, colorless or slightly infumate apically, veins red to dark reddish-brown; terga 2–5 with apical areas extremely slightly rufescent; sterna 2–5 apically hyaline, yellowish; distitarsi slightly rufescent; tibial spurs yellow.

STRUCTURE: Antennae short, in repose reaching about to middle of tegulae; scape equal in length to less than length of segments 1–3; segment 1 equal in length to about succeeding two and one-half segments; segments 2–5 as in female. Eye about three and one-fourth times as long as broad, inner margins converging towards mandibles. Mandibles, malar space and galea as in female. Maxillary palpus as in female but segmental ratios of about 1.0:1.2:0.9:0.8:0.7:0.9. Labial palpus as in female but ratio about 1.4;1.0:0.8:0.9. Labrum, clypeus, supraclypeal area, genal area, vertex and face above antennal fossae as in female.

Thoracic and metasomal sculpturing as in female except as follows: propodeum with lateral surfaces duller; terga 1–5 with surfaces often slightly shinier, dense reticular shagreening often restricted to about basal halves especially on terga 2 and 3; sterna shinier, less punctate. Wings and pterostigma as in female. Claws and tibial spurs normal. Sternum 6 as in *afimbriata*.

Genitalia and sterna 7 and 8 (Figs. 179–183) similar to those of *crawfordi* but gonoforceps blunter at apices; gonocoxite with dorsal lobe turned outwards; sternum 7 narrower in apical region; sternum 8 with basal area much shorter and neck region longer.

VESTITURE: Generally white to cinereous, occasionally pale ochraceous on vertex and thoracic dorsum. Terga 1–5 without apical pale pubescent fasciae, otherwise as in *verecunda*. Sterna 2–5 without subapical fimbriae of long suberect barbed hairs, otherwise as in *verecunda*. Inner surfaces tarsi pale yellow.

Type Material. The female holotype (USNM No. 10,003) of *sitiliae* from Cotula, Texas, May 12, 1906, was collected by J. C. Crawford on *Coreopsis tinctoria*.

Distribution. *A. sitiliae* is known only from Texas and Oklahoma. It has been collected from April 10th through June 11th from the localities listed below (50 specimens).

OKLAHOMA: Mooreland, Woodward Co.; Stillmater (3 miles E.). **TEXAS:** Cotula; Crosby; Giddings; LaGrange; Lavaca Co.; Palmetto State Park, Gonzales Co.

Flower Records. In addition to the record of the holotype being

taken on *Coreopsis tinctoria*, this species has been taken only on *Pyrrhoppappus* sp. and *P. carolinianus* and it seems likely that *A. sitiliae* is an oligolege of flowers of plants of the genus *Pyrrhoppappus* (Compositae).

Andrena (Callandrena) senticulosa, n. sp.

This is a medium-sized bee known only from Texas. It is closely related to *A. sitiliae* and *A. verecunda*. The female of *senticulosa* is distinctive in the form of the middle basitarsus which is not markedly expanded medially but is generally broader than in other species of this group and has the anterior apical angle produced into a short sharp spinelike process. The posterior apical angle of the middle basitarsus forms a rounded right angle. Both sexes have terga 2-4 with more or less distinct apical pale pubescent bands (often interrupted medially on terga 2 and 3), the clypeus and terga dulled by fine reticular shagreening, and relatively short verticles. The male is marked by weak subapical sternal fimbriae and by sternum 6 being reflexed apically.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 12.0-13.5; width, 3.0-3.5 mm; wing length, $M = 4.22 \pm 0.075$ mm; FL/FW, $M = 1.04 \pm 0.004$; FOVL/FOVW, $M = 2.42 \pm 0.041$.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical half rufescent; flagellar segments 4 or 5 to 10 rufescent below; tegulae rufescent to piceous; wing membranes hyaline, slightly infumate apically, veins red to dark reddish-brown; terga 2-4 with narrow apical area slightly translucent; sterna 2-5 narrowly hyaline apically, yellow; distitarsi and often basitarsi dark rufescent; tibial spurs yellow.

STRUCTURE: Antennae short, scape length equals about first three and one-half flagellar segments; flagellar segment 1 equal to about succeeding two and one-half segments; segment 2 subequal to segment 3 or 4 and shorter than 5. Eye about three and one-half times as long as broad, inner margins converging slightly towards mandibles. Malar space, mandible and galea as in *verecunda*. Maxillary palpus as in *verecunda* but segmental ratio about 1.2:1.1:1.0:0.8:0.7:0.8. Labial palpus as in *verecunda* but segment 1 less curved and less broadened apically, ratio about 1.8:1.0:0.6:0.7. Labral process as in *verecunda*. Clypeus punctate as in *verecunda*, surface dulled by fine dense reticular shagreening, opaque posteriorly and laterally, moderately dulled apicomediaally. Supraclypeal area as in *verecunda*. Genal area in profile slightly broader than eye, sculptured as in *verecunda*. Vertex short, above lateral ocellus equals about one ocellar diameter, sculptured as in *verecunda*. Face above antennal

fossae with contiguous punctures, dulled by weak shagreening, a few longitudinal rugulae evident laterally near foveae. Facial fovea long, extends to below level of middle of antennal fossa, extremely shallow and indistinct below, rounded above, separated from lateral ocellus by two-thirds to three-fourths of an ocellar diameter.

Pronotum as in *verecunda*. Thoracic sculpturing as in *verecunda* except as follows: mesoscutal, scutellar and mesepisternal punctures extremely shallow, with bottoms dulled by fine tessellation, obscured by the general tessellation. Fore wing with three submarginal cells; second submarginal cell receiving vein 1st m-cu at or before middle of cell; second cell along posterior margin longer than half of first cell, along dorsal margin twice as long as vein r from pterostigma to cell. Pterostigma long, about as broad as from inner margin prestigma to wing margin. Middle basitarsus about as broad as hind basitarsus, sides evenly and gently curved, anterior apical angles produced into a sharp spinelike process, posterior apical angle forming a rounded right angle. Claws and tibial spurs normal.

Metasomal terga dulled by fine dense reticular shagreening, apical areas slightly shinier. Terga 1-4 with basal areas with minute indistinct punctures separated mostly by 2-4 puncture widths, apical areas with punctures slightly larger and more crowded. Pygidial plate large, apex bluntly rounded, broader basally. Sterna 2-5 as in *verecunda* but slightly duller.

VESTITURE: Generally pale ochraceous on vertex and dorsum of thorax, white to cinereous at sides and below. Tergum 1 almost hairless above, with long hairs laterally. Terga 2-4 with basal areas with short erect to suberect hairs, apical areas with pale pubescent fasciae but interrupted medially on terga 2 and 3. Terga 5 and 6 with long ochraceous to white hairs. Propodeal corbicula, trochanteral flocculus, and tibial scopa as in *verecunda* but scopal hairs not washed with brown posteriorly.

Male. **MEASUREMENTS AND RATIOS:** N = 2; length, about 12 mm; width, about 3 mm; wing length, 3.90-3.99 mm; FL/FW, about 1.05; FS1/FS2, 2.36-2.80.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical third dark rufescent; flagellar segments 4-11 dark red below; tegulae piceous; wing membranes hyaline, infumate apically, veins red; terga 2-5 extremely narrowly translucent apically; sterna 2-5 hyaline apically, somewhat rufescent basally; distitarsi dark rufescent; tibial spurs yellow.

STRUCTURE: Antennae short, in repose reaching middle of tegulae; scape equal in length to segments 1-3; flagellar segment 1 equal in length to slightly more than segment 2 plus 3, segments 2 and 3 subequal and each distinctly shorter than 4. Eye about three and

one-third times as long as broad, inner margins converging towards mandibles. Malar space, mandibles and galeae as in female. Maxillary palpus as in female but ratio about 1.2:1.0:1.0:0.8:0.8:1.0. Labial palpus as in female but ratio about 2.0:1.0:0.9:1.3. Labrum, clypeus, supraclypeal area, genal area, vertex and face above antennal fossae as in female.

Thoracic and metasomal sculpturing as in female except as follows: lateral propodeal surfaces less shiny; terga 1-5 like female terga 1-4; sterna 2-5 with punctures less abundant. Wing veins and pterostigma as in female. Claws and tibial spurs normal. Sternum 6 strongly reflexed apically, especially apicolaterally, medially with broad shallow V-shaped emargination.

Genitalia and sterna 7 and 8 (Figs. 189-193) similar to *tonkaworum* but note following differences: sternum 7 with apical median emargination extremely shallow; sternum 8 with shallow apical median emargination.

VESTITURE: Generally white to cinereous or white to ochraceous, cinereous or ochraceous on vertex and thoracic dorsum, paler at sides and below. Terga 2-5 with narrow apical pale pubescent fasciae but interrupted medially on terga 2 and 3. Sterna 2-5 with weak, short, white subapical fimbriae. Inner surfaces tarsi pale yellow.

Type Material. The holotype (SECK) female was collected on *Pyrrhopappus* sp., 9 miles west of Giddings, Texas, April 11, 1953, L. D. Beamer and the allotype (SECK) male was collected at Edna, Texas, May 7, 1953, R. H. Beamer. Twenty-nine paratypes (SECK; INHS; USNM; RBR); all from Texas, are as follows: *Edna*. 1 ♀, May 25, 1907, F. C. Bishopp; 1 ♂ on *Englemannia bipinnatifida*, May 7, 1953, R. H. Beamer. *Giddings*. 13 ♀♀, April 11, 1953, R. H. Beamer; 4 ♀♀ on *Serinia oppositifolia*, April 11, 1953, R. H. Beamer; 3 ♀♀ on *Berlandiera* sp., April 12, 1953, L. D. and R. H. Beamer; 1 ♀ on *S. oppositifolia*, April 12, 1953, L. D. and R. H. Beamer; 1 ♀, April 12, 1953, L. D. Beamer; 3 ♂♂ (9 miles west) on *Pyrrhopappus* sp., April 11, 1953, L. D. Beamer. *La Grange*. 1 ♀, April 10, 1953, L. D. Beamer. *Palmetto State Park, Gonzales County*. 1 ♀, April 10, 1963, R. B. Roberts and M. Naumann.

Andrena (Callandrena) haynesi Viereck and Cockerell

Andrena haynesi Viereck and Cockerell, 1914, Proc. United States Nat. Mus., vol. 48, p. 26; Cockerell, 1931, American Mus. Nov. No. 458, p. 14; Stevens, 1949, Bimo. Bull. North Dakota Agric. Exp. Sta., vol. 12, p. 22.

Andrena (Pterandrena) haynesi: Lanham, 1949, Univ. California Publ. Ent., vol. 8, p. 200.

This is a large dark bee of the western Great Plains region. It is similar to species of the *verecunda* group in that the male clypeus is entirely black. However, it is not closely related to *verecunda* as is shown by its sculpturing, short maxillary palpus, male terminalia and female propodeal corbicula. It is distinctive in both sexes by the dark ochraceous pile and deeply infumate wings and in the females by the dark brown scopal hairs.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 14–17 mm; width, 3.5–5.0 mm; wing length, M = 5.88 ± 0.144 mm; FL/FW, M = 1.11 ± 0.058 ; FOVL/FOVW, M = 2.45 ± 0.030 .

INTEGUMENTAL COLOR: Black except as follows: mandible with apical half dark rufescent in part; flagellar segments 5–10 below dark red; tegulae dark red to piceous; wing membranes deeply infumate, brown, veins dark blackish-brown; tergal apices slightly rufescent; sterna 2–5 with apices translucent, yellow; distitarsi dark rufescent; tibial suurs red to reddish-brown.

STRUCTURE: Antennae of moderate length, scape length equals flagellar segments 1–3; flagellar segment 1 somewhat longer than segments 2 plus 3, shorter than segments 2–4; segment 2, 3 and 4 subequal in length, shorter than segment 5, almost as long as broad. Eye about three and three-fourths as long as broad or slightly longer, inner margins parallel. Malar space broader posteriorly, at shortest length about four and one-half times as broad as long. Mandible short, extends beyond middle of labrum by one-fifth its length or less; subgenal coronet well developed; ventrobasal angle not developed. Galea evenly rounded from top to side, lateral portion about half as broad as dorsal; surface opaque, densely and finely tessellate, impunctate. Maxillary palpus slightly shorter than galea when extended, segmental ratio about 1.2:1.2:1.0:0.9:0.9:1.1. Labial palpus long, with first segment straight along outer, curved along inner margin, apically almost twice as broad as near base, segmental ratio about 2.3:1.5:1.0:1.2. Labral process about three times as broad as long, trapezoidal, emarginate medially, bidentate. Clypeus flattened, slightly constricted just before apical margin, produced beyond level of ends of compound eyes by about two-thirds its median length; shiny to moderately shiny, with small round punctures separated by half a puncture width or less except along midline and fine irregular shagreening posteriorly. Supraclypeal area with small contiguous but distinct punctures and extremely fine shagreening. Genal area in profile about one and one-half times as broad as eye, with minute punctures crowded near eye, sparse posteriorly, and coarse tessellation dulling surface. Vertex above lateral ocellus equals slightly more than one ocellar diameter, surface with scattered small round punctures crowded

above ocelli, along apex and near upper margins foveae, dulled by coarse reticular shagreening. Face above antennal fossae with irregularly anastomizing longitudinal rugulae almost reaching lateral ocelli, interrugal spaces with scattered large round punctures and coarse tessellation, moderately shiny. Facial fovea long, extends to or below level of lower margin of antennal fossa, lower end relatively broad and rounded, upper end broader, rounded, separated from lateral ocellus by about half an ocellar diameter.

Pronotum normal, with sparse obscure punctures and coarse regular tessellation dulling surface. Mesoscutum with shallow round punctures separated by half to one puncture width, surface and bottoms of punctures dulled by fine regular tessellation; parapsidal line long. Scutellum and metanotum sculptured as in mesoscutum but punctures more crowded. Propodeum with dorsal enclosure coarsely tessellate and surface irregularly roughened medially; posterior and dorsolateral surfaces as in mesoscutum but punctures sparser especially on posterior surface; corbicular surfaces with scattered small punctures and coarse tessellation, moderately shiny. Mesepisternum sculptured like mesoscutum but punctures sparser and many with upper margins elevated slightly above surface so that punctures appear directed ventrad. Metepisternum similar to corbicular area in upper half, becoming shiny in lower half with extremely coarse reticular shagreening. Wings with three submarginal cells; vein 1st m-cu meets second submarginal cell at or before middle of cell; second submarginal cell along posterior margin equals about half of first cell and along dorsal margin distinctly longer than vein r from pterostigma to second cell; pterostigma long, about as broad as from inner margin prestigma to wing margin. Middle basitarsus about as broad medially as hind basitarsus, gently curved outward along anterior margin, anterior apical angle not produced. Claws and tibial spurs normal.

Metasomal terga 1-4 with minute round punctures separated mostly by three to four puncture widths on tergum 1, but two puncture widths on tergum 2 and by one puncture width or less on terga 3 and 4; surfaces dulled by dense, coarse reticular shagreening except apical areas moderately shiny. Pygidial plate V-shaped, as broad basally as long, blunt or rounded apically. Sterna 2-5 with small crowded punctures along apical margins, with small punctures separated by 2 to 4 puncture widths basally, surfaces moderately shiny, with fine dense reticular shagreening.

VESTITURE: Generally extremely dark ochraceous, often slightly reddish on vertex and dorsum of thorax. Tergum 1 without apical pale fascia, tergum 2 with broadly interrupted apical pale fascia; tergum 3 with narrowly interrupted apical fascia; tergum 4 with

complete apical pale fascia; terga 5 and 6 with long dark ochraceous to fuscus hairs. Sterna 2-5 with hairs ochraceous, long along apical margins, short and sparse basally. Propodeal corbicula without anterior fringe, interior with long, slightly barbed hairs scattered throughout. Trochanteral flocculus complete, weak. Tibial scopal hairs plumose throughout, dark brown. Fore basitarsi with inner surfaces, middle and hind basitarsi with inner and outer surfaces and distitarsi with inner surfaces with brown hairs.

Male. MEASUREMENTS AND RATIOS: N = 20; length, 13-15 mm; width, 3-4 mm; wing length, M = 5.31 ± 0.174 mm; FL/FW, M = 1.13 ± 0.006 ; FS1/FS2, M = 2.07 ± 0.027 .

INTEGUMENTAL COLOR: As in female except as follows: flagellar segments 4 to 11 red below; wing membranes moderately infumate, yellowish-brown, veins dark reddish-brown to blackish-brown.

STRUCTURE: Antennae short, in repose not reaching back beyond middle of tegulae; scape equal in length to first two and one-half flagellar segments; flagellar segment 1 equal in length to succeeding two and one-half segments; segments 2 and 3 subequal in length, each shorter than 4 and almost as long as broad. Eye about three and one-third times as long as broad, inner margins parallel. Malar space, mandible and galea as in female. Maxillary palpus as in female but ratio about 1.2:1.2:1.0:0.9:0.9:1.1. Labial palpus as in female but ratio about 2.3:1.5:1.0:1.2. Labrum, clypeus, supraclipeal area, genal area, vertex and face above antennal fossae as in female except as follows: eye about as broad as genal area in profile; face above antennal fossae with longitudinal rugulae weak; narrow, rudimentary facial fovea present near upper eye margins.

Thoracic and metasomal sculpturing as in female except as follows: propodeal dorsal enclosure slightly more roughened medially, almost rugulose; metepisternal punctures slightly more crowded; propodeum with lateral surfaces tessellate; terga 1-5 as in female terga 1-4 but punctures on each tergum more distinct and more crowded. Tergum 7 with large triangular pseudopygidial area with low longitudinal ridges marking surface. Wing venation and pterostigma as in female. Claws and tibial spurs normal. Sternum 6 reflexed apically, especially apicolaterally, with broad shallow V-shaped apical emargination.

Genitalia and sterna 7 and 8 (Figs. 194-198) as figured. Note resemblance to *senticulosus* but with following differences: penis valves longer; volsellae smaller; sternum 7 with apical region much reduced in size; sternum 8 with apex not much expanded but with shallow emargination.

VESTITURE: Generally pale to dark ochraceous, usually darker on vertex and thoracic dorsum, paler at sides and below. Terga 2-5

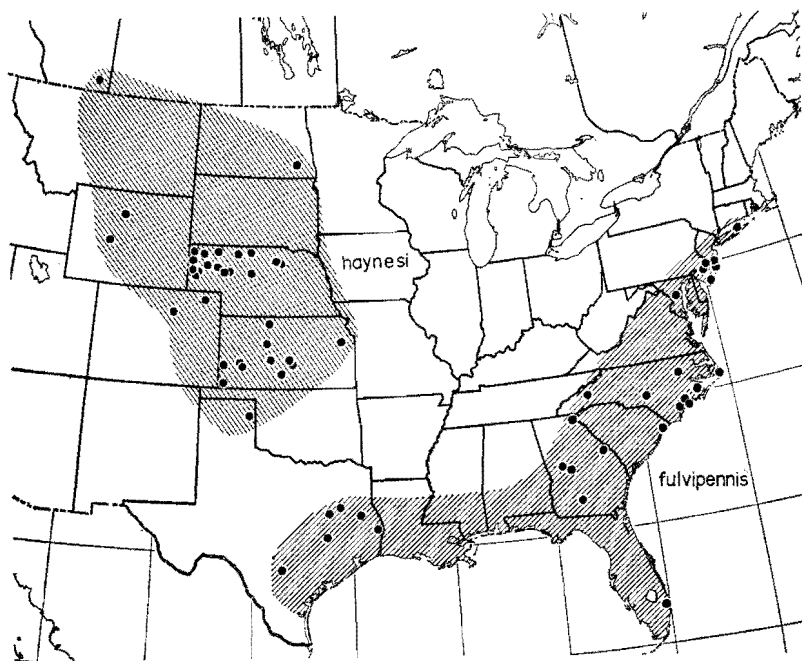


FIG. 13. Map showing distributions of *A. (Callandrena) fulvipennis* Smith and *A. (Callandrena) haynesi* Viereck and Cockerell.

similar to female terga 2-4 in apical fasciae. Sterna 2-5 with short weak ochraceous apical fimbriae; basal area hairs short, erect, sparse. Inner surfaces tarsi reddish-brown.

Type Material. The holotype female (USNM No. 18, 139) from War Bonnet Canyon, Sioux County, Nebraska, June 24, 1901, on *Helianthus* sp., was collected by J. C. Crawford.

Distribution. *A. haynesi* is known to occur from Texas north to North Dakota and west to Wyoming and Colorado (Fig. 13). It has been collected from June 24th through September 6th, but chiefly in July and August. In addition to the holotype, 94 females and 73 males have been examined from the localities listed below.

COLORADO: Fleming; Fort Lupton; Xenia (7.5 miles W.). KANSAS: Elkhart (8 miles N.); Garden City (and 2 miles S.); Hays Co.; Hutchinson; Isabel (8 miles N.E.); Larned; Lawrence; Nickerson; Phillips Co.; Syracuse. NEBRASKA: Alliance (and 10 miles S.); Atkinson (24 miles S. on Lierman Ranch); Ellsworth (1 mile E.); Gering (8 miles S.); Gordon (33 miles S.); Halsey; Holt Co.; Hyannis (5 and 17 miles S.); Mitchell; Monroe Canyon, Sioux Co.; Nenzel (9 miles S.); Scottsbluff; Valentine (25 miles S. on Crowe Ranch); War

Bonnet Canyon, Sioux Co.; Whitman (20 miles N.); Whitney. NORTH DAKOTA: Sheldon. TEXAS. Canadian. WYOMING: Riverton; Worland. Canada. ALBERTA: Medicine Hat.

Floral Records. *A. haynesi* is an oligoecy of *Helianthus*. Out of 43 collections (74 females and 61 males) with floral data available to the author, 42 (72 females and 54 males) were from some species of *Helianthus*, mostly *H. petiolaris*. The single collection not from *Helianthus* was made early in the season (June) on *Campanula*. Stevens (1949) reports this species on a few other species of plants, namely *Echinacea pallida* and *Solidago rigida*, in North Dakota.

Andrena (Callandrena) fulvipennis Smith

Andrena fulvipennis Smith, 1853, Cat. Hymenoptera British Mus., vol. 1, p. 117; Provancher, 1888, Addit. faun. Canada, Hymén., p. 313; Viereck, 1902, Ent. News, vol. 13, p. 237; Smith, 1910, Ann. Rept. New Jersey St. Mus., p. 690; Brimley, 1938, Insects of North Carolina, p. 452.

Andrena (Pterandrena) fulvipennis: Lanham, 1949, Univ. California Publ. Ent., vol. 8, p. 200; Mitchell, 1960, North Carolina St. Agric. Exp. Sta. Tech. Bull. No. 141, vol. 1, p. 141.

A. fulvipennis is not closely related to any of the foregoing species. It is, perhaps, most closely related to a group of *Callandrena* occurring chiefly in Mexico and Central America but including a few forms in southern and eastern United States, such as *A. duplicata* Mitchell and *A. simulata* Smith. *A. fulvipennis* is marked by the following combination of characters: wings deeply infumate, brown; hind tibiae and basal portions of basitarsi yellow to reddish-yellow; claws of hind legs of the female reduced; basoventral angle of mandible well developed. *A. fulvipennis* can be distinguished from *duplicata*, *simulata* and related forms by the clypeus being evenly rounded or with a low longitudinal median ridge, not markedly flattened medially, and by being generally less coarsely punctate.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 9–11 mm; width, 2.5–3.0 mm; wing length, M = 3.73 ± 0.125 mm; FL/FW, M = 1.10 ± 0.008 ; FOVL/FOVW, M = 2.99 ± 0.034 .

INTEGUMENTAL COLOR: Black except as follows: mandible with apical one-third to one-half rufescent; flagellar segments 4–10 dull red or brown below; wing membranes deeply infumate, dark brown, especially near anterior margins, veins brown to red, pterostigma and prestigma usually yellowish-red; terga 1–4 with narrow apical margins hyaline, colorless, rufescent basad of hyaline area; sterna 2–5 with extremely narrow apical margins hyaline, colorless, rufes-

cent basally; distitarsi usually rufescent; hind basitarsus with basal third to half yellow or reddish-yellow; hind tibiae yellow to reddish-yellow; tibial spurs yellow.

STRUCTURE: Antennae short; scape equal in length to slightly more than flagellar segments 1-13; flagellar segment 1 equal in length to somewhat less than segments 2-4; segment 2 about equal in length to 3, each distinctly shorter than segment 4; segments 4-7 subquadrate to quadrate, 8-10 longer than broad. Eye about three and three-fourths as long as broad, inner margins converging slightly towards mandibles. Malar space linear. Mandibles long, outer mandible in repose extending beyond middle of labrum by one-third to one-fourth its length; basoventral angle well developed, with a narrow lamella, broadest width of mandible (at angle) slightly more than twice minimum width; subgenal coronet well developed but hairs slender and barbed rather than stout and spinelike. Galea evenly rounded from dorsum to side, side about one-third as broad as dorsum; surface dulled by fine regular tessellation, punctures obscure; covered with relatively long, moderately abundant, erect, white hairs. Maxillary palpus short, not reaching apex of galea when extended forward, segmental ratio about 1.0:1.1:0.7:0.7:0.6:0.9. Labial palpus with first segment long, slightly curved especially along inner margin, apex broadened and flattened; segmental ratio about 1.6:1.2:0.6:1.0. Labral process short, sharply bidentate. Clypeus protruding beyond tips of compound eyes by slightly more than one-fourth its median length, evenly rounded or often with slightly longitudinal impunctate ridge especially in basal half; punctures small round, separated by one-half to one puncture width medially, becoming smaller peripherally, surface moderately dulled by regular reticular shagreening. Supraclypeal area with small crowded punctures and reticular shagreening dulling surface. Genal area about as broad as eye in profile or slightly narrower; punctures minute, separated mostly by two or more puncture widths, surface shiny near eye margin, moderately dulled by reticular shagreening elsewhere. Vertex short, above lateral ocellus equal to one ocellar diameter or slightly less (at shortest about 1.1:1.4); with crowded punctures above ocelli, with scattered punctures above foveae and compound eyes, surface dulled by coarse reticular shagreening. Face above antennal fossae with longitudinal rugulae, interrugal spaces sparsely punctured and shiny, weakly shagreened, rugulae extend between lateral ocellus and fovea and above fovea half distance to compound eye. Facial fovea long, shallow, extending down to level of lower margin antennal fossa or slightly more, lower end slightly narrower than upper, rounded, upper end rounded, sepa-

rated from lateral ocellus by at least three-fourths of an ocellar diameter.

Pronotum normal, with scattered punctures, surface moderately dulled by coarse reticular shagreening. Mesoscutum and scutellum with distinct round punctures irregularly spaced mostly by one to three puncture widths, surface moderately dulled by coarse tessellation; parapsidal lines short, about as long as from its lower end to margin of scutum. Metascutum opaque, with contiguous, coarse punctures. Tegulae normal, impunctate. Propodeum with dorsal enclosure variably sculptured, often with rather coarse, irregularly anastomizing rugulae over entire surface, in some with rugulae confined to extreme base, in most specimens apical periphery of triangle finely tessellate and mediobasal area with fine rugulae which are chiefly transverse apically and longitudinal basally except along midline where they usually are interrupted or meet; dorsolateral and posterior surfaces punctate and tessellate, opaque, punctures abundant on dorsolateral area, sparse posteriorly; corbicular area moderately shiny, extremely coarsely shagreened, obscure punctures in anterodorsal quarter or third. Mesepisternum with extremely large contiguous punctures anterodorsally, punctures becoming small and discrete below, anteriorly and posteriorly surface dulled by fine reticular shagreening. Metepisternum similar to corbicular area but with more punctures in upper third. Middle basitarsus expanded medially along anterior margin, about as broad as hind basitarsus or slightly broader. Fore wing with three submarginal cells, second submarginal cell receiving vein 1st m-cu near or beyond middle of cell; cell along posterior margin equal in length to somewhat more than half length of first cell; pterostigma broad, slightly broader than from inner margin pterostigma to wing margin. Claws of hind tarsi reduced; slightly smaller than claws of middle and fore tarsi; tibial spurs normal.

Metasomal terga 1-4 opaque, coarsely, regularly and densely tessellate, bottoms of tessellations and intertessellar ridges often with one to two fine aciculations under high power magnification. Pygidial plate broad, V-shaped with rounded apex, margin reflexed, without central triangular raised area, shiny unless worn. Sterna 2-5 with apical margins impunctate, basally with small punctures separated by 3-4 puncture widths but more crowded near impunctate apex, surfaces moderately dulled by reticular shagreening.

VESTITURE: Pale ochraceous with the following exceptions: vertex and dorsum of thorax usually brighter; mesoscutum and scutellum with median areas with short sparse brown hairs; terga 5 and 6 with long dark brown hairs; femoral apex and tibial plate dark brown; hind tibia with scopal hairs often washed with brown pos-

teriorly; outer surfaces tarsi and fore and middle tibiae often brown; inner surface tarsi golden to pale ochraceous. Metasomal terga 1-4 with white to pale ochraceous apical fasciae, often interrupted medially on tergum 1. Sterna 2-5 with subapical fimbriae of suberect to decumbent, moderately long, white hairs. Propodeal corbicula incomplete anteriorly, with anterodorsal fourth to third with long, weakly barbed, internal hairs. Trochanteral flocculus complete, well developed. Tibial scopal hairs plumose throughout.

Male. MEASUREMENTS AND RATIOS: N = 14; length, 8-10 mm; width, 2.0-2.5 mm; wing length, $M = 3.40 \pm 0.114$ mm; FL/FW, $M = 1.19 \pm 0.013$; FS1/FS2, $M = 3.60 \pm 0.054$.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical third rufescent; clypeus yellow except dark spots at tentorial pits and dark apical margin; parocular areas occasionally with minute yellow maculae; wing membranes deeply infumate, brown, veins dark red, pterostigma and prestigma reddish-yellow; terga and sterna with apical margins narrowly hyaline as in female; hind tibiae and basitarsi yellow to orange as in female; distitarsi usually rufescent.

STRUCTURE: Antennae moderately long, in repose reaching or almost reaching posterior margin of tegulae; scape equals in length slightly less than flagellar segments 1-3; flagellar segment 1 slightly longer than segments 2 plus 3, segments 2 and 3 subequal in length, distinctly shorter than 4, segments 4-7 subquadrate or quadrate. Eye about three times as long as broad, inner margins converging slightly towards mandibles. Malar space and mandible as in female but basoventral mandibular angle and subgenal coronet absent. Galea as in female. Maxillary palpus as in female but segmental ratio about 0.9:1.0:0.6:0.6:0.6:0.9. Labial palpus as in female but ratio about 1.5:1.0:0.5:0.8. Clypeus evenly rounded, protruding as in female, without median longitudinal impunctate ridge, punctures small, irregular in size, separated mostly by one-half to one puncture width, surface shiny, delicately shagreened. Supraclypeal area, genal area, vertex and face above antennal fossae as in female.

Pronotum normal, as in female. Mesocutum, scutellum and metanotum as in female but mesoscutal and scutellar punctures usually slightly more crowded and surfaces often duller, shagreening slightly coarser. Tegulae as in female. Propodeum with dorsal enclosure as in female but usually slightly less coarsely rugulose; dorsolateral and posterior surfaces as in female; lateral surfaces dulled by tessellation and scattered punctures. Mesepisternum and metepisternum as in female. Tibial spurs normal. Tarsal claws not reduced as in female.

Terga 1-5 sculptured as in female terga 1-4. Tergum 7 with

broad, U-shaped, shiny, median, pseudopygidial area. Sterna 2-5 sculptured as in female but reticular shagreening coarser. Sternum 6 with apical half gently reflexed, with broad, V-shaped, shallow emargination.

Genitalia and sterna 7 and 8 (Figs. 199-203) as figured. Note following structures: gonoforceps narrowed apically and slightly upturned; penis valves with tips narrow, long; sternum 7 with apical area elongate, broad, with V-shaped emargination and extremely short hairs; sternum 8 with neck region relatively long, not broadened medially; apex enlarged and extremely shallowly emarginate medially.

VESTITURE: Generally pale ochraceous, brighter on vertex and thoracic dorsum where occasionally almost fox-red. Vestiture color as in female except as follows: mesoscutum and scutellum without brown; apical terga ochraceous; tergo 1-5 banded as in female terga 1-4; sterna 2-5 with subapical fimbriae of long suberect pale hairs; legs without brown; inner surfaces tarsi pale yellow.

Type Material. The holotype female of *fulvipennis* from North America is in the collection of the British Museum (Natural History), London, England.

Distribution. This species is known to occur along the east coast from Florida north to New Jersey and in eastern Texas (Fig. 13). It probably occurs in Alabama, Mississippi and Louisiana, but has not been recorded from these states as yet. It has been collected from July 5th through December 11th, but chiefly in September and October. The author has not seen the holotype but has examined specimens compared with the type by T. D. A. Cockerell and by T. B. Mitchell. A total of 52 females and 42 males have been examined from localities listed below.

FLORIDA: Lake Worth; Panama City. **GEORGIA:** Fort Gordon, Richmond Co.; Griffin; Roberts; Tallulah Falls; Tifton. **MARYLAND:** Blandenburg. **NEW JERSEY:** Anglesis; Clementon; Lakehurst; Lebanon State Forest, Ocean Co.; Lucaston; Palmyra; Sea Isle City. **NEW YORK:** Southold, Long Island. **NORTH CAROLINA:** Catherine Lake, Onslow Co.; Cherry Point; Holly Shelter; Kill Devil Hills; New River; Southern Pines; Swannanoa; Tarboro. **SOUTH CAROLINA:** Myrtle Beach. **TEXAS:** Brazos Co.; Fairfield (14.5 miles S.); Jacksonville; Nacagdoches; Newton (2 miles W.); Somerset.

Floral Records. *A. fulvipennis* seems to be an oligolege of the Compositae. No further statement of flower preferences is possible from the data now available. Eight collections of eleven specimens indicate that these bees have been collected visiting flowers of the following plants.

Aster sp., *Chrysopsis* sp., *C. mariana*, *Haplopappus* sp., *Hetero-
theca latifolia*, *H. subaxillaris*, *Gutierrezia texana*.

Andrena (Callandrena) simulata Smith

Andrena simulata Smith, 1879, *Descrip. new spp. Hymen. in the
colls. of the British Museum*, p. 52; Morice and Cockerell, 1901,
Canadian Entom., vol. 33, p. 152; Cockerell, 1906, *Pysche*, vol.
13, p. 36.

Andrena aureocincta Cockerell, 1896, *Ann. Mag. Nat. Hist.*, ser. 6,
vol. 18, p. 88 (*new synonymy*); 1898, *Bull. Denison Univ. Sci.
Labr.*, vol. 11, p. 48; 1900; *Ann. Mag. Nat. Hist.*, ser. 7, vol. 5,
p. 406; Lanham, 1949, *Univ. California Pub. Ent.*, vol. 8, p. 226.

A. simulata is the first of several small bees which are unrelated to any of the foregoing species except, perhaps, *A. fulvipennis* to which they bear some resemblance. *A. simulata* is similar to *fulvipennis* in having a well-developed mandibular basoventral lamella in the female and in the relatively long clypeus in both sexes. It is distinct from the foregoing species in its coloration, as described below, the extremely short female facial foveae, the relatively long antennae, the flattened and protruding clypeus and the short, almost entire labral process.

Female. MEASUREMENTS AND RATIOS: N = 3; length, 9–10 mm; width, 3.0–3.5 mm; wing length, $M = 3.35 \pm 0.285$ mm; FL/FW, $M = 1.19 \pm 0.074$; FOVL/FOVW, $M = 2.96 \pm 0.085$.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical half rufescent; flagellar segments 3–10 reddish-brown below; tegulae testaceous; wing membranes hyaline, colorless to slightly yellowed apically, veins red; terga 1–4 broadly hyaline apically, colorless to rufescent at bases of hyaline area, rufescent especially on terga 1 and 2; sterna 2–5 narrowly hyaline apically, yellow; hind tibia orange or broadly banded once or twice with orange; hind basitarsus with basal fourth to two-thirds yellowish-orange; middle tibia and fore, middle and hind femora rufescent on one specimen; distitarsi rufescent; tibial spurs pale yellow.

STRUCTURE: Antenna moderately long, scape slightly longer than flagellar segments 1–3; flagellar segment 1 slightly longer than segments 2 plus 3, segments 2 and 3 subequal in length and shorter than 4; segment 4 quadrate; segments 5–9 slightly longer than broad. Eye about three and one-half times as long as broad, inner margins parallel. Malar area linear. Mandible bidentate; outer mandible extends in repose beyond middle of labrum by one-fourth its length or less; basoventral angle well developed with well-formed lamella, maximum width (at angle) about twice minimum width; subgenal

coronet present. Galea turned down at sides rather abruptly, lateral surface equals half or slightly less of dorsal surface; impunctate, opaque, dulled by fine regular tessellation. Maxillary palpus shorter than galea when extended forward, segmental ratio about 1.1:1.0:0.6:0.5:0.4:0.7. Labial palpus with first segment long, flattened, curved in basal half, segmental ratio about 2.7:1.0:0.8:1.3. Labral process short, about three times as broad as long, simple or with extremely shallow, small apical emargination. Clypeus somewhat flattened medially, protruding beyond tips of compound eyes by about half its length; broadly impunctate along midline, laterally with large, round, irregularly spaced punctures separated by half to two puncture widths, at extreme periphery punctures smaller; surface shiny, unshagreened except at periphery. Supraclypeal area with minute round distinct punctures separated by half a puncture width or slightly more and reticular shagreening dulling surface. Genal area almost one and one-half times as broad as eye in profile; with minute round punctures separated mostly by one-half to one puncture width, surface shiny to moderately shiny, lightly shagreened posteriorly. Vertex short, above lateral ocellus equals slightly less than one ocellar diameter; crowded punctures above ocelli, scattered punctures and coarse reticular shagreening laterally. Face above antennal fossae with fine longitudinal rugulae which do not reach median ocellus but reach lateral ocelli, interrugal spaces and unrugose area below median ocellus with abundant coarse round or elongate punctures, surface slightly dulled by fine irregular shagreening. Facial fovea short, deep, extending below to or to just above level of upper margin antennal fossa, converging towards ocelli, slightly narrower below than above, separated from lateral ocellus by at least three-fourths of one ocellar diameter.

Pronotum normal, with small round punctures crowded above, scattered on sides, surface dulled by reticular shagreening. Mesoscutum with distinct round punctures separated by half a puncture width or slightly more, surface shiny or moderately so, reticular shagreening fine; parapsidal line shorter than from its posterior end to margin of scutum. Tegulae normal, impunctate. Scutellum like mesoscutum. Metanotum with minute crowded punctures and fine irregular shagreening, moderately shiny at apex. Propodeum with dorsal enclosure with sides bowed slightly outward, surface roughened by extremely fine rugulae, irregular basally and largely transverse apically, dulled by fine reticular shagreening; dorsolateral and posterior surfaces with deep punctures separated by one to two puncture widths, surface dulled by coarse reticular shagreening; corbicular area shiny, with scattered punctures and coarse reticular shagreening. Mesepisternum with deep large punctures separated

by half a puncture width or slightly more, surface shiny, unshagreened or delicately so. Metepisternum with lower area like corbicular area, upper third dulled by small punctures and coarse shagreening. Middle basitarsus with evenly curved sides, about as broad medially as hind basitarsus or narrower. Fore wing with three submarginal cells; second submarginal cell short, along posterior margin equals in length slightly more than one-third first cell, receiving vein 1st m-cu at two-thirds distance from base of cell; pterostigma long, about as broad as from inner margin prestigma to wing margin. Claws and tibial spurs normal.

Metasomal tergum 1 with small round punctures in basal area separated mostly by two puncture widths or more, in narrow apical area by one to two puncture widths, surface shiny, unshagreened or extremely delicately so. Terga 2-4 with large round punctures separated mostly by half to one puncture width or less, surfaces shiny, unshagreened or only delicately so. Pygidial plate broad, V-shaped, apex narrowly rounded, with small, raised, internal triangle. Sterna 2-5 with narrow apical areas impunctate, basomedially impunctate, laterally and apically with scattered punctures becoming crowded along impunctate margins, surfaces shiny, delicately shagreened.

VESTITURE: Generally yellowish-ochraceous, brighter on thoracic dorsum. Terga 2-4 with apical pale pubescent fasciae, broadly interrupted medially on tergum 2, narrowly interrupted on 3; terga 5 and 6 with long ochraceous hairs, golden medially. Sterna 2-5 with weak subapical fimbriae of long erect hairs, sparse erect hairs basally. Basitarsi with outer surface brown to ochraceous; inner surfaces tarsi golden-yellow. Propodeal corbicula incomplete anteriorly, with long plumose hairs internally at least in upper half. Trochanteral flocculus complete, sparse. Tibial scopal hairs plumose throughout.

Male. **MEASUREMENTS AND RATIOS:** N = 5; length, 9-10 mm; width, 2.0-2.5 mm; wing length, $M = 3.03 \pm 0.241$ mm; FL/FW, $M = 1.17 \pm 0.037$; FS1/FS2, $M = 1.74 \pm 0.061$.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical third rufescent; clypeus yellow except lateral angles, maculae mesad and below tentorial pits and apical margin dark brown to black; flagellar segments 2-11 dark rufescent below; tegulae testaceous; wing membranes hyaline, colorless, veins red; terga 1-5 with apices hyaline, orange basad of hyaline areas and bases of terga 2-6 orange, thus forming five orange bands, tergum 5 occasionally and often terga 4 and 3 with orange coloring lacking (in holotype only two distinct orange bands present, third band present but less orange and indistinct); tarsi yellowish-orange; hind tibiae yellowish-

orange at apex, along anterior margin and in basal half or entirely yellowish-orange; tibial spurs white to pale yellow.

STRUCTURE: Antennae long, extend beyond tegulae in repose; scape equals about first two and one-half flagellar segments in length; flagellar segment 1 slightly longer than segment 3, segment 2 distinctly shorter than 3, segments 3-11 distinctly longer than broad. Eye slightly longer than three times as long as broad, inner margins converging slightly towards mandibles. Malar space as in female. Mandible as in female but basoventral angle absent; subgenal coronet absent. Galea as in female. Maxillary palpus as in female but segmental ratio about 1.0:1.0:0.7:0.6:0.5:0.8. Labial palpus as in female but ratio about 2.1:1.0:0.8:1.1. Labral process trapezoidal in outline, slightly longer than one-third width, extremely shallowly emarginate medially, not at all bidentate. Clypeus sculptured as in female but median impunctate area usually broader, peripheral punctures coarser and peripheral shagreening absent. Supraclypeal area as in female. Genal area as in female but about as broad as eye in profile. Vertex as in female but usually above lateral ocellus equal to about one ocellar diameter. Face above antennal fossa as in female but rugulae shorter and less distinct and punctures coarser and more crowded.

Thorax as in female except as follows: mesoscutum and scutellum moderately dulled peripherally by fine tessellation; propodeum with dorsal enclosure more coarsely rugulose, basally occasionally with short longitudinal rugulae, lateral surfaces dulled by coarse punctures, irregular rugulae and fine tessellation; mesepisternum with surface often moderately dulled by reticular shagreening. Terga 2-5 sculptured as in female terga 2-4; tergum 1 with punctures separated mostly by one to two puncture widths, not noticeably smaller than punctures of succeeding terga. Tergum 7 with extremely narrow, slightly raised, moderately shiny pseudopygidial area. Sterna 2-5 sculptured as in female. Sternum 6 flat, shallowly emarginate medially.

Genitalia and sterna 7 and 8 (Figs. 204-208) as figured. Note the following: gonoforceps with few hairs, rather blunt; penis valves blunt in lateral view, narrow viewed dorsally; volsellae of moderate size; sternum 7 with deep v-shaped emargination but apicolateral lobes not distinctly set-off laterally, hairs sparse; sternum 8 with apex broadened, entire, neck region with sides gently concave.

VESTITURE: Generally pale ochraceous, brighter at vertex and thoracic dorsum. Terga 2-5 with basal areas with erect hairs, apical areas with pale fasciae, interrupted medially on tergum 2; terga 6 and 7 with long pale ochraceous hairs. Sterna 2-5 with subapical fimbriae of long erect hairs, weak on sternum 2, basally with scat-

tered suberect hairs. Leg hairs white to pale ochraceous except inner surfaces tarsi pale golden.

Type Material. The holotype female (BM 17-a-1391) of *simulata* from Mexico is in the British Museum (Natural History). The holotype male (USNM No. 18228) of *aureocincta* from Santa Fe, New Mexico, was collected by Marion Boyle.

Distribution. *A. simulata* is known from Arizona, New Mexico and Colorado. In addition to the holotype, 4 females and 7 males have been examined. The data for these and for one additional published record are given below in full.

ARIZONA: *Oak Creek Canyon*. 1 ♂, August, F. M. Snow. *Flagstaff*. 1 ♀, September 20, 1938, on *Aster* sp., I. McCracken. *Springerville* (32 miles W.). 2 ♀♀, September 14, 1961, on *Viguiera annua*, P. D. Hurd. COLORADO: 1 ♂ labeled, "Col." NEW MEXICO: *Fort Wingate*. 1 ♂, August 21, 1908, John Woodgate. *Pecos*. 1 ♂, September 4, T. D. A. Cockerell. *San Ignacio*. 1 ♂, September 1, Wilmattae Porter (Cockerell, 1900). *San Mateo*. 1 ♂, August 18, 1962, R. and K. Dreisbach. *Santa Fe* (8 miles N.E. at Hyde State Park). 1 ♂, August 18, 1961, G. C. Eickwort. *Willow Creek*. 1 ♀, September 3, 1933.

Andrena (Callandrena) inculta, n. sp.

This species, known from three females from Mexico, is closely related to *A. simulata*. It is similar to the female of *simulata* in the wing venation, the facial foveal shape and the labral process. It differs from the female of *simulata* in the facial rugulae which are weak and scarcely visible, the mesoscutal and scutellar punctures which are scarcely visible due to their shallowness and the dense tessellation, the dorsal propodeal enclosure which is finely tessellate, not rugulate, and the moderately shagreened tergal surfaces.

Female. MEASUREMENTS AND RATIOS: N = 1; length, about 9 mm; width, about 3 mm; wing length, about 3.21; FL/FW, 1.12; FOVL/FOVW, 3.05.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical two-thirds rufescent; flagellar segments 3-10 dark brown below; tegulae translucent, dark reddish-brown; wing membranes hyaline, slightly infumate, veins brown; terga 1-4 narrowly hyaline apically, terga 1 and 2 with small oval lateral rufescent areas just basad of hyaline areas; sterna narrowly hyaline apically; distitarsi red; hind basitarsi orange basally; tibial spurs pale yellow.

STRUCTURE: Antennae moderately long, scape equal to flagellar segments 1-3; flagellar segment 1 slightly longer than segments 2 plus 3; segments 2 and 3 subequal in length and each distinctly

shorter than 4. Eye about three and three-fourths times as long as broad, inner margins converging extremely slightly towards mandibles. Malar space, mandibles and galea as in *simulata*. Maxillary palpus as in *simulata* but segmental ratio about 1.1:1.0:0.7:0.6:0.5:0.7. Labial palpus as in *simulata* but segmental ratio about 2.8:1.0:1.0:1.3. Labral process trapezoidal in outline, about three times as long as broad, extremely slightly emarginate medially. Clypeus and supraclypeal area as in *simulata* but clypeal punctures of irregular size and clypeus moderate-dulled by reticular shagreening at least peripherally. Genal area as in *simulata* but in profile only slightly broader than eye. Vertex above lateral ocellus equals distinctly less than one ocellar diameter, sculptured as in *simulata*. Face above antennal fossae with rugulae obscured by dense tessellation and punctures, distinctly visible only immediately above fossae and near facial foveae. Facial fovea deep, extending down to level of upper margin of antennal fossa, slightly narrowed below, rounded above and separated from lateral ocellus by about three-fourths an ocellar diameter; foveae converge towards ocelli.

Pronotum as in *simulata*. Mesoscutum and scutellum opaque, punctures large and extremely shallow, scarcely visible due to coarse, dense tessellation; parapsidal line short as in *simulata*. Tegulae normal, impunctate. Propodeum with dorsal enclosure tessellate; without rugulae; dorsolateral and posterior surfaces with sparse shallow punctures obscured by coarse dense tessellation; corbicular area as in *simulata*. Mesepisternum with shallow but distinct punctures separated mostly by one puncture width or more and coarse tessellation dulling surface. Metepisternum similar to corbicular area below, finely punctate and shagreened in upper third. Middle basitarsus and wing venation as in *simulata*. Claws and tibial spurs normal.

Metasomal tergum 1 with minute punctures separated mostly by two to three puncture widths, surface dulled by fine reticulo-transverse shagreening. Terga 2-4 with minute punctures separated mostly by one puncture width, surface dulled as in tergum 1. Pygidial plate broad basally, V-shaped, apex acute, with small raised internal triangle. Sterna 2-5 as in *simulata*.

VESTITURE: Generally as in *simulata* with the following differences: metasomal tergum 2 with apical fascia narrowly interrupted medially; tergum 3 with fascia complete, uninterrupted; metasomal fasciae and long hairs of terga 5 and 6 whitish; basitarsi with hairs entirely pale.

Type Material. The female holotype (SECK) from 4 miles south of Saltillo, Nuevo Leon, México, was collected by the University of Kansas Mexican Expedition, September 7, 1962, on *Encelia farinosa*.

Two female paratypes (UCB; INHS) from México are as follows: 1 ♀, 10 miles north of Apizaco, Tlascala, August 20, 1962, K. U. Mexican Expedition; 1 ♀, 5 miles south of Zacatecas, Fresnillo, August 7, 1954, E. G. Linsley, J. W. MacSwain and Ray F. Smith.

Remarks. The paratype female from Apizaco is a mosaic caused by stylopid parasites. The hind legs are more malelike than femalelike and the clypeus has a narrow subapical band of yellow. However, in general this specimen is more femalelike than otherwise and most of the specific characters appear normal.

Andrena (Callandrena) tegularis, n. sp.

A. tegularis is a small species from Arizona related to *A. simulata*. Both sexes of *tegularis* can be readily distinguished from *simulata* by the coarser and more abundant punctures throughout most of the body surface, but especially by the fact that the tegulae bear small distinct punctures throughout. In addition, the male terga are unbanded and somewhat reflexed apically and both sexes have the wings moderately infumate and darker than in *simulata*.

Female. MEASUREMENTS AND RATIOS: N = 3; length, 10–12 mm; width, 2.5–3.5 mm; wing length, M = 3.49 ± 0.530 mm; FL/FW, M = 1.18 ± 0.032 ; FOVL/FOVW, M = 2.67 ± 0.092 .

INTEGUMENTAL COLOR: Black except as follows: mandibles with apical half rufescent; flagellar segments 4–10 dark reddish-brown below; tegulae dark rufescent to blackish-brown; wing membranes hyaline, moderately infumate, brownish-yellow, veins dark reddish-brown to black; terga 1–4 broadly hyaline apically, yellowish; distitarsi dark rufescent; hind basitarsi yellow basally; tibial spurs yellow.

STRUCTURE: Antennae moderately long, scape distinctly longer than flagellar segments 1–3; flagellar segment 1 equal in length to segments 2–4; segments 2–4 subequal to each other (holotype), or 4 extremely slightly longer, and each distinctly shorter than segment 5. Eye almost four times as long as broad, inner margins parallel or converging extremely slightly toward mandibles. Malar space, mandible and galea as in *simulata*. Maxillary palpus as in *simulata* but segmental ratio about 1.1:1.0:0.6:0.5:0.5:0.6. Labial palpus as in *simulata* but first segment rather abruptly broadened shortly above base, segmental ratio about 2.5:1.0:0.8:1.3. Labral process trapezoidal in outline, about three times as broad as long, apical emargination shallow, inconspicuous. Clypeus as in *simulata* but punctures somewhat coarser, in holotype not much flattened and median area not impunctate but with sparse round punctures, in paratypes flattened, impunctate, median area present, surface shiny, unshagreened

except peripherally (holotype) or with sparse fine transverse shagreening. Supraclypeal area as in *simulata*. Genal area slightly broader than eye in profile, with small deep, round punctures separated mostly by half a puncture width or less, surface shiny, slightly shagreened. Vertex above lateral ocellus equals about one ocellar diameter; with crowded punctures above ocelli, scattered punctures laterally, surface dulled by fine tessellation. Face above antennal fossae with fine longitudinal rugulae rather widely spaced and converging towards ocelli, interrugal spaces with large punctures, surface moderately shiny; space between lateral ocellus and facial fovea and just above fovea irrugulose but with small, round, crowded punctures. Facial fovea deep, short, extending below not quite to level of upper margin of antennal fossae, slightly narrow in lower half and rounded below, bluntly pointed toward lateral ocellus above, separated from ocellus by almost one ocellar diameter.

Pronotum normal, with abundant, deep, round punctures and reticular shagreening dulling surface. Mesoscutum with round, almost contiguous punctures and fine irregular shagreening dulling surface; parapsidal line of moderate length, slightly longer than from its lower end to margin of scutum. Scutellum similar to mesoscutum but punctures slightly more discrete, separated by half a puncture width or less, surface moderately shiny, irregularly shagreened. Tegulae with small, distinct, round punctures separated mostly by about half a puncture width or slightly more over entire surface, surface slightly dulled by fine reticular shagreening. Metanotum sculptured as in mesoscutum. Propodeum with dorsal enclosure with sides straight, interior roughened by irregular, anastomizing rugulae and dulled by fine tessellation; dorsolateral and posterior surfaces with coarse punctures, crowded above, and fine tessellation; corbicular area with several small round punctures, especially anterodorsally, surface moderately shiny, with coarse reticular shagreening. Mesepisternum with coarse, almost contiguous, elongate punctures and fine tessellation dulling surface. Metepisternum similar to corbicular area below, finely punctate and tessellate in upper third. Middle basitarsus with evenly curved sides, slightly broader medially than hind basitarsus. Fore wing with venation as in *simulata*. Claws and tibial spurs normal.

Metasomal terga 1-4 with apical areas narrowly impunctate, basal areas with deep round punctures separated mostly by half a puncture width or less, slightly more crowded near impunctate apical areas; tergum 1 with punctures slightly less crowded but of same size as on succeeding terga. Pygidial plate V-shaped with slightly raised internal triangular area, apex moderately acute.

Sterna 2-5 as in *simulata* but surfaces moderately dulled by fine reticular shagreening.

VESTITURE: Generally as in *simulata* with the following differences: tergum 2 with apical fascia interrupted medially by about one-third its width; tergum 3 extremely narrowly interrupted medially; tergum 6 with long brown hairs except laterally.

Male. MEASUREMENTS AND RATIOS: N = 5; length, 9-10 mm; width, 2.0-2.5 mm; wing length, $M = 3.23 \pm 0.245$ mm; FL/FW, $M = 1.20 \pm 0.012$; FS1/FS2, $M = 2.25 \pm 0.072$.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical third to one-half rufescent; flagellar segments 3 to 11 dark reddish-brown below; tegulae piceous, reddish-brown to black; wing membranes hyaline, moderately infumate, brownish-yellow, veins dark brown to black; tergal apices broadly hyaline, narrowly rufescent basad of hyaline areas; sternal apices narrowly hyaline; distarsi slightly rufescent; basitarsi dark reddish-brown to dark red.

STRUCTURE: Antennae of moderate length, reaching rear margins of tegulae; scape equals about first two and one-half flagellar segments; flagellar segment 1 about as long as segments 2 plus 3, segment 2 distinctly shorter than 3 and 3 subequal to 4, segments 3-10 longer than broad. Eye about three times as long as broad, inner margins converging towards mandibles. Malar space as in female. Mandible as in female but lacking basoventral angle; subgenal coronet absent. Galea as in female. Maxillary palpus as in female but segmental ratio about 1.0:0.6:0.5:0.4:0.4:0.6. Labial palpus as in female but ratio about 2.6:1.0:0.8:1.4. Labral process as in female but apical emargination broader and appearing bluntly bidentate. Clypeus as in female but punctures seem slightly larger and deeper, median impunctate area variable as in female. Supraclypeal area as in female. Genal area not quite as broad as eye in profile, sculptured as in female. Vertex and face above antennal fossae as in female but longitudinal rugulae less distinct.

Thorax as in female with the following differences: scutellum with crowded punctures as in mesoscutum; tegular punctures larger and deeper than in female; propodeum with dorsal enclosure roughened throughout by irregularly anastomizing rugulae, dorsolateral and posterior surfaces with large punctures contiguous, lateral surfaces with abundant, contiguous, shallow punctures and fine shagreening; mesepisternal punctures small, round, deep, separated by about half a puncture width, surface dulled by fine tessellation. Fore wing venation as in female. Claws and tibial spurs normal.

Terga 1-5 sculptured as in female with the following differences: punctures slightly larger and deeper; apical areas depressed slightly basally with margins moderately reflexed. Pseudopygidial area not

evident. Sterna 2-5 as in female. Sternum 6 flat, apical emargination shallow, broadly V-shaped.

Genitalia and sterna 7 and 8 (Figs. 209-213) similar to those of *simulata* except as follows: penis valves thicker and blunter apically and broader basally; dorsal lobe of gonocoxites much longer with apex turned outwards; sternum 8 with apex more rounded.

VESTITURE: Generally as in *simulata* except as follows: thoracic dorsum with hairs sparse; sterna 3-5 with short, white, subapical fimbriae.

Type Material. The holotype female from the Santa Rita Mountains, Arizona, from the Bryant collection (Lot 51), October 5, 1936, and the allotype male from the Santa Rita Mountains, Arizona, Bryant collection (Lot 237), September 10, 1933, are the property of the California Academy of Sciences. Two female and four male paratypes (AMNH; PHT; USU) from Arizona are as follows: *Rustlers Park*, Chiricahua Mts. 1 ♂, September 5, 1950, W. Gertsch and M. A. Cazier; 1 ♀, September 5, 1962, J. G. Rozen, M. Statham and S. J. Hessel. *Chiricahua Mts.*, Cochise Co. 1 ♀, September 28, 1960, on *Heliopsis* sp., G. E. Bohart. *Madera Canyon, Santa Rita Mts.* 3 ♂♂, September 27, 1952, N. A. Lewis and E. R. Tinkham.

Andrena (Callandrena) uyacensis Cockerell

Andrena uyacensis Cockerell, 1949, Proc. United States Nat. Mus., vol. 98, p. 434.

This small species is known only from four females from Honduras. *A. uyacensis* belongs in the same group as *A. simulata* as is shown by the flattened, shiny clypeus, the shiny mesoscutum and scutellum, the pale hind basitarsus and tibiae, and the interrupted apical fasciae of terga 2 and 3. It differs from *simulata* in its simple labral process, in the less space between the facial fovea and the lateral ocellus, in the dulled metasomal terga, and in the darker scopal hairs.

Female. MEASUREMENTS AND RATIOS: N = 3; length, 10-11 mm; width, 3.0-3.5 mm; wing length, 3.51-3.69 mm; FL/FW, 1.14-1.32; FOVL/FOVW, 2.60-2.70.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical half rufescent; flagellar segments 3-10 dark reddish-brown below; tegula testaceous; wing membranes hyaline, moderately infumate, especially apically, veins dark reddish-brown; terga 1-4 with apical areas translucent, brown basally to yellow at extreme apex; sterna 2-5 hyaline apically, yellow; distitarsi rufescent; hind tibia and basal half hind basitarsus orange; femora rufescent.

STRUCTURE: Antennae moderately long, scape about equal in

length to flagellar segments 1–3; flagellar segment 1 slightly longer than segments 2 plus 3, segment 2 subequal in length to 4 and each slightly longer than 3; segments 4–10 longer than broad. Eye about four times as long as broad, inner margins parallel. Malar space, mandibles, and galea as in *simulata*. Maxillary palpus as in *simulata* but segmental ratio about 1.0:1.0:0.8:0.8:0.7:0.8. Labial palpus as in *simulata* but ratio about 2.1:1.0:0.6:1.1, third segment triangular. Labral process short, about three times as broad as long, entire, apical margin evenly curved. Clypeus as in *simulata* but punctures more regular and more crowded, impunctate medial area much reduced in size. Supraclypeal area as in *simulata*. Genal area slightly broader than eye in profile (as 2.5:2.0), with minute punctures separated mostly by one puncture width and coarse reticular shagreening dulling surface except near eye margin. Vertex short, above lateral ocellus distinctly shorter than one ocellar diameter (about as 1.3:1.6), with crowded punctures above ocelli, scattered punctures laterally, surface moderately dulled by fine tessellation. Face above antennal fossae with longitudinal rugulae converging towards ocelli, interrugal spaces with coarse punctures, surface moderately dulled by fine tessellation. Facial fovea short, deep, not quite extending down to level of upper margin of antennal fossa, slightly narrowed below, separated from lateral ocellus by about one-half an ocellar diameter.

Pronotum normal, with minute punctures abundant above, sparse laterally, surface dulled by coarse reticular shagreening. Mesoscutum with small, round, shallow punctures separated mostly by one puncture width or slightly less, surface shiny, shagreening or fine tessellation present peripherally; parapsidal line shorter than from its posterior end to margin of scutum. Tegula normal, impunctate. Scutellum sculptured as in mesoscutum. Metanotum with fine contiguous punctures and shagreening except in small median area behind scutellum where sculpturing resembles scutellum. Propodeum with dorsal area short, largely and evenly declivous; dorsal enclosure with sides curved gently outward, surface coarsely tessellate; dorsolateral and posterior surfaces with large shallow punctures separated mostly by one to two puncture widths (larger and more crowded posteriorly), fine tessellation dulling surface; corbicular area with several punctures crowded in anterodorsal fourth or less, surface moderately shiny, with coarse reticular shagreening. Mespisternum with large, deep, round punctures somewhat irregular in size, separated by half a puncture width except posteriorly where sparse, surface moderately dulled by fine reticular shagreening. Metepisternum like corbicular area below, punctate and shagreened in upper third. Middle basitarsus slightly broader than hind basi-

tarsus medially, with evenly curved sides. Fore wing venation as in *simulata* but second submarginal cell almost square, along posterior margin only slightly less than half length of first cell, receiving vein 1st m-cu near its apex; pterostigma not as broad as from inner margin prestigma to wing margin.

Metasomal tergum 1 with basal area with minute round punctures separated by two to three puncture widths; apical area impunctate; surface dulled by fine reticulotransverse shagreening. Terga 2-4 with basal areas with small crowded punctures separated mostly by half a puncture width or less, surfaces dulled by fine reticulotransverse shagreening; apical areas impunctate, moderately shiny, with coarse reticular shagreening. Pygidial plate V-shaped with rounded apex and slightly raised internal triangular area. Sterna 2-5 as in *simulata* but surfaces moderately dulled by fine reticular shagreening.

VESTITURE: Generally as in *simulata* with the following differences: tergum 2 with apical fascia broadly interrupted medially, short resulting lateral fasciae equal about one-sixth width of tergum; tergum 3 interrupted medially by about one-third width of tergum; tarsi, including basitarsi, with dark brown hairs; propodeal corbicula with internal hairs restricted to small anterodorsal patch less than one-fourth area of corbiculum; scopal hairs pale brown, dark near tips.

Type Material. The holotype female (USNM No. 58, 437), was collected on Uyaca Peak, Honduras, at over 5000 feet altitude, February 9, 1947, by T. D. A. and W. P. Cockerell.

Distribution. *A. uyacensis* is known only from the holotype and three additional female specimens collected with the holotype. These additional females did not bear identification labels and were not mentioned by Cockerell in the original description of the species. Therefore, they should not be regarded as paratypes.

Andrena (Callandrena) sodalis Smith

Andrena sodalis Smith, 1879, Descrip. N. Spp. Hymen. in the British Mus., p. 52; Morice and Cockerell, 1901, Canadian Ent., vol. 33, p. 152; Cockerell, 1906, Psyche, vol. 13, p. 8.

This small Mexican species is closely related to *A. uyacensis* Cockerell from Honduras. The female of *sodalis* can be told from that of *uyacensis* by the mesoscutum being entirely opaque with the punctures almost completely obscured by fine dense tessellation. In *uyacensis* females the mesoscutum has distinct punctures with the surface at least moderately shiny posteromedially. *A. sodalis* may be no more than a race of *uyacensis*, but this cannot be verified

until males of the later have been discovered and compared with the males of *sodalis*.

Female. MEASUREMENTS AND RATIOS: N = 8; length, 10.5–11.5 mm; width, 3.0–3.5 mm; wing length, $M = 3.44 \pm 0.147$ mm; FL/FW, $M = 1.17 \pm 0.012$; FOVL/FOVW, $M = 2.93 \pm 0.094$.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical third rufescent; flagellar segments 3–10 dark reddish-brown to brownish-black below; tegulae testaceous to translucent brown; wing membranes moderately infumate, brownish, especially apically, veins dark brown; terga 1–4 with apical areas translucent, yellowish at extreme apex, infumate basally; sterna 2–5 hyaline apically, yellow; distitarsi rufescent; hind basitarsi orange at extreme base to orange in basal half; hind tibia usually piceous, reddened in a few specimens.

STRUCTURE: Antennae as in *uyacensis*. Eye almost four times as long as broad, inner margins parallel. Malar space, mandible and galea as in *simulata*. Maxillary palpus as in *simulata* but segmental ratio about 1.2:1.0:0.6:0.7:0.5:0.7. Labial palpus as in *simulata* but segmental ratio about 3.1:1.0:0.9:1.1. Clypeus as in *simulata* but distinctly flattened medially, with distinct median impunctate area, coarse lateral punctures slightly elongate, and surface moderately dulled by coarse reticular shagreening. Supraclypeal area and genal areas as in *simulata*. Vertex short, above lateral ocellus distinctly but slightly shorter than one ocellar diameter, sculptured as in *uyacensis*. Face above antennal fossae and facial fovea as in *uyacensis* but facial fovea separated from lateral ocellus by one-half to three-fourths of an ocellar diameter.

Thoracic sculpturing as in *uyacensis* except mesoscutum and scutellum without distinct punctures, surfaces opaque, fine dense tessellation obscuring any punctation and dulling surfaces. Tegulae, parapsidal lines, wing venation, middle basitarsus, claws and spurs as in *uyacensis*. Metasomal terga sculptured as in *uyacensis*. Pygidial plate as in *uyacensis*. Sterna sculptured as in *uyacensis*.

VESTITURE: Generally as in *simulata* with the following differences: tergum 2 with apical pale fascia broadly interrupted medially, resulting lateral fasciae each equals one-fourth or less width of tergum; tergum 3 with apical pale fascia narrowly interrupted medially; terga 5 and 6 and sternum 6 occasionally with brown hairs; tarsi, including basitarsi, with dark brown hairs; hind tibial scopal hairs occasionally brown in part or entirely. Propodeal corbicula and trochanteral flocculus as in *uyacensis*.

Male. MEASUREMENTS AND RATIOS: N = 5; length, 9–11 mm; width, 2.0–2.5 mm; wing length, $M = 3.26 \pm 0.473$ mm; FL/FW, $M = 1.20 \pm 0.007$; FS1/FS2, $M = 1.94 \pm 0.086$.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical margin and small maculae slightly mesad and below tentorial pits dark brown; flagellar segments 2-11 dark brown below or wholly black; tegulae testaceous to translucent brown; wing membranes hyaline, moderately infumate especially apically, veins dark brown to red; terga 1-5 with apices often broadly hyaline, occasionally infumate except at extreme apices; sterna 2-5 with apices narrowly hyaline, more or less rufescent basally; distitarsi orange to red; hind basitarsi orange; hind tibiae orange with a small oval brown spot just below middle or dark brown with orange near base and at apex, or entirely piceous.

STRUCTURE: Antennae long, surpassing scutellum in repose; scape equal in length to flagellar segments 1 plus 3; segment 1 distinctly shorter than segments 2 plus 3; segment 2 shorter than 3; segments 3-11 longer than broad. Eye slightly less than three times as long as broad, inner margins converging strongly towards mandibles. Malar space linear. Mandible bidentate; outer mandible extends beyond middle of labrum by about one-fourth its length in repose. Galea with lateral portion equal in width to about half of dorsal portion, turned down evenly at sides, narrow; surface dull, finely tessellate. Maxillary palpus slightly shorter than galea when both extended forward, segmental ratio about 1.0:0.8:0.7:0.7:0.5:0.8. Labial palpus entirely flattened, first segment curved rather abruptly near base, segmental ratio about 2.4:1.0:0.7:0.9. Labral process trapezoidal in outline, about two and one-half times as broad as long, extremely weakly and broadly emarginate, if at all. Clypeus flattened medially, with large median impunctate area, elsewhere with small round punctures irregularly separated by half to one puncture width, surface shiny and unshagreened except at extreme periphery or with delicate reticular shagreening scarcely dulling surface. Supraclypeal area with minute punctures and fine tessellation dulling surface. Genal area subequal to eye in profile, with small round punctures separated by half to one puncture width or slightly more, dulled by fine reticular shagreening except near eye margin. Vertex above lateral ocellus equals about one ocellar diameter or slightly more, with crowded punctures above ocelli, scattered punctures laterally, surface moderately dulled by tessellation. Face above antennal fossae with longitudinal rugulae, interrugal spaces punctate, surface moderately dulled by fine reticular shagreening.

Pronotum normal, with sparse minute punctures and coarse reticular shagreening dulling surface. Mesoscutum opaque, with extremely shallow punctures obscured by coarse regular tessellation; parapsidal line shorter than from its posterior end to margin of scutum. Tegula normal, impunctate. Scutellum sculptured like

mesoscutum. Metanotum opaque, dulled by minute contiguous punctures and fine tessellation. Propodeum with dorsal enclosure dulled by fine tessellation and slightly roughened basally and medially by irregular, indistinct rugulae; dorsolateral, posterior and upper part of lateral surfaces with large, extremely shallow, obscure punctures and regular coarse tessellation; lower lateral surfaces moderately shiny with coarse reticular shagreening. Mesepisternum with large, round, shallow, obscure punctures and coarse tessellation dulling surface. Metepisternum with lower portion like lower lateral propodeal surface, upper third minutely punctate and tessellate. Fore wing venation as in *simulata* but in one paratype second submarginal cell receives vein 1st m-cu near middle. Claws and tibial spurs normal.

Metasomal terga 1-5 with extremely narrow apices impunctate, basally with small round punctures which on tergum 1 separated by one to two puncture widths, on succeeding terga by half to one puncture width; surfaces dulled by moderately coarse, reticulo-transverse shagreening except extreme apices. Pseudopygidial area bare, extremely narrow, V-shaped. Sterna 2-5 with hyaline margins impunctate, impunctate basally and with scattered punctures in area near hyaline margins. Sternum 6 flat, shallowly emarginate medially. Genitalia and sterna 7 and 8 (Figs. 214-218) similar to those of *simulata* except as follows: gonoforceps longer, blunter, less hairy, inner-apical margins truncate; penis valves with basal lamellae larger, raised above general level of valves; dorsal lobe of gonocoxite much as in *regularis*; sternum 7 with more distinct apical lobes; sternum 8 with apex enlarged, suboval, shallowly emarginate.

VESTITURE: Generally ochraceous, brighter on thoracic dorsum and vertex (orange in one male). Terga 2-5 with weak apical fasciae of pale decumbent hairs; tergum 2 with fascia interrupted medially. Sterna 3-5 with well-developed subapical fimbriae of long suberect pale hairs. Inner surfaces basitarsi with hairs pale golden.

Type Material. The holotype female (BMNH No. 17-a-2663) of *sodalis* was collected at Oaxaca, Mexico.

Distribution. *A. sodalis* is known only from central México. Nine female and thirteen male specimens were examined in addition to the holotype. The collection data is given in full for these specimens.

HIDALGO: *El Chico*. 1 ♂, September 23, 1938, L. J. Lipovsky. *Ozumbilla*. 1 ♂, October 30, 1957, R. and K. Dreisbach. *Pachuca*. 1 ♂, October 30, 1957, R. and K. Dreisbach. **MÉXICO:** *Chapingo*. 1 ♀. *México City*. 1 ♀, 1 ♂, September 25, 1957, R. and K. Dreisbach; 1 ♂, September 7, 1957 (40 miles E.), H. A. Scullen; 1 ♂, September 10, 1957 (18 miles S.), H. A. Scullen. *Atacomulco*. 1 ♂, August 15, 1964 (22 miles N.), C. D. Michener and party. **MICH-**

OACÁN: *Morelia*. 1 ♂, September 22, 1957, R. and K. Dreisbach; 1 ♀, February 12, 1952. PUEBLA: *Amecameca*. 1 ♂, September 25, 1957, R. and K. Dreisbach. TLAXCALA: *Apizaco*. 4 ♂♂, on *Argemone* sp., August 19, 1962 (10 miles E.), R. B. Roberts. VERA CRUZ: *Río Blanco*. 6 ♀♀, November 13, 1957, R. and K. Dreisbach.

Remarks. The female from Morelia, Michoacán, is darker than the other females. It has entirely brown scopal hairs and brown hairs on terga 5 and 6 and sternum 6. It is possible that this dark female represents another species but it is included here as a color variant of *A. sodalis* as no structural differences have been found to differentiate it. This dark specimen is in the collection of Mr. P. H. Timberlake.

Andrena (Callandrena) auripes, n. sp.

A. auripes is similar to and closely related to *A. sodalis*. Both sexes of *auripes* differ from *sodalis* by the shiny, unshagreened terga and sterna. In addition the male of *auripes* has the first flagellar segment longer than segments two and three together, whereas in *sodalis* segment one is shorter than segments two and three. *A. auripes* resembles *sodalis* and differs from *simulata* in that the mesoscutum is opaque, dulled by fine dense tessellation.

Female. MEASUREMENTS AND RATIOS: N = 3; length, 10–11 mm; width, 3.0–3.5 mm; wing length, M = 3.60 ± 0.442 mm; FL/FW, M = 1.20 ± 0.308; FOVL/FOVW, M = 2.72 ± 0.153.

INTEGUMENTAL COLOR: Black except as follows: mandible with at least apical half rufescent; flagellar segments 3–10 dark reddish-brown below; wing membrane moderately infumate, yellowish-brown, especially apically, veins dark reddish-brown; tegulae testaceous; terga 1–5 with apices broadly hyaline, yellow to somewhat rufescent; sterna 2–5 apically narrowly hyaline, yellow, basally moderately rufescent; distitarsi bright golden yellow to orange; hind basitarsi with basal half to two-thirds orange; hind tibiae orange.

STRUCTURE: Antennae as in *simulata* but flagellar segment 1 equal to segments 2–4 together and segments 2–4 subequal in length. Eye almost four times (at least three and three-fourths) as long as broad, inner margins parallel. Malar area, mandible and galea as in *simulata*. Maxillary palpus as in *simulata* but segmental ratio about 1.0:0.8:0.8:0.7:0.6:0.8. Labial palpus as in *simulata* but segmental ratios about 2.1:1.0:0.9:1.1. Labral process as in *simulata*. Clypeus as in *simulata* but median impunctate area narrow and lateral punctures separated mostly by half to one puncture width, surface shiny. Supraclypeal area as in *simulata* but punctures almost contiguous and surface moderately shiny. Genal area as in *simulata* except only slightly broader than eye in profile. Vertex short, above

lateral ocellus equals about one ocellar diameter, sculptured as in *simulata*. Face above antennal fossae and facial foveae as in *simulata* but fovea separated from lateral ocellus by less than three-fourths and more than one-half an ocellar diameter. Thoracic sculpturing, parapsidal lines and tegulae as in *sodalis* but scutellum slightly to moderately shiny and with distinct punctures. Wing venation, claws and tibial spurs as in *simulata*.

Metasomal tergum 1 with apical area impunctate, basal area medially with minute, widely separated punctures, laterally punctures larger and separated mostly by two to three puncture widths. Terga 2-4 with apical areas impunctate, basal areas with small round punctures separated by two to three puncture widths medially, somewhat coarser and more crowded laterally; surfaces shiny, unshagreened or extremely finely so. Pygidial plate V-shaped with round apex and slightly raised internal triangle. Sterna 2-5 as in *simulata* but surfaces with distinct reticular shagreening although not dull.

VESTITURE: Generally as in *aureocincta* with the following differences: terga 2 and 3 with apical pale fasciae broadly interrupted medially (on tergum 2 by half to three-fifths width of tergum, less on tergum 3); tergum 4 with apical pale fascia narrowly interrupted medially; terga 5 and 6 with hairs golden yellow medially; tarsi with outer surfaces pale ochraceous.

Male. MEASUREMENTS AND RATIOS: N = 13; length, 8-10 mm; width, 2.0-2.5 mm; wing length, $M = 3.15 \pm 0.117$ mm; FL/FW, $M = 1.19 \pm 0.013$; FS1/FS2, $M = 2.40 \pm 0.185$.

INTEGUMENTAL COLOR: Black except as follows: Mandible with apical half or more rufescent; clypeus yellow except lateral angles, apical margin and dark maculae mesad and below tentorial pits; flagellar segments 3-11 dark brown to black below; tegulae piceous to dark rufescent; wing membranes moderately infumate, brown, especially apically, veins dark reddish-brown to black; terga 1-5 with apices hyaline, narrowly so on tergum 1, yellowish; sterna 2-5 with apices narrowly hyaline, yellowish; distitarsi golden yellow or orange; hind basitarsi yellow to orange; hind tibiae entirely dark, dark with pale subbasal spot and pale apex, orange with submedian brown blotch, or entirely orange (allotype with third alternative); tibial spurs orange.

STRUCTURE: Antennae long, extend beyond tegulae in repose; scape equals first two flagellar segments in length or slightly more; flagellar segment 1 as long as or longer than segments 2 plus 3, segment 3 longer than 2 and slightly shorter than 4; segments 4-11 longer than broad. Eye almost three and three-fourths as long as broad, inner margins converging towards mandibles. Malar space,

mandible and galea as in *simulata*. Maxillary palpus as in *simulata* but segmental ratio about 1.0:0.9:0.8:0.7:0.5:0.7. Labial palpus as in *simulata* but segmental ratio about 2.1:1.0:0.7:1.1. Labial process and clypeus as in *simulata* but surface of clypeus often extremely finely, reticularly shagreened, but surface scarcely dulled. Supraclypeal area, genal area, vertex and face above antennal fossae as in *simulata*.

Thorax as in female except as follows: scutellum opaque, sculptured like mesoscutum; propodeum with lateral surfaces dulled by coarse tessellation and scattered punctures. Tegulae and wing venation as in female. Claws and tibial spurs normal. Terga 1-5 with apical areas slightly depressed, not reflexed, impunctate, basal areas with coarse round punctures separated mostly by one-half to one puncture width, slightly sparser on tergum 1, surfaces shiny to almost opaque, usually with reticulotransverse shagreening in basal areas but this restricted to extreme base of terga in some specimens. Pseudopygidial area extremely narrow, usually obscured by hairs. Sterna 2-5 with apical areas impunctate, basally with scattered punctures, surfaces moderately dulled by reticular shagreening. Sternum 6 flat, shallowly emarginate medially.

Genitalia and sterna 7 and 8 (Figs. 219-223) similar to those of *sodalis* but gonoforceps more as in *simulata*.

VESTITURE: Generally as in *simulata* with the following differences: usually duller on thoracic dorsum; terga 2 and 3 with apical pale fasciae broadly interrupted medially; sterna 3-5 with distinct subapical fimbriae.

Type Material. The holotype (AMNH) female and the allotype (AMNH) male from Palos Colorados, Durango, México, were collected by Schramel (David Rockefeller Expedition), August 5, 1947. Two female and ten male paratypes (AMNH; INHS; LACM; USNM) from México are as follows: *Palos Colorados*, Durango: 1 ♂, same data as in holotype. *El Salto* (6 miles northeast), Durango: 1 ♂, August 10, 1947, W. Gertsch (David Rockefeller Expedition). *México City*, Distrito Federal: 1 ♀, 1913, Godman-Salvin collection. *Meadow Valley*, México: 9 ♂♂, Townsend collection. Two male paratypes were collected by Mr. L. B. Koenig, August 23, 1959, at Hospital Flat and Riggs Flat, respectively, Graham Mt., Arizona.

Andrena (Callandrena) rubens, n. sp.

This small Mexican species is related to *A. auripes*. The female of *rubens* differs from that of *auripes* by the much reddened metasoma, the dark scopal hairs and the simple triangular labral process. The male of *rubens* differs from that of *auripes* by the reddened

metasoma and the infuscated wings. This species also resembles red specimens of *A. discreta*, especially in the female sex. Both sexes can be told from *discreta* by the flattened clypeus and the fore wing having vein 1st m-cu meeting the second submarginal cell well beyond the middle of the cell.

Female. MEASUREMENTS AND RATIOS: N = 1; length, about 11 mm; width, about 3 mm; wing length, about 4.02 mm; FL/FW, about 1.17; FOVL/FOVW, about 2.95.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical half dark rufescent; flagellar segments 3-10 dark reddish-brown below; tegulae testaceous; wing membranes moderately infumate throughout, brownish, veins dark reddish-brown; terga 1-4 broadly hyaline apically, yellowish; tergum 1 extremely narrowly reddened just basad of hyaline apex; terga 2-4 bright orange-red basally, more or less infuscated mediobasally; terga 5 and 6 orange; sterna 2-5 broadly hyaline apically, clear to yellowish, at extreme bases, beneath apices of preceding sterna, extremely narrowly reddened; distitarsi rufescent; hind basitarsi dark orange-red with apical third slightly darker; hind tibiae orange-red; hind femora rufescent apically; tibial spurs yellow.

STRUCTURE: Antennal scape length equals first three flagellar segments; flagellar segment 1 equals succeeding two and one-half segments; segment 2 distinctly shorter than 3 which is subequal in length to segment 4; segments 8-10 longer than broad. Eye about three and one-half times as long as broad, inner margins parallel. Malar space, mandible and galea as in *simulata*. Maxillary palpus as in *simulata* but segmental ratio about 0.9:1.0:0.7:0.7:0.5:0.7. Labial palpus as in *simulata* but segmental ratio about 2.0:1.0:1.0:0.9. Labral process short, simple, pointed (triangular in outline). Clypeus as in *simulata* but lateral punctures separated mostly by less than one puncture width, surface shiny, delicately shagreened. Supraclypeal area as in *simulata*. Genal area as in *simulata* but slightly narrower, punctures minute and separated by one to two puncture widths, and surface moderately dulled by delicate reticular shagreening. Vertex and face above antennal fossae as in *simulata*. Facial fovea as in *simulata* but separated from lateral ocellus by about half a ocellar diameter.

Thoracic structure and sculpturing as in *simulata* except as follows: mesoscutum and scutellum impunctate or virtually so, punctures being obscured by fine dense tessellation dulling surfaces; propodeal dorsal enclosure errugate, finely tessellate; mesepisternal punctures irregularly separated by one to two puncture widths, surface dull, finely tessellate. Middle basitarsus, wing venation, claws and tibial spurs as in *simulata*.

Metasomal tergum 1 with basal area punctures minute, separated mostly by two puncture widths or more, apical area impunctate, basal areas with small, round, crowded punctures separated by less than one puncture width, surfaces moderately dulled by fine reticular shagreening. Sterna 2-5 as in *simulata* but shagreening regular, slightly dulling surface.

VESTITURE: Generally ochraceous to fox-red, brighter on vertex of head and thoracic dorsum than below or at sides. Mesoscutum with erect hairs dense, obscuring surface. Terga 2-4 with basal area hairs short, dense, erect; apical fasciae incomplete or weak except on tergum 4. Sterna 2-5 with subapical fimbriae weak. Leg hairs ochraceous except as follows: tibiae and basitarsi with hairs dark brown except outer surface hind basitarsi at least above with hairs paler; hind femora and tibiae with hairs pale brown to dark brown. Pollen-collecting hairs as in *simulata*.

Male. MEASUREMENTS AND RATIOS: N = 4; length, 9-10 mm; width, 2.5-3.0 mm; wing length, $M = 3.70 \pm 0.300$ mm; FL/FW, $M = 1.19 \pm 0.007$; FS1/FS2, $M (3) = 1.58 \pm 0.012$.

INTEGUMENTAL COLOR: Black except as follows: mandible with apex rufescent; clypeus yellow except lateral angles, apical margin, small maculae below and mesad of tentorial pits, and narrowly infuscated posterior margin; flagellar segments 2-11 reddish-brown below; tegulae testaceous; wing membranes moderately infumate, veins dark reddish-brown; terga 1-5 with apices broadly hyaline, yellow; tergum 1 with basal area just basad of apical hyaline margin extremely narrowly reddened; terga 2-5 reddened basally except medial infuscation more or less developed; tibial spurs yellow.

STRUCTURE: Antennae as in *simulata* except flagellar segment 1 about equal in length to segment 3. Eye about three and one-fourth times as long as broad, inner margins converging slightly towards mandibles. Malar space, mandible and galea as in *simulata*. Maxillary palpus as in *simulata* but segmental ratio about 1.0:1.0:0.7:0.7:0.6:0.9. Labial palpus as in *simulata* but segmental ratio 2.0:0.7:0.6:0.8. Labral process as in *simulata*. Clypeus, supraclypeal area, genal area as in female. Vertex as in female but above lateral ocellus equal to one ocellar diameter or almost so. Face above antennal fossae with short longitudinal rugulae below ending in sub-ocellar area of large, almost confluent, shallow punctures.

Thoracic structure and sculpturing as in female with usual sexual differences. Metasomal tergum 1 with basal area punctures small, round, separated mostly by one to two puncture widths, apical area with similar punctures but slightly shallower and sparser, extreme apex impunctate, surface moderately dulled by reticular shagreening. Terga 2-5 as in female terga 2-4 except apical areas

with minute punctures separated mostly by one puncture width or more. Pseudopygidial area not evident. Sterna 2-5 as in female. Sternum 6 flat, shallowly emarginate apically.

Genitalia and sterna 7 and 8 (Figs. 224-228) similar to those of *sodalis* except as follows: gonoforceps hairier; penis valves much thicker and apically blunt; volsellae larger; sternum 7 with apico-lateral lobes small with few hairs.

VESTITURE: Generally bright ochraceous, paler on lower surfaces of head and lateral and lower surfaces of thorax, occasionally fox-red on vertex and thoracic dorsum. Terga 2-5 as in terga 2-4 of female but erect basal area hairs somewhat longer and apical pubescence suberect, not forming distinct fasciae. Sternal hairs as in *simulata* but subapical fimbriae not evident. Leg hairs ochraceous except inner surfaces tarsi golden.

Type Material. The holotype (MSU) female, allotype (MSU) male and one male paratype (INHS) from Amecameca, Puebla, México, were collected September 25, 1957, by R. and K. Dreisbach. Four additional male paratypes from México are as follows: 1 ♂ from Cuernavaca, Morelos, E. G. Smythe (UMC); 1 ♂ from "México" from the W. M. Gifford collection (USNM); 1 ♂ from México City, D. F., September 10, 1957, H. A. Scullen (OSU); 1 ♂ from Puebla, Puebla, September 7, 1957, H. A. Scullen (OSU).

Andrena (Callandrena) agilis Smith

Andrena agilis Smith, 1879, Descrips. N. Spp. Hymen. in the British Mus., p. 53; Morice and Cockerell, 1901, Canadian Ent., vol. 33, p. 152; Cockerell, 1906, Psyche, vol. 13, p. 36.

This is a small species from Mexico which was described from a single male. The author has examined the holotype but has not been able to associate this male with any other known species of *Callandrena*. This male belongs in the *aureocincta*-group and is closely related to *A. sodalis* from which it differs primarily in the partially black clypeus as described below. Since this male was studied only after the manuscript on *Callandrena* had been submitted to the editor, this species does not appear in the key to species. Also, the description which follows is an almost direct transcription of notes which the author made from the type specimen while visiting the British Museum; therefore, the form of the description is not the same as for other species in this paper and certain structures remain undescribed, for instance the genital capsule and hidden sterna.

Male. Mouthparts hidden. Clypeus extends well beyond half clypeal length below subocular line, somewhat flattened, largely

impunctate medially and shiny, laterally with small, irregular punctures and fine reticular shagreening; median flattened area cream-colored, lateral areas, apical and posterior margins black (pale area shaped much like a muchroom with a rather thick stem). Antennae missing. Malar space linear. Supraclypeal area with large confluent punctures and fine tessellation dulling surface. Face above antennal fossae with distinct but relatively irregular longitudinal rugulae reaching ocelli, rather coarse tessellation moderately dulling surface. Vertex above lateral ocellus equals slightly more than one ocellar diameter; surface tessellate, dull.

Mesoscutum dulled by very coarse tessellation, punctures shallow and sparse and scarcely recognizable; anteromedian line distinct; parapsidal line long. Scutellum similar to mesoscutum but moderately shiny at summit and punctures slightly deeper. Propodeal enclosure finely rugulose with a distinct longitudinal median rugula and distinct, more or less complete, transverse rugulae at either side; dorsolateral and posterior surfaces punctatorugose and tessellate; lateral surface with scattered punctures, coarse tessellation and several extremely fine, vertical rugulae above coxae. Mesepisternum with distinct punctures separated irregularly by one-half to two or three puncture widths, surface dulled by coarse, rather regular tessellation.

Metasomal terga 1-5 shiny, unshagreened or only extremely finely so, apical areas impunctate. Tergum 1 with basal area punctures separated mostly by 3 to 4 puncture widths. Terga 2-5 with basal area punctures separated mostly by 1 to 2 puncture widths. Sterna sparsely punctate (cannot see if shagreening is present). Cannot see sternum 6. Subapical fimbriae of sterna weak if at all present.

Hairs of face, gena, thorax and hind legs rather fuzzily barbed much as in a *Ptilandrena*. Most vestiture white but dark brown to black on mandibles, clypeus, along inner margins eyes, on genae (with white mixed especially below) and vertex. Dorsum of thorax with some dark hairs mixed with pale. Leg hairs largely brown except basally on femora and coxae. Terga 2-4 with apical pale pubescent fasciae broadly interrupted medially and weak. Tergum 1 with sparse pale hairs. Terga 2-5 basally and terga 6-7 with sparse brown hairs.

Type Material. The holotype male of *agilis* (BMNH No. 17-a-1382) is from Oaxaca, México.

Andrena (Callandrena) hondurasica Cockerell

Andrena hondurasica Cockerell, 1949, Proc. United States Nat. Mus., vol., 98, pp. 434-435.

This small species, known only from a few males from British Honduras, is closely related to the preceding species. It can be distinguished from other members of this group described above by the entirely black clypeus. It differs from most of these also in the dark legs and piceous tegulae. It is similar to *awripes* in the sculpturing and the antennal segments as described below.

Male. MEASUREMENTS AND RATIOS: N = 1; length, about 10 mm; width, about 2.5 mm; wing length, about 3.42 mm; FL/FW, about 1.14; FS1/FS2, about 1.67.

INTEGUMENTAL COLOR: Black except as follows: mandibles with apical fourth rufescent clypeus black; flagellar segments 2–11 dark brownish-black below: tegulae dark, rufescent; wing membranes moderately infumate, brownish, especially apically, veins dark reddish-brown; terga 1–5 broadly hyaline apically, narrowly rufescent at base of hyaline zones; sterna 2–5 narrowly hyaline apically, moderately rufescent basally; distitarsi rufescent, hind distitarsi with each segment orange at tip; hind basitarsi piceous along posterior margin, somewhat rufescent anteriorly; hind tibiae piceous.

STRUCTURE: Antennae long, surpassing tegulae in repose; scape length equals about first two and one-half flagellar segments; flagellar segment 1 slightly longer than segment 3 which is distinctly longer than segment 2 and extremely slightly shorter than 4; segments 3–11 longer than broad. Eye about three times as long as broad, inner margins converging slightly towards mandibles. Mandible bidentate, outer mandible surpassing middle of labrum by about one-fourth its own length. Galea as in *simulata*. Maxillary palpus as in *simulata* but segmental ratio about 1.0:1.0:0.8:0.8:0.7:0.9. Labial palpus as in *simulata* but segmental ratio about 2.0:1.0:0.7:1.0. Labral process about three times as broad as long, trapezoidal, entire. Clypeus flattened medially, with small median impunctate area, punctures large, round, separated by one-half to one puncture width, surface dulled by fine reticular shagreening. Supraclypeal area dulled by small distinct punctures separated mostly by one puncture width or more and fine tessellation. Genal area narrower than eye in profile, surface dulled by small, round punctures separated mostly by one-half to one puncture width and coarse reticular shagreening. Vertex above lateral ocellus equals slightly more than one ocellar diameter, with abundant punctures above ocelli, scattered punctures laterally, dulled by fine tessellation. Face above antennal fossae with short longitudinal rugulae not reaching ocelli, with crowded, almost contiguous punctures below ocelli, punctures scattered interrugally, surface dulled by coarse reticular shagreening.

Pronotum normal, with sparse shallow punctures and extremely

fine, dense tessellation dulling surface. Mesocutum opaque, with large, round, extremely shallow punctures separated mostly by half a puncture width or slightly more and obscured by fine dense tessellation; parapsidal line of moderate length, about as long as from its posterior end to margin of scutum. Scutellum sculptured as mesoscutum. Metanotum similar to scutellum but punctures smaller, slightly deeper and more crowded. Propodeum with dorsal enclosure irregularly roughened medially, dulled by extremely fine tessellation; dorsolateral and posterior surfaces with large shallow punctures separated mostly by one-half to one puncture width, surface dulled by dense tessellation; lateral surfaces similar to posterior surface but punctures sparse especially anteriorly. Mesepisternum sculptured as in mesoscutum but punctures larger, deeper and separated mostly by one puncture width or more. Metepisternum with lower portion impunctate, reticularly shagreened, moderately shiny, upper third dulled by fine punctation and dense tessellation. Fore wing with three submarginal cells, second cell along posterior margin somewhat less than half as long as first cell, receiving vein 1st m-cu near apex of cell; pterostigma long, tapering, no broader than from inner margin prestigma to wing margin. Claws and tibial spurs normal.

Terga 1-5 with apical areas slightly depressed, impunctate, shiny, reticularly shagreened at least near base. Tergum 1 with basal area with round punctures separated mostly by one to two puncture widths, surface moderately shiny, reticularly shagreened. Terga 2-5 with basal areas with round punctures separated by one puncture width or less, surfaces moderately shiny, reticularly shagreened. Pseudopygidial area not evident. Sterna 2-5 sculptured as in *simulata*, but surfaces moderately dulled by reticular shagreening. Sternum 6 as in *simulata*.

Genitalia and sterna 7 and 8 (Figs. 229-233) similar to those of *sodalis* with the following differences: penis valve shorter and thicker, basal lamellae not raised distinctly above general level of penis valve; sternum 7 with apicolateral lobes short; sternum 8 with tip not much expanded, entire.

VESTITURE: Generally pale ochraceous; sparse on thoracic dorsum, not hiding surface. Terga 2 and 3 with pale apical fasciae broadly interrupted medially. Terga 4 and 5 with pale apical fasciae complete but weak. Terga 6 and 7 with pale ochraceous hairs. Sterna 3-5 with subapical fimbriae of moderately long, erect, curled, pale ochraceous hairs. Inner surfaces tarsi pale yellow.

Type Material. The holotype male (USNM No. 58, 438) from Uyaca Peak, British Honduras was collected on February 9, 1947, by T. D. A. Cockerell. A second male, collected with the holotype,

is also in the U.S. National Museum. Cockerell (1949, p. 435) did not mention any specimen other than the holotype in his original description so this second male should not be considered as a paratype.

Remarks. It is possible that *A. hondurasica* represents the male of *A. amarilla* Cockerell which is redescribed below. However, the testaceous tegulae, pale wing veins, paler tarsi, and shorter vertex of *amarilla* seem to cast considerable doubt upon this association. It remains to have the sexes collected together and to have considerably more material in order to assess the intraspecific variation before association of the *hondurasica* males with the females of *amarilla* can be done with any confidence.

Andrena (Callandrena) amarilla Cockerell

Andrena amarilla Cockerell, 1949, Proc. United States Nat. Mus., vol. 98, p. 433.

This species is known only from a few females from British Honduras. As discussed above, the possibility exists that these are the females of *A. hondurasica* to which they are doubtlessly related. The female of *amarilla* closely resembles that of *simulata* in the presence of orange integumental bands on the abdomen and in the pale hind tarsi and it differs in the dense thoracic hairs, the opaque integument of the mesoscutum and scutellum, and the relatively short scopal hairs of the hind tibiae.

Female. MEASUREMENTS AND RATIOS: N = 2; length, about 11 mm; width, about 3 mm; wing length, 3.66–3.72 mm; FL/FW, 1.15–1.22; FOVL/FOVW, 3.50–3.71.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical three-fourths or entirely dark rufescent; flagellar segments 2–10 dark red below; tegulae testaceous; wing membranes hyaline, moderately infumate especially apically, yellowish, veins orange to red; terga 1–5 broadly hyaline apically, yellowish and terga 2–5 with narrow basal areas orange so that four transverse orange bands appear on abdomen; sterna 2–5 narrowly hyaline apically, rufescent at extreme bases; distitarsi rufescent; hind basitarsi piceous except basal third yellow; hind tibiae piceous; tibial spurs rufescent.

STRUCTURE: Antennae moderately long, scape slightly longer than flagellar segments 1–3; flagellar segment 1 slightly longer than segments 2 plus 3; segments 2 and 3 subequal in length and shorter than 4; segment 4 about as long as broad, segments 5–10 longer than broad. Eye about three and two-thirds times as long as broad, inner margins parallel or converging towards mandibles extremely slightly. Mandible, malar space, galea and maxillary palpus as in

simulata but segmental ratio of maxillary palpus about 1.0:1.1:0.7:0.7:0.6:0.9. Labial palpus as in *simulata* but segmental ratio about 2.2:1.0:0.6:1.0. Labral process entire, slightly more than twice as broad as long. Clypeus as in *simulata* but median impunctate area narrow and surface moderately dulled by fine reticular shagreening. Supraclypeal area with small, almost contiguous punctures and reticular shagreening dulling surface. Genal area about as broad as eye in profile, sculptured as in *simulata*. Vertex above lateral ocellus equals one ocellar diameter or slightly more, sculptured as in *simulata*. Face above antennal fossae with longitudinal rugulae reaching ocelli and abundant interrugal punctures, moderately shiny. Facial fovea narrow, extends to below level of upper margins of antennal fossae, rounded above and separated from lateral ocellus by about half an ocellar diameter.

Pronotum normal, with minute round punctures and dense coarse reticular shagreening dulling surface. Mesoscutum opaque, with shallow, small, crowded punctures obscured by fine dense tessellation; parapsidal line shorter than from its posterior tip to margin of scutum. Scutellum similar to mesoscutum. Metanotum sculptured like scutellum but punctures smaller, more abundant and more distinct. Propodeum with dorsal enclosure with delicate, transverse rugulae basally, surface dulled by tessellation. Dorsolateral and posterior surfaces with small, round punctures separated mostly by one to two puncture widths and coarse tessellation dulling surface. Corbicular surface moderately shiny, with sparse punctures concentrated anteriorly and coarse reticular shagreening. Mesepisternum with shallow punctures separated mostly by one to two puncture widths and rather coarse tessellation dulling surface. Metepisternum as in *simulata*. Tegulae impunctate. Wing venation as in *simulata*. Claws and tibial spurs normal.

Terga 1-5 with apical areas impunctate except at extreme bases, shiny, with extremely fine reticular shagreening becoming coarser near bases. Tergum 1 with basal area with minute punctures separated by three to five puncture widths or more, surface shiny, reticular shagreening extremely fine if present. Terga 2-5 with basal areas with small round punctures separated mostly by one to two puncture widths, surfaces shiny, with fine reticular shagreening especially at extreme bases. Pygidial plate V-shaped with well-rounded apex and strongly raised internal triangle. Sterna 2-5 impunctate apically, with abundant punctures in apical half of basal area, sparsely punctate basally, surfaces dulled by coarse reticular shagreening.

VESTITURE: Generally pale ochraceous except as follows: dorsum of thorax brighter, yellow to orange; tergum 6 pale brown; basi-

tibial plate brown; scopal hairs posteriorly below basitibial plate washed with brown; tarsi and inner surfaces tibiae reddish-brown. Thoracic dorsum with hairs denser than normal, obscuring surface. Terga 2 and 3 with apical pale fasciae broadly interrupted medially. Sterna 3-5 with weak subapical fimbriae. Propodeal corbicula complete anteriorly, with few internal hairs and these concentrated in anterior fourth. Trochanteral flocculus complete, weak. Scopal hairs plumose throughout, shorter than usual especially near apex of tibia.

Type Material. The holotype female (USNM No. 58,435) and four female paratypes from Agua Amarilla, British Honduras, were collected by the T. D. A. Cockerell party, December 15, 1946. An additional female with the same locality data as the holotype and another female from the same locality but collected on November 17, 1946, by the Cockerell party, have been found. These last two specimens should not be regarded as paratypes.

Andrena (Callandrena) bilimeki, n. sp.

A. bilimeki is a small Mexican species closely allied to *A. inculta* LaBerge. The female of *bilimeki* can be distinguished from that of *inculta* by the broad orange or red integumental band near the base of the abdomen (involving metasomal terga 1 and 2), the broadly interrupted pale apical fasciae of terga 2 and 3, and the dark hairs of the basitarsi. The male of *bilimeki* is similar to that of *hondurasica* in having an entirely black clypeus, but it differs from *hondurasica* in that the first flagellar segment is as long as or shorter than the second segment and the propodeal enclosure has fine transverse rugulae.

Female. MEASUREMENTS AND RATIOS: N = 4; length, 10-11 mm; width, 3.0-3.5 mm; wing length, M = 3.41 ± 0.001 mm; FL/FW, M = 1.13 ± 0.001; FOVW/FOVL, M = 3.06 ± 0.056.

INTEGUMENTAL COLOR: Black except as follows: mandible largely dark rufescent; flagellar segments 3-10 dark reddish-brown below; tegulae testaceous; wing membranes hyaline, slightly infumate apically, veins red to reddish-brown; terga 1-5 broadly hyaline apically, colorless, just basad of apical colorless area narrowly orange to red except tergum 2 almost entirely orange to red, extreme bases of terga 3-4 under hyaline apices, rufescent; distitarsi dark rufescent; hind basitarsi with extremes bases orange; hind tibiae and femora dark rufescent; tibial spurs pale yellow.

STRUCTURE: Antennae moderately long, scape length equal to slightly more than flagellar segments 1 plus 2; flagellar segment 1 in length about equal to segments 2 plus 3; segments 2 and 3 sub-

equal and shorter than 4; segments 4 and 6 subquadrate, 6-10 longer than broad. Eye about three and one-half times as long as broad, inner margins parallel. Malar space, mandible and galea as in *simulata*. Maxillary palpus as in *simulata* but segmental ratio about 1.0:0.9:0.6:0.6:0.5:0.6. Labial palpus as in *simulata* but segmental ratio about 1.9:1.0:0.5:0.7. Labral process, clypeus and genal area as in *inculta*. Vertex above lateral ocellus equals one ocellar diameter or extremely slightly less, sculptured as in *simulata*. Face above antennal fossae with distinct longitudinal rugulae reaching ocelli, interrugal spaces with sparse, coarse punctures and delicate shagreening, moderately shiny. Facial fovea reaching below to level of upper margins antennal fossae or slightly below, separated from lateral ocellus by about three-fourths of an ocellar diameter; foveae converging towards ocelli.

Thoracic sculpturing as in *simulata* except as follows: mesoscutal and scutellar punctures almost completely obscured by dense, coarse, regular tessellation; propodeal dorsal enclosure tessellate, without rugulae. Tegulae impunctate. Middle basitarsus and forewing venation as in *simulata*. Claws and tibial spurs normal.

Metasomal tergum 1 with apical area impunctate, basally with minute punctures separated mostly by two to four puncture widths, moderately dulled by coarse reticulotransverse shagreening. Terga 2-4 similar to tergum 1 but basal area punctures separated mostly by one puncture width or less. Pygidial plate V-shaped with rounded apex and distinct, raised, internal, triangular area. Sterna 2-5 sculptured as in *simulata*.

VESTITURE: Generally as in *simulata* but metasomal tergum 2 with pale apical fascia interrupted medially by more than half width of tergum and tergum 3 with pale apical fascia interrupted by one-third width of tergum. Distitarsi with ochraceous hairs; inner surfaces basitarsi and outer surfaces middle and hind basitarsi with hairs dark brown to reddish-brown. Pollen collecting hairs as in *simulata*.

Male. MEASUREMENTS AND RATIOS: N = 2; length 8-9 mm; width, about 2.5 mm; wing length, 2.85-3.15 mm; FL/FW, 1.13-1.23; FS1/FS2, 0.94-1.00.

INTEGUMENTAL COLOR: Black except as follows: mandible rufescent at least in apical third; flagellar segments 2-11 dark brownish-red below; tegulae testaceous; wing membranes hyaline, slightly infumate apically, veins dark reddish-brown; terga 1-5 broadly hyaline apically, colorless, narrowly rufescent just basad of colorless apical margins; sterna 2-5 narrowly hyaline apically, dark rufescent basally; distitarsi rufescent; hind femora dark rufescent.

STRUCTURE: Antennae moderate in length, extend to beyond

tegulae in repose; scape length equals about first two and one-half flagellar segments; flagellar segment 1 equal in length or shorter than segment 2; segment 2 distinctly shorter than 3 which is subequal to 4 or 5; all flagellar segments longer than broad. Eye, malar space, mandible and galea as in *simulata*. Maxillary palpus as in *simulata* but segmental ratio about 1.0:1.0:0.9:0.7:0.7:1.0. Labial palpus as in *simulata* but segmental ratio about 1.9:1.0:0.5:0.8. Labral process as in *simulata*. Clypeus as in *simulata* but median impunctate area small, punctures irregular in size and peripherally dull, coarsely shagreened. Supraclypal area and genal area as in *simulata* but eye slightly broader than genal area in profile. Vertex and face above antennal fossae as in *simulata*.

Thorax in structure and sculpturing as in *simulata* except mesoscutum and scutellum opaque, with punctures almost completely obscured by fine dense tessellation. Wing venation as in female. Metasomal terga 1-5 as in female but punctures slightly larger, tergum 1 with punctures almost as crowded as on succeeding terga, and without or with only extremely fine reticulotransverse shagreening, surfaces shiny. Pseudopygidial area not evident. Sternal punctures as in female. Sternum 6 as in *simulata*.

Genitalia and sterna 7 and 8 (Figs. 234-238) similar to those of *hondurasica* but note sternum 7 with greater median length and sternum 8 with short neck and large diamond-shaped apex.

VESTITURE: Generally white to pale ochraceous; dorsum of thorax and vertex slightly darker. Tergal bands worn on allotype and paratype but presumably interrupted medially on terga 2 and 3 as in female. Sterna 3-5 with subapical fimbriae as in *simulata*. Tarsi with inner surfaces pale yellow.

Type Material. The holotype (SECK) female and male allotype (SECK) from México, were collected in 1871 by Bilimek. Three female and one male paratypes (SECK; INHS; MSU) from México are as follows: 1 ♂, Cuernavaca, Morelos, 1871, Bilimek; 2 ♀♀, Orizaba, Vera Cruz, 1871, Bilimek; 1 ♀, Jalapa, Vera Cruz, November 7, 1957, R. and K. Dreisbach.

Andrena (Callandrena) duplicata Mitchell

Andrena (Pterandrena) duplicata Mitchell, 1960, North Carolina Agric. Exp. Sta. Tech. Bull., No. 141, pp. 144-145.

A. duplicata is the only species of the *aureocincta* group of *Callandrena* to occur in eastern United States. It is related to *simulata* in the yellow male clypeus, but differs in both sexes from *simulata* in the denser shagreening or tessellation of the thoracic dorsum and the darker integument of the terga and legs as described

below. The female of *duplicata* has the hair of the thoracic dorsum dense and hiding the surface as in *amarilla* but has the facial foveae shorter as in *simulata*. The male differs from that of *simulata* in the shortness of the first flagellar segment.

Female. MEASUREMENTS AND RATIOS: N = 19; length, 9–11 mm; width, 2.5–3.5 mm; wing length, $M = 3.22 \pm 0.124$ mm; FL/FW, $M = 1.16 \pm 0.005$; FOVL/FOVW, $M = 2.93 \pm 0.056$.

INTEGUMENTAL COLOR: Black except as follows: mandible mostly dark rufescent; flagellar segments 3–10 dark brown below; tegulae testaceous; wing membranes slightly infumate, especially apically near anterior margins, veins blackish-brown to dark reddish-brown; terga 1–5 broadly hyaline apically, yellowish, basally slightly rufescent; sterna 2–5 narrowly hyaline apically, rufescent basally; distitarsi rufescent (not orange); hind basitarsi piceous to somewhat rufescent; hind tibiae piceous; tibial spurs pale yellow.

STRUCTURE: Antennae of moderate length, scape slightly longer than flagellar segments 1–3; flagellar segment 1 about equal in length to segments 2 plus 3; segment 2 equal to 3 in length and shorter than 4; segment 4 as long as broad; segments 5–10 longer than broad. Eye about four times as long as broad, inner margins parallel. Malar space, mandible and galea as in *simulata*. Maxillary palpus as in *simulata* but segmental ratio about 1.0:1.1:0.6:0.6:0.5:0.8. Labial palpus as in *simulata* but segmental ratio about 2.2:1.0:0.7:1.2. Labral process short, three to four times as broad as long, entire or with minute median emargination. Clypeus as in *simulata* except lateral punctures smaller, separated mostly by half to one puncture width and surface often with extremely fine reticular shagreening but scarcely dulled. Supraclypeal area with minute crowded punctures and reticular shagreening dulling surface. Genal area slightly broader than eye in profile, with minute punctures near eye separated by one puncture width, posteriorly by two to three puncture widths, surface shiny and unshagreened near eye, moderately dulled posteriorly by reticular shagreening. Vertex above lateral ocellus equals one ocellar diameter or slightly less, sculptured as in *simulata*. Face above antennal fossae with longitudinal rugulae reaching ocelli and abundant interrugal punctures, moderately shiny. Facial fovea short, not extending to level of upper margin of antennal fossae, rounded above, separated from lateral ocellus by three-fourths of an ocellar diameter or slightly less.

Pronotum normal, with minute punctures crowded above, sparse laterally, and fine reticular shagreening. Mesoscutum with small round punctures separated by half to one puncture width, surface moderately dulled by fine reticular shagreening to opaque and coarsely shagreened or finely tessellate; parapsidal line moderately

long, about as long as from its posterior tip to margin of scutum. Tegulae impunctate. Scutellum sculptured as in mesoscutum. Metanotum like scutellum but punctures contiguous. Propodeum with dorsal enclosure slightly roughened mediobasally, tessellate; dorso-lateral and posterior surfaces with small round punctures separated mostly by two to three puncture widths, tessellate; corbicular area moderately shiny, with few punctures anteriorly and dorsally and coarse reticular shagreening. Mesepisternum with large round punctures separated by half to one puncture width, sparser posteriorly, surface moderately to completely dulled by fine shagreening. Metepisternum as in *simulata*. Middle basitarsus as in *simulata* slightly broader than hind basitarsus medially. Fore wing venation as in *simulata* except second submarginal cell only slightly less than half as long as first. Claws and tibial spurs normal.

Metasomal terga 1-5 with apical areas impunctate, shiny, with coarse sparse reticular shagreening. Tergum 1 with basal area punctures minute, separated mostly by three to five puncture widths, less laterally, surface moderately dulled by reticular shagreening. Terga 2-5 basally with small to minute punctures separated mostly by one to two puncture widths, surface moderately dulled by reticular shagreening. Pygidial plate V-shaped, with well-rounded apex and distinctly raised internal triangle. Sterna 2-5 as in *simulata* but shagreening slightly denser.

VESTITURE: Generally as in *simulata* with the following differences: thoracic dorsum with hairs yellowish to fox-red, relatively short, dense and hiding surface; tarsi without brown hairs; inner surfaces basitarsi pale yellow.

Male. MEASUREMENTS AND RATIOS: N = 3; length, 7-9 mm; width, 1.5-2.5 mm; wing length, $M = 2.87 \pm 0.549$ mm; FL/FW, $M = 1.16 \pm 0.053$; FS1/FS2, $M = 1.26 \pm 0.007$.

INTEGUMENTAL COLOR: Black except as follows: mandible entirely dark rufescent; clypeus bright yellow except apical margin, extremely lateral angles, and small maculae mesad and below tentorial pits; flagellar segments 2-11 dark reddish-brown below; tegulae testaceous; wing membranes hyaline, veins dark brown; terga 1-5 broadly hyaline apically; sterna 2-5 narrowly hyaline apically, dark rufescent basally; tarsi including hind basitarsi piceous with segments with rufescent tips to orange; hind tibiae piceous to slightly rufescent; tibial spurs pale yellow.

STRUCTURE: Antennae long, reaching well beyond tegulae in reposes; scape length equals slightly more than flagellar segments 1 plus 2; flagellar segment 1 about equal in length to segment 3, longer than segment 2; segment 3 subequal to segment 4; segments 3-11 longer than broad. Eye about three and one-fourth times as

long as broad, inner margins converging towards mandibles. Malar space as in female. Mandible as in female but lacking basoventral angle and subgenal coronet. Galea as in female. Maxillary palpus as in female but segmental ratio about 1.0:1.0:1.0:0.9:0.7:1.2. Labial palpus as in female but segmental ratio about 1.8:1.0:0.8:1.2. Labral process trapezoidal, two and one-half to three times as broad as long, with shallow median emargination. Clypeus as in female but less flattened, impunctate area larger, punctures smaller. Supraclypeal area as in female. Genal area as broad as eye in profile, sculptured as in female. Vertex above lateral ocellus slightly shorter than one ocellar diameter, sculptured as in female. Face above antennal fossae as in female but rugulae less distinct.

Thoracic structure and sculpturing as in female with the following differences: mesocutum, scutellum and mesepisternum usually moderately shiny, shagreening weak; propodeal dorsal enclosure more coarsely rugulose mediobasally; propodeal lateral surfaces dulled by coarse reticular shagreening and with punctures scattered throughout. Venation as in female.

Terga 1-5 with apical areas impunctate apically, with extremely minute sparse punctures near bases, shiny, shagreening extremely weak if present; basal areas with small round punctures separated mostly by two to three puncture widths (slightly sparser on tergum 1), surfaces shiny, unshagreened or only delicately so. Pseudopygidial area not evident. Sterna 2-5 sculptured as in female but punctures extremely sparse basally. Sternum 6 as in *simulata*.

Genitalia and sterna 7 and 8 (Figs. 239-242) similar to those of *hondurasica* but gonoforceps with inner apical margin less truncate and penis valves narrower.

VESTITURE: Generally as in *simulata* except as follows: tergum 3 with pale apical fascia narrowly interrupted medially and terga 4 and 5 with pale apical fasciae weak.

Type Material. The holotype (NCSU) female and allotype (NCSU) male of *duplicata* from Marion, North Carolina, were collected August 29, 1929, by T. B. Mitchell.

Distribution. *A. duplicata* is known to occur from North Carolina north to New Jersey and west to northeastern Missouri. It has been collected from August 15th through October 29th. In addition to the holotype and allotype, 22 females and 4 males (including 3 female and 2 male paratypes) have been examined from localities listed below.

ILLINOIS: Urbana. **MISSOURI:** Hannibal. **NEW JERSEY:** Englewood. **NORTH CAROLINA:** Cedar Mt.; Marion; Swannanoa. **OHIO:** Jackson Co.

Floral Records. Few floral records exist so that one cannot make

a statement regarding flower preferences at this time other than that this bee seems to prefer plants of the family Compositae. *A. duplicata* has been taken from flowers of the following plants:

Bidens coronata, *Helianthus* sp., *H. divaricatus*, *H. grosse-serratus*, *Solidago* sp.

Andrena (*Callandrena*) *solivaga*, n. sp.

This small species from México is related to *Andrena simulata*. It differs from *simulata* by having the mesoscutum more closely punctate, the propodeum shorter, more abruptly declivous and coarsely rugulose (often with transverse rugulae apically), the wing venation as described below, a broader labral process and by lacking the basoventral mandibular angle and lamella.

Female. MEASUREMENTS AND RATIOS: N = 5; length, about 8–9 mm; width, about 3 mm; wing length, 2.94 ± 0.90 mm; FL/FW, 1.12 ± 0.009 ; FOVL/FOVW, 3.98 ± 0.150 .

INTEGUMENTAL COLOR: Black except as follows: mandible dark rufescent; flagellar segments 2–10 dark rufescent below; tegula testaceous; wing membranes hyaline, slightly yellow, veins dark red; terga 2–4 narrowly hyaline apically, yellowish; sterna 2–5 narrowly hyaline apically; tarsi red; hind tibia dark red; tibial spurs yellow.

STRUCTURE: Antennae moderately long, scape almost as long as flagellar segments 1–4; flagellar segment 1 equals in length about succeeding two and one-half segments; segment 2 subequal to 3 and each distinctly shorter than 4. Eye almost four times as long as broad, inner margins converging extremely slightly towards mandibles. Mandible as in *simulata* but lacking basoventral angle and lamella. Malar space and galea as in *simulata*. Maxillary palpus as in *simulata* but segmental ratio about 1.2:1.0:0.7:0.6:0.5:0.7. Labial palpus as in *simulata* but ratio about 2.4:1.0:0.7:1.0. Labral process broad, about one-fourth as long as broad, minutely emarginate medially, not bidentate. Clypeus and supraclypeal area as in *simulata*. Genal area slightly broader than eye in profile, sculptured as in *simulata*. Vertex and face above antennal fossae as in *simulata* but facial rugulae more distinct and abundant and reaching ocelli. Facial fovea as in *simulata* but somewhat narrower and not reaching upper margin of antennal fossa below.

Pronotum, mesoscutum, scutellum and metanotum as in *simulata* except mesoscutal punctures almost contiguous, separated by mere ridges, but distinct and round, surface slightly dulled by fine irregular shagreening. Tegulae impunctate. Propodeum shorter than metanotum, abruptly declivous posteriorly, dorsal triangle with moderately coarse, irregular rugulae and fine tessellation dulling sur-

face; dorsolateral, posterior and corbicular surfaces as in *simulata*. Mesepisternum as in *simulata* but surface dulled by fine tessellation. Metepisternum as in *simulata*. Middle basitarsus slightly narrower than hind. Fore wing venation as in *simulata* except second submarginal cell receives vein 1st m-cu before middle of cell. Claws and tibial spurs normal.

Metasomal terga and sterna sculptured as in *simulata* except as follows: tergal punctures smaller and more crowded, those of tergum 1 of same size as of terga 2-4 but separated mostly by 2 puncture widths, on terga 2-4 separated mostly by half to one puncture width; surfaces moderately dulled by distinct reticular shagreening. Pygidial plate broad, U-shaped, with broad, bulging, internal, triangular area separated by a slightly raised ridge.

VESTITURE: Essentially as in *simulata* but thoracic dorsum with hairs slightly more abundant and basitarsi with outer surfaces with hairs pale.

Type Material. The holotype (CAS) female from 9 miles S.E. of Fresnillo, Zacatecas, México, August 7-14, 1954, was collected by E. G. Linsley, J. W. MacSwain and R. F. Smith. Five paratype females (SECK; INHS) were collected by the University of Kansas Mexican Expedition at Cuernavaca, Morelos, México, August 14, 1954, at 5000 feet altitude. One female paratype was collected 8 miles east of Tulancingo, Hidalgo, México, August 24, 1962, by E. Ordway and R. B. Roberts.

Remarks. A single male collected by C. D. Michener and party, 13 miles S.E. of Leon, Guanajuato, México, August 19, 1954, may be the male of *solivaga*. It is similar to *solivaga* in that the second submarginal cell receives vein 1st m-cu at or just before the middle of the cell and in the close-set punctures of the terga and mesoscutum. However, both terga and mesoscutum are shinier than in the *solivaga* females and, since the two sexes were not captured together, serious doubt exists in the author's mind whether or not they represent the same species. This male has been labeled as *Andrena solivaga* var. *A.* and is placed in the Snow Entomological Collection of the University of Kansas at Lawrence.

This male can be readily distinguished from the male of *simulata* by the lack of orange tergal bands (although the terga are hyaline apically), by the entirely black clypeus, and by the dark reddish-brown hind tibiae.

Andrena (Callandrena) perpunctata, n. sp.

This small species, together with *A. tegularis*, are unique among the *Callandrena* in having the tegulae distinctly punctate. The female of *perpunctata* can be distinguished from that of *tegularis*

by the lack of the mandibular basoventral lamella and the male of *perpunctata* can be readily told from that of *tegularis* by its entirely black clypeus. In spite of the similarity of the punctation, *perpunctata* is probably more closely related to *solivaga* than to *tegularis*. *A. perpunctata* resembles *solivaga* in lacking the mandibular basoventral lamella, in the crowded mesoscutal punctures and in the relatively coarsely sculptured propodeal dorsal enclosure.

Female. MEASUREMENTS AND RATIOS: N = 5; length, 8–9 mm; width, 2.5–3.0 mm; wing length, M = 2.74 ± 0.359 mm; FL/FW, M = 1.12 ± 0.022 ; FOVL/FOVW, M = 3.16 ± 0.165 .

INTEGUMENTAL COLOR: Black except as follows: mandible rufescent; flagellar segments 3–10 dark reddish-brown below; tegulae piceous; wing membranes hyaline, slightly infumate, especially apically, veins dark reddish-brown; terga 1–4 extremely narrowly hyaline apically, slightly rufescent just basad of hyaline margins; sterna 2–5 narrowly hyaline apically, basally dark rufescent; distitarsi rufescent; tibial spurs yellow.

STRUCTURE: Antennae moderately long; scape length equals flagellar segments 1–4 or almost so; flagellar segment 1 slightly, if any, longer than segments 2 plus 3; segment 2 equal in length to 3 and distinctly shorter than segment 4; segments 4–9 at least as broad as long, segment 10 longer than broad. Eye slightly more than three and one-half times as long as broad, inner margins parallel. Malar space linear. Mandible bidentate; outer mandible extends beyond middle of labrum by about one-third its length; basoventral angle and lamella absent; subgenal coronet well developed. Galea as in *simulata*. Maxillary palpus as in *simulata* but segmental ratio about 1.1:1.0:0.9:0.9:0.7:0.9. Labial palpus as in *simulata* but segmental ratio about 1.7:1.0:0.5:0.7. Labral process three times as broad as long or slightly broader, the tip usually slightly turned outwards, entire or extremely shallowly emarginate medially. Clypeus as in *simulata* except as follows: impunctate median area narrow; punctures extremely coarse, laterally obliquely elongated, smaller peripherally; surface shiny medially, peripherally dulled by reticular shagreening. Supraclypeal area with small, deep, close-set punctures, surface shiny, shagreening delicate. Genal area slightly narrower than eye in profile; punctures deep, separated mostly by one-half to one puncture width, surface shiny, unshagreened near eye margin, lightly shagreened posteriorly. Vertex above lateral ocellus equals one ocellar diameter or slightly more; punctures small, deep, round, crowded above ocelli, scattered but rather regularly so laterally, surface moderately shiny, reticularly shagreened. Face above antennal fossae with distinct rugulae reaching ocelli, inter-rugal spaces densely punctate, surface moderately shiny. Facial

fovea deep, narrow, oblique, extending below to level of upper margin of antennal fossa or slightly below, rounded above or slightly angulate near lateral ocellus, separated from lateral ocellus by half an ocellar diameter or slightly more.

Pronotum normal, with minute round punctures separated mostly by half a puncture width except sparser anteriorly, surface moderately dulled by reticular shagreening. Mesoscutum with round, moderate-sized, deep punctures separated by mere ridges, surface moderately shiny medially to dull peripherally, reticularly shagreened; parapsidal line longer than from its anterior end to margin of scutum. Tegulae distinctly narrowed anteriorly, with small round distinct punctures separated mostly by one puncture width or slightly more, shiny. Scutellum and metanotum like mesoscutum but metanotum dull and punctures smaller. Propodeum with dorsal enclosure irregularly rugulose, often near apex with rugulae largely transverse; dorsolateral and posterior surfaces with small punctures separated mostly by half a puncture width, moderately shiny, with delicate reticular shagreening; corbicular area with sparse punctures anteriorly and near dorsal margin, surface shiny with coarse reticular shagreening. Mesepisternum with deep round punctures separated by half a puncture width or less except sparser posteriorly, surface dulled by fine reticular shagreening. Metepisternum with lower portion shiny, unshagreened or delicately so and impunctate, upper third with minute punctures and fine shagreening moderately dulling surface. Middle basitarsus and wing venation as in *simulata*. Claws and tibial spurs normal.

Metasomal tergum 1 with apical area with minute round crowded punctures except impunctate apical rim, basally with slightly larger punctures separated mostly by half a puncture width or less, surface shiny, with extremely fine, delicate, reticular shagreening. Terga 2-4 like tergum 1. Tergum 5 like 1 but surface moderately dulled by reticular shagreening. Pygidial plate as in *simulata*. Sterna 2-5 as in *simulata* but surfaces moderately dulled by reticular shagreening.

VESTITURE: White except as follows: vertex with erect dark brown hairs; mesoscutum posteromedially to level of anterior margins of tegulae with short, erect, dark brown hairs; tegulae with few dark brown hairs on summits; terga 1-4 with basal areas with short, relatively sparse, erect, dark brown hairs; terga 5 and 6 medioapically with long decumbent brown hairs; inner surfaces tarsi with hairs golden to golden-brown. Terga 2-4 with apical fasciae weak, of short decumbent white hairs, usually interrupted medially on tergum 2. Sterna 2-5 with indistinct subapical fimbriae. Propodeal corbicula complete anteriorly, with several long barbed hairs inter-

nally near anterior margin and along dorsal margin. Trochanteral flocculus complete, weak. Tibial scopal hairs white, plumose throughout, relatively short, especially apically.

Male. MEASUREMENTS AND RATIOS: N = 7; length, 6.5–8.0 mm; width, 1.5–2.0 mm; wing length, M = 2.50 ± 0.247 mm; FL/FW, M = 1.17 ± 0.021 ; FSI/FS2, M = 1.05 ± 0.033 .

INTEGUMENTAL COLOR: Black except as follows: mandible with at least apical third rufescent; clypeus black; flagellum dark brown to reddish-brown below; tegulae piceous; wing membranes hyaline, slightly infumate, especially apically, veins dark reddish-brown; terga 1–5 with apices extremely narrowly hyaline, yellow; sterna 2–5 narrowly hyaline apically; distitarsi rufescent; tibial spurs yellow.

STRUCTURE: Antennae moderately long, in repose extending back to posterior margins of tegulae or slightly beyond; scape length equals somewhat less than flagellar segments 1–3; flagellar segment 1 only slightly, if at all, longer than segment 2; segment 2 quadrate, distinctly shorter than 3; segments 3–11 longer than broad. Eye about three and one-third times as long as broad, inner margins converging towards mandibles. Malar space, mandible and galea as in female. Maxillary palpus as in *simulata* but segmental ratio about 1.3:1.0:0.9:0.7:0.6:0.9. Labial palpus as in *simulata* but segmental ratio about 2.4:1.0:0.7:1.0. Labral process trapezoidal with apical margin shallowly and broadly emarginate, three times as broad as long or longer, apex thickened or slightly reflexed. Clypeus as in female but not flattened and punctures somewhat smaller. Supraclypeal area, genal area, vertex and face above antennal fossae as in female.

Thoracic structure and sculpturing as in female except as follows: tegulae with punctures more crowded; scutellum slightly shinier; propodeal dorsolateral and posterior surfaces rugulopunctate, lateral surface moderately dulled by abundant punctures in dorsal half and reticular shagreening. Wing venation as in female. Metasomal terga 1–5 with subapical areas moderately impressed and apical margins moderately reflexed; sculptured as in female but apical impunctate rim broader. Pseudopygidial area narrow, indistinct. Sterna 2–5 as in female. Sternum 6 flat, with shallow, V-shaped apical emargination.

Genitalia and sterna 7 and 8 (Figs. 243–247) similar to those of *simulata*. Note the following structures: penis valves narrow basally; volsellae with minute but distinct teeth; dorsal lobes of gonocoxites short; sternum 7 with almost U-shaped median emargination; sternum 8 entire apically.

VESTITURE: Generally white to pale ochraceous but slightly

darker on vertex and thoracic dorsum; inner surfaces tarsi pale yellow. Terga 2-5 with white apical fasciae but broadly interrupted medially on tergum 2 and usually narrowly interrupted on tergum 3. Sterna 3-5 with subapical fimbriae of long, semidecumbent, curled hairs.

Type Material. The holotype (SECK) male from 10 miles south of Acatlán, Morelos, México, was collected September 8, 1959, by R. H. Painter at 4800 feet altitude. The allotype female (SECK) from 17 miles north of Chilponciago, Guerero, México, was collected by the University of Kansas Mexican Expedition, August 13, 1962. Five female and six male paratypes (SECK; LACM; INHS; MSU) are as follows: *México*. 3 ♂♂ with the same data as the holotype. Huajitlan, Morelos: 1 ♀, September 27, 1957, R. and K. Dreisbach; 2 ♂♂, August 22, 1956, R. and K. Dreisbach. Yacutepec, Morelos: 1 ♀, August 19, 1956, R. and K. Dreisbach. *United States*. 5 miles west of Portal (Chiricahua Mts.), Arizona: 1 ♀, 1 ♂, August 18, 1958, P. A. Opler; 1 ♀, September 3, 1959, G. I. Stage, on *Heterotheca subaxillaris*. Rodeo (7 miles S.E.), New Mexico: 1 ♀, August 21, 1958, R. M. Bohart.

Andrena (Callandrena) dreisbachorum, n. sp.

This small Mexican species is known from only four specimens. It is remarkable because it is one of the few species of *Callandrena* which have a metallic luster to the integument. *A. dreisbachorum* is closely related to *A. perpunctata* and *A. solivaga* which it resembles in lacking the mandibular basoventral lamella in the female, having a rugulose propodeal dorsal enclosure and in the black clypeus of the male. The female of *dreisbachorum* can be distinguished from that of *solivaga* or *perpunctata* by the metallic blue-black integument and the broader pygidial plate. The male of *dreisbachorum* is readily recognized by the complete lack of subapical fimbriae on the metasomal sterna.

Female. MEASUREMENTS AND RATIOS: N = 1; length, about 10 mm; width, about 3 mm; wing length, about 2.91 mm; FL/FW, about 1.1; FOVL/FOVW, about 4.13.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical half rufescent; face, vertex and genal areas dark metallic blue-black; thorax dark metallic blue-black; tegulae translucent, dark reddish-brown; wing membranes hyaline, slightly infumate, veins dark brown; terga 1-4 slightly metallic, especially terga 2 and 3; sterna 2-5 narrowly hyaline apically, slightly rufescent basally; distitarsi rufescent; spurs pale yellow.

STRUCTURE: Antennae moderately long scape length equals first

three and one-half flagellar segments; flagellar segment 1 equal in length to segments 2 plus 3 which are equal in length and shorter than segment 4; segments 4-7 at least as broad as long, segments 8-10 longer than broad. Eye about four times as long as broad, inner margins parallel. Malar space, mandible and galea as in *perpunctata*. Maxillary palpus as in *simulata* except slightly shorter and segmental ratio about 1.0:0.9:0.5:0.5:0.4:0.6. Labial palpus as in *simulata* but segmental ratio about 3.4:1.0:0.8:1.2. Labral process as in *perpunctata*. Clypeus as in *simulata* with large median flattened impunctate area, laterally punctures round, deep, irregular in size and spacing but relatively sparse, smaller and crowded peripherally, surface shiny, unshagreened except near periphery. Supraclypeal area with small round punctures separated mostly by half a puncture width or slightly more and reticular shagreening dulling surface. Genal area slightly broader than eye in profile, sculpturing as in *simulata* but shagreening somewhat denser. Vertex as in *perpunctata* but punctures sparse except above ocelli and surface dulled by fine reticular shagreening. Face above antennal fossae with distinct longitudinal rugulae reaching ocelli, interrugal spaces with sparse coarse punctures, surface shiny to moderately so. Facial fovea as in *perpunctata*.

Pronotum normal, with sparse minute punctures and fine dense reticular shagreening dulling surface. Mesoscutum with small round punctures, posteromedially separated by half a puncture width or less, peripherally by one puncture width or more, surface tessellate posteromedially, reticularly shagreened peripherally; parapsidal line long as in *perpunctata*. Tegulae impunctate on summits. Scutellum with round punctures separated by one to two puncture widths medially but crowded along midline and on periphery, surface moderately shiny, reticularly shagreened. Metanotum with minute well-separated punctures and dense reticular shagreening dulling surface. Propodeum with dorsal enclosure shorter than metanotum medially, with sides curved outwards, with irregularly anastomizing rugulae; dorsolateral and posterior surfaces with sparse indistinct punctures and coarse tessellation dulling surfaces; corbicular area with minute punctures scattered in anterior half, surface shiny, coarsely and reticularly shagreened. Mesepisternum with small round punctures separated by one to two puncture widths anteriorly, sparse posteriorly, surface dulled by fine tessellation. Metepisternum with lower portion shiny, delicately shagreened, upper third dulled by minute sparse punctures and dense fine shagreening. Middle basitarsus as in *simulata*. Fore wing venation as in *simulata* but second submarginal cell receives vein 1st m-cu near middle of cell. Claws and tibial spurs normal.

Metasomal tergum 1 with minute punctures, medially separated by two to three puncture widths, subapically more crowded, surface dulled by fine dense tessellation. Terga 2 and 3 similar to tergum 1 but punctures more crowded. Terga 4 and 5 with minute punctures extremely sparse, surfaces dulled by dense reticular shagreening. Pygidial plate broadly U-shaped with sides diverging slightly towards base, with slightly raised internal triangle. Sterna 2-5 impunctate basomedially, with small sparse punctures laterally and subapically, surfaces shiny to moderately shiny, with fine reticular shagreening.

VESTITURE: Generally as in *perpunctata* with the following differences: tergal basal areas almost bare, with extremely short, erect, brown hairs intermixed with sparse, longer white hairs; inner surfaces tarsi with hairs reddish-brown.

Male. MEASUREMENTS AND RATIOS: N = 2; length, 7-8 mm; width, 2.0-2.5 mm; wing length, 2.43-2.79 mm; FL/FW, 1.14-1.15; FS1/FS2, 1.00-1.09.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical third or slightly more rufescent; clypeus black; flagellar segments 2-11 dark brown below; tegulae piceous or translucent dark reddish-brown (holotype); wing membranes hyaline, scarcely infumate, veins dark brown; tergal apices piceous (holotype) or slightly translucent; sterna 2-5 with apical margins narrowly hyaline, basally dark rufescent; distitarsi rufescent; tibial spurs pale yellow.

STRUCTURE: Antennae long, extending well beyond tegulae in repose; scape length equals first two and one-half flagellar segments or slightly more; flagellar segments as in *perpunctata*. Eye, malar space, mandible and galea as in *perpunctata*. Maxillary palpus as in female but segmental ratio about 1.0:0.9:0.7:0.7:0.5:0.6. Labial palpus as in female but segmental ratio about 2.3:1.0:0.9:1.0. Labral process as in *perpunctata*. Clypeus as in female but punctures separated mostly by half a puncture width or slightly more and without median impunctate area. Supraclypeal area and genal area as in female but genal area slightly less broad than eye in profile. Vertex and face above antennal fossae as in female.

Thorax as in female except as follows: mesoscutal and metanotal punctures slightly more crowded; scutellum shiny medially; propodeum with dorsal enclosure longer medially than metanotum, more finely rugulose than in female; propodeal lateral surface with small punctures in dorsal half, surface moderately shiny, reticularly shagreened, lower-posterior area with several extremely fine rugulae extending from above coxae dorsad and slightly caudad. Metasomal tergum 1 with relatively large, deep punctures separated mostly by half to one puncture width basally, subapically more

crowded, surface shiny, unshagreened or with extremely delicate shagreening. Terga 2-5 similar to tergum 1 but punctures separated mostly by half a puncture width and shagreening progressively more evident posteriorly. Pseudopygidial area narrow, indistinct. Sterna 2-5 as in female. Sternum 6 flat, shallowly and broadly emarginate apically.

Genitalia and sterna 7 and 8 (Figs. 248-251) similar to those of *perpunctata* but penis valves somewhat more bulbous at tips, volsellae larger and without evident teeth, and sternum 8 slightly broader with a shorter neck region.

VESTITURE: Generally as in *perpunctata* with the following differences: terga 2-4 with apical white fasciae, interrupted medially on tergum 2, tergum 5 lacking fascia; sterna 2-5 completely lacking subapical fimbriae; inner surfaces tarsi pale yellow.

Type Material. The holotype (MSU) female, allotype (MSU) male and one male paratype (MSU) (without head) from Tepotzlan, Morelos, México, were collected by R. and K. Dreisbach on September 26, 1957. One male paratype (INHS) from Matilde, Distrito Federal, México, was collected by R. and K. Dreisbach on August 27, 1956.

Andrena (Callandrena) levigata, n. sp.

A. levigata is a distinctive Mexican species related to *A. dreisbachelorum* and *perpunctata*. Like *dreisbachelorum*, *levigata* has the integument in part with a metallic lustre. In the case of *levigata* the head and thoracic are nonmetallic and the metasomal terga are dark metallic blue-black or greenish blue-black, whereas in *dreisbachelorum* the head and thorax are metallic and the terga nonmetallic. *A. levigata* differs from both *dreisbachelorum* and *perpunctata* by the almost complete lack of punctures on the terga, by the generally shiny, unshagreened integument, and by the darker vestiture as described below.

Female. MEASUREMENTS AND RATIOS: N = 4; length, 9-10 mm; width, 3.0-3.5 mm; wing length, M = 3.35 ± 0.407 mm; FL/FW, M = 1.14 ± 0.027 ; FOVL/FOVW, M = 3.76 ± 0.020 .

INTEGUMENTAL COLOR: Black except as follows: mandible with apical half rufescent; flagellar segments 3-10 dark blackish-brown below; tegulae piceous or slightly translucent; wing membranes deeply infumate, especially subapically and near anterior margin, veins blackish-brown; tergal apices piceous, slightly reddened below apical fasciae, basal areas dark metallic blue-black or greenish blue-black; sterna 2-5 with narrowly hyaline apices, yellowish, basally dark rufescent; distitarsi rufescent; tibial spurs yellow.

STRUCTURE: Antennae short, scape length equals flagellar seg-

ments 1-3 or extremely slightly more; flagellar segment 1 slightly longer than segments 2 plus 3 which are equal in length and each shorter than segments 4; segments 4 and 5 quadrate, 6-10 longer than broad. Eye, malar space, mandible and galea as in *perpunctata*. Maxillary palpus as in *simulata* but segmental ratio about 1.0:0.8:0.6:0.5:0.4:0.6. Labial palpus as in *simulata* but segmental ratio about 2.5:1.0:0.8:1.5. Labral process extremely short, about six times as broad as long, entire, less than one-third as long as labrum medially. Clypeus flattened medially, extends beyond ends of compound eyes by about half its median length, with deep round punctures, medially separated irregularly by one-half to two puncture widths, peripherally smaller and separated mostly by half a puncture width, surface shiny, unshagreened except slightly so in extreme periphery. Supraclypeal area with small round punctures separated by half to one puncture width, surface shiny, unshagreened or only slightly so. Genal area about as broad as eye in profile; sculptured as in *perpunctata* but punctures separated mostly by two puncture widths. Vertex short, above lateral ocellus equals slightly less than one ocellar diameter; with deep punctures, above middle ocellus separated mostly by half to one puncture width, absent above lateral ocelli and foveae and separated mostly by one to two puncture widths above eyes, surface moderately shiny, dulled by coarse, reticular shagreening forming extremely fine, parallel rugulae between fovea and lateral ocellus and above fovea. Face above antennal fossae with fine longitudinal rugulae reaching lateral ocelli, interrugal spaces with coarse punctures and extremely delicate shagreening. Facial fovea as in *perpunctata*, separated from lateral ocellus by half an ocellar diameter or less.

Pronotum normal, posterolaterally with small punctures separated mostly by one puncture width, impunctate anteriorly, surface dulled by moderately coarse, reticular shagreening. Mesoscutum with small round punctures, sparse posteromedially, peripherally separated mostly by half to one puncture width, surface shiny to slightly dulled by fine reticular shagreening; parapsidal line short, slightly longer than from its posterior end to margin of scutum. Tegulae normal, impunctate. Scutellum sculptured as in mesoscutum. Metanotum at summit unshagreened and with minute punctures separated by one puncture width or more, laterally and posteriorly dulled by reticular shagreening and small punctures. Propodeum with dorsal enclosure as long as metanotum medially, sides straight, basally with transverse or oblique rugulae, apically with extremely fine transverse rugulae, rugulae usually interrupted medially, surface moderately shiny; dorsolateral and posterior surfaces with round punctures separated mostly by one-half to one puncture

width, surface scarcely dulled by fine reticular shagreening, posterior longitudinal median sulcus shallow, as broad as long; corbicular area with small punctures widely scattered in anterior half, fine rugulae extending up and back from coxae in posterior third, surface shiny, with coarse reticular shagreening. Mesepisternum with deep, moderate-sized punctures, anteriorly separated by half a puncture width or less, posteriorly sparse, surface shiny, unshagreened or with delicate reticular shagreening. Metepisternum shiny, extremely delicately shagreened, lower portion impunctate, upper third with minute, well-spaced punctures. Middle basitarsus almost parallel-sided, slightly narrower than hind basitarsus. Fore wings with three submarginal cells, middle cell receives vein 1st m-cu well beyond middle of cell; pterostigma large, broader than from inner margin prestigma to wing margin; otherwise as in *perpunctata*. Claws and tibial spurs normal.

Metasomal terga 1-4 almost impunctate, with minute scattered punctures especially near extreme base or hidden under apical fasciae; surfaces shiny, unshagreened or with extremely delicate, reticular shagreening. Pygidial plate U-shaped with slightly diverging sides, apex rounded, internal raised triangular area present. Sterna 2-5 with narrow apical areas impunctate, basal areas with minute scattered punctures becoming denser near apical areas but still separated by two to more puncture widths, surfaces moderately shiny, reticularly shagreened.

VESTITURE: Head white except vertex, upper part of genal areas, and facial foveae with blackish-brown hairs. Thorax pale ochraceous except as follows: mesoscutum and scutellum dark brown medially, ochraceous peripherally, mesoscutal dark patch extends forward at least to anterior margins tegulae and usually beyond (holotype); mesepisternum pale anteriorly, dark brown posteriorly, or almost entirely dark brown (holotype), or dark brown intermixed with pale hairs anteriorly and dark posteriorly; propodeal hairs dark brown except dorsal fringe of corbiculum. Tergum 1 glabrous except dark brown hairs at sides (becoming pale near apex). Terga 2-4 with ochraceous to bright golden (holotype), dense, apical fasciae of short, plumose hairs, that on tergum 2 narrowly interrupted or thinned medially; basally glabrous or with sparse pale hairs especially near extreme bases. Terga 5 and 6 with long brown hairs, paler at sides. Sternal hairs brown, pale at sides. Leg hairs brown to blackish brown except tibial scopal hairs whitish posteriorly and middle tibia with apical outer surface pale. Propodeal corbicula incomplete anteriorly, interior with scattered, long, plumose hairs in anterior half. Trochanteral flocculus and tibial scopae as in *perpunctata*.

Male. MEASUREMENTS AND RATIOS: N = 3; length, 7.5–9.0 mm; width, 1.5–2.5 mm; wing length, M = 2.99 ± 0.426 mm; FL/FW, M = 1.16 ± 0.032 ; FS1/FS2, M = 1.56 ± 0.068 .

INTEGUMENTAL COLOR: Generally as in female with the following differences: mandible with apical third rufescent; flagellar segments 3–11 dark brownish-black below; terga 1–5 with nonmetallic apical areas and metallic basal areas.

STRUCTURE: Antennae long, reaching beyond tegulae in repose; scape length equal first two and one-half flagellar segments; flagellar segment 1 longer than segment 2, equal in length to 3 or 4; segments 3–11 longer than broad. Eye, malar space, mandible and galea as in *perpunctata*. Maxillary palpus as in *simulata* but segmental ratio about 1.2:1.0:0.9:0.8:0.8:1.0. Labial palpus as in *simulata* but segmental ratio about 2.2:1.0:0.8:1.0. Labral process trapezoidal in outline with broad, shallow, median emargination, slightly broader than three times greatest length. Clypeus as in female but punctures somewhat more crowded and regular medially. Supraclypeal area and genal area as in female. Vertex as in female but above lateral ocellus equals one ocellar diameter or slightly more, without shagreening or extremely fine rugulae laterally. Face above antennal fossae as in female.

Thoracic sculpturing and structure as in female except as follows: prothorax more shiny, shagreening delicate; mesoscutal and scutellar punctures smaller and sparser; propodeum with dorsal enclosure with apex without rugulae, finely shagreened, lateral surface with deep punctures in upper third or more, delicately shagreened, shiny. Terga 1–6 like female terga 1–4. Pseudopygidial area distinct, narrow. Sterna 2–5 with basal area punctures minute and extremely sparse except in narrow subapical zone. Sternum 6 flat, apex extremely shallowly and broadly emarginate medially.

Genitalia and sterna 7 and 8 (Figs. 252–256) similar to those of *perpunctata* but differ as follows: dorsal lobe gonocoxites longer; gonoforceps less hairy; penis valves broader near base; volsellae with fewer minute teeth; sternum 7 with median length greater, hairs sparse; sternum 8 with apex broader, scalloped or sinuate.

VESTITURE: Generally as in female with the following differences: head with dark hairs along margin of eyes and apex of clypeus; propodeal hairs white to pale ochraceous; terga 1–5 with apical fasciae like female terga 2–4, that on tergum 1 thinner than on following terga; tergum 7 with brown hair, 6 with sparse, pale ochraceous hairs. Sterna 2–5 with distinct, subapical fimbriae of moderately long, slightly curled, pale ochraceous, barbed hairs. Leg hairs white to pale ochraceous except tibiae and tarsi dark brown (base of tibiae occasionally pale).

Type Material. The holotype (MSU) female and the allotype (MSU) male from Morelia, Michoacán, México, were collected on September 22, 1957, by R. and K. Dreisbach. Two female and two male paratypes (MSU, INHS) were collected with the holotype and allotype. An additional female paratype (SECK) is as follows: Urupán, Michoacán, México, October 1954, N. L. H. Krauss collector.

Andrena (Callandrena) limatula, n. sp.

This species is closely related to *A. levigata*. The female of *limatula* is readily distinguished from that of *levigata* by the terga being dulled by tessellation or reticular shagreening. The male of *limatula* differs from that of *levigata* in having more dark hairs on the head and in the terga being at least moderately dulled by reticular shagreening. It is possible that *limatula* is an eastern or coastal race of *levigata* but many more specimens are needed to determine the validity of such an assumption. It is preferable to consider these forms as distinct species until such time as their true status can be determined.

Female. MEASUREMENTS AND RATIOS: N = 3; length, 9–10 mm; width, about 3 mm; wing length, M = 3.54 ± 0.387 mm; FL/FW, M = 1.13 ± 0.014 ; FOVL/FOVW, M = 3.87 ± 0.115 .

INTEGUMENTAL COLOR: Black except as follows: mandible with apical half rufescent; flagellar segments 3–10 dark brown below; tegulae piceous or somewhat translucent at summits; wing membranes deeply infumate, especially subapically and near anterior margin, veins blackish-brown; tergal apices piceous or brownish, bases dark metallic blue-black or slightly greenish; sterna 2–5 narrowly hyaline apically, rufescent basally; distitarsi rufescent; tibial spurs yellow.

STRUCTURE: Antennae short; scape length equals first three and one-half flagellar segments; flagellar segment 1 slightly longer than segments 2 plus 3 which are equal in length (or 2 extremely slightly shorter than 3) and each shorter than segment 4; segments 4 and 5 subquadrate, 6–10 longer than broad. Eye, malar space, mandible, and galea as in *perpunctata*. Maxillary palpus as in *simulata* but segmental ratio about 1.0:1.0:0.7:0.6:0.5:0.7. Labial palpus as in *simulata* but segmental ratio about 2.4:1.0:0.7:1.0. Labral process, clypeus, supraclypeal area, genal area, vertex, face and facial fovea as in *levigata*.

Thoracic sculpturing and structure as in *levigata* except as follows: mesoscutum posteromedially and scutellum medially with punctures sparser, almost impunctate; mesoscutum with periphery dulled by reticular shagreening especially anteriorly (shagreening

may extend posteriorly to level of posterior ends of parapsidal lines or slightly more); propodeum with dorsal enclosures less rugulose, rugulae confined to basal half, apically tessellate. Wing venation and middle basitarsus as in *levigata*. Claws and tibial spurs normal.

Metasomal terga as in *levigata* but terga 1-3 opaque, tessellate; tergum 4 moderately shiny subapically, basal tessellae grading into coarse reticular shagreening; tergum 5 coarsely shagreened. Pygidial plate and sterna as in *levigata*.

VESTITURE: In general as in *levigata* with the following differences: metasomal terga 2-4 with apical fasciae white to pale ochraceous; tergum 2 with apical fascia broadly interrupted medially forming lateral patches one-sixth to one-fourth width of tergum; tergum 3 with apical fascia at least narrowly interrupted medially.

Male. MEASUREMENTS AND RATIOS: N = 3; length, 7-9 mm; width, 1.5-2.0 mm; wing length, $M = 3.01 \pm 0.272$; FL/FW, $M = 1.11 \pm 0.022$; FS1/FS2, $M = 1.32 \pm 0.032$.

INTEGUMENTAL COLOR: Generally as in female except as follows: mandible with apical third rufescent; flagellar segments 2-11 blackish-brown below; terga 1-5 like female terga 1-4.

STRUCTURE: Antennae as in *levigata* but first flagellar segment extremely slightly shorter than third segment. Eye, malar space, mandible and galea as in *perpunctata*. Maxillary palpus as in *simulata* but segmental ratio about 1.0:1.0:0.9:0.8:0.7:1.0. Labral process as in *levigata*. Clypeus as in female but with scattered punctures medially and punctures slightly smaller. Supraclypeal area and genal area as in female. Vertex as in female but above lateral ocellus equal to about one ocellar diameter, shiny. Face above antennal fossae as in female.

Thoracic sculpturing and structure as in female except as follows: mesoscutum with reticular shagreening only on extreme periphery, anteriorly not extending back to level of anterior ends of parapsidal lines; propodeum with dorsal enclosure with rugulae minute, irregular, restricted to extreme base, apex shiny, delicately shagreened; propodeal lateral surface with punctures in upper half, below shiny, shagreened. Metasomal terga as in *levigata* but with delicate reticular shagreening dulling surfaces at least basally. Pseudopygidial area distinct, narrow. Sterna 2-5 as in female. Sternum 6 flat, apex shallowly and broadly emarginate.

Genitalia and sterna 7 and 8 (Figs. 257-261) similar to those of *levigata* except as follows: sternum 7 with median length shorter, apical emargination broader and deeper; sternum 8 with longer hairs.

VESTITURE: Generally as in female with the following differences: head with more black, clypeus with hairs all or mostly black or

brown, dark hairs follow eye margins from vertex to mandibles, hypostomal areas with brown; propodeal hairs white to pale ochraceous; terga 1-5 with distinct apical fasciae as in female terga 1-4 but uninterrupted medially, that on tergum 1 thin. Sterna 2-5 with distinct, subapical fimbriae of moderately long, slightly curled, suberect, ochraceous hairs. Leg hairs white to pale ochraceous except tibiae and tarsi dark brown.

Type Material. The holotype (SECK) female from Orizaba, México, was collected in November, 1871, by Bilimek. The allotype (MSU) male from Jalapa, Veracruz, México, was collected September 28 to October 3, 1961, by R. and K. Dreisbach. Two additional male paratypes (MSU; INHS) were taken with the allotype. In addition, two female paratypes (MSU; INHS) were collected by R. and K. Dreisbach in Veracruz, México, as follows: 1 ♀ from Jalapa, November 7, 1957; 1 ♀ from Río Blanco, November 13, 1957.

Andrena (Callandrena) optanda, n. sp.

This small species from central Mexico is represented by a single female. It is related to the *solivaga-limatula* group of species but is readily distinguished from any of these by the closely punctate, short clypeus and by the front wings having only two submarginal cells.

Female. MEASUREMENTS AND RATIOS: N = 1; length, about 8 mm; width, about 2.5 mm; wing length, about 2.67; FL/FW, about 1.14; FOVL/FOVW, about 3.07.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical half rufescent; flagellar segments 4-10 dark reddish-brown below; tegulae translucent, reddish-brown; wing membranes moderately infumate, brownish, veins dark brown; terga 1-4 with apices rather broadly hyaline, colorless at extreme apex becoming yellow towards basal area; sterna 2-5 narrowly hyaline apically, rufescent basally; distarsi rufescent; hind basitarsi orange; tibial spurs pale yellow.

STRUCTURE: Antennae short; scape length equals slightly more than flagellar segments 1-4; flagellar segment 1 equals in length succeeding two and one-half segments; segments 2, 3 and 4 subequal in length and distinctly shorter than 5; segments 2-5 broader than long, 6 and 7 quadrate, 8-10 longer than broad. Eye slightly less than three and one-half times as long as broad, inner margins converging slightly towards mandibles. Malar space, mandible and galea as in *perpunctata*. Maxillary palpus as in *simulata* but segmental ratio about 1.0:1.0:0.8:0.7:0.7:0.8. Labial palpus as in *simulata* but segmental ratio about 1.2:1.0:0.8:1.0. Labral process as in

levigata. Clypeus short, protruding beyond ends of compound eyes by less than half but slightly more than one-third its median length, flattened; with small, round regularly-spaced punctures separated by half a puncture width or slightly more, surface shiny, scarcely shagreened except on extreme periphery. Supraclypeal area minute, distinct punctures and delicate shagreening moderately dulling surface. Genal area slightly broader than eye in profile, with minute punctures separated mostly by one to two puncture widths, surface shiny, unshagreened. Vertex short, above lateral ocellus equals three-fourths of one ocellar diameter; impunctate around lateral ocellus, crest with crowded punctures, above compound eyes and foveae with sparse punctures, surface shiny, unshagreened except delicately so posteriorly. Face above antennal fossae with distinct longitudinal rugulae reaching ocelli, interrugal spaces with small punctures, surface shiny. Facial fovea narrow, extending below to level of upper margin of antennal fossae or slightly lower, rounded above and separated from lateral ocellus by half an ocellar diameter or slightly more.

Pronotum normal with minute punctures crowded above, sparse laterally, moderately dulled, especially posteriorly, by fine reticular shagreening. Mesoscutum with relatively coarse, round punctures separated mostly by half a puncture width (slightly more postero-medially), surface shiny, unshagreened except on periphery; parapsidal line slightly longer than from its posterior end to margin of scutum. Tegulae normal, impunctate on summits. Scutellum sculptured as in mesoscutum. Metanotum with summit flat, with small distinct punctures and surface shiny, laterally and posteriorly with small crowded punctures and delicate shagreening. Propodeum with dorsal enclosure shorter than metanotum medially, with extremely delicate, oblique rugulae basolaterally, surface shiny, delicately shagreened; dorsolateral and posterior surfaces with small round punctures separated mostly by two to three puncture widths, shiny; corbicular area with several minute punctures in anterior half, surface shiny, coarsely shagreened. Mesepisternum with distinct round punctures separated mostly by one to two puncture widths anteriorly, sparse posteriorly, surface shiny. Metepisternum shiny, unshagreened, lower portion impunctate, upper third with minute well-spaced punctures. Middle basitarsus parallel-sided, narrower than hind basitarsus. Fore wings with two submarginal cells, second cell along posterior margin longer than first, receiving vein 1st m-cu at about one-fourth distance from base; pterostigma large, broader than from inner margin prestigma to wing margin. Claws and tibial spurs normal.

Metasomal tergum 1 impunctate apically and medially, basally

and laterally with extremely minute and sparse punctures, surface shiny, unshagreened. Terga 2-4 impunctate apically, basal areas with minute but distinct punctures separated by several puncture widths, surfaces shiny, unshagreened. Pygidial plate U-shaped with sides diverging slightly basad, apex rounded, slightly raised internal triangle present. Sterna 2-5 impunctate apically and at extreme bases, subapically with minute, well-spaced punctures, surface shiny, with delicate reticular shagreening.

VESTITURE: Pale ochraceous except as follows: vertex and dorsum of thorax with hairs yellow; inner surfaces tarsi pale yellow. Terga 2-4 with apical fasciae, that on terga 2 and 3 broadly interrupted medially and on tergum 4 narrowly so. Propodeal corbicula, trochanteral flocculus, and tibial scopa as in *perpunctata*.

Type Material. The holotype (SECK) female from 49 miles northeast of Tehuacan, Puebla, México, at 6300 feet altitude, was collected September 11, 1959, by R. H. and E. M. Painter.

Andrena (Callandrena) gardineri Cockerell

Andrena (Pterandrena) gardineri Cockerell, 1906, Ann. Mag. Nat. Hist., ser. 7, vol. 17, p. 307; Lanham, 1949, Univ. California Pubs. Ent., vol. 8, p. 200; Mitchell, 1960, North Carolina Agric. Exp. Sta., Tech. Bul. No. 141, pp. 146-147.

Andrena gardineri: Viereck and Cockerell, 1914, Proc. United States Nat. Mus., vol. 48, p. 57; Clements and Long, 1923, Carnegie Inst. Washington, Pub. 366, p. 249; Brimley, 1938, Insects of North Carolina, p. 453; Lanham, 1941, Ann. Ent. Soc. America, vol. 34, p. 711.

Andrena ashmeadi Viereck and Cockerell, 1914, Proc. United States Nat. Mus., vol. 48, p. 45; Lanham, 1949, Univ. California Pubs. Ent., vol. 8, p. 200; Lanham, 1951, in Muesebeck *et al.*, United States Dept. Agric., Agric. Monogr. No. 2, p. 1066 (synonymy).

Andrena (Opandrena) lamellicauda Cockerell, 1925, Ann. Mag. Nat. Hist., ser. 9, vol. 16, p. 629; Lanham, 1941, Ann. Ent. Soc. America, vol. 34, p. 711 (synonymy).

Andrena campbelli Cockerell, 1933, Pan- Pac. Ent., vol. 9, p. 153; Lanham, 1941, Ann. Ent. Soc. America, vol. 34, p. 711 (synonymy).

Andrena gardineri is a small bee occurring east of the Rocky Mountains in the United States. It is the first of a series of species characterized by having a more or less distinct pale apical fascia on tergum 1 as well as terga 2-4 in both sexes. In addition the labral process is bidentate, the clypeus and terga are distinctly punctate and usually shiny in both sexes, and the terga have hya-

line apical margins. The males have a yellow clypeus and often yellow parocular maculae (rare and small in *gardineri*), the sixth sternum has the apical margin reflexed, and flagellar segments 2 and 3 are subequal in length to each other and shorter than segment 4 which is broader than long.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 9–11 mm; width, 2.5–3.5 mm; wing length, $M = 3.39 \pm 0.172$ mm; FL/FW, $M = 1.07 \pm 0.005$; FOVL/FOVW, $M = 2.77 \pm 0.028$.

INTEGUMENTAL COLOR: Black except as follows: mandible usually dark rufescent; flagellar segments 4–10 dark reddish-brown below; tegulae testaceous; wing membranes hyaline, only slightly infumate apically, veins red to dark reddish-brown; terga 1–4 with apices narrowly hyaline, colorless to yellowish, often slightly rufescent basad of hyaline areas; sterna 2–5 with apices narrowly hyaline; disitarsi rufescent to orange; hind basitarsi occasionally rufescent, usually piceous; tibial spurs white to pale yellow.

STRUCTURE: Antennae short; scape length equals flagellar segments 1–4 or almost so; flagellar segment 1 as long as succeeding two and one-half segments; segments 2 and 3 equal in length and shorter than 4; segment 4 broader than long, 5 and 6 quadrate, 7–10 longer than broad. Eye about three and three-fourths as long as broad or slightly less, inner margins parallel. Malar space linear. Mandible bidentate; outer mandible when closed extends beyond middle of labrum by less than one-fourth its own length; basoventral lamella well developed but angle rounded; subgenal coronet well developed. Galea with lateral surface almost as broad as dorsal, curved evenly from top to side, surface moderately dulled to opaque, finely and regularly tessellate, punctures minute and sparse. Maxillary palpus barely reaching tip of galea when both stretched forward, segmental ratio about 1.0:1.2:0.7:0.7:0.7:0.8. Labial palpus with first segment long, flattened apically, curved along inner margin, outer margin almost straight, segmental ratio about 4.0:1.0:0.7:0.7. Labral process short, less than half as long as broad, bidentate. Clypeus evenly rounded from side to side, protruding beyond lower ends of compound eyes by less than half length of clypeus; with regular round punctures separated mostly by half a puncture width, slightly sparser apicomediaally and somewhat smaller peripherally, surface shiny to moderately dulled, with fine reticular shagreening especially peripherally. Supraclypeal area with distinct minute punctures and reticular shagreening at least moderately dulling surface. Genal area about one and one-half times as broad as eye in profile, with minute punctures separated mostly by one puncture width, surface shiny near eye to dull posteriorly, delicately shagreened. Vertex above lateral ocellus equals one ocellar diameter

or slightly more; with round punctures crowded above median ocellus, posteriorly and above facial foveae, sparse elsewhere, surface dulled by coarse tessellation. Face above antennal fossae with extremely weak, longitudinal rugulae often not reaching ocelli, with interrugal punctures and fine reticular shagreening moderately dulling surface. Facial fovea short, extends below about to level of upper margin of antennal fossae, narrow below, rounded above and separated from lateral ocellus by one ocellar diameter or slightly more.

Pronotum normal, with small punctures dorsally separated by one to two puncture widths, laterally sparse, surface shiny anteriorly, dulled posteriorly by dense reticular shagreening. Mesocutum with regular, small, round punctures separated mostly by half to one puncture width or slightly more, surface moderately dulled by fine reticular shagreening; parapsidal line of moderate length, about as long as from its posterior tip to margin of scutum. Tegulae impunctate. Scutellum similar to mesoscutum but shiny at least medially. Metanotum with abundant small punctures, surface opaque, tessellate. Propodeum with dorsal enclosure with fine irregularly anastomizing rugulae, often short longitudinal rugulae at base and irregularly transverse rugulae medially, surface finely tessellate; dorsolateral and posterior surfaces with small round punctures separated mostly by one puncture width, surfaces tessellate; corbicular surface moderately shiny, with scattered punctures and coarsely reticulate shagreening. Mesepisternum with moderately coarse, round punctures separated mostly by half to one puncture width, less posteriorly, surface opaque, tessellate. Metepisternum with lower portion like corbicular surface, upper third tessellate. Middle basitarsus only slightly broadened medially, about equal to hind basitarsus medially; without apical spine. Fore wing usually with three submarginal cells (rarely with two), middle cell slightly narrowed above, along posterior margin equals slightly more than one-third of first cell, receiving 1st m-cu at or before middle, rarely slightly beyond middle of cell; pterostigma usually slightly narrower than from inner margin prestigma to wing margin, often rather truncate apically; vein M interstitial with or basad of vein cu-v. Claws and tibial spurs normal.

Metasomal terga 1-5 impunctate apically. Tergum 1 with basal area punctures crowded near apical area, medially separated mostly by one and one-half to two puncture widths, surface shiny, unshagreened or with delicate reticular shagreening especially laterally. Terga 2-4 similar to 1 but punctures progressively more crowded and shagreening progressively more dense and coarse. Pygidial plate V-shaped with narrowly rounded apex, without distinctly

delineated internal raised triangle but with a low median ridge near base. Sterna 2-5 impunctate apically, basally with round punctures separated by two to four puncture widths on sternum 2, by one to two puncture widths on sterna 3-5, surfaces only moderately dulled by delicate reticular shagreening.

VESTITURE: Generally white to pale ochraceous except as follows: vertex of head and thoracic dorsum darker or more yellowish; inner surfaces tarsi pale yellow. Terga 1-4 with distinct, rather narrow, white to pale yellow, apical fasciae, each of about same length medially, on tergum 1 occasionally interrupted medially but probably due to wear; basally with short erect to suberect hairs not hiding surface. Propodeal corbicula incomplete anteriorly, with long, simple or weakly barbed, internal hairs scattered throughout or in upper two-thirds. Trochanteral flocculus complete, weak. Tibial scopal hairs long, plumose throughout scopa.

Male. **MEASUREMENTS AND RATIOS:** N = 20; length, 8-10 mm; width, 2-3 mm; wing length, M = 3.09 ± 0.152 mm; FL/FW, M = 1.10 ± 0.006 ; FS₁/FS₂, M = 2.56 ± 0.030 .

INTEGUMENTAL COLOR: Black except as follows: mandible with at least apical third to one-half rufescent; clypeus yellow except testaceous to brown apical margin, extreme lateral angles and maculae mesad and below tentorial pits; parocular areas occasionally with very small yellow areas, usually not; flagellar segments 4 or 5 to 11 reddish-brown below; tegulae testaceous to red; wing membranes hyaline, not infumate, veins red to reddish-brown; terga 1-5 with apices narrowly hyaline, colorless to yellow, basally occasionally somewhat rufescent; sterna 2-5 with apices narrowly hyaline, basally moderately rufescent; sternum 6 with apex testaceous; distitarsi rufescent; hind basitarsi occasionally rufescent; tibial spurs white to pale yellow.

STRUCTURE: Antennae short, not surpassing tegulae in repose; scape length equals slightly more than flagellar segments 1-3; flagellar segment 1 longer than segments 2 plus 3; segments 2 and 3 subequal in length, shorter than 4; segments 2-5 broader than long, 6 and 7 quadrate, 8-11 longer than broad. Eye about three and one-half times as long as broad, inner margins converging towards mandibles. Malar space and mandible as in female but basoventral mandibular lamella and subgenal coronet absent. Galea as in female. Maxillary palpus as in female but segmental ratio about 0.9:1.0:0.7:0.7:0.6:0.8. Labial palpus as in female but segmental ratio about 2.3:1.0:0.8:0.6. Labral process bidentate, slightly deflected inward near apex. Clypeus as in female but punctures usually slightly more crowded. Supraclypeal area, genal area, vertex, and face above antennal fossae as in female. Extremely small but dis-

tinct vestige of facial foveae present near inner eye margins.

Thoracic sculpture and structures as in female except as follows: propodeal dorsal enclosure often more coarsely rugulose especially basally; propodeal lateral surface dulled by tessellation. Metasomal terga sculptured as in female but generally punctures are coarser and tergum 5 is like female tergum 4. Pseudopygidial area present, narrow. Sterna 2-5 sculptured as in female. Sternum 6 with apex reflexed, broadly concave so that lateral corners form short apicolateral, reflexed teeth, but middle also at least slightly reflexed.

Genitalia and sterna 7 and 8 (Figs. 262-266) as figured. Note the following structures: penis valves broad near base with well-developed lateral lamellae, thin apically; gonoforceps blunt with abundant hairs; volsellae of moderate size, without minute teeth; sternum 7 relatively long medially, with shallow V-shaped emargination; sternum 8 with neck region broad basally, extremely narrow just before expanded apical area, margin entire or almost so.

VESTITURE: Generally as in female with the following differences: terga 1-5 with apical pale fasciae; sterna 2-5 with subapical fimbriae of moderately long, pale, slightly curled hairs (often weak on tergum 2).

Type Material. The holotype (PHT) female of *A. gardineri* Cockerell from Boulder, Colorado, was collected June 4, 1905, by W. F. Campbell. The holotype female of *A. ashmeadi* Viereck and Cockerell, from Colorado, was collected by C. F. Baker (USNM No. 18,156). The holotype (PHT) male of *A. lamellicauda* Cockerell, from Boulder, Colorado, was collected May 12, 1925, by C. H. Hicks. The holotype (PHT) male of *A. campbelli* Cockerell, from Boulder, Colorado, was collected May 21, 1933, by H. W. Campbell.

Distribution. *A. gardineri* is known from Georgia north to Maryland and Ohio and west to Texas, Colorado and South Dakota (Fig. 14). It has been collected from April 7th through August 26th, but chiefly in May and June. In addition to the type material, 190 females and 60 males have been examined from localities listed below.

ARKANSAS: DeValls Bluff; Forest City. COLORADO: Berkeley; Boulder; Canon City; Colorado Springs; Denver; Elbert; Fort Collins; Golden (Green Mt.); Larkspur; Limon; Los Pinos; Plainview. GEORGIA: Augusta; Clayton. KANSAS: Sawyer (3 miles S.), Barber Co. LOUISIANA: Mound. MARYLAND: Dawsonville. NORTH CAROLINA: Arcola; Black Mt.; Bryson City; Clayton (2 miles W.); Raleigh; Umstead State Park. OHIO: Hocking Co. SOUTH CAROLINA: Cheraw. SOUTH DAKOTA: Hot Springs. TENNESSEE: Tallahasee. TEXAS: Clarendon; Richmond. VIR-

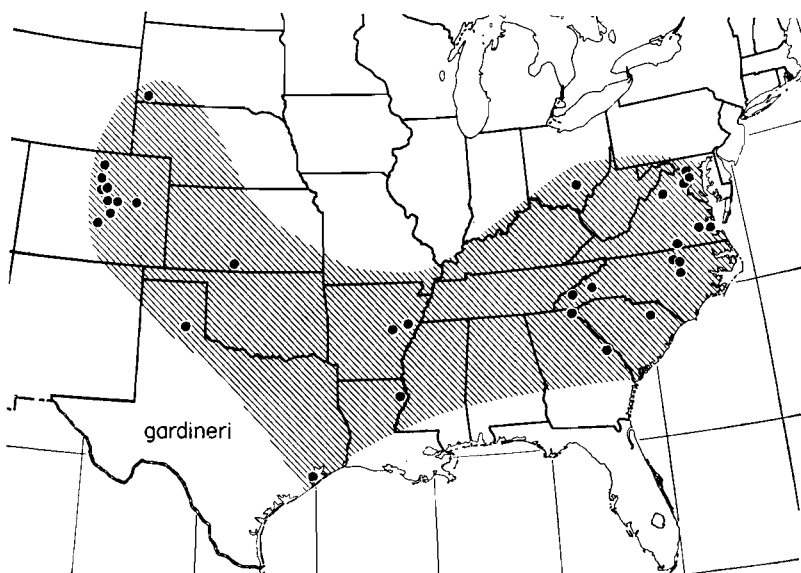


FIG. 14. Map showing the known distribution of *A. (Callandrena) gardineri* Cockerell.

GINIA: Barcroft; Falls Church; Fort Lee; Great Falls; South Hill, Mecklenburg Co.; Sperryville; Williamsboro.

Floral Records. *A. gardineri* is an oligolege on plants of the family Compositae which bloom in early summer, especially species of *Senecio*. Out of 21 collections (101 females and 37 males) with floral data, 15 collections (77 females and 34 males) were from some species of *Senecio*. A few records are probably incorrect due to mis-determined plants. For instance, the bee was recorded visiting *Aster* flowers in April in Georgia and from flowers of *Geraea* in Texas. Flowers from which this bee has been collected are listed below.

Aster sp., *Astragalus striatus*, *Baileya multiradiata*, *Crepis runcinata*, *Geraea* sp., *Hymenoxys glabra*, *Lesquerella ovalifolia*, *Senecio* sp., *S. aureus*, *S. pauperculus* var. *balsamitae*, *S. smallii*, *S. multilobatus*, *S. triangularis*.

Remarks. The distribution of *A. gardineri*, as now known, is disjunct and suggests that two species might be involved. Two large populations of *gardineri* apparently occur, one in the foothill region of the Rocky Mountains in Colorado and the other in the mid-Atlantic states of Virginia and the Carolinas. Few specimens are known from the intervening region. This may, of course, be simply due to relatively poor collecting in the region between the two large populations. The specimens available from Ohio, Arkan-

sas, Louisiana, Texas and Kansas seem to indicate that populations of *gardineri* do occur across this area and will doubtlessly be sampled in the future.

The Atlantic states populations of *gardineri* differ in a number of respects from the Colorado populations. The eastern specimens average slightly smaller in size, have the propodeal dorsal enclosure slightly more coarsely rugulose, and have the vestiture in general somewhat darker in color. All of these characters are of a type that one would expect to vary geographically. Two of these, size and color, generally vary in bees from east to west as they appear to do in *gardineri*. That is, bees are often smaller and darker in the eastern than in the western parts of the range of a wide-ranging species. It seems likely, then, that the eastern populations of *gardineri* represent at most a rather distinct geographic race or subspecies. This race is not formally named here because of the lack of information concerning the connecting populations of the species from the midwestern region. Without this information, it remains a possibility that the eastern populations represent a distinct species.

Andrena (Callandrena) isocomae Timberlake

Andrena (Pterandrena) isocomae Timberlake, 1951, Proc. United States Nat. Mus., vol. 101, pp. 378-380.

This small species from California is closely related to *A. gardineri*. The female of *isocomae* can be distinguished from that of *gardineri* by its slightly smaller size, longer and broader facial foveae, and slightly paler vestiture. The male of *isocomae* is readily distinguished from that of *gardineri* by its large parocular yellow maculae and longer third flagellar segment (distinctly longer than the second segment which is unusually short).

Female. MEASUREMENTS AND RATIOS: N = 20; length, 9-11 mm; width, 2.5-3.5 mm; wing length, M = 3.30 ± 0.184 mm; FL/FW, M = 1.00 ± 0.006; FOVL/FOVW, M = 2.48 ± 0.020.

INTEGUMENTAL COLOR: Black except as follows: mandible usually with apical half dark rufescent; flagellum entirely (or segments 2-10) dark reddish-brown below; tegulae translucent brownish-red; wing membranes hyaline, colorless, veins reddish-brown; terga 1-5 with apical areas hyaline, colorless, often narrowly rufescent just basad of colorless margins; sterna 2-5 narrowly hyaline apically, dark rufescent basally; distarsi dark rufescent; tibial spurs yellow.

STRUCTURE: Antennae short; scape length slightly less than flagellar segments 1-4; flagellar segment 1 equals succeeding two and one-third segments in length; segment 2 extremely slightly

shorter than 3 and 3 shorter than segment 4; segments 4-8 subquadrate to quadrate, 9 and 10 longer than broad. Eye about three and one-fourth times as long as broad, inner margins converging towards mandibles. Malar space, mandible and galea as in *gardineri*. Maxillary palpus as in *gardineri* but segmental ratio about 1.2:1.0:0.6:0.6:0.5:0.6. Labial palpus as in *gardineri* but segmental ratio about 1.9:1.0:0.7:1.0. Labral process strongly bidentate. Clypeus as in *gardineri* but punctures absent along narrow midline especially in basal half and shiny, reticular shagreening restricted to posterior periphery. Supraclypeal area with minute punctures, shiny, shagreening absent or extremely delicate. Genal area as in *gardineri* but posteriorly punctures separated by two puncture widths and surface shiny, unshagreened or delicately so. Vertex above lateral ocellus equals slightly more than one ocellar diameter, punctate as in *gardineri*, surface shiny, with delicate reticular shagreening. Face above antennal fossae as in *gardineri*. Facial fovea long and broad, extending below to level of lower margins of antennal fossae, separated from lateral ocellus by about half an ocellar diameter.

Pronotum as in *gardineri* but shinier, shagreening delicate. Mesoscutum and scutellum as in *gardineri* with punctures separated mostly by half a puncture width and surface shiny, unshagreened or extremely delicately so. Tegulae, parapsidal line and metanotum as in *gardineri*. Propodeum with dorsal enclosure roughened in basal half, elsewhere tessellate; dorsolateral surfaces with punctures small and shallow, moderately shiny, reticularly shagreened; posterior surface with small round punctures separated mostly by two to three puncture widths, shiny, reticular shagreening delicate; corbicular area with scattered punctures in anterior half, shiny, unshagreened or delicately so. Mesepisternum with small punctures separated by one to two puncture widths anteriorly, less posteriorly, surface shiny, delicately and reticularly shagreened. Metepisternum with lower portion impunctate, delicately shagreened, shiny, upper third with small punctures and reticular shagreening moderately dulling surface. Middle basitarsus somewhat expanded, slightly broader than hind basitarsus medially. Forewing with venation as in *gardineri* but vein M interstitial or apical to vein cu-v. Claws and tibial spurs normal.

Metasomal terga as in *gardineri* except punctures slightly smaller and surfaces shinier, unshagreened. Pygidial plate as in *gardineri* but apex broader and median longitudinal ridge longer. Sterna 2-5 as in *gardineri* but shinier, unshagreened.

VESTITURE: Generally white to pale ochraceous as in *gardineri* with the following differences: tergal distal pale bands white; scopal

hairs white; pollen collecting hairs distributed as in *gardineri* but propodeal corbicula with internal hairs throughout or in anterior half or more.

Male. MEASUREMENTS AND RATIOS: N = 20; length, 8–10 mm; width, 2–3 mm; wing length, M = 2.97 ± 0.119 mm; FL/FW, M = 1.05 ± 0.008 ; FS1/FS2, M = 2.15 ± 0.048 .

INTEGUMENTAL COLOR: Black except as follows: mandible with apical third rufescent, often basal triangle with a small yellow maculae (about one-third of specimens); clypeus yellow except reddish-brown apical margin and dark maculae mesad and below tentorial pits; parocular area with large yellow macula extending up to level of posterior of margin of clypeus and usually beyond, rounded above; flagellar segments 2–11 brown below; tegulae translucent, reddish-brown; wing membranes hyaline, veins dark reddish-brown; terga 1–5 narrowly hyaline apically, colorless, rufescent just basad of hyaline margins; sterna 2–5 narrowly hyaline apically, dark rufescent basally; sternum 6 with reflexed margin testaceous to translucent brown; distitarsi dark rufescent; tibial spurs pale yellow.

STRUCTURE: Antennae short, extending back to middle of tegulae in repose; scape length equals about first two and one-third flagellar segments or slightly less; flagellar segment 1 equal to or slightly shorter than segments 2 plus 3; segment 2 distinctly shorter than 3 and 3 shorter than segment 4; segment 4 quadrate, segments 5–11 longer than broad. Eye about three and one-third times as long as broad, inner margins strongly converging towards mandibles. Malar space, mandible and galea as in *gardineri*. Maxillary palpus as in *gardineri* but segmental ratio about 1.0:0.8:0.7:0.6:0.6:0.7. Labial palpus as in *gardineri* but segmental ratio about 1.9:1.0:0.9:1.0. Labral process as in *gardineri*. Clypeus as in female but median impunctate area often absent and punctures often slightly smaller and sparser. Supraclypeal and genal areas, vertex and face above antennal fossae as in female.

Thoracic structure and sculpturing as in female except as follows: propodeal lateral surface with abundant punctures in dorsal half or more, surface shiny; mesepisternal punctures more crowded. Metasomal terga 1–5 like female terga 1–4. Pseudopygidial area well developed, almost half as broad as long, apex rounded. Sterna 2–5 sculptured as in female. Sternum 6 with apical margin reflexed as in *gardineri*.

Genitalia and sterna 7 and 8 (Figs. 267–271) similar to those *gardineri* but note the following differences: penis valves with tips bulbous; gonoforceps more pointed with inner-dorsal ridge more

developed; sternum 8 with neck region less broadened in basal half, tip broader and entire.

VESTITURE: Generally as in female with the following differences: terga 1-5 with apical pale fasciae; sterna 2-5 with well-developed, suberect to decumbent, subapical fimbriae as in *gardineri*.

Type Material. The female holotype (USNM No. 59,273), was collected at Riverside, California, October 13, 1928, on *Isocoma vernonioides* by P. H. Timberlake.

Distribution. This bee is known only from California. It has been collected from July 20th through November 6th, but chiefly in September and October. In addition to the holotype, 150 females and 50 males have been examined from the localities listed below:

CALIFORNIA: Antioch; Bishop (6 miles N.), Mono Co.; Bodfish; Fort Tejon; Hemit Valley, San Jacinto Mts., Riverside Co.; Keen Camp (3 miles E.), Riverside Co.; Mission Valley; Morango Valley; Naples; Ocean Side, San Diego Co.; Pine Meadow, San Jacinto Mts., Riverside Co.; Red Rock Canyon, Kern Co.; Riverside; San Diego; Seal Beach, Orange Co.; Sonoma Co.; Turlock; Walker Pass, Kern Co.; Warner Springs; Yucca Valley, San Bernardino Co.

Floral Records. *Andrena isocomae* is an oligolege of plants of the family Compositae and seems to prefer pollen from *Gutierrezia*, *Isocoma* and *Heterotheca*, in that order. Flowers from which *A. isocomae* has been collected are listed below.

Erigonum sp., *Gaillardia* sp., *Gutierrezia* sp., *G. californica*, *G. lucida*, *G. sarothrae*, *Heterotheca grandiflora*, *Isocoma* sp., *I. vernonioides*, *Senecio douglasii*, *Solidago* sp.

Andrena (Callandrena) neomexicana, n. sp.

A. neomexicana is closely related to *A. isocomae* which it resembles in the form of the female facial foveae, the large yellow parocular maculae and the short second flagellar segments of the male, and the distinct apical fascia on the first metasomal tergum. *A. neomexicana* differs from *isocomae* in being smaller, having the vestiture white, in the coarser punctures of the terga, and in the pale hind basitarsi and tibiae of both sexes.

Female. MEASUREMENTS AND RATIOS: N = 5; length, 8-9 mm; width, 2.5-3.0 mm; wing length, M = 2.76 ± 0.100 mm; FL/FW, M = 1.01 ± 0.015; FOVL/FOVW, M = 2.27 ± 0.038.

INTEGUMENTAL COLOR: Black except as follows: mandible rufescent; flagellum brown or reddish-brown below; tegulae testaceous; wing membranes hyaline, colorless, veins yellow to orange; terga

1-5 hyaline apically, colorless; sterna 2-5 narrowly hyaline apically, dark rufescent basally; distitarsi red to orange; hind basitarsi (and occasionally middle and fore basitarsus) yellow to orange; hind tibiae yellow to orange (holotype) or at least pale in apical third; tibial spurs pale yellow.

STRUCTURE: Antennae short; scape length equals first three and one-half flagellar segments; flagellar segments as in *isocomae*. Eye almost three and three-fourths times as long as broad, inner margins converging toward mandibles. Malar space, mandible and galea as in *gardineri* or *isocomae*. Maxillary palpus slightly exceeding tip of galea, segmental ratio about 0.7:1.0:0.7:0.7:0.6:0.8. Labial palpus as in *gardineri* but segmental ratio about 2.0:1.0:0.9:1.0. Labral process bidentate but not as sharply so as in *isocomae*. Clypeus as in *gardineri* but punctures separated by half to one puncture width, surface scarcely dulled by delicate reticular shagreening. Supraclypeal area moderately dulled by minute crowded punctures and delicate shagreening. Genal area as in *gardineri* but somewhat shinier. Vertex above lateral ocellus equals about one ocellar diameter, with crowded punctures above ocelli, sparse punctures laterally, surface moderately shiny, tessellate. Face above antennal fossae as in *gardineri*. Facial fovea extends below at least to level of lower margins antennal fossae, broad and rounded above, separated from lateral ocellus by half an ocellar diameter or slightly more.

Pronotum as in *gardineri* but shiny, shagreening delicate. Mesoscutum, tegulae, scutellum and metanotum as in *gardineri* but mesocutal and scutellar surfaces with reticular shagreening absent or delicate medially. Propodeum with dorsal enclosure with sides curving inward, with fine anastomizing rugulae roughening internal triangle and forming small areoli, elsewhere tessellate; dorsolateral and posterior surfaces with coarse punctures separated by one or two punctures widths, surface opaque, tessellate; corbicular area shiny, with small punctures in anterodorsal two-thirds and delicate reticular shagreening. Mesepisternum as in *gardineri*. Metepisternum as in *gardineri* but upper third shiny, delicately shagreened and with minute punctures. Middle basitarsus distinctly broader than hind basitarsus medially. Fore wing as in *gardineri*.

Metasomal terga as in *gardineri* except as follows: tergum 1 with basal area punctures irregularly separated by one to five punctures widths except in narrow subapical zone where crowded; terga 2-4 with basal area punctures separated mostly by one puncture width or less; surfaces shiny, unshagreened. Pygidial plate V-shaped with rather acute apex, without visible internal raised area. Sterna as in

gardineri but basal area punctures more crowded and surface shiny, unshagreened.

VESTITURE: Generally white but vertex and thoracic dorsum extremely pale ochraceous and inner surfaces tarsi pale ochraceous or yellowish. Terga 1-4 with thick, complete, white, apical, pubescent fasciae. Terga 5 and 6 with long white or slightly yellowish hairs. Corbicular, trochanteral and scopal hairs arranged as in *gardineri*.

Male. MEASUREMENTS AND RATIOS: N = 2; length, about 8 mm; width, about 2 mm; wing length, 2.46-2.52 mm; FL/FW, about 1.13; FS1/FS2, about 2.43.

INTEGUMENTAL COLOR: Generally as in *isocornae* with the following differences: clypeus and parocular maculae white or slightly creamy in color; tegulae testaceous; wing membranes hyaline, veins yellow to orange; distitarsi and basitarsi orange to yellow; hind tibiae largely orange, middle tibiae with apices orange.

STRUCTURE: Antennae short, not surpassing tegulae in repose; scape length equals slightly less than flagellar segments 1-3; flagellar segment 1 distinctly shorter than segments 2 plus 3; segment 2 distinctly shorter than 3 which is slightly shorter than segment 4; segments 3-10 subquadrate to quadrate, segment 11 longer than broad. Eye, malar space, mandible and galea as in *gardineri*. Maxillary palpus as in *gardineri* but segmental ratio about 0.9:1.0:0.7:0.7:0.9. Labial palpus as in *gardineri* but segmental ratio about 1.6:1.0:0.7:0.9. Iabral process bidentate. Clypeus, supraclypeal area, genal area, vertex and face as in female.

Thorax as in female but with the following differences: mesoscutum with posteromedian area sparsely punctate, shiny and unshagreened; scutellum medially with sparse punctures, shiny, unshagreened; propodeal dorsal enclosure roughened by extremely fine, irregular rugulate, but scarcely areolar; propodeal lateral surface more coarsely shagreened. Terga as in female except as follows: terga 1-6 like female terga 1-4; tergum 1 with slightly more crowded punctures basally. Pseudopygidial area distinct, about three times as long as broad, testaceous. Sterna 2-5 as in female but sterna 4 and 5 somewhat dulled by fine shagreening. Sternum 6 with apex reflexed as in *gardineri*.

Genitalia and sterna 7 and 8 (Figs. 272-276) much as in *isocornae* but penis valves not bulbous at tips, sternum 7 with apicolateral lobes larger and rounded, and sternum 8 with extremely narrow neck region and apex rounded.

VESTITURE: Generally white and as in female except as follows: terga 1-5 with distinct, apical, white, pubescent fasciae like female terga 1-4; sterna 2-5 with subapical fimbriae of moderately long,

white, suberect, barbed hairs; inner surfaces tarsi slightly yellowed.

Type Material. The holotype (UCB) female from 3 miles west of Bingham, Socorro Co., New Mexico, was collected September 12, 1961, on *Baileya pleniradiata*, by P. D. Hurd. The allotype (SECK) male from Snowflake, Navajo Co., Arizona was collected August 29, 1957. Four female paratypes and one male paratype (UCB; UCD; INHS; UCNH; PHT) are as follows: ARIZONA: 1 ♀, 15 miles west of Holbrook, Navajo Co., September 3, 1930, on *Erigeron* sp., P. H. Timberlake. NEW MEXICO: 1 ♂, 1 ♀, same data as holotype; 1 ♀, Rio Puerco, Bernalillo Co., September 8, 1951, A. T. McClay; 1 ♀, White Sands National Monument, Otero Co., September 1, 1940, Hugo G. Rodeck.

Andrena (Callandrena) ardis, n. sp.

Andrena ardis is a medium-sized bee closely related to *A. neomexicana* and *A. isocomae* which it resembles in the form of the female facial foveae and the male parocular maculae. The female of *ardis* can be distinguished from that *neomexicana* by its slightly larger size and by the facial fovea being separated from the lateral ocellus by nearly the diameter of one ocellus. The male of *ardis* can be distinguished from that of *neomexicana* by its larger size, darker vestiture and yellow facial markings. Both *ardis* and *neomexicana* differ from *isocomae* in the pale basitarsi and hind tibiae.

Female. MEASUREMENTS AND RATIOS: N = 7; length, 10–12 mm; width, 3.0–3.5 mm; wing length, M = 3.48 ± 0.329 mm; FL/FW, M = 1.00 ± 0.027 ; FOVL/FOVW, M = 2.45 ± 0.097 .

INTEGUMENTAL COLOR: Black except as follows: mandible with apical half or more rufescent; flagellum dark reddish-brown below; tegulae testaceous, red to reddish-brown; wing membranes hyaline, veins orange to red; terga 1–4 hyaline apically, often narrowly rufescent adjacent to hyaline apex; sterna 2–5 narrowly hyaline apically, dark rufescent basally; distitarsi rufescent; hind basitarsi orange to red; hind tibiae orange to red.

STRUCTURE: Antennae short; scape length equals first three and three-fourths flagellar segments; flagellar segment 1 equal in length to segments 2 plus 3 or slightly longer; segments 2 and 3 subequal in length; segment 3 shorter than 4; segments 2–8 broader than long; segment 9 quadrate; segment 10 longer than broad. Eye about four times as long as broad, inner margins converging towards mandibles. Malar space, mandible and galea as in *gardineri*. Maxillary palpus as in *gardineri* but segmental ratio about 0.8:1.0:0.6:0.6:0.5:0.8. Labial palpus as in *gardineri* but segmental ratio about 1.7:1.0:0.6:0.7. Labral process as in *gardineri*. Clypeus evenly

rounded, flatter than in *gardineri*, protruding beyond ends compound eyes by one-third its median length or less; punctures round, coarser medially, separated by one-half to one puncture width, surface shiny medially, dulled by coarse reticular shagreening peripherally, shagreening may cover clypeus (not in holotype) but surface remains at least moderately shiny medially. Supraclypeal area with minute crowded punctures, surface shiny, unshagreened or delicately so. Genal area as in *gardineri* but surface unshagreened and punctures separated mostly by one-half to one puncture width posteriorly. Vertex above lateral ocellus equals one and one-third to one and one-half ocellar diameters; punctures crowded medially above ocelli, sparse laterally except crowded in narrow band adjacent to upper margins of facial foveae, surface moderately shiny, reticularly shagreened. Face above antennal fossae with weak, irregular, longitudinal rugulae and coarse, crowded punctures, surface dulled by fine shagreening. Facial fovea long and broad as in *isocomae* except separated from lateral ocellus by at least three-fourths of one ocellar diameter.

Pronotum normal, as in *gardineri* but shinier, shagreening more delicate. Mesoscutum with moderately large, round punctures separated mostly by less than one puncture width except in small posteromedian area where separated by two to four puncture widths, surface shiny posteromedially, moderately dulled by reticular shagreening elsewhere; parapsidal line as in *gardineri*. Tegulae normal, impunctate. Scutellum as in mesoscutum but shinier. Metanotum opaque, dulled by small crowded punctures and tessellation. Propodeum as in *isocomae* except as follows: dorsal enclosure occasionally without median roughening (holotype), corbicular area with punctures crowded in anterodorsal third, scattered elsewhere. Mesepisternum as in *gardineri* but punctures shallow. Metepisternum as in *gardineri* but lower two-thirds with minute round punctures separated mostly by one to two puncture widths, surface shiny. Middle basitarsus as in *gardineri* but distinctly broader than hind basitarsus. Wing venation as in *gardineri*.

Metasomal terga 1-4 with narrow apical margins impunctate, surfaces shiny, unshagreened or delicately so. Tergum 1 with apical third (except narrow margin) with moderate-sized, round, crowded punctures, basally with smaller punctures separated mostly by one puncture width or slightly more. Terga 2-4 with basal area punctures separated mostly by less than one puncture width and more crowded adjacent to narrow apical margins. Pygidial plate V-shaped with apex not rounded (unless eroded), internal raised triangle absent. Sterna 2-5 with apical hyaline margins impunctate, basal areas with crowded punctures of moderate size separated mostly

by one-half to one puncture width except on sternum 2 where sparser, surfaces moderately shiny, reticularly shagreened.

VESTITURE: Generally as in *gardineri* but usually paler and propodeal corbicular internal hairs plumose throughout.

Male. MEASUREMENTS AND RATIOS: N = 5; length, 9–11 mm; width, 2–3 mm; wing length, $M = 3.22 \pm 0.356$ mm; FL/FW, $M = 1.10 \pm 0.023$; FS1/FS2, $M = 2.09 \pm 0.051$.

INTEGUMENTAL COLOR: As in *gardineri* with the following differences: parocular yellow areas large, extend upward to level of lower margins antennal fossae or almost so; supraclypeal area often with median yellow macula (not in allotype); tegulae brown to red; wing veins orange to red; basitarsi yellow to orange; hind tibiae orange to red.

STRUCTURE: Antennae short, not surpassing tegulae in repose; scape length equals flagellar segments 1–3; flagellar segments as in *isocornae*. Eye, malar space, mandible and galea as in *gardineri*. Maxillary palpus as in *gardineri* but segmental ratio about 0.9:1.0:0.6:0.6:0.5:0.6. Labial palpus as in *gardineri* but segmental ratio about 2.0:1.0:0.8:1.0. Labral process as in female but teeth usually somewhat blunted. Clypeus, supraclypeal area, genal area, vertex and face as in female.

Thorax as in female with the following differences: propodeal dorsal enclosure roughened medially; propodeal lateral areas with punctures more abundant, surface moderately dulled by reticular shagreening; mesepisternum with punctures deep. Tegulae normal, impunctate. Wing venation as in female. Terga sculptured as in female except as follows: terga 1–5 like female terga 1–4; terga 1 and 2 with basal area punctures slightly sparser. Sterna 2–5 as in female. Sternum 6 with apical margin reflexed as in *gardineri*.

Genitalia and sterna 7 and 8 (Figs. 277–281) similar to those of *isocornae* but note shape of inner-dorsal ridge of gonoforceps and sternum 8.

VESTITURE: Generally white to pale ochraceous and as in female except as follows: terga 1–5 with distinct pale apical fasciae as in female terga 1–4; sterna 2–5 with subapical fimbriae of moderately long, pale ochraceous, straight, suberect hairs; fimbriae less distinct from more basal hairs than in *gardineri*, *isocornae* or *neomexicana*; inner surfaces tarsi pale yellow.

Type Material. The holotype (UCB) female and the allotype (UCB) male from seven and one-half miles south of Three Rivers, Otero County, New Mexico, were collected by P. D. Hurd, September 9, 1961, on *Gutierrezia microcephala*. One male paratype (UCB) was taken with the holotype and allotype. In addition six

female and three male paratypes (UCB; UAT; NSM; MSU; INHS) are as follows:

COLORADO: *Limon*, 1 ♀, August 29, 1951, R. R. Dreisbach. NEBRASKA: *Crawford* (5 miles N.), 1 ♂, August 30, 1959, *Chrysothamnus nauseosus*, W. E. LaBerge. NEW MEXICO: *Carlsbad* (5 miles E.), 4 ♀♀, September 21, 1956, on *Chrysothamnus* sp., J. W. MacSwain; *Carrizozo*, 2 ♂♂, September 10, 1961, on *Gutierrezia microcephala*, P. D. Hurd. TEXAS: *McNary*, 1 ♀, September 27, 1957, on *G. sarothrae*, W. Nutting and F. G. Werner.

Andrena (*Callandrena*) *balsamorhizae*, n. sp.

This is a medium-sized bee closely related to *A. gardineri* Cockerell and, perhaps, annectant between *A. gardineri* and *A. biscutellata* Viereck. The female of *balsamorhizae* is readily distinguished from either *gardineri* or *biscutellata* by the red abdomen. It is further distinguished from *gardineri* by the high vertex and the short dense mesoscutal hairs and from *berkeleyi* and *utahensis* by the narrow middle basitarsi. The male of *balsamorhizae* differs from that of *gardineri* by the high vertex, the yellow parocular maculae and the less rugulose dorsal propodeal enclosure. The male differs from that of *berkeleyi* by the slightly longer sternal fimbriae and the less coarsely punctate terga and from that of *utahensis* by the shorter sternal fimbriae and weaker tergal fasciae.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 11–13 mm; width, 3.5–4.0 mm; wing length, M = 4.12 ± 0.135 mm; FL/FW, M = 1.06 ± 0.005 ; FOVL/FOVW, M = 2.81 ± 0.074 .

INTEGUMENTAL COLOR: Black except as follows: mandible with apical half or more rufescent, clypeus with apical margin rufescent; flagellar segments 3–10 and apices of 1 and 2 reddish-brown below; tegulae translucent reddish-brown; wing membranes hyaline, veins dark red to reddish-brown; terga entirely orange-red except tergum 2 with small black maculae at sides; sterna orange-red with hyaline apices; distitarsi rufescent; middle and hind basitarsi reddish-brown; hind tibiae (and occasionally base of hind basitarsi) red; tibial spurs testaceous.

STRUCTURE: Antennae as in *gardineri* but segments 2 and 3 slightly longer, subequal to each other in length and to segment 4 which is shorter than 5; segments 5–8 quadrate, 9–10 longer than broad. Eye about four times as long as broad, inner margins parallel. Malar space, mandible and galea as in *gardineri*. Maxillary palpus as in *gardineri* but segmental ratio about 0.6:1.0:0.8:0.8:0.6:0.9. Labial palpus as in *gardineri* but segmental ratio about 1.8:1.0:0.8:0.9. Labral process short, broad, at least twice as broad

as long and usually broader, emarginate medially but scarcely bidentate. Clypeus evenly rounded from side to side, protruding beyond level of lower ends of compound eyes by no more than one-fourth median length; punctures irregular, separated mostly by one-half to one puncture width, more crowded and smaller near posterior margin, surface shiny, unshagreened except slightly so peripherally. Supraclypeal area with minute crowded punctures, surface shiny. Genal area as in *gardineri* but shiny, shagreening delicate if present. Vertex above lateral ocellus equals almost two ocellar diameters; sculptured as in *gardineri* but surface dulled by reticular shagreening rather than tessellate. Face above antennal fossae without longitudinal rugulae, with crowded round punctures, interpunctural ridges shiny. Facial fovea short, extends below to about level of middle of antennal fossa, well separated from compound eye, rounded above and separated from lateral ocellus by three-fourths to almost one ocellar diameter.

Thoracic structure and sculpturing as in *gardineri* but mesoscutum and scutellum with punctures slightly smaller, surface shiny to moderately shiny, shagreening delicate in posteromedian area of mesoscutum; propodeal dorsal enclosure with extremely fine longitudinal rugulae basally, tessellate apically; dorsolateral and posterior propodeal surfaces with punctures small, separated mostly by two to four puncture widths or more, surface moderately shiny, reticular shagreening delicate. Middle basitarsus only slightly broadened medially, about equal to hind basitarsus medially in width. Venation as in *gardineri* but second submarginal cell longer than one-third of first. Claws and tibial spurs normal.

Metasomal terga 1-4 with apical areas impunctate, moderately shiny; basal areas with surfaces shiny, unshagreened. Tergum 1 with basal area punctures small, separated mostly by two to four puncture widths; terga 2 and 3 with basal area punctures separated mostly by one to two puncture widths or slightly more; terga 4 and 5 with basal area punctures separated mostly by one puncture width or slightly more. Pygidial plate V-shaped with rounded apex. Sterna 2-5 sculptured as in *gardineri*.

VESTITURE: Generally white to pale cinereous, slightly darker on vertex and thoracic dorsum. Mesoscutum and scutellum with very short, erect, thick, dense, grayish-white hairs obscuring surfaces, forming almost a mat as in *biscutellata* but much less dense. Tergum 1 without apical pale fascia. Tergum 2 with apical pale fascia interrupted medially by more than half width of tergum. Tergum 3 with pale apical fascia weak medially or interrupted by one-third or less of width of tergum. Tergum 4 with pale apical fascia complete but

weak. Sternal hairs as in *gardineri*. Pollen collecting hairs as in *gardineri*.

Male. MEASUREMENTS AND RATIOS: N = 5; length, 9–12 mm; width, 2.5–3.5 mm; wing length, $M = 4.05 \pm 0.317$ mm; FL/FW, $M = 1.09 \pm 0.009$; FS1/FS2, $M = 2.29 \pm 0.094$.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical half rufescent; clypeus yellow except large maculae mesad and below tentorial pits and broad testaceous apical margin; parocular area with large yellow macula not quite reaching posterior margin of clypeus; flagellar segments 4–11 and apices of 2 and 3 and often 1 reddish-brown below; tegulae translucent reddish-brown to red; wing membranes hyaline, veins red to reddish-brown; terga 1–6 with apical margins broadly hyaline, narrowly reddened basad of hyaline margin especially on terga 1–3; sterna 2–5 narrowly hyaline, yellowish, apically; distitarsi rufescent; tibial spurs yellowish.

STRUCTURE: Antennae as in *gardineri* but segments 2 and 3 usually subequal in length to 4 which is slightly shorter than 5. Eye about three and one-third times as long as broad, inner margins converging slightly towards mandibles. Malar space and mandible as in female but basoventral mandibular lamella and subgenal coronet lacking. Galea as in female. Maxillary palpus as in female but segmental ratio about 0.8:1.0:0.7:0.6:0.9. Labial palpus as in female but segmental ratio about 1.8:1.0:0.8:0.9. Labral process bidentate, deflected. Clypeus as in female but punctures usually slightly more crowded. Suprecylpeal area, genal area, vertex and face above antennal fossae as in female. Small but distinct vestiges of facial foveae present near inner eye margins.

Thoracic sculpture and structure as in female but posteromedial mesoscutal area with punctures sparse; propodeal lateral surfaces dulled by fine tessellation, punctures sparse. Metasomal terga sculptured as in female but punctures sparser on terga 2–5 than on female terga 2–4. Pseudopygidial area not evident. Sterna 2–5 sculptured as in female. Sternum 6 as in *gardineri* except not reflexed medially, apicolateral angles reflexed to form large lateral teeth, broadly emarginate medially.

Genitalia and sterna 7 and 8 (Figs. 282–286) similar to those of *gardineri* but note the following: gonoforceps blunter apically; penis valves turned down at a greater angle with gonoforceps in lateral view; sternum 7 only shallowly emarginate apically, lateral lobes with tips not rounded; sternum 8 distinctly emarginate.

VESTITURE: Generally as in female with the following differences: mesoscutal and scutellar hairs of normal length and density, erect; terga 1 and 2 with apical pale fasciae reduced to short lateral

patches; terga 3-5 with pale apical fasciae complete but weak and occasionally interrupted medially on tergum 3. Sterna 3-5 with distinct subapical fimbriae of short white suberect hairs but these shorter than in *gardineri* although slightly longer than in *berkeleyi*; inner surfaces hind basitarsi pale yellow.

Type Material. The holotype (USU) female and fifteen female paratypes (USU; INHS) were collected by G. E. Bohart at Lake Mead, Nevada, April 15, 1959, on *Balsamorhiza* sp. The male allotype (USU) and four male paratypes (USU; INHS) were collected by G. E. Bohart at Overton Beach, Nevada, March 25, 1953, on *Balsamorhiza* sp. Twenty additional female paratypes (USU; INHS) were taken by G. E. Bohart at Lake Mead, Nevada, April 8, 1959, on *Balsamorhiza* sp. and one additional male paratype (USU) taken by E. R. Jaycox at Rodgers Springs (near Overton), Nevada, April 5, 1962.

Andrena (Callandrena) berkeleyi Viereck and Cockerell

Andrena berkeleyi Viereck and Cockerell, 1914, Proc. United States Nat. Mus., vol. 48, p. 19.

This colorful species is closely related to *A. gardineri* Cockerell. The female of *berkeleyi* differs from that of *gardineri* by the broad middle basitarsus, the usually red abdomen, the lack of a first tergal apical pale band and the higher vertex. The male of *berkeleyi* can be distinguished from that of *gardineri* by the slightly higher vertex, the larger yellow parocular maculae, the shinier mesoscutum and the short apical sternal fimbriae. The females associated here with *berkeleyi* were not collected with any of the known males. However, the structural correspondence seems to make probable the correctness of this association.

Female. MEASUREMENTS AND RATIOS: N = 4; length, 10-13 mm; width, 3.5-4.0 mm; wing length, M = 4.02 ± 0.196 mm; FL/FW, M = 0.97 ± 0.007 ; FOVL/FOVW, M = 2.44 ± 0.108 .

INTEGUMENTAL COLOR: Black except as follows: mandible except tip and clypeus dark rufescent; flagellum dark reddish-brown below; tegulae translucent reddish-brown to testaceous; wing membranes hyaline, slightly infumate apically, veins brown; terga entirely orange-red except hyaline apices and tergum 2 with small lateral dark spots (3 specimens) to piceous with broad hyaline apices (1 specimen); sterna entirely orange-red with hyaline apices (3 specimens) to piceous (slightly rufescent basally) with hyaline apices (1 specimen); distitarsi rufescent; hind basitarsi and basal two-thirds of tibiae occasionally rufescent; tibial spurs testaceous.

STRUCTURE: Antennae as in *gardineri*. Eye more than four times

as long as broad, inner margins parallel. Malar space, mandible and galea as in *gardineri*. Maxillary palpus as in *gardineri* but segmental ratio about 1.1:1.0:0.6:0.5:0.5:0.6. Labial palpus as in *gardineri* but segmental ratio about 1.6:1.0:0.5:0.6. Labral process as in *gardineri*. Clypeus protruding beyond lower ends of eyes by less than one-third its median length; evenly rounded from side to side; with deep round punctures separated mostly by less than one puncture width, slightly sparser medially; surface shiny, shagreened only posteriorly, apical margin short medially. Supraclypeal area with crowded minute punctures, surface moderately shiny. Genal area as in *gardineri* but surface shinier especially posteriorly. Vertex above lateral ocellus equals almost one and one-half ocellar diameters; sculptured as in *gardineri* but shiny, shagreening sparse, delicate. Face above antennal fossae with coarse, round, almost contiguous punctures, interpunctural ridges slightly shagreened. Facial fovea short, extends below to level of middle of antennal fossae, narrow, in upper half well separated from eye margin, separated from lateral ocellus by almost one ocellar diameter.

Thoracic form and sculpturing as in *gardineri* except as follows: mesoscutal and scutellar punctures slightly coarser, surfaces shiny, unshagreened except at extreme periphery; propodeal dorsal enclosure finely rugulose as in western specimens of *gardineri*; mesepisternal punctures shallow, less distinct. Tegulae normal, impunctate. Wing venation as in *gardineri* but middle submarginal cell narrower anteriorly than posteriorly and slightly longer than one-third of first cell. Claws and tibial spurs normal.

Metasomal sculpturing as in *gardineri* but punctures slightly coarser and more crowded especially on terga 1 and 2 and sterna unshagreened or delicately so. Pygidial plate with broadly rounded apex.

VESTITURE: White to pale ochraceous, vertex and thoracic dorsum slightly darker. Tergum 1 lacking apical pale fascia. Terga 2-4 with apical pale fasciae interrupted medially, broadly so on 2 and 3 and narrowly on 4. Leg hairs and pollen-collecting hairs as in *gardineri* but middle and hind basitarsi with outer surfaces and scopal hairs extremely pale fuscous in two specimens (ochraceous in the other two).

Male. MEASUREMENTS AND RATIOS: N = 2; length, about 11 mm; width, about 2.5 mm; wing length, 3.58-3.96 mm; FL/FW, about 1.02; FS1/FS2, 2.50-2.82.

INTEGUMENTAL COLOR: As in *gardineri* except as follows: clypeus yellow at extreme lateral angles as well as elsewhere; parocular area with large yellow macula; tegula piceous to translucent reddish-

brown; wing membranes slightly infumate apically, veins dark brown; hind basitarsi piceous.

STRUCTURE: Antennae as in *gardineri* but scape length about equal to flagellar segments 1-3. Eye as in *gardineri*. Malar space, mandible and galea as in female but mandible lacking basoventral lamella and sugenal coronet. Maxillary palpus as in female but segmental ratio about 1.0:1.0:0.5:0.6:0.6:0.7. Labial palpus as in female but segmental ratio about 1.6:1.0:0.5:0.6. Labral process as in *gardineri*. Clypeus as in female but punctures slightly smaller. Supraclypeal area with minute punctures and delicate shagreening moderately dulling surface. Genal area, vertex and face above antennal fossae as in female. Vestige of facial fovea (present in *gardineri*) absent.

Thoracic sculpturing as in female except as follows: propodeal dorsal enclosure slightly more coarsely rugulose; mesepisternal punctures more distinct. Wing venation as in female. Claws and tibial spurs normal. Metasomal terga as in female but tergum 1 with punctures more crowded, separated by less than one puncture width and terga 2-5 with basal area punctures separated mostly by half a puncture width or less. Pseudopygidial area not evident. Sterna 2-5 sculptured as in female. Sternum 6 with apicolateral angles reflexed strongly, forming large teeth, medially scarcely reflexed.

Genitalia and sterna 7 and 8 (Figs. 287-291) as figured; compare with those of *balsamorhizae*.

VESTITURE: Generally white, cinereous or pale ochraceous on vertex and thoracic dorsum. Terga 1-5 with narrow, white, distal fasciae, those of terga 1-3 weak or interrupted medially. Sterna 2-5 with short white apical fimbriae of barbed hairs, fimbriae considerably shorter than in *gardineri*. Inner surfaces tarsi pale yellow.

Type Material. The holotype male, (USNM No. 18,136) was collected at Berkeley, Colorado.

Distribution. *A. berkeleyi* is known from Colorado, Oklahoma and Texas. Only six specimens, in addition to the holotype, have been examined. The data for these are given in full.

OKLAHOMA: *Caddo*. 1 ♀, April 10, 1953, the University of Kansas Mexican Expedition. *Mt. Scott*. 1 ♀, May 30, 1931, H. Mathewson. TEXAS: *Eagle Pass*. 1 ♀, March 28, 1940, C. D. Michener. *Eldorado*. 2 ♂♂ on *Englemannia pinnatifida*, April 10, 1950, C. D. Michener, R. H. Beamer, J. G. Rozen and W. P. Stephen. *Fabens*. 1 ♀ on *Actinea* sp., April 22, 1954, L. D. Beamer.

Andrena (Callandrena) utahensis, n. sp.

This is a medium-sized to large bee which is closely related to *A. berkeleyi* Viereck and Cockerell. The female of *utahensis* is similar to *berkeleyi* and differs from *gardineri* in the high vertex, the lack of the first tergal apical fascia, the broadened middle basitarsus and the sometimes red abdomen. The female of *utahensis* differs from that of *berkeleyi* in the shorter and denser mesoscutellar hair (almost as in *A. biscutellata* Viereck) and the less dense tergal punctures. The male of *utahensis* differs from that of *gardineri* in the higher vertex, the larger size and the sixth sternum being reflexed only in the apicolateral angles. The male of *utahensis* can be distinguished from that of *berkeleyi* by the less dense tergal punctures and the longer sternal apical fimbriae.

Female. MEASUREMENTS AND RATIOS: N = 10; length, 11–14 mm; width, 3.0–4.5 mm; wing length, $M = 4.62 \pm 0.194$ mm; FL/FW, $M = 1.05 \pm 0.024$; FOVL/FOVW, $M = 2.17 \pm 0.029$.

INTEGUMENTAL COLOR: Generally as in *berkeleyi* except as follows: specimens with red abdomens with tergum 1 brown basally and terga 5 and 6 reddish-brown basally; hind basitarsi and tibiae piceous; wing membranes extremely slightly infumate apically.

STRUCTURE: Antennae as in *gardineri*. Eye slightly more than four times as long as broad, inner margins converging slightly towards mandibles. Malar space, mandible and galea as in *gardineri*. Maxillary palpus as in *gardineri* but segmental ratio about 1.0:1.0:0.7:0.7:0.05:0.7. Labial palpus as in *gardineri* but segmental ratio about 2.1:1.0:0.8:0.9. Labral process as in *gardineri*. Clypeus slightly flattened medially, protruding beyond lower ends of eyes by one-third or less of length of clypeus; with round punctures separated mostly by half a puncture width or slightly more, smaller posteriorly, surface shiny, unshagreened or delicately so near periphery. Supraclypeal area with minute crowded punctures, surface moderately dulled by fine shagreening. Genal area less than one and one-half but more than one times width of eye in profile; sculptured as in *gardineri* but shiny and unshagreened posteriorly. Vertex above lateral ocellus equals slightly more than one ocellar diameter; with round punctures crowded above ocelli, posteriorly and above facial foveae, surface moderately dulled by reticular shagreening. Face above antennal fossae as in *berkeleyi*. Facial fovea as in *berkeleyi* but closer to compound eye in upper half.

Thoracic sculpturing and form as in *gardineri* except as follows: mesoscutal and scutellar punctures separated mostly by half a puncture width or less except slightly sparser posteromedially on mesoscutum, surfaces shiny to moderately shiny, shagreening delicate or

absent; propodeal dorsal enclosure with rugulae fine and obscure. Middle basitarsus distinctly broadened medially, broader than hind basitarsus; without apical spine. Venation as in *gardineri* but second submarginal cell longer. Claws and tibial spurs normal.

Metasomal terga 1-5 with small round crowded punctures in apical areas except at extreme apices. Terga 1-4 with basal area punctures as in *gardineri*, surfaces shiny, unshagreened or extremely delicately so. Pygidial plate V-shaped, sides often slightly concave, with truncate apex. Sterna 2-5 as in *gardineri* but surfaces shiny, shagreening delicate.

VESTITURE: Generally as in *berkeleyi* except terga 2-4 with apical pale fasciae uninterrupted medially or at most narrowly interrupted on tergum 2 alone.

Male. MEASUREMENTS AND RATIOS: N = 9; length, 10-13 mm; width, 2.5-4.0 mm; wing length, $M = 4.28 \pm 0.264$ mm; FL/FW, $M = 1.10 \pm 0.011$; FS1/FS2, $M = 2.55 \pm 0.087$.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical third rufescent; flagellar segments 3-11 dark reddish-brown below; clypeus yellow except small brown maculae below and mesad of tentorial pits and broad apical margin; parocular area with large yellow macula but not extending up to level of posterior clypeal margin; supraclypeal area usually with small median diffuse yellow spot; tegula dark reddish-brown; wing membranes hyaline, slightly infumate apically, veins dark reddish-brown to black; terga 1-6 broadly hyaline apically, narrowly reddened immediately basad of hyaline apices; sterna 2-5 narrowly hyaline apically, yellow; tarsi piceous; tibial spurs testaceous.

STRUCTURE: Antennae as in *gardineri*. Eye about three and one-fourth times as long as broad, inner margins distinctly converging towards mandibles. Malar space, mandible and galea as in female. Maxillary palpus as in female but segmental ratio about 1.9:1.0:0.6:0.7:0.4:0.7. Labial palpus as in female but segmental ratio about 1.5:1.0:0.7:0.6. Labral process bidentate. Clypeus as in female but not flattened medially. Supraclypeal and genal areas as in female. Vertex above lateral ocellus equals about one and one-half ocellar diameters, sculptured as in female. Face above antennal fossae as in female but punctures in rows with weak longitudinal rugulae between rows.

Thoracic structure and sculpturing as in female except as follows: propodeal dorsal enclosure with rugulae more distinct at extreme base; propodeal lateral surface dulled by fine tessellation. Metasomal terga sculptured as in female but basal area punctures slightly larger and more crowded. Pseudopygidial area not evident. Sterna 2-5 sculptured as in female. Sternum 6 reflexed apicolaterally

forming strong lateral teeth, medially almost flat, with broad V-shaped median emargination.

Genitalia and sterna 7 and 8 (Figs. 292–296) similar to those of *balsamorhizae* and *berkeleyi* but not sternum 8 with entire apex and longer hairs.

VESTITURE: Generally white to pale ochraceous, darker on vertex and thoracic dorsum. Mesoscutal hairs moderately long, erect not hiding surface as in female. Terga 1–5 with distinct apical pale fasciae but that of tergum 1 interrupted medially. Inner surfaces hind tarsi yellowish. Sterna 3–5 with moderately long subapical fimbriae much as in *gardineri* and longer than in *berkeleyi*.

Type Material. The holotype (USU) female, allotype (USU) male, and one paratype (USU) female, were collected by G. E. Bohart at Duchesne, Utah, June 11, 1963, on *Coreopsis* sp. Ten additional female and 8 male paratypes (USU; UCNH; UCB; USNM; INHS; CAS) are as follows:

ARIZONA: *Flagstaff*. 1 ♂, June 11, 1909, on *Iris* sp., F. C. Pratt. *Grand Canyon*. 5 ♀♀, 1 ♂, June 5, 1940, G. E. Bohart. *Kayenta* (23 miles W.). 1 ♀, June 10, 1933, H. N. Hultgren; (19 miles S.W.) 1 ♀, June 20, 1933, H. N. Hultgren. *Show Low*. 2 ♀♀, June 2, 1946, R. M. Bohart. COLORADO: *Bondad*. 1 ♀, June 27, 1919, F. E. Lutz. UTAH: *Duchesne* (3 miles W.). 2 ♂♂, May 20, 1962, on *Geraea* sp., R. W. Thorp; 4 ♂♂, May 20, 1962, J. W. MacSwain. *Myton*. 1 ♀, June 11, 1963, Brumly.

Andrena (Callandrena) biscutellata Viereck

Andrena (Ptilandrena) biscutellata Viereck, 1917, Trans. American Ent. Soc., vol. 43, p. 393.

Andrena (Pterandrena) biscutellata: Lanham, 1949, Univ. California Publ. Ent., vol. 8, p. 200.

A. biscutellata is a large distinctive bee not closely related to any of the foregoing species but, perhaps, nearest to *A. gardineri* which it resembles in the male sex. The female of *biscutellata* is readily recognized by the mesoscutum being provided with short, dense, erect, barbed, scalelike hairs and the scutellum being bare and polished. The contrast between the mesoscutum and scutellum is striking and doubtlessly prompted Viereck to name the species *biscutellata*. The male is similar to that of *gardineri* in having the sixth sternum reflexed apically and the first tergum with a weak apical fascia (absent in female). But the male of *biscutellata* can be distinguished from that of *gardineri* by the larger size, the larger parocular maculae, the higher vertex, the longer third flagellar segment, and the smoother dorsal enclosure of the propodeum.

Female. MEASUREMENTS AND RATIOS: N = 7; length, 12–14 mm; width, 4–5 mm; wing length, M = 4.80 ± 0.216 mm; FL/FW, M = 1.01 ± 0.006 ; FOVL/FOVW, M = 2.32 ± 0.059 .

INTEGUMENTAL COLOR: Black except as follows: mandible, apex of clypeus and labral process rufescent; occasionally with small parocular yellow spot just above mandibular base; flagellar segments 3–10 rufescent below; tegulae translucent, brownish-red; wing membranes moderately infumate, veins dark reddish-brown; terga 1–5 with apices narrowly hyaline, colorless, slightly rufescent just basad of hyaline areas; sterna 2–5 with apices narrowly hyaline, yellowish, basal areas dark rufescent; distarsi rufescent; tibial spurs yellow.

STRUCTURE: Antennae short; scape length equal to first three and one-half flagellar segments or slightly more; flagellar segment 1 as long as two and one-half succeeding segments; segments 2 and 3 subequal and each shorter than 4; segments 2–7 shorter than broad or quadrate, 8–10 longer than broad. Eye about four and one-fourth times as long as broad, inner margins parallel or diverging slightly toward mandibles. Malar space linear. Mandibles as in *gardineri* but basoventral lamella poorly developed. Galae as in *gardineri* but surface with relatively abundant short erect hairs. Maxillary palpus as in *gardineri* but segmental ratio about 1.0:1.0:0.7:0.6:0.5:0.7. Labial palpus as in *gardineri* but segmental ratio about 2.0:1.0:0.6:0.9. Labral process bidentate. Clypeus evenly rounded from side to side, protruding beyond ends of compound eyes by less than half median length; punctures small, round, sparse along narrow midline, laterally separated mostly by half a puncture width, surface slightly dulled by extremely fine reticular shagreening. Supraclypeal area with minute crowded shallow punctures and fine reticular shagreening dulling surface. Genal area as in *gardineri*. Vertex high, above lateral ocellus equal to one and one-half ocellar diameters or slightly more; punctures small, round, crowded above ocelli, sparse laterally except crowded in narrow band above facial foveae, surface moderately dulled by coarse reticular shagreening. Face above antennal fossae without distinct rugulae, with crowded coarse punctures and fine irregular shagreening dulling surface. Facial fovea long and broad, shallow and rounded below, lower end about reaches level of lower margins antennal fossae, upper end separated from lateral ocellus by two-thirds or more of one ocellar diameter.

Pronotum normal, with minute punctures dorsally separated by one puncture width or less, laterally sparse, surface moderately dulled by fine reticular shagreening. Mesoscutum with minute round punctures separated by one-half to one puncture width, sur-

face dulled by fine tessellation except posteromedially; parapsidal line slightly shorter than from its posterior end to margin of scutum. Tegulae normal, impunctate. Scutellum with minute round punctures separated mostly by one puncture width or more except medially and peripherally, surface shiny. Metanotum similar to scutellum but punctures smaller, crowded except at summit and dulled by fine shagreening except at summit. Propodeum with dorsal enclosure slightly wrinkled in basomedial triangular area, finely tessellate; dorsolateral and posterior areas with small round punctures separated by one to two puncture widths or more and fine reticular shagreening slightly dulling surface; corbicular area with punctures sparse, scattered throughout, surface shiny, with coarse shagreening. Mesepisternum with small round punctures separated by one to two puncture widths, surface moderately dulled by fine reticular shagreening. Metepisternum similar to corbicular area below, upper third with minute punctures and fine shagreening. Middle basitarsus expanded medially or just below, distinctly broader than hind basitarsus. Wing venation as in *gardineri* but second submarginal cell slightly longer than half of first cell along posterior margin. Claws and tibial spurs normal.

Metasomal tergum 1 with scarcely discernible, minute punctures sparse except near apex laterally, surface shiny to moderately so, at most with delicate reticular shagreening. Terga 2-4 with small round punctures separated by two puncture widths or slightly more, surface moderately shiny with fine reticular shagreening.

VESTITURE: Generally pale ochraceous, somewhat brighter ochraceous on vertex, mesoscutum, terga 5 and 6 and inner surfaces tarsi golden-yellow. Mesoscutum with short, erect, profusely barbed, scalelike hairs completely hiding surface; scutellum, metanotum and dorsum of propodeum bare. Tergum 1 glabrous except at extreme sides and apically; terga 2-4 with pale ochraceous to white apical fasciae (often weak medially on tergum 2). Propodeal corbiculum incomplete anteriorly, internally with long, mostly simple hairs scattered throughout. Trochanteral flocculus complete. Tibial scopal hairs plumose throughout.

Male. MEASUREMENTS AND RATIOS: N = 9; length, 11-13 mm; width, 3.0-3.5 mm; wing length, $M = 4.22 \pm 0.143$ mm; FL/FW, $M = 1.11 \pm 0.003$; FS1/FS2, $M = 2.25 \pm 0.044$.

INTEGUMENTAL COLOR: Black except as follows: mandible dark rufescent; clypeus pale yellow except rufescent apical margin and dark maculae below tentorial pits; parocular area pale yellow to level of lower margin of antennal fossa; flagellar segments 3-11 red below; tegulae translucent, red; wing membranes somewhat infumate apically, veins reddish-brown; terga 1-5 narrowly hyaline,

colorless, apically; sterna 2-5 hyaline apically, yellowish, basally rufescent; distitarsi rufescent; tibial spurs pale yellow.

STRUCTURE: Antennae moderately long, just reaching posterior margins of tegulae in repose; scape length equals first two and one-half flagellar segments or slightly longer; flagellar segment 1 equal to or slightly longer than segments 2 plus 3; segment 3 distinctly longer than 2 and slightly shorter than 4; segments 4-11 longer than broad. Eye about 3 times as long as broad, inner margins subparallel, curving inwards slightly. Malar space, mandible and galea as in female. Maxillary palpus as in female but segmental ratio about 1.0:1.0:0.7:0.7:0.5:0.7. Labial palpus as in female but segmental ratio about 1.6:1.0:0.6:0.7. Labral process bidentate. Clypeus as in female but punctures slightly coarser, median impunctate line absent, surface usually shinier. Supraclypeal area, genal area, vertex and face above antennal fossae as in female.

Pronotum as in female but punctures more distinct laterally. Mesoscutum as in female but punctures larger and parapsidal line slightly longer than from its posterior end to margin of scutum. Tegulae impunctate. Scutellum and metanotum as in female. Propodeum as in female except dorsal enclosure with basomedian triangular area more distinctly wrinkled, lateral areas with more abundant punctures and moderately dulled by fine reticular shagreening. Mesepisternum, metepisternum and wing venation as in female.

Tergal sculpturing as in female except as follows: tergum 1 with minute punctures more abundant in apical area; terga 2-4 with basal area punctures separated by two puncture widths or more at least medially. Pseudopygidial area nonexistent. Sterna 2-5 sculptured as in female. Sternum 6 with apical margin strongly reflexed.

Genitalia and sterna 7 and 8 (Figs. 297-301) similar to those of *balsamorhizae* but note the following: penis valves not bent down but parallel to gonoforceps in lateral view, narrow apically; gonoforceps enlarged by inward development of the inner-dorsal ridge; sternum 7 extremely shallowly emarginate and sparsely haired; sternum 8 with neck region broad, densely hairy, apex broadened, entire.

VESTITURE: Generally pale ochraceous or white, slightly more yellowish on dorsum of thorax. Tergum 1 with long erect hairs basally, apically with fascia of short, white, decumbent hairs but rather thin medially and occasionally interrupted (perhaps eroded). Terga 2-5 with complete apical white fasciae. Sterna 2-5 with complete, subapical fimbriae of moderately long, erect hairs. Inner surfaces tarsi pale yellow.

Type Material. The holotype (PANS) female of *biscutellata* was

collected at Fedor, Texas, April 5, 1902, by the Reverend G. Birkmann.

Distribution. Since *A. biscutellata* is known from only 16 specimens in addition to the holotype, the data for these is given below in full.

COLORADO: *Regnier*. 1 ♂, June 6–9, 1919, F. Lutz. KANSAS: *Lawrence*. 1 ♀, October 5, 1959. *Meade*. 1 ♀, June 16, 1949, on *Gaillardia* sp., C. D. Michener and R. H. Beamer. NEW MEXICO: *Tucumcari*. 1 ♀, June 8, 1950, R. H. Beamer. TEXAS: *Bakersfield*. 1 ♀, May 3, 1954, R. H. Beamer. *Dalhart*. 1 ♀, 7 ♂♂, June 8, 1950, J. G. Rozen, R. H. and L. D. Beamer; 1 ♀, June 26, 1915, on *Monarda* sp., F. C. Bishopp. *Midland*. 1 ♂, April 11, 1954, R. H. and L. D. Beamer. "Tex." 1 ♀.

Andrena (Callandrena) texana Cresson

Andrena texana Cresson, 1872, Trans. American Ent. Soc., vol. 4, p. 258.

Andrena imitatrix var. *texana*: Leonard, 1928, Cornell Univ. Agric. Exper. Sta., Mem. 101, p. 1023; Cockerell, 1929, Ann. Ent. Soc. America, vol. 22, p. 755.

This small species from Texas seems to be related to *A. gardineri* and is similar to the latter in size, punctation, shape of the facial foveae and form of the tergal fasciae. The female of *texana* differs from that of *gardineri* in the short, broad labral process, weak subgenal coronet and transverse propodeal rugulae. The male of *texana* differs from that of *gardineri* in the black clypeus, transverse propodeal rugulae, flat sixth sternum and longer third flagellar segment. *A. texana*, although similar to *gardineri*, is not closely related to that species. It also resembles *A. krigiana* in size and in the black male clypeus. The transverse propodeal rugulae, the sparsely punctate metasomal sterna and the longer third flagellar segment of the male will serve to distinguish *texana* from *krigiana*.

Female. MEASUREMENTS AND RATIOS: N = 16; length, 10–11 mm; width, 2.5–3.0 mm; wing length, M = 3.19 ± 0.129 mm; FL/FW, M = 1.04 ± 0.006; FOVL/FOVW, M = 3.49 ± 0.053.

INTEGUMENTAL COLOR: As in *gardineri* except wing membranes slightly infumate, especially in apical thirds, yellowish-brown.

STRUCTURE: Antennae short, scape length equals segments 1–4; flagellar segment 1 equal in length to succeeding two and one-half segments or more; segments 2 and 3 short, equal in length, considerably shorter than segment 4; segments 4–6 quadrate, 7–10 longer than broad. Eye about four times as long as broad, inner margins converging extremely slightly toward mandibles. Malar space linear.

Mandible as in *gardineri* but without basoventral lamella and subgenal coronet poorly developed. Galea as in *gardineri*. Maxillary palpus as in *gardineri* but segmental ratio about 1.3:1.0:0.6:0.7:0.5:0.8. Labial palpus as in *gardineri* but segmental ratio about 2.0:1.0:0.9:0.9. Labral process three to four times as broad as long, entire or with shallow median emargination, not at all bidentate. Clypeus flattened medially, protruding beyond ends of eyes by less than one-third length of clypeus; with small round punctures separated mostly by half to one puncture width except along median impunctate line, surface shiny, unshagreened. Supraclypeal area as in *gardineri*. Genal area slightly broader than eye in profile, sculptured as in *gardineri*. Vertex as in *gardineri* but with sparse punctures above facial foveae. Face above antennal fossae with strong longitudinal rugulae slightly diverging above, reaching lateral ocelli and a few between lateral ocelli and foveae; interrugal spaces with coarse, moderately sparse punctures, moderately shiny. Facial fovea short, narrow, deep, separated from compound eye its entire length by a shiny area almost as broad as base of first flagellar segment, slanted inwards towards ocelli, reaching level of upper margin of antennal fossae or lower, separated from lateral ocelli by one-half to one ocellar diameter.

Thoracic structure and sculpturing as in *gardineri* except as follows: propodeal dorsal enclosure moderately coarsely rugulose, irregularly so basally, becoming transversely rugulose near apex and on posterior surface; mesepisternal punctures shallow, indistinct.

Metasomal structure as in *gardineri* except as follows: tergum 1 with punctures separated mostly by two to three puncture widths; terga 2 and 3 with basal area punctures separated mostly by one to two puncture widths; tergum 4 with basal area punctures separated mostly by two to four puncture widths. Pygidial plate V-shaped with sides bowed out gently and apex broadly rounded, with raised internal triangular area. Sterna 2-5 with apices impunctate, basal areas extremely sparsely punctate except laterally and in one or two rows of more crowded punctures subapically; surfaces moderately shiny, with coarse reticular shagreening.

VESTITURE: As in *gardineri* except as follows: tergum 1 with apical pale fascia broadly interrupted medially by more than half width of tergum; tergum 2 with pale apical fascia narrowly interrupted or weak medially; propodeal corbicula with internal hairs plumose, largely in anterodorsal half; tibial scopal hairs relatively short especially apically.

Male. MEASUREMENTS AND RATIOS: N = 20; length, 8-10 mm;

width, 2.0–2.5 mm; wing length, $M = 3.05 \pm 0.121$ mm; FL/FW, $M = 1.10 \pm 0.009$; FS1/FS2, $M = 1.86 \pm 0.023$.

INTEGUMENTAL COLOR: As in *gardineri* except as follows: clypeus black; parocular areas black; flagellar segments 2 or 3 to 11 dark reddish-brown below; wing membranes slightly infumate apically, veins dark brown to reddish-brown.

STRUCTURE: Antennae as in *gardineri* but segment 1 slightly shorter than segments 2 plus 3 and slightly longer than segment 3, segment 2 distinctly shorter than 3; segments 3–9 quadrate or extremely slightly longer than broad, 10–11 longer than broad. Eye about three times as long as broad or slightly longer, inner margins converging towards mandibles. Malar space and mandible as in female but subgenal coronet absent. Galea as in female. Maxillary palpus as in female but segmental ratio about 1.3:1.0:0.9:0.9:0.7:1.1. Labial palpus as in female but segmental ratio about 2.3:1.0:0.9:1.0. Labral process bidentate, though teeth often somewhat blunt. Clypeus, supraclypeal area, genal area, vertex and face above antennal fossae as in female. Extremely small vestige of facial foveae present near inner upper eye margins.

Thoracic sculpturing and structure as in female except as follows: mesoscutum and scutellum often slightly shinier; propodeal dorsal enclosure usually with transverse apical rugulae more distinctly developed. Metasomal tergal sculpturing as in female but tergum 1 with punctures separated mostly by two puncture widths or slightly less and terga 2–5 with basal area punctures separated mostly by one puncture width or slightly more. Pseudopygidial area not evident. Sterna 2–5 sculptured as in female. Sternum 6 flat apically.

Genitalia and sterna 7 and 8 (Figs. 302–306) as figured. Note the following: penis valves short, broad apically, narrow basally; gonoforceps blunt at tip, bent down only moderately; dorsal lobes gonocoxites short; sternum 7 deeply emarginate apicomediaally, median length moderately long; sternum 8 with neck region short, apical area large, rounded, entire or almost so.

VESTITURE: Generally as in female with the following differences: tergum 1 with pale apical fascia narrowly interrupted medially; terga 2–5 with complete pale apical fasciae; sterna 2–5 with subapical fimbriae of long, slightly curved, erect hairs.

Type Material. The male lectotype was collected in Texas (PANS No. 2796).

Distribution. *A. texana* has been collected so few times that the data for these specimens are given in full.

TEXAS: *Roosevelt.* 1 ♀, 11 ♂♂, on *Amphiachyrus* sp., September 25, 1906, F. C. Pratt. *Victoria.* 11 ♀♀ and 10 ♂♂, on *Aster* sp.,

November 6, 1904, A. J. Lister. 3 ♀♀ and 6 ♂♂ with no data except "TEX." and 2 ♀♀ from the Belfrage collection with the same data. México. SAN LUIS POTOSÍ: Valles. 1 ♂, October 6, 1957, H. A. Scullen.

Andrena (Callandrena) ofella, n. sp.

This very small species from the southwestern states seems to be related to *A. texana* and *A. gardineri*, although not closely. *A. ofella* is similar to *texana* in size, punctation, tergal banding, flagellar segments and the male sixth sternum but differs by being slightly smaller, having a less rugulose dorsal propodeal enclosure without distinct transverse rugulae and by the male clypeus and parocular areas being cream-colored or yellow. *A. ofella* is similar to *gardineri* (and especially to *A. neomexicana* of the *gardineri* group) in the tergal and sternal banding, the pollen collecting hairs, the bidentate male labral process and in sculpturing but differs in the longer facial foveae of the female, the large pale parocular areas of the male and the flat sixth sternum of the male. Both sexes of *ofella* differ from *gardineri* and *texana* in the front wing having vein 1st m-cu meeting the second submarginal cell well beyond the middle and in the pterostigma being broader than usual in *Callandrena*.

Female. MEASUREMENTS AND RATIOS: N = 7; length, 8–9 mm; width, 2.0–2.5 mm; wing length, $M = 2.66 \pm 0.151$ mm; FL/FW, $M = 0.96 \pm 0.006$; FOVL/FOVW, $M = 3.13 \pm 0.089$.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical half rufescent; flagellar segments 3 or 4 to 10 red below; tegula translucent brown; wing membranes hyaline, veins red to reddish-brown; terga 1–4 with apices narrowly hyaline, rufescent just basad of hyaline margins; sterna 2–5 with apical margins hyaline, more or less rufescent basally; distitarsi rufescent to orange; tibial spurs yellow.

STRUCTURE: Antennae short, scape length equals flagellar segments 1–4; flagellar segment 1 slightly longer than segments 2 plus 3; segment 2 equals 3 in length and considerably shorter than 4; segments 4–8 quadrate, 9–10 longer than broad. Eye about three and one-half times as long as broad, inner margins parallel or converging slightly towards mandibles. Malar space and mandible as in *gardineri* but basoventral angle of mandible weakly developed. Galea as in *gardineri*. Maxillary palpus in *gardineri* but segmental ratio about 1.2:1.0:0.6:0.6:0.8. Labial palpus as in *gardineri* but segmental ratio about 2.3:1.0:0.8:1.0. Labral process trapezoidal, about twice as broad as long, entire or extremely slightly emarginate medially. Clypeus gently rounded from side to side, with small round punctures separated mostly by half a puncture width except

along median longitudinal impunctate area, surface shiny, delicately or not at all shagreened. Supraclypeal area with small crowded punctures, surface moderately shiny, delicately shagreened. Genal area as in *gardineri* but only slightly broader than eye in profile. Vertex above lateral ocellus equal to one ocellar diameter, sculptured as in *gardineri*. Face above antennal fossae as in *texana* but with several rugulae reaching vertex between lateral ocellus and facial fovea. Facial fovea narrow, extends down to level of about middle of antennal fossae, separated from lateral ocellus by slightly less than one ocellar diameter, only narrowly separated from compound eye laterally.

Thoracic structure and sculpturing as in *gardineri* except as follows: mesoscutum with small posteromedian area sparsely punctate; mesoscutal and scutellar surfaces shiny, unshagreened; dorso-lateral and posterior propodeal surfaces with punctures separated mostly by three or four puncture widths; front wing with vein 1st m-cu meeting second submarginal cell at about two-thirds distance from base of cell; pterostigma as broad or slightly broader than from inner margin of prestigma to wing margin; middle basitarsus parallel-sided, narrower than hind basitarsus medially.

Metasomal terga 1-4 with basal area punctures small, separated mostly by two to three puncture widths, surfaces shiny, shagreening absent or delicate. Pygidial plate V-shaped with narrowly rounded apex, without raised internal triangular area. Sterna 2-5 with narrow apical margin and small mediobasal area impunctate, elsewhere with small punctures separated mostly by two to four puncture widths, surfaces shiny, with delicate, coarsely reticular shagreening.

VESTITURE: White to pale ochraceous, vertex and thoracic dorsum somewhat darker than below; terga and sternal vestiture as in *texana*. Pollen-collecting hairs as in *texana* but propodeal corbicula with plumose internal hairs scattered throughout and tibial scopal hairs long, not shorter apically.

Male. MEASUREMENTS AND RATIOS: N = 16; length, 6.0-7.5 mm; width, 1.5-2.0 mm; wing length, $M = 2.39 \pm 0.114$ mm; FL/FW, $M = 0.98 \pm 0.007$; FS1/FS2, $M = 1.57 \pm 0.027$.

INTEGUMENTAL COLOR: Black except as follows: mandible with at least apical third rufescent; clypeus cream-colored or yellow except apical margin and small maculae below and mesad of tentorial pits; parocular areas yellow to level of posterior margin of clypeus and a little higher laterally; flagellar segments 2-11 reddish-brown below; tegula translucent reddish-brown; wing membrane hyaline, veins red to reddish-brown; terga 2-5 narrowly hyaline apically; sterna 2-5 hyaline apically, more or less rufescent basally;

distitarsi orange to red; middle and hind basitarsi somewhat rufescent apically; tibial spurs yellow.

STRUCTURE: Antennae short, as in *texana*. Malar space and mandible as in female but mandible without basoventral angle and subgenal coronet absent. Labral process bidentate but median emargination often shallow, slightly deflected. Clypeus as in female but lacking median impunctate line. Supraclypeal area, genal area and vertex as in female. Face above antennal fossae as in female but longitudinal rugulae not extending onto vertex laterally. Vestige of facial fovea not present.

Thoracic sculpturing and structure as in female except as follows: mesoscutal and scutellar punctures medially separated mostly by three to four puncture widths; propodeum with dorsal enclosure more regularly but finely rugulose. Metasomal tergum 1 with basal area punctures small, separated mostly by two to three puncture widths, surface shiny, unshagreened; terga 2-5 with basal area punctures small, separated mostly by one to two puncture widths, surfaces slightly dulled by fine reticular shagreening. Pseudopygidial area not present. Sterna 2-5 sculptured as in female. Sternum 6 flat, not reflexed apically.

Genitalia and sterna 7 and 8 (Figs. 307-311) as figured; compare with those of *texana*.

VESTITURE: Generally white to pale cinereous; distribution of tergal bands as in *texana*. Sterna 2-5 with subapical fimbriae present but not strongly differentiated from more basal erect hairs.

Type Material. The holotype (UCB) female, male allotype (UCB) and six paratypes (UCB; INHS) from five miles north of Carlsbad, Eddy Co., New Mexico, were collected on *Chrysothamnus* sp. by J. W. MacSwain, September 21, 1956. Three female and 13 male paratypes (UCB; PHT; AMNH; UAT; INHS) are as follows: ARIZONA: *Kirkland Junction*, Yavapai Co. 3 ♂♂ on *Gutierrezia microcephala*, September 15, 1961, P. D. Hurd. *Prescott*. 2 ♀♀ on *Aplopappus gracilis*, August 31, 1930, P. H. Timberlake. *Price* (4.8 miles S.). 1 ♂ on *Gutierrezia* sp. September 7, 1957, P. H. Timberlake. *Roadforks* (7 miles S.W.), Chiricahua Mts. 1 ♀, September 23, 1955, C. and M. Cazier. NEW MEXICO: *Carrizozo* (24 miles N.). 1 ♂ September 10, 1961, and 2 ♂♂, September 12, 1961, on *G. microcephala*, P. D. Hurd. *Hurley* (5 miles S.). 1 ♂, September 22, 1950, W. Gertsch and M. Cazier. TEXAS: *Vanhorn* (20 miles N.). 1 ♂ on *Gutierrezia sarothrae*, September 28, 1957, W. Nutting and F. G. Werner.

Andrena (Callandrena) discreta Smith

Andrena discreta Smith, 1879, Descrip. new species Hymenoptera in the British Museum, p. 52; Cockerell, 1896, Ann. Mag. Nat. Hist., ser. 6, vol. 18, p. 80; 1898, Ent. News, vol. 9, p. 171; 1901, Canad. Ent., vol. 33, p. 152; 1906, Psyche, vol. 13, p. 36.

This colorful bee from Mexico and Central America was considered by T. D. A. Cockerell (1898) to be allied to species now placed in the subgenus *Plastandrena*, which it resembles superficially in color. However, judging from the descriptions given by Smith (1879) and Cockerell (1906), *A. discreta* is most likely identified as a *Callandrena* of a rather unusual type. The female is distinctive in the more or less red integument, the triangular, sharply pointed, labral process, the usually red hind basitarsi, the ochraceous to brown scopal hairs and the usually ferruginous tergal vestiture. The male usually has the integument more or less red, the labral process triangular (although with the apex blunted and minutely emarginate), usually red hind tarsi and more or less ferruginous tergal vestiture. *A. discreta* is distinguished from allied species described below by usually having sternum 6 with a small subconical tubercle in both sexes.

Female. MEASUREMENTS AND RATIOS: N = 12; length, 12–15 mm; width, 3.5–4.0 mm; wing length, M = 4.43 ± 0.185 mm; FL/FW, M = 1.10 ± 0.011 ; FOVL/FOVW, M = 3.50 ± 0.064 .

INTEGUMENTAL COLOR: Black except as follows: mandible with apical third rufescent; flagellar segments 3–10 brown below; tegulae testaceous to brownish-red; wing membranes moderately infumate, especially in anterior half and apically, veins dark reddish-brown; in pale forms terga bright red except first tergum black with broad yellow to rufescent apical margins on all terga; sterna with apical area hyaline, rufescent to yellow, apical sternum usually all or mostly rufescent; hind tarsi, fore and middle distitarsi, hind tibiae rufescent in pale forms, basitarsi and tibiae all dark in dark forms; tibial spurs yellow.

Structure: Scape length equals about first two and one-half flagellar segments; flagellar segment 1 equal to following two and one-half segments; segment 2 slightly shorter than 3, segment 3 subequal to 4; segments 3–11 longer than broad. Eye almost three and three-fourths times as long as broad, inner margins parallel. Malar space linear, about five times as broad as long. Mandible of moderate length, in repose outer mandible surpasses middle of labrum by almost one-third its length; basal angle and lamella present; subgenal coronet well developed. Galea opaque, tessellate, in lateral view about half as broad as in dorsal view, rather sharply

pointed. Maxillary palpus not reaching tip of galea in repose, segmental ratio about 1.0:1.0:0.6:0.6:0.6:0.9. Labial palpus with first segment long, slightly flattened, curved especially along inner margin, segmental ratio about 2.3:1.0:0.8:1.0. Labral process large, flat, triangular with sharply pointed apex or minutely emarginate at apex. Clypeus evenly rounded or slightly flattened subapically, protruding beyond ends of eyes by about half its length, with small round punctures separated irregularly by half to one and one-half puncture widths, surface moderately dulled by reticular shagreening especially posteriorly. Supraclypeal area with minute crowded punctures and dense tessellation dulling surface. Genal area slightly broader than eye in profile, with minute punctures near eye separated mostly by one puncture width or less, sparse posteriorly, dulled by dense reticular shagreening especially posteriorly. Vertex above lateral ocellus equal to one ocellar diameter or slightly more, with small punctures above ocelli and along posterior margin to eyes, surface opaque, tessellate. Face above antennal fossae with longitudinal rugulae abundant, reaching ocelli, interrugal spaces punctate, surface moderately shiny. Facial fovea large, shallow, reaching to below level of posterior median margin of clypeus, separated from lateral ocellus by about two-thirds of one ocellar diameter.

Pronotum normal, opaque, tessellate, punctures shallow and indistinct. Mesoscutum and scutellum coarsely tessellate, punctures obscure; parapsidal line about as long as from its posterior end to margin of mesoscutum or longer. Tegulae impunctate with coarse reticular shagreening at summits. Metanotum with small crowded punctures and coarse tessellation dulling surface. Propodeum with dorsal enclosure with sides straight, often irregularly rugulose at base, coarsely tessellate apically or entirely tessellate; dorsolateral and posterior surfaces opaque, coarsely tessellate, with large shallow punctures separated mostly by one to two puncture widths; corbicular area coarsely tessellate, moderately shiny, with small punctures scattered in anterodorsal third. Mesepisternum opaque, tessellate, with shallow obscure punctures anteriorly separated mostly by one to two puncture widths, sparser posteriorly. Metepisternum with upper third with minute punctures and fine tessellation dulling surface, lower portion shiny with coarsely reticular shagreening. Middle basitarsus medially about as broad as hind basitarsus, with almost parallel sides. Fore wing with venation much as in *helianthi* but vein 1st m-cu meets second submarginal cell at or before middle of cell and pterostigma usually about as broad as from inner margin prestigma to wing margin. Claws and tibial spurs normal.

Metasomal tergum 1 with minute round punctures sparse in lateral thirds, medially separated mostly by two to three puncture

widths; surface moderately dulled by fine reticular shagreening. Terga 2-4 with minute round crowded punctures separated mostly by less than one puncture width, surfaces dulled by fine reticular shagreening. Tergum 5 with punctures sparse, shagreening dense. Pygidial plate large, V-shaped with rounded apex, with internal, slightly raised, punctate, triangular area. Sterna 3-5 with apical areas and basal halves impunctate, apical halves of basal areas with small punctures separated mostly by one to two puncture widths, surfaces moderately shiny, finely and reticularly shagreened. Sternum 6 with a minute median apicoventral tubercle.

VESTITURE: Ochraceous to fox-red, paler on lower surfaces. Tergum 1 almost bare; terga 2-4 with basal areas with short dense erect plumose hairs, apical areas with decumbent apical fasciae; terga 5-7 with long decumbent golden to fox-red hairs. Sterna 3-5 bare basally, with subapical fimbriae of long suberect plumose hairs. Corbicula with anterior fringe of moderately long plumose hairs, interior with long plumose hairs in anterodorsal third. Tibial scopal hairs plumose, usually slightly brownish at least anteriorly. Trochanteral flocculus complete, weak. Fore and middle basitarsus with hairs dark brown to reddish-brown; hind basitarsus hairs golden-yellow; distitarsal hairs yellow.

Male. MEASUREMENTS AND RATIOS: $N = 16$; length, 11-12 mm; width, 2.5-3.0 mm; wing length, $M = 3.71 \pm 0.269$ mm; FL/FW, $M = 1.14 \pm 0.009$; FS1/FS2, $M = 1.87 \pm 0.039$.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical third rufescent; clypeus cream-colored to lemon-yellow except small maculae below and mesad of tentorial pits, narrow posterior margin and lateral angles; flagellar segments 3-11 blackish-brown below; tegulae reddish-brown to testaceous; fore wing membranes moderately infumate in anterior half and apically, veins dark reddish-brown; terga 1-6 broadly hyaline apically, almost clear to red, terga 2-6 narrowly rufescent basally; sterna 2-5 broadly hyaline apically, sterna 3-5 narrowly rufescent basally; sternum 6 usually testaceous to rufescent; in pale forms tarsi orange to red, hind tibiae pale at least apically; in dark forms distitarsi orange, basitarsi and tibiae dark reddish-brown; tibial spurs yellow.

STRUCTURE: Antennae moderately long, in repose surpassing tegulae by one to two flagellar segments; scape length equals first two and one-half flagellar segments; flagellar segment 1 extremely slightly shorter than segments 2 plus 3; segment 2 distinctly shorter than 3; segment 3 subequal to 4; segments 3-11 longer than broad. Eye about three times as long as broad, inner margins converging toward mandibles. Malar space, mandible and galea as in female. Maxillary palpus as in female but segmental ratio about 1.0:1.0:

0.9:0.9:0.9:1.0. Labial palpus as in female but segmental ratios about 2.3:1.0:0.7:1.0. Labral process triangular with apex blunted and minutely emarginate, almost as long as broad. Clypeus as in female but slightly flattened medially, shinier and punctures coarser. Supraclypeal area and genal area as in female. Vertex and face above antennal fossae as in female but longitudinal rugulae of face extend up to vertex on either side of lateral ocelli.

Thoracic structure and sculpturing as in female except as follows: propodeal dorsal enclosure with basal rugulae extremely weak; propodeal lateral surfaces with minute obscure punctures scattered throughout, dull. Tergum 1 as in female but minute punctures slightly more abundant. Terga 2-5 as in female terga 2-4 but punctures slightly coarser and more evident. Tergum 7 with narrow median glabrous pseudopygidial area. Sterna 2-5 as in female. Sternum 6 flat apically, with broadly V-shaped apical emargination, just anterior of apex of emargination with a small low tubercle usually present. Tibial spurs and claws normal.

Genitalia and sterna 7 and 8 (Figs. 312-315) as figured. Note the following: narrow type of penis valves; dorsal lobes gonocoxites extremely long.

VESTITURE: Generally ochraceous to fox-red. Tergal vestiture as in female; sterna 2-5 without clear subapical fimbriae; tibiae and basitarsi in dark forms with reddish-brown hairs.

Type Material. The female holotype from México is in the collection of the British Museum (Natural History), London, England.

Distribution. *A. discreta* is known to occur throughout México from Chiapas to Durango and in Costa Rica. It has been collected from August 2nd through February 16th. Thirteen females and 18 males have been examined from the following localities:

México. CHIAPAS: San Cristobál las Cases. DURANGO: Palos Colorados. GUANAJUATO: Panajachel (8 miles S.E.). HIDALGO: Tulancingo (6 miles W.). PUEBLA: Amecameca; Huachinango (8 miles W.); Puebla. SAN LUIS POTOSÍ: Tamazunchale. TLAXCALA: Apizaco (10 miles N.). VERACRUZ: Cascomatepec; Jalapa; Orizaba. *Costa Rica.* Monteverde.

Remarks. Specimens from eastern México, that is, the state of Veracruz, tend to be darker in color than those from elsewhere. An eastern subspecies might be recognized in the future when larger samples of the populations of this bee become available.

The single female collected at Monteverde, Costa Rica, February 16, 1963, by C. W. and M. E. Rettenmeyer is remarkable in its dark vestiture. In general this female is like the dark females from the state of Veracruz in Mexico but the head hairs, most of the dorsal thoracic hairs and the abdominal hairs are dark brown. In addition,

the tergal apices are translucent, smoky brown. This female appears to be an extreme variant of *A. discreta*. However, it is considerably out of the range of the remainder of the available material and was collected at a time of year when *discreta* is unknown from Mexico. The true status of this female must await additional material from Mexico, Costa Rica and intervening areas.

Andrena (Callandrena) fulminea, n. sp.

This brightly colored Mexican species is closely related to *A. discreta* Smith. The female of *fulminea* can be distinguished from that of *discreta* by the bidentate labral process, the dark scopal and femoral hairs, the less punctate terga, and the apical tubercle of the last sternum being flattened. The male of *fulminea* differs from that of *discreta* by the shorter vertex, the less distinctly punctate terga, and the terminalia as described below.

Female. MEASUREMENTS AND RATIOS: N = 2; length, about 13 mm; width, about 3.5 mm; wing length, 3.96–4.08 mm; FL/FW, 1.11–1.13; FOVL/FOVW, 2.66–2.94.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical half rufescent, flagellar segments 2–10 dark reddish-brown below; tegulae testaceous; wing membranes moderately infumate throughout, veins dark reddish-brown; terga 1–4 with apices broadly (nearly half of terga 2–4) hyaline, yellow; terga 2–4 with bases (below apical areas of preceeding terga) fulvous to red; sterna 2–5 broadly hyaline apically, yellow, basally reddish-brown; sternum 6 red; distitarsi, hind basitarsi, hind tibiae orange; middle basitarsi dark red; tibial spurs yellow.

STRUCTURE: Antennal scape length equals first two and one-half flagellar segments; flagellar segment 1 equals succeeding two and one-half segments; segment 2 slightly shorter than 3; segment 3 as long as 4; segments 3–10 longer than broad. Eye slightly more than three and three-fourths times as long as broad, inner margins converging extremely slightly towards mandibles. Malar space, mandible and galea as in *discreta*. Maxillary palpus as in *discreta* but segmental ratio about 1.0:1.0:0.8:0.6:0.7:0.8. Labial palpus as in *discreta* but segmental ratio about 2.3:1.0:0.8:1.0. Labral process trapezoidal, about twice as broad at base as llog, distinctly emarginate medially, flat. Clypeus as in *discreta* but impunctate or sparsely so medially, slightly gibbous subapically, dulled by reticular shagreening especially in posterior half. Supraclypeal area as in *discreta*. Genal area about as broad as eye in profile, with minute punctures separated by one to two puncture widths, surface dulled by fine tessellation except near eye. Vertex short, above lateral

ocellus equals distinctly less than one ocellar diameter, with minute punctures crowded above eyes and ocelli, surface dulled by fine tessellation. Face above antennal fossae with relatively irregular longitudinal rugulae, interrugal spaces sparsely punctate, finely tessellate. Facial fovea long, shallow, extending below to about level of posterior clypeal margin, upper end separated from lateral ocellus by half an ocellar diameter or slightly less.

Thoracic sculpturing and structure as in *discreta* except as follows: propodeum with dorsal enclosure without rugulae, tessellation coarser than elsewhere; corbicular area moderately shiny, tessellation coarse, punctures restricted to anterodorsal fourth; mesepisternum with punctures small, sparse, obscure; pterostigma narrower than from inner margin prestigma to wing margin; middle basitarsus slightly broader medially than hind basitarsus (as 9:8), with evenly rounded sides. Claws and tibial spurs normal.

Metasomal tergum I mipunctate, surface dulled by coarse reticular shagreening; terga 2-4 with basal area punctures minute, shallow, obscure, surfaces dulled by fine dense tessellation. Pygidial plate as in *discreta*. Sterna 2-5 as in *discreta* but surfaces dulled by coarse reticular shagreening. Sternum 6 with apical tubercle flattened into a small circular area barely raised above surrounding surface of sternum.

VESTITURE: Generally dark ochraceous to fulvous or fox-red except as follows: paler on lower sides of head and thorax, brighter above; facial foveal hairs and sparse long hairs of vertex and along eye margins dark brown; terga 2-4 with basal area hairs subdecumbent, ochraceous to pale brown, apical fasciae indistinct; terga 5 and 6 with reddish-brown hairs, paler at sides; sterna 2-5 with basal hairs reddish-brown, subapical fimbriae ochraceous; hind legs except tarsi with dark brown to black hairs; fore and middle legs with ochraceous hairs except outer surfaces tibiae and basitarsi dark brown; corbicular hairs as in *discreta* but internal hairs brown; scopal and floccular hairs as in *discreta* but dark brown to black.

Male. MEASUREMENTS AND RATIOS: N = 13; length, 10-12 mm; width, 2-3 mm; wing length, $M = 3.87 \pm 0.204$ mm; FL/FW, $M = 1.21 \pm 0.009$; FS1/FS2, $M = 2.02 \pm 0.016$.

INTEGUMENTAL COLOR: Black except as follows: mandible with at least apical half rufescent; clypeus pale yellow except extremely narrow posterior margin, lateral angles, apical margin and spots below and mesad of tentorial pits; flagellar segments 2-11 dark brown below; tegulae clear red to dark reddish-brown; wing membranes moderately infumate throughout, veins reddish-brown; terga 1-5 with apical margins broadly hyaline, reddish-yellow, often red basad of hyaline margin (as much as two-thirds of tergum red

occasionally); terga 2-6 with narrow bases (below hyaline preceding tergal margins) red; terga 6 and 7 and occasionally 5 entirely red; sterna entirely ferruginous or terga 3-5 dark medially; tarsi orange; hind tibiae usually entirely orange, or pale in part; middle tibiae often with apex reddened; tibial spurs reddish-yellow.

STRUCTURE: Flagellum as in *discreta* but flagellar segment 1 usually as long as or slightly longer than segments 2 plus 3. Eye, malar space and galea as in female. Mandible as in female but lacking basal angle, lamella and subgenal coronet. Maxillary palpus as in female but segmental ratio about 1.3:1.0:1.0:1.0:0.9:1.0. Labial palpus as in female but ratio about 2.0:1.0:0.7:1.1. Labral process as in female. Clypeus as in female but punctures smaller and sparser and median impunctate area larger. Supraclypeal area and genal area as in female. Vertex as in female but less punctate especially above eyes. Face above antennal fossae as in female but longitudinal rugulae less distinct and more irregular.

Thoracic sculpturing and structure as in female except propodeal lateral surfaces duller, with punctures minute and scattered throughout. Metasomal tergum 1 with minute obscure sparse punctures basally, scarcely visible due to tessellation; terga 2-5 as in female but basal area punctures slightly more distinct although obscured by dense fine tessellation. Tergum 7 with pseudopygidial area obliterated by hairs. Sterna 2-6 as in *discreta*.

Genitalia and sterna 7 and 8 (Figs. 316-320) as in *discreta* but note the following: penis valves almost straight, not much bent downwards; dorsal lobes of gonocoxites with apices turned sharply outwards; sternum 7 with apicolateral lobes greatly lengthened so that plate is almost X-shaped; sternum 8 with neck narrow, elongate, not expanded at tip, base elongated medially.

VESTITURE: Generally as in female except as follows: vertex and face along inner margins of eyes with long black hairs; basal tergal hairs longer, erect or suberect, fuscous; terga 6 and 7 with ochraceous to fuscous hairs; sterna 2-5 without subapical fimbriae, with ochraceous hairs; leg hairs entirely reddish-yellow to ochraceous.

Type Material. The holotype (PHT) female, allotype (PHT) male, one female paratype (INHS) and five male paratypes (PHT; INHS) were collected by I. J. Condit on highway east of Morelia, Michoacán, México, February 12, 1952. Ten additional paratypes (MSU; SECK; USNM; INHS; OSU) from México are as follows: Amecameca, Veracruz: 5 ♂♂, September 9-25, 1957, R. and K. Dreisbach. Apizaco (6 miles W.N.W.), Tlaxcala: 1 ♂, on *Heterotheca chrysopsidis*, June 10, 1961, the University of Kansas Mexican Expedition. Tlalpan, México: 1 ♂, November, 1887. Morelia (21 miles E.), Michoacán: 3 ♀♀, May 29, 1956, H. A. Scullen.

Andrena (Callandrena) fulminoides, n. sp.

This species, represented by only four females from Mexico, is very similar and closely related to *A. fulminea*. It differs from *fulminea* chiefly in the pale color of the terga and the leg hairs and the pale middle basitarsus. It is possible that this species will prove to be a variant of *fulminea* which will then be found to be as variable as the related *A. discreta*. However, considerable additional material is needed to verify such an hypothesis.

Female. MEASUREMENTS AND RATIOS: N = 4; length, 14–15 mm; width, 3.5–4.0 mm; wing length, M = 4.58 ± 0.237 mm; FL/FW, M = 1.05 ± 0.023 ; FOVL/FOVW, M = 2.95 ± 0.164 .

INTEGUMENTAL COLOR: Black except as follows: mandible with apical third rufescent; parocular and subantennal areas rufescent below; flagellar segments 4–10 dark reddish-brown below; tegulae dark reddish-brown; wing membranes moderately infumate throughout, veins reddish-brown; terga 1–5 broadly hyaline apically, yellowish (on tergum 2 about half of tergum yellow to red); terga 2–5 with extreme bases (beneath hyaline apices of preceding terga) red; sterna 2–5 narrowly hyaline apically, yellowish, piceous basally; hind tarsi and tibiae reddish-yellow; fore distitarsi, middle basitarsi red-orange; middle and hind femora and trochanters dark rufescent; tibial spurs yellow.

STRUCTURE: Antennae as in *discreta*. Eye about four times as long as broad, inner margins parallel. Malar space, mandible and galea as in *discreta*. Maxillary palpus as in *discreta* but segmental ratio about 1.0:0.9:0.8:0.8:0.7:1.0. Labial palpus as in *discreta* but segmental ratio about 2.2:1.0:0.8:1.2. Labial process trapezoidal with apex small, about two and one-half times as long as broad, usually slightly but distinctly emarginate apically. Clypeus as in *fulminea* but punctures irregular in size and spacing, impunctate median area extensive. Supraclypeal and genal areas as in *discreta*. Vertex short, as in *fulminea*. Face above antennal fossae with fine longitudinal rugulae, area immediately below median ocellus and inner margins of lateral ocelli without rugulae, below this area rugulae strongly diverging towards vertex, surface dulled by minute sparse punctures and fine tessellation. Facial fovea large, shallow, extending below to about level of posterior clypeal margin or not quite reaching this level, above separated from lateral ocellus by half an ocellar diameter or less.

Thoracic sculpturing and structure as in *discreta* except as follows: propodeum with dorsal enclosure without basal rugulae or these extremely short at extreme base; dorsolateral and posterior surfaces propodeum, mesepisternum and metepisternum with punc-

tures minute, sparse, obscured by dense tessellation; corbicular area of propodeum with small punctures in anterodorsal fourth or less; middle basitarsus moderately expanded medially along anterior margin, distinctly broader than hind basitarsus medially; pterostigma slightly narrower than from inner margin prestigma to wing margin. Structure and sculpturing of terga and sterna as in *fulminea* but pygidial plate with apex rounded to subtruncate.

VESTITURE: Generally ochraceous to fulvous, brighter on vertex and thoracic dorsum than below. Tergum 1 bare dorsally. Terga 2-5 basally with short, subdecumbent, ochraceous hairs, apically with short decumbent hairs but not forming discrete fasciae except, perhaps, on terga 3 and 4. Terga 5 and 6 with hairs golden. Sterna 2-5 as in *discreta*, hairs pale. Leg hairs ochraceous to yellow. Propodeal corbicula complete anteriorly, with several long, apically plumose hairs in anterodorsal fourth or less; scopal hairs plumose throughout, ochraceous to yellow; trochanteral flocculus complete, weak.

Type Material. The holotype (USNM) female and three female paratypes (USNM; INHS) were collected at Cima, Distrito Federal, México, November 2, 1922, by E. G. Smyth.

Andrena (Callandrena) aevipes, n. sp.

This small Mexican species is known only from three females. It is closely related to *A. fulminea* but can be readily recognized by the yellow clypeus, the pale middle basitarsi and the weak tergal vestiture.

Female. MEASUREMENTS AND RATIOS: N = 2; length, about 12 mm; width, about 3 mm; wing length, 3.87-3.90 mm; FL/FW, 1.09-1.12; FOVL/FOVW, 2.66-2.71.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical half rufescent; clypeus yellow except broad apical margin, lateral angles, narrow posterior margin and small maculae mesad and below tentorial pits; flagellar segments 4-10 dark brown below; tegulae testaceous; wing membranes slightly infumate, veins reddish-brown; terga largely red or orange-red; in holotype terga 5 and 6 brownish-red and terga 1 and 2 piceous except apically; in paratype all terga piceous medially; sterna orange-red to darker basally; distarsi yellow to orange; middle and hind basitarsi orange, hind tibiae and femora rufescent; tibial spurs yellow.

STRUCTURE: Antennal scape length equals first two and one-half flagellar segments; flagellar segment 1 equal in length to succeeding two and one-third segments; segment 2 slightly shorter than 3 which is shorter than 4; segments 4-10 longer than broad. Eye about four

and one-fourth times as long as broad or slightly less, inner margins converging extremely slightly towards mandibles. Malar space, mandible and galea as in *discreta*. Maxillary palpus as in *discreta* but segmental ratio about 1.3:1.0:0.8:0.9:0.8:0.9. Labial palpus as in *discreta* but segmental ratio about 2.1:1.0:0.9:0.9. Labral process small, about twice as long as broad, trapezoidal with or without shallow apical emargination. Clypeus as in *discreta* but median area impunctate for length of clypeus and punctures obscure elsewhere. Supraclypeal and genal areas as in *discreta*. Vertex short, above lateral ocellus slightly shorter than one ocellar diameter, tessellate, punctures obscure except immediately above facial fovea and compound eyes. Face above antennal fossae with longitudinal rugulae except in small area below median ocellus, rugulae not extending between fovea and lateral ocellus. Facial fovea large, shallow, extending to level below lower margin antennal fossae, separated from lateral ocellus by half an ocellar diameter or less.

Thoracic structure and sculpturing as in *discreta* except as follows: propodeal dorsal enclosure without basal rugulae although slightly roughened mediobasally; mesepisterna finely tessellate, punctures minute and obscure; middle basitarsus distinctly broader than hind medially, rather strongly expanded anteriorly just below middle; pterostigma narrower than from inner margin prestigma to wing margin. Terga 1-4 with apical areas impunctate, reticularly shagreened, basal areas with punctures minute, sparse, virtually impunctate, surface moderately dulled by reticular shagreening. Pygidial plate V-shaped with narrowly rounded apex, with slightly raised triangular, punctate, internal area. Sterna 2-5 as in *discreta*. Sternum 6 flat with apex rounded, without subapical tubercle but subapical area impunctate and shiny.

VESTITURE: Generally pale ochraceous to ochraceous except as follows: tergal hairs pale brown to brown; hind femora and tibial scopal hairs dark brown to black; sternal hairs brownish basally on each sternum. Terga 1-4 with hairs sparse, short, not at all hiding surface, without apical fasciae. Sterna 3-5 with weak subapical fimbriae interrupted medially. Pollen collecting hairs as in *discreta*.

Type Material. The holotype (UCB) female from Pino Gordo, Michoacán, México, was collected by R. C. Bechtel and E. I. Schlinger, May 1, 1953. Two additional paratype females were collected in México: one female (PANS) is without further data, the second (OSU) was collected by H. A. Scullen, 21 miles E. of Morelia, Michoacán on May 29, 1956.

Andrena (Callandrena) vulpoides, n. sp.

A. vulpoides is a brightly-colored Mexican species related to *A. discreta*. Both sexes of *vulpoides* can be distinguished from those of *discreta* by the long, suberect to decumbent, fox-red hairs clothing terga 2-4 (these terga lack distinct apical fasciae) and the trapezoidal, relatively short, slightly emarginate, labral process.

Female. MEASUREMENTS AND RATIOS: N = 10; length, 11-13 mm; width, 3-4 mm; wing length, $M = 4.04 \pm 0.217$ mm; FL/FW, $M = 1.07 \pm 0.010$; FOVL/FOVW, $M = 2.52 \pm 0.032$.

INTEGUMENT(L COLOR: Black except as follows: mandible with apical third rufescent; flagellar segments 4-10 brown below; tegulae dark translucent red to testaceous; wing membranes slightly to moderately infumate throughout, veins dark reddish-brown to black; terga 1-4 extremely narrowly hyaline apically, yellow; sterna 2-5 extremely narrowly hyaline apically, yellow; distitarsi dark rufescent; tibial spurs yellow.

STRUCTURE: Antennal scape length slightly shorter than flagellar segments 1-3; flagellar segment 1 equal in length to two and one-half succeeding segments; segment 2 slightly shorter to equal in length to segment 3, each shorter than 4; segments 4-10 longer than broad. Eye four times as long as broad or slightly longer, inner margins converging extremely slightly toward mandibles. Malar space, mandible and galea as in *discreta*. Maxillary palpus as in *discreta* but segmental ratio about 1.0:0.9:0.7:0.7:0.7:0.7. Labial palpus as in *discreta* but segmental ratio about 2.3:1.0:0.8:1.0. Labral process small, flat, trapezoidal with apex only slightly emarginate. Clypeus as in *discreta* but punctures irregular in size, separated mostly by one to two puncture widths except medially where smaller and sparser, obscured by dense fine tessellation. Supraclypeal and genal areas as in *discreta*. Vertex short, above lateral ocellus equal to slightly less than one ocellar diameter, sculptured as in *discreta*. Face above antennal fossae as in *discreta*. Facial fovea as in *discreta* but slightly shorter, not quite reaching level of posterior margin of clypeus, separated from lateral ocellus by half an ocellar diameter or slightly more.

Thoracic structure and sculpturing as in *fulminea* except as follows: propodeum with dorsolateral and posterior surfaces with punctures minute, obscure; propodeum with corbicular area with sparse punctures in anterior half; mesepisternal punctures minute, sparse, obscure; middle basitarsus with sides evenly curved, about as broad medially as hind basitarsus. Tergal sculpturing as in *fulminea* but terga 2-4 with crowded minute punctures made indistinct by fine regular tessellation. Sternal sculpturing and pygidial plate as in *fulminea*.

VESTITURE: Fox-red except as follows: head with lower parts and thorax with sides and below paler reddish-yellow; hind legs except distitarsi with hairs dark brown to black; fore and middle tibiae and basitarsi with dark brown hairs; internal corbicular hairs dark brown to black; sternal hairs dark brown to black, subapical fimbriae poorly developed. Tergum 1 with dorsum bare; terga 2-4 with long, suberect to decumbent, barbed hairs (no distinction between basal suberect and apical decumbent hairs, one grading into the other); terga 5 and 6 long reddish-yellow to fox-red hairs. Propodeal corbiculum as in *discreta* but long internal hairs present in anterodorsal half. Trochanteral flocculus and tibial scopal hairs as in *discreta*.

Male. MEASUREMENTS AND RATIOS: N = 18; length, 10-13 mm; width, 2.5-3.5 mm; wing length, $M = 3.81 \pm 0.136$ mm; FL/FW, $M = 1.12 \pm 0.009$; FS1/FS2, $M = 2.33 \pm 0.031$.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical third to half rufescent; clypeus cream-colored except apical margin, small maculae mesad and below tentorial pits (usually present), lateral angles, and extremely narrow posterior margin dark (rather broadly infumate posteriorly in one specimen); flagellar segments 3-11 dark brown below; tegulae testaceous; wing membranes slightly to moderately infumate, veins dark reddish-brown; terga 1-5 rather narrowly hyaline apically, reddish-yellow; sterna 2-5 narrowly hyaline apically, yellow; sternum 6 broadly hyaline apically to entirely hyaline, reddish-yellow; distitarsi and basitarsi red to orange; hind tibiae mostly and apex of middle tibiae red to orange; tibial spurs yellow.

STRUCTURE: Antennae short, slightly surpassing tegula in repose or not at all; scape length subequal to flagellar segments 1 plus 2; flagellar segment 1 equal in length to segments 2 plus 3; segment 2 shorter than 3 which is subequal in length to 4; segments 3-11 longer than broad. Eye three and one-half times as long as broad, inner margins distinctly converging towards mandibles. Malar space, mandibles and galea as in *discreta*. Maxillary palpus as in *discerta* but segmental ratio about 1.3:1.0:1.0:0.7:0.7:1.0. Labial palpus as in *discreta* but segmental ratio about 2.0:1.0:0.8:1.0. Labral process as in female but tip slightly reflexed. Clypeus as in female but slightly shinier medially. Supraclypeal and genal areas as in female. Vertex and face above antennal fossae as in female.

Thoracic sculpturing and structure as in female with the usual sexual differences. Metasomal terga sculptured as in female but surface dulled by fine reticular shagreening (rather than tessellate), shinier, and minute basal area punctures more distinct, separated

mostly by one to two puncture widths. Pseudopygidial area not evident. Sternal sculpturing as in *discreta*. Sternum 6 as in *discreta*.

Genitalia and sterna 7 and 8 (Figs. 321-325) as in *fulminea* except as follows: dorsal lobes gonocoxites slender apically and only gently deflected outwards; sternum 8 with neck region shorter, apex expanded slightly and emarginate, hairs more abundant.

VESTITURE: In general as in female, fox-red but legs, lateral surfaces propodeum and sterna without black to dark brown hairs. Terga hairs arranged as in female. Sterna 2-5 without subapical fimbriae, hairs sparse, fox-red.

Type Material. The holotype (SECK) female, allotype (SECK) male, and three female and one male paratypes (SECK; INHS) were collected 8 miles west of Huauchinango, Puebla, México, August 23, 1962, by the University of Kansas Mexican Expedition. Seven female and 17 male paratypes (MSU; SECK; INHS; UCB; OSU) in addition to the above, all from México, are as follows:

DISTRITO FEDERAL: *México City*. 1 ♂, September 7, 1957, H. A. Scullen. HIDALGO: *Pachuca*. 1 ♀, October 30, 1957, R. and K. Dreisbach. *Tulancingo* (7 miles S.). 9 ♂♂, on *Brickellia* sp., August 26, 1962, Naumann and Roberts. MÉXICO: *Atlatomulco* (22 miles N.). 1 ♂, August 18, 1954, C. D. Michener and party. *Rio Frio* (9 miles W.). 1 ♀, October 8, 1964, A. E. Michelbacher. PUEBLA: *Huauchinango*. 1 ♀, June 16, 1961, the University of Kansas Mexican Expedition. *Puebla Road, Kilo 64*. 4 ♂♂, October 2, 1957, R. and K. Dreisbach. TLAXCALA: *Apizaco*. 4 ♀♀ on *Heterotheca chrysopsidis*, June 16, 1961, the University of Kansas Mexican Expedition; 2 ♂♂, August 20, 1962, the University of Kansas Mexican Expedition.

Andrena (Callandrena) aerifera, n. sp.

Andrena aerifera is closely related to *A. vulpoides* from which it can be distinguished in both sexes by the distinct apical fasciae on terga 2 to 4, the basal areas of these terga having short erect to suberect hairs. The female of *aerifera* differs from that of *vulpoides* in having apicodorsal hairs on tergum 1, pale basitarsi and paler scopal hairs. The male of *aerifera* differs from that of *vulpoides* in usually having small parocular pale maculae and in the slightly higher vertex.

Female. MEASUREMENTS AND RATIOS: N = 1; length, about 14 mm; width, about 3.5 mm; wing length, about 4.47 mm; FL/FW, 1.05; FOVL/FOVW, 2.57.

INTEGUMENTAL COLOR: Black except as follows: mandible with tip rufescent; flagellar segments 2-10 dark brown below; tegula

translucent dark reddish-brown; wing membranes moderately infumate, especially apically, veins dark reddish-brown; terga 1-5 narrowly hyaline apically, yellow; sterna 2-5 extremely narrowly hyaline apically, yellow; distitarsi orange; hind basitarsi orange; hind tibiae rufescent; tibial spurs yellow.

STRUCTURE: Antennal scape length equals first two and one-third flagellar segments; flagellar segment 1 equal in length to succeeding two and one-half segments; segment 2 slightly shorter than 3 which is slightly shorter than segment 4; segments 4-7 about quadrate, 8-10 longer than broad. Eye four times as long as broad or slightly longer, inner margins parallel. Malar space, mandible and galea as in *discreta*. Maxillary palpus as in *discreta* but segmental ratio about 1.3:1.0:1.0:1.1:0.7:1.0. Labial palpus as in *discreta* but segmental ratio about 2.3:1.0:0.8:1.0. Labral process as in *vulpoides*. Clypeus as in *vulpoides* but shinier subapically and more punctate medially. Supraclypeal and genal areas as in *vulpoides*. Vertex above lateral ocellus equals about one ocellar diameter, sculptured as in *discreta* but minute rugulae attaining vertex from between ocelli and foveae and a few above foveae. Face above antennal fossae as in *discreta*. Facial fovea shallow, large, extending down to below level of lower margins antennal fossae but not reaching level of posterior margin of clypeus, separated from lateral ocellus by half an ocellar diameter or less.

Thoracic structure and sculpturing as in *discreta* except as follows: middle basitarsus slightly broader medially than hind basitarsus, with evenly curved sides; pterostigma narrower than from inner margin prestigma to wing margin. Tergum 1 with apical area impunctate, shagreened; subapically with band of minute crowded punctures; basally opaque, tessellate. Terga 2-4 with basal area punctures minute, shallow, obscure, surface dulled by fine dense tessellation. Pygidial plate broadly rounded apically, internally punctate but without distinctly raised internal triangular area. Sterna 3-5 with narrow apical areas and mediobasal areas impunctate, apicobasal area with minute round punctures separated mostly by two puncture widths, surface dulled by coarse reticular shagreening. Sternum 6 with apical margin rounded, without subapical tubercle.

VESTITURE: Generally fox-red except as follows: lower parts of head and thorax paler; sterna 2-5 with basal area hairs dark brown, subapical fimbriae pale; corbicula with internal hairs brown; leg hairs brown except as follows: distitarsi ochraceous, outer surface hind basitarsi ochraceous, inner surface hind basitarsi golden, inner surface fore and middle basitarsi rufescent, posterior scopal hairs pale brownish-ochraceous. Tergum 1 with subapical band of long

decumbent to suberect hairs, bare basally. Terga 2-4 with distinct apical fasciae of decumbent pubescence; basal areas with relatively short, suberect to erect hairs. Sterna 3-5 with weak subapical fimbriae. Distribution and type of pollen collecting hairs as in *vulpoides*.

Male. MEASUREMENTS AND RATIOS: N = 4; length, about 11 mm; width, 2.5-3.0 mm; wing length, $M = 4.00 \pm 0.152$ mm; FL/FW, $M = 1.13 \pm 0.015$; FS1/FS2, $M = 2.17 \pm 0.038$.

INTEGUMENTAL COLOR: Black except as follows: mandible with apical third rufescent; clypeus cream-colored except apical margin and minute spots below and mesad of tentorial pits; parocular areas usually with small cream-colored maculae (absent in allotype although integument of this area is paler than normal); flagellar segments 3-11 dark reddish-brown below; tegulae testaceous to translucent red; wing membranes moderately infumate, especially apically, yellowish-brown, veins dark reddish-brown; terga 1-5 and sterna 2-5 narrowly hyaline apically, yellow; distitarsi and basitarsi yellow to orange; hind tibiae rufescent basally to orange in apical third and along posterior margin; middle tibiae orange at tips.

STRUCTURE: Antennae barely surpassing tegulae in repose; scape length equals first two and one-half flagellar segments; flagellar segment 1 slightly longer than segments 2 plus 3; segment 2 subequal to 3 which is distinctly shorter than 4; segments 4-11 longer than broad. Eye slightly longer than three and three-fourths width, inner margins converging extremely slightly towards mandibles. Malar space, mandible and galea as in *discreta*. Maxillary palpus as in *discreta* but segmental ratio about 1.0:0.9:0.7:0.7:0.5:0.7. Labial palpus as in *discreta* but segmental ratio about 2.4:1.0:0.7:0.8. Labral process as in female. Clypeus as in female but punctures smaller, sparser, median area punctate. Supraclypeal and genal areas as in *discreta*. Vertex above lateral ocellus equal to about one ocellar diameter, sculptured as in *discreta*. Face above antennal fossae as in female but rugulae coarser.

Thoracic sculpturing and structure as in *discreta* except as follows: punctures everywhere shallower and less distinct; pterostigma narrow as in female. Terga 1-5 sculptured as in female terga 1-4 but basal area punctures slightly more distinct. Pseudopygidial area not evident. Sterna 3-5 with narrow apical areas impunctate, basal areas with small sparse punctures except crowded subapically. Sternum 6 flat with V-shaped apical emargination.

Genitalia and sterna 7 and 8 (Figs. 326-330) similar to those of *discreta* but note the following: dorsal lobes gonocoxites slender; penis valves with apices less slender; sternum 7 long medially, with

deep V-shaped emargination; sternum 8 with neck region long, slender, tip not expanded.

VESTITURE: Generally fox-red except as follows: lower parts of head and thorax paler, ochraceous; sternal and leg hairs ochraceous; inner surfaces basitarsi golden. Terga 1-5 with apical fasciae of decumbent pubescence; terga 2-5 with basal areas with relatively short, erect to suberect hairs. Sterna 3-5 without distinct subapical fimbriae.

Type Material. The holotype (SECK) female from Manzanmitla, Jalisco, México, was collected October 1950, by A. A. Alcorn. The allotype (USNM) male from the Distrito Federal, México, was collected by L. Conradt. Four male paratypes (MSU; INHS) from México are as follows: MICHOACÁN: *Morelia*. 1 ♂, September 23, 1957, R. and K. Dreisbach. *Tuxpan*. 1 ♂, September 19, 1957, H. A. Scullen. VERACRUZ: *Jalapa*. 2 ♂♂, September 28-October 3, 1961, R. and K. Dreisbach.

Remarks. The female holotype was not collected with any one of the males assigned to this species. It is possible that a mistake in the association of sexes has been made. However, the evidence from the structure of the two sexes described above seems to make such an error unlikely.

Andrena (Callandrena) repanda, n. sp.

This strikingly beautiful Mexican species is not closely related to any of the foregoing species. It is placed here, near the *discreta* group of species, because of the agreement of a number of characters such as the size and shape of the facial foveae, the form of the mandibular base, the shape of the sixth sternum of the female and of the male, the shape of the middle basitarsus of the female, etc. *A. repanda* can be told from almost all other species of *Callandrena* in either sex by the apical areas of the terga which are strongly constricted with the margins turned upwards. In addition, the dorsal enclosure of the propodeum ends abruptly posteriorly, the division line between dorsal and posterior surfaces being almost carinate. These characters, together with the black integument and hairs of the head, thorax, base of the metasoma and legs, and the bright golden metasomal apical segments, make this species easily recognizable.

Female. MEASUREMENTS AND RATIOS: N = 3; length, 14-15 mm; width, about 4 mm; wing length, M = 4.88 ± 0.426 mm; FL/FW, M = 1.07 ± 0.011 ; FOVL/FOVW, M = 3.04 ± 0.074 .

INTEGUMENTAL COLOR: Black except as follows: mandible with apical half rufescent; flagellar segments 4-10 dark brown below; tegulae piceous; wing membranes infumate throughout, brown,

veins reddish-brown; tergum 1 with apical area translucent, brown; tergum 2 with apical area hyaline, yellow and extreme apex of basal area orange (in darkest specimen apical area translucent, brown); tergum 3 with apical area hyaline, yellow, basal area orange in apical fourth or fifth and irregularly blotched with orange across extreme base (in darkest specimen apical area translucent, yellow-brown, without orange in basal area); tergum 4 entirely orange, apical area hyaline (in darkest specimen tergum 4 as in tergum 2 of pale specimen); terga 5 and 6 entirely yellow-orange with hyaline apex on 5 and rufescent pygidial plate; sterna 2-5 narrowly hyaline apically, red; sternum 6 yellow-orange except apex; distitarsi rufescent; tibial spurs rufescent to somewhat yellowish.

STRUCTURE: Antennal scape length equals flagellar segments 1-3; flagellar segment 1 equal in length to succeeding two and three-fourths segments; segment 2 about equal to 3 and slightly shorter than 4; segments 4-10 longer than broad. Eye about three and one-half times as long as broad, inner margins parallel or converging extremely slightly toward apex. Malar space linear, about six times as broad as long. Mandible of moderate length, outer mandible surpassing middle of labrum by about one-third its length; base angulate but lamella poorly developed. Galea as in *discreta*. Maxillary palpus as in *discreta* but segmental ratio about 1.0:1.0:1.0:1.0:0.8:1.1. Labial palpus as in *discreta* but segmental ratio about 2.3:1.1:0.8:1.1. Labral process flat, about twice as broad as long or slightly broader, trapezoidal with shallow but distinct apical emargination. Clypeus protruding beyond ends of eyes by about one-third its length, evenly rounded from side to side; submedially with small impunctate area, elsewhere with shallow punctures of irregular size separated mostly by one to two puncture widths, surface moderately shiny, with coarse reticular shagreening. Supraclypeal area dulled by minute punctures and reticular shagreening. Genal area slightly broader than eye in profile, with minute round punctures separated mostly by one puncture width or less, surface shiny, only delicately shagreened. Vertex high, above lateral ocellus equal to one and one-half ocellar diameters or slightly more, with small crowded punctures above ocelli and compound eyes, with minute rugulae angling from between lateral ocellus and fovea to above fovea, surface moderately shiny, with fine reticular shagreening. Face above antennal fossae with longitudinal rugulae, interrugal spaces punctate, moderately shiny. Facial fovea large, shallow, extending down to below level of lower margins antennal fossae, separated from lateral ocellus by three-fourths of an ocellar diameter or slightly more.

Pronotum normal, with minute punctures and fine reticular

shagreening moderately dulling surface. Mesoscutum with small deep round punctures separated mostly by half a puncture width or less and fine reticular shagreening dulling surface; parapsidal line about as long as from its posterior end to margin of scutum. Scutellum similar to mesoscutum but shagreening coarser. Metanotum similar to mesoscutum but punctures shallower and denser, shagreening coarse. Propodeum with dorsal enclosure ending abruptly posteriorly (almost carinate), opaque, tessellate with slight basomedial roughening; dorsolateral and posterior areas with moderate-sized shallow punctures separated by one to two puncture widths and fine tessellation dulling surface; corbicular area shiny, with small punctures in anteroventral third or more, surface with fine shagreening. Mesepisternum like mesoscutum but punctures sparser especially posteriorly and surface dulled by reticular shagreening. Metepisternum like corbicular area in lower two-thirds except impunctate and shinier, upper third with minute punctures and reticular shagreening. Middle basitarsus with evenly curved sides, about as broad as hind basitarsus medially. Tegula normal, impunctate. Wings with venation as in *discreta* but pterostigma narrow. Claws and tibial spurs normal.

Metasomal tergum 1 with crowded minute punctures apically, sparse punctures at extreme sides, impunctate in basal three-fourths, surface moderately shiny, finely shagreened. Terga 2-4 with apical area strongly impressed near base and margins reflexed; apical area impunctate, shiny; basal area with small round punctures separated mostly by half a puncture width or less, surface shiny, weakly shagreened. Pygidial plate V-shaped with narrowly rounded apex, with broad shiny impunctate margin and narrow triangular punctate internal area but internal triangle not raised. Sterna 2-5 with apices impunctate, extreme bases impunctate, with crowded, minute punctures subapically, becoming sparser towards base. Sternum 6 with apical tubercle which is circular in outline and flattened.

VESTITURE: Head and thorax with black hairs; those of thoracic dorsum moderately short. Metasoma with first two segments with brown hairs, third segment with brown shading into gold and bright gold on remaining segments (in dark specimens first three segments black, fourth segment brown shading into gold apically, last two segments bright gold). Tergum 1 with apical fringe of moderately long, suberect hairs, base glabrous. Terga 2-4 with short, subdecumbent, highly plumose hairs, sparser on tergum 2, more abundant posteriorly. Sterna with well-formed subapical fimbriae but undeveloped medially on each sternum. Leg hairs black except scopal hairs brown and inner surfaces tarsi reddish-brown. Corbicular area with long, internal, apically plumose hairs in anterobasal third,

without anterior fringe of long curled plumose hairs other than of the internal type. Trochanteral flocculus complete, dense. Tibial scopal hairs highly plumose throughout.

Male. MEASUREMENTS AND RATIOS: N = 2; length, 12–13 mm; width, about 3 mm; wing length, 4.11–4.71 mm; FL/FW, 1.14–1.17; FS1/FS2, 2.13–2.19.

INTEGUMENTAL COLOR: Black except as follows: mandible with tip rufescent; clypeus pale yellow except apical margin, extreme lateral angles and usually (not in allotype) small maculae below and mesad of tentorial pits; allotype with small parocular pale spots, paratype without; flagellar segments 3–11 dark brown below; tegulae piceous to translucent dark reddish-brown; wing membranes infumate, especially apically, brownish, veins dark reddish-brown; terga 2–5 with apical areas testaceous, tergum 3 extremely narrowly pale just basad of apical area; tergum 4 orange except extreme base; terga 5–7 entirely orange. Sterna 2–5 narrowly hyaline apically, dark rufescent basally; sternum 6 rufescent. Distitarsi rufescent; in allotype hind basitarsi dark rufescent. Tibial spurs testaceous.

STRUCTURE: Antennae in repose surpassing tegulae; scape length equals first two and one-half flagellar segments; flagellar segment 1 about equal to segments 2 plus 3 in length; segment 2 slightly shorter than 3 which is subequal to 4; segments 3–11 longer than broad. Eye about three times as long as broad, inner margins parallel. Malar space, mandible and galea as in female. Maxillary palpus as in female but segmental ratio about 1.0:1.0:0.9:0.8:0.8:1.0. Labial palpus as in female but segmental ratio about 2.0:0.8:0.7:1.2. Labral process as in female. Clypeus as in female but punctures more obscure. Supraclypeal area, genal area, vertex and face above antennal fossae as in female.

Thoracic structure and sculpturing as in female with usual sexual differences except as follows: propodeum in allotype with dorsal area rather abruptly declivous posteriorly but without carina-like delimitation between dorsal and posterior surfaces; propodeum with dorsolateral, posterior and lateral areas more coarsely punctate and opaque, finely tessellate. Terga 1–5 like female terga 1–4 except tergum 1 with basal area with small punctures separated mostly by one puncture width. Pseudopygidial area not evident. Sterna 2–5 with apical areas and broad basal area impunctate, with small scattered punctures subapically. Sternum 6 flat with broad V-shaped emargination.

Genitalia and sterna 7 and 8 (Figs. 331–335) similar to those of *fulminea* but note the following: penis valves bent downward (see lateral views); dorsal lobes gonocoxites short and rounded; sternum 7 with apicolateral lobes slightly shorter; sternum 8 with neck

region half as long as basal area, apex shallowly emarginate.

VESTITURE: Head and thoracic hairs black. Terga 1 and 2 with brown hairs; tergum 3 with hairs brown basally shading to golden apically; terga 4-7 with bright gold hairs; terga without apical fasciae, generally as in female except hairs slightly longer and tergum 1 with basal hairs. Sternal hairs brown basally, pale apically; sterna 3-5 without subapical fimbriae. Leg hairs brown to black except distitarsi with pale brown to ochraceous hairs and basitarsi with outer surface with pale brown hairs and inner surface with reddish-brown hairs.

Type Material. The holotype female and allotype male (CAS) from seven miles south of Manzamitla, Jalisco, México, in pine forest, collected by E. G. Ross, December 1, 1948. Two female and one male paratypes (MSU; SECK; INHS) from the state of Michoacán in México are as follows: 2 ♀♀ from Morelia, September 22, 1957, R. and K. Dreisbach; 1 ♂ from Uruapán, October, 1954, N. L. H. Krause.

Andrena (Callandrena) levipes, n. sp.

A. levipes is a very small and distinctive species of *Callandrena* from California and Oregon. The female of *levipes* is readily identified by the narrow facial fovea which is separated from the lateral ocellus by more than one ocellar diameter and which is slightly broader in the lower third than in the upper third. Both sexes often have the abdomen red or banded with red and the face unusually long, as described below. The male is less distinctive than the female but can be distinguished from other small species of *Callandrena* by the sixth sternum having a moderately deep, V-shaped, median emargination and the apicolateral angles forming distinct, blunt, recurved teeth.

Mr. P. H. Timberlake, according to labels he left on certain specimens, considered this species as representative of a new monotypic subgenus. The present author has placed *A. levipes* in the subgenus *Callandrena* because, in spite of the unique characteristics of the female, *levipes* does have the diagnostic *Callandrena* features of barbed scopal hairs, short maxillary palpi, bidentate labral process, incomplete propodeal corbícula and banded terga. Furthermore, the male of *levipes* does not bear features which are unique or which would distinguish them from all other *Callandrena*.

Female. MEASUREMENTS AND RATIOS: N = 20; length, 7.5-9.0 mm; width, 1.5-2.5 mm; wing length, M = 2.53 ± 0.105 mm; FL/FW, M = 1.21 ± 0.018 ; FOVL/FOVW, M = 7.72 ± 0.123 .

INTEGUMENTAL COLOR: Black except as follows: mandible rufes-

cent or mostly so; flagellar segments 2 or 3 to 10 red below; tegula piceous; wing membranes hyaline, veins dark brown; terga entirely red or dark with apical margins hyaline, bases red and just basad of apical margins red forming three or four, more or less red bands or in between these extremes; sterna red with hyaline apical margins; distitarsi dark rufescent; tibial spurs yellow.

STRUCTURE: Antennae short, scape length equals first three and one-half flagellar segments; flagellar segment 1 subequal in length to segments 2 plus 3; segment 2 about equal in length to 3 and slightly shorter than 4; segments 2-5 broader than long, 6-8 quadrate, 9-10 longer than broad. Eye about four times as long as broad or slightly longer, inner margins parallel or converging slightly towards ocelli. Malar space linear. Mandible bidentate, in repose surpassing middle of labrum by about one-third its length; basoventral angle and lamella absent; subgenal coronet well developed. Galea pointed, rounded from dorsum to side, lateral surface equals about half of dorsal or more; surface moderately dulled by coarsely reticular shagreening, punctures minute, sparse. Maxillary palpus about as long as galea or slightly shorter, segmental ratio about 1.1:1.0:0.8:0.7:0.7:0.8. Labial palpus with first segment slightly curved, broadest near tip, segmental ratio about 1.7:1.0:0.8:0.9. Labral process sharply bidentate, slightly deflected. Clypeus evenly rounded from side to side, protruding beyond level of lower margins of eyes by about one-third its median length; punctures medially separated mostly by one-half to one puncture width, more crowded laterally and near posterior margin, surface shiny, unshagreened. Supraclypeal area moderately shiny, with minute, crowded punctures and fine shagreening. Genal area slightly broader than eye in profile, with small punctures separated mostly by one puncture width and delicate shagreening, surface moderately shiny. Vertex above lateral ocellus equals one ocellar diameter or less; punctures crowded above ocelli and in small area above facial fovea, elsewhere sparse, surface shiny, shagreening absent or delicate. Face above antennal fossae with strong parallel longitudinal rugulae reaching ocelli and between lateral ocellus and facial foveae, interrugal spaces with coarse punctures, shiny. Facial fovea narrow, well separated from eye margin, broader in lower third than in upper third, extending below to level of lower margins of antennal fossae or almost, above separated from lateral ocellus usually by about one and one-half ocellar diameters, always by more than one diameter.

Pronotum normal with scattered punctures, dulled above by reticular shagreening, moderately shiny laterally. Mesoscutum with minute round punctures separated mostly by half a puncture width (slightly more posteromedially), surface shiny. Tegula normal, im-

punctate. Scutellum as in mesoscutum. Metanotum dulled by minute crowded punctures and fine tessellation. Propodeum with dorsal enclosure with extremely fine, irregular rugulae basally, surface moderately dulled by fine tessellation; dorsolateral and posterior surfaces with round punctures separated mostly by two puncture widths or less and dulled by dense tessellation; lateral surface shiny, with coarsely reticular shagreening and punctures scattered throughout. Mesepisternum dulled by small crowded punctures and fine tessellation, punctures sparse posteriorly. Metepisternum impunctate and shiny in lower two-thirds, minutely punctate above. Fore wing with three submarginal cells, second cell along posterior margin not much longer than one-third of first cell; veins 1st m-cu meets second submarginal cell near or before middle of cell; pterostigma about as broad as from inner margin prestigma to wing margin. Claws and tibial spurs normal.

Metasomal tergum 1 with minute punctures separated mostly by one to two puncture widths, surface shiny. Terga 2-4 with minute punctures separated mostly by one-half to one puncture width, surface shiny, shagreening present on terga 3 and 4 but delicate. Pygidial plate V-shaped with apex rounded, sides usually slightly concave. Sterna 2-5 with small punctures separated mostly by one to two puncture widths, surfaces slightly dulled by fine reticular shagreening.

VESTITURE: Generally pale ochraceous, vertex and thoracic dorsum slightly darker. Mesoscutal and scutellar hairs short, erect. Terga 2-4 with pale apical fasciae, that on tergum 2 interrupted medially by about one-third width of tergum; tergum 1 with short lateral patches of apical fasciae. Propodeal corbicula incomplete anteriorly, internally with scattered long plumose hairs throughout. Trochanteral flocculus complete, well developed. Tibial scopal hairs long, with minute, close-set barbs in outer half or more of each hair; posterior half of scopa brown in darker specimens, entirely pale ochraceous in pale specimens. Inner surfaces tarsi pale yellow.

Male. MEASUREMENTS AND RATIOS: N = 20; length, 6-8 mm; width, 1.5-2.0 mm; wing length, $M = 2.40 \pm 0.098$ mm; FL/FW, $M = 1.19 \pm 0.008$; FS1/FS2, $M = 1.80 \pm 0.040$.

INTEGUMENTAL COLOR: Black except as follows: mandible with apices rufescent; clypeus cream-colored or pale yellow except apical margin brown, lateral angles black, dark maculae mesad and below tentorial pits and, rarely, slightly infuscated along posterior margin; flagellar segments 3-11 reddish-brown below; tegula piceous to translucent reddish-brown; wing membranes hyaline, veins dark brown to reddish-brown; terga often piceous except apical margins;

terga 1-5 usually hyaline and reddish just basad of apical margins and at extreme bases of terga 2-6 to form red bands across metasoma at least at apices of terga 1-3, often on terga 4 and 5 as well; occasionally terga 2 and 3 largely red and rarely 2 and 3 entirely red and 4 largely so; sterna 2-5 red with hyaline apical margins; distitarsi dark rufescent; tibial spurs pale yellow.

STRUCTURE: Antennae moderately short, in repose barely surpassing tegulae; scape almost as long as first three flagellar segments; flagellar segment 1 slightly longer than segment 3 and twice as long as 2; segment 3 distinctly shorter than 4; segments 4-11 longer than broad. Eye about three and one-half times as long as broad, inner margins converging slightly towards mandibles. Malar space, mandible and galea as in female. Maxillary palpus as in female but segmental ratio about 1.0:1.0:0.9:0.7:0.6:0.7. Labial palpus as in female but segmental ratio about 1.6:1.0:0.6:0.8. Labral process as in female. Clypeus as in female but punctures separated mostly by half a puncture width. Supraclypeal area, genal area and vertex as in female. Face above antennal fossae as in female but median rugulae diverging towards ocelli. Facial fovea represented by narrow impression near inner margin compound eye.

Thoracic sculpture and structure as in female except as follows: mesoscutal and scutellar punctures slightly coarser; propodeum with dorsolateral and posterior surfaces with punctures more crowded and tessellation coarser; lateral surface propodeum moderately dulled by fine tessellation. Metasomal terga as in female but tergum 5 as in terga 2-4. Pseudopygidial area present, with narrow median ridge slightly broadened basad. Sterna 2-5 with apical margins narrowly impunctate, basally with small punctures separated mostly by two to three puncture widths. Sternum 6 rather deeply emarginate medially, apicolateral angles forming piceous, recurved, blunt teeth.

Genitalia and sterna 7 and 8 (Figs. 336-340) similar to those of *gardineri*. Note the following structures: penis valves pointed apically; sternum 7 long medially, with narrow V-shaped apical emargination; sternum 8 with neck region somewhat broadened in lower half, expanded apically, shallowly emarginate.

VESTITURE: Generally pale ochraceous or cinereous, vertex and thoracic dorsum slightly darker. Terga 2-5 with pale apical fasciae, that on tergum 2 broadly interrupted medially, on tergum 3 narrowly so. Sterna 2-5 with relatively short subapical fimbriae, that on sternum 2 less distinctly formed. Inner surfaces tarsi pale yellow.

Type Material. The holotype (UCB) female and the allotype (UCB) male from Lockwood Creek near Stauffer, Ventura County, California, were collected on *Linanthus aureus* by P. D. Hurd. In

addition, 52 female and 23 male paratypes (UCB; INHS; PHT; GEB) from Ventura County, California, are as follows: *Lockwood Creek* near Stauffer, 16 ♀♀, 5 ♂♂, same data as the holotype; 1 ♀, May 5, 1959, on *L. aureus*, G. I. Stage; 15 ♀♀, 9 ♂♂, May 7, 1959, on *L. aureus*, P. H. Timberlake. *Chuchupate Ranger Station* (Frazier Mountain). 2 ♀♀, 2 ♂♂, May 2, 1959, on *Baeria chrysostoma*, P. D. Hurd; 1 ♀, May 2, 1959, on *B. chrysostoma*, G. I. Stage; 1 ♀, May 5, 1959, on *B. chrysostoma*, J. Powell; 2 ♂♂, May 5, 1959, on *B. chrysostoma*, P. D. Hurd; 2 ♀♀, 2 ♂♂, May 8, 1959, on *B. chrysostoma*, P. D. Hurd; 4 ♀♀, 1 ♂, May 8, 1959, on *B. chrysostoma*, P. H. Timberlake; 8 ♀♀, May 10, 1959, on *B. chrysostoma*, P. H. Timberlake. *Hungry Valley*, 5 miles S. of Gorman. 1 ♀, 1 ♂, April 10, 1960, G. I. Stage; 1 ♀, May 6, 1959, J. Powell. *Mt. Pinos*. 1 ♂, May 31, 1943, R. M. Bohart.

Distribution. *A. levipes* is known from California and Oregon. It has been collected from April 2nd through June 17th but chiefly in May. In addition to the type material, 98 females and 17 males have been examined from localities listed below (type localities included).

CALIFORNIA: Canebrake Creek (3 miles W. of Walker Pass), Kern Co.; Carrville; Chuchupate Ranger Station, Frazier Mt., Ventura Co.; Del Puerto Canyon, Stanislaus Co.; Desert Springs; Fawn Lodge, Trinity Co.; Finley (4 miles W.); Hemet Reservoir (San Jacinto Mts.), Riverside Co.; Hungry Valley (5 miles S. of Gorman), Ventura Co.; Kern Camp, San Jacinto Mts.; Idylwild, Riverside Co.; Indian Wells (3.5 miles N.W.), Kern Co.; Lockwood Creek (near Stauffer), Ventura Co.; Mather; McKittrick; Morongo Valley; Mt. Pinos, Ventura Co.; New Cuyama; Pearl Blossom (5 miles N.); Panoche Hills, San Benito Co.; Santa Rosa Summit, Riverside Co.; Shasta County; Short Canyon (6 miles W. of Inyokern), Kern Co.; Temblor Range (12 miles E. of Simmler), S. L. Obispo Co.; Walker Pass, Kern Co.; Weldon (16 miles S.). OREGON: Antelope Mt., Harney Co.

Floral Records. *A. levipes* seems to be somewhat polylectic in its pollen-collecting habits. It has been taken most frequently on flowers of *Linantus aureus* (10 out of 25 collections with floral data) and next most frequently on *Baeria chrysostoma*. *A. levipes* has been taken from flowers of the following plants:

Baeria sp., *B. chrysostoma*, *Coreopsis bigelovii*, *Cryptantha* sp., *Linantus* sp., *L. aureus*, *Phacelia distans*.

SPECIES REMOVED FROM THE SUBGENUS
CALLANDRENA

- Andrena angusi* Viereck, 1907, Ent. News, vol. 18, p. 284; Mitchell, 1960, North Carolina Agric. Exp. Sta. Tech. Bull. 141, p. 139 (referred questionably to *Pterandrena*): remove to subgenus *Plastandrena*.
- Andrena (Pterandrena) brassicae* Mitchell, 1960, North Carolina Agric. Exp. Sta. Tech. Bull. 141, p. 142: of uncertain position.
- Andrena (Pterandrena) dimorpha* Mitchell, 1960, North Carolina Agric. Exp. Sta. Tech. Bull. 141, p. 143: of uncertain position.
- Andrena (Pterandrena) platyrhina* Cockerell, 1930, Jour. New York Ent. Soc., vol. 37, p. 446: remove to *Gymnandrena*.
- Andrena (Pterandrena) plumiscopa* Timberlake, 1951, Proc. United States Nat. Mus., vol. 101, p. 376: of uncertain position.
- Andrena (Opandrena) ricardonis* Cockerell, 1916, Canadian Ent., vol. 48, p. 272; Lanham, 1949, Univ. California Pub. Ent., vol. 8, p. 200 (provisionally referred to *Pterandrena*): of uncertain position.
- Andrena (Andrena) scutellinitens* Viereck, 1916, Proc. Acad. Nat. Sci., Philadelphia, vol. 68, p. 573; Lanham, 1949, Univ. California Pub. Ent., vol. 8, p. 200 (referred to *Pterandrena*): remove to subgenus *Cnemidandrena*.
- Andrena trevoris* Cockerell, 1897, Entomologist, vol. 30, p. 306; Lanham, 1949, Univ. California Pub. Ent., vol. 8, p. 200 (referred to *Pterandrena*): remove to subgenus *Gonandrena*.

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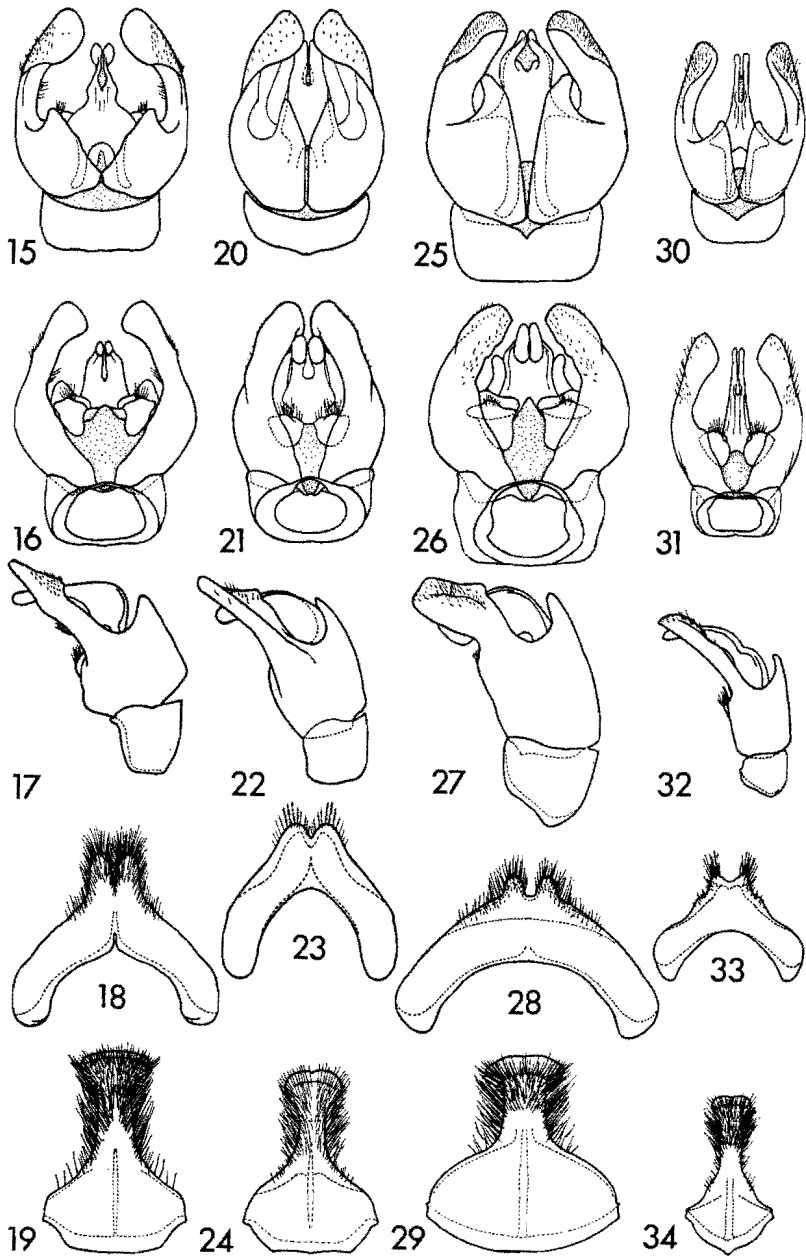
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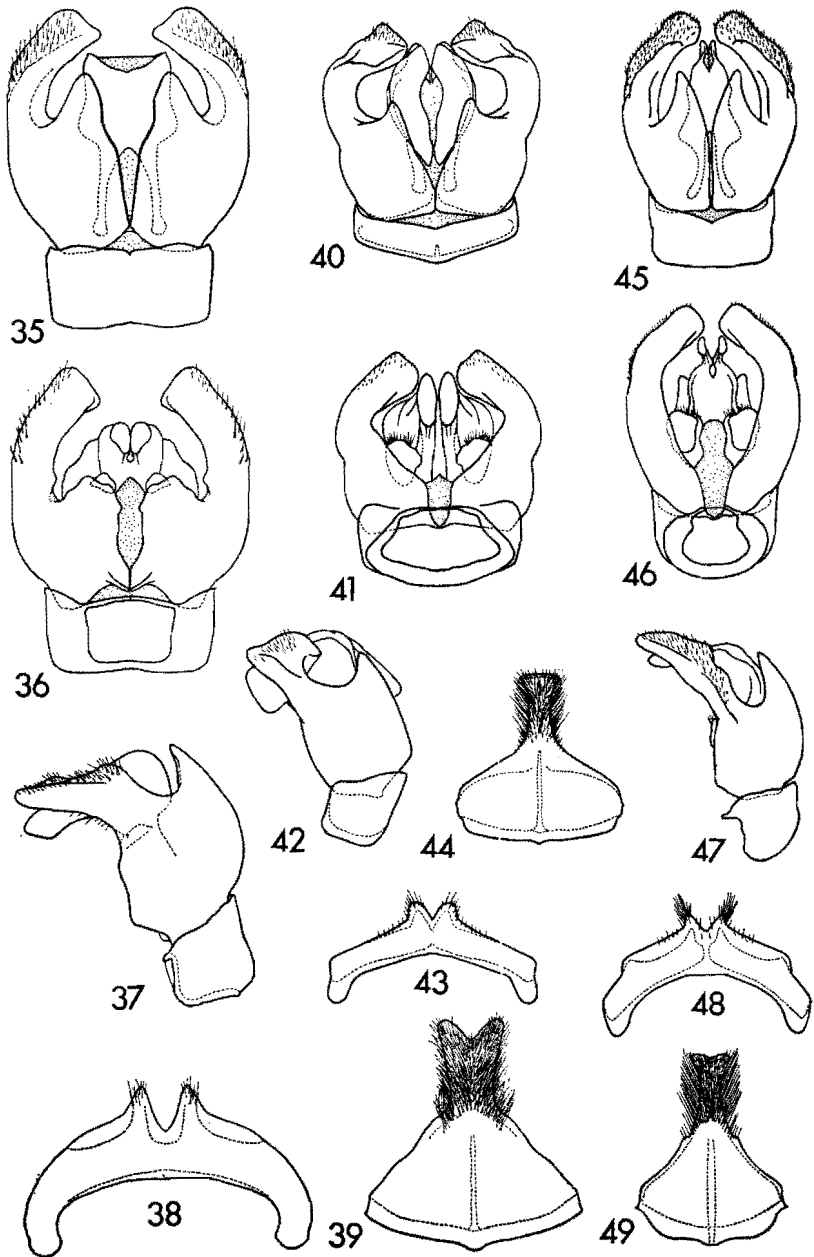
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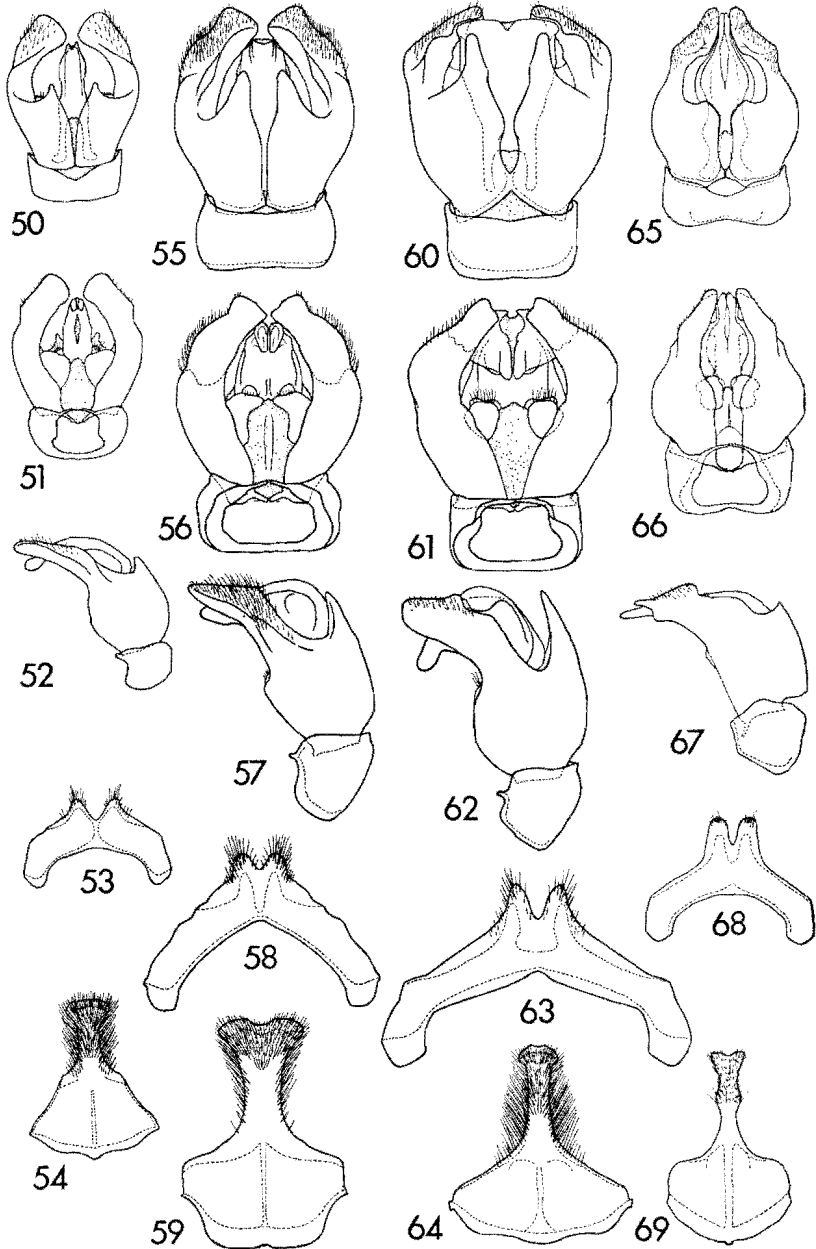
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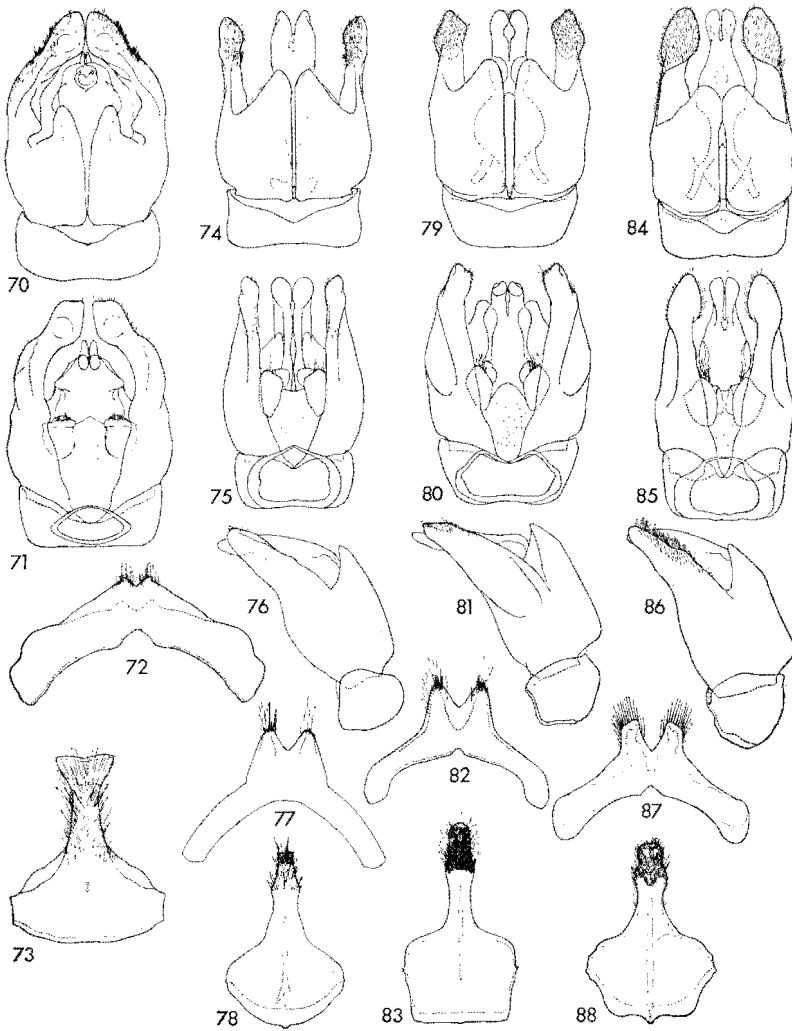
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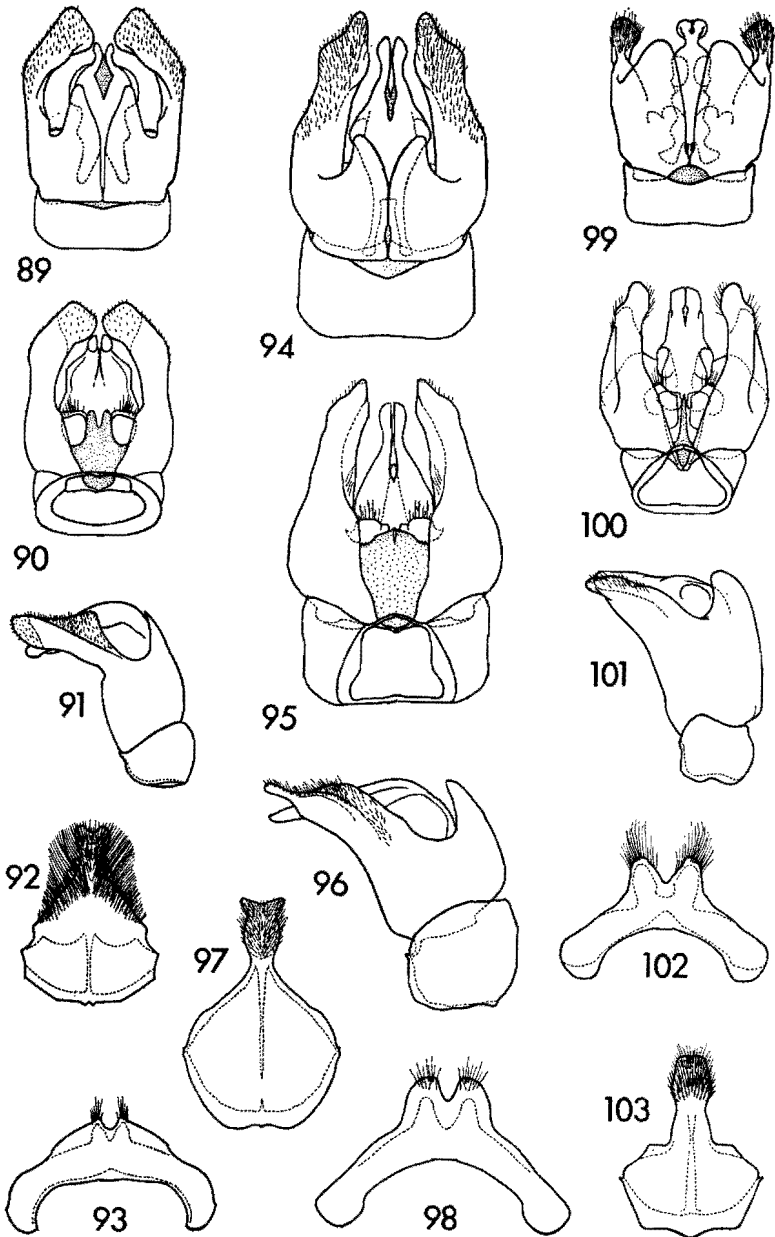


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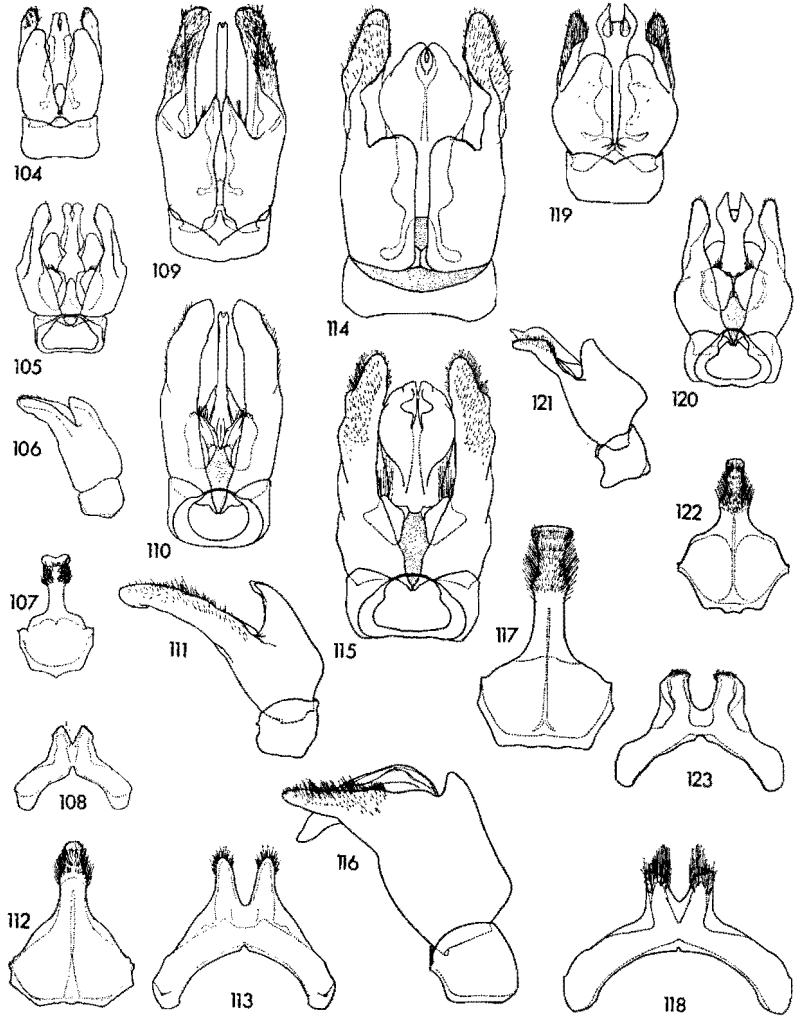


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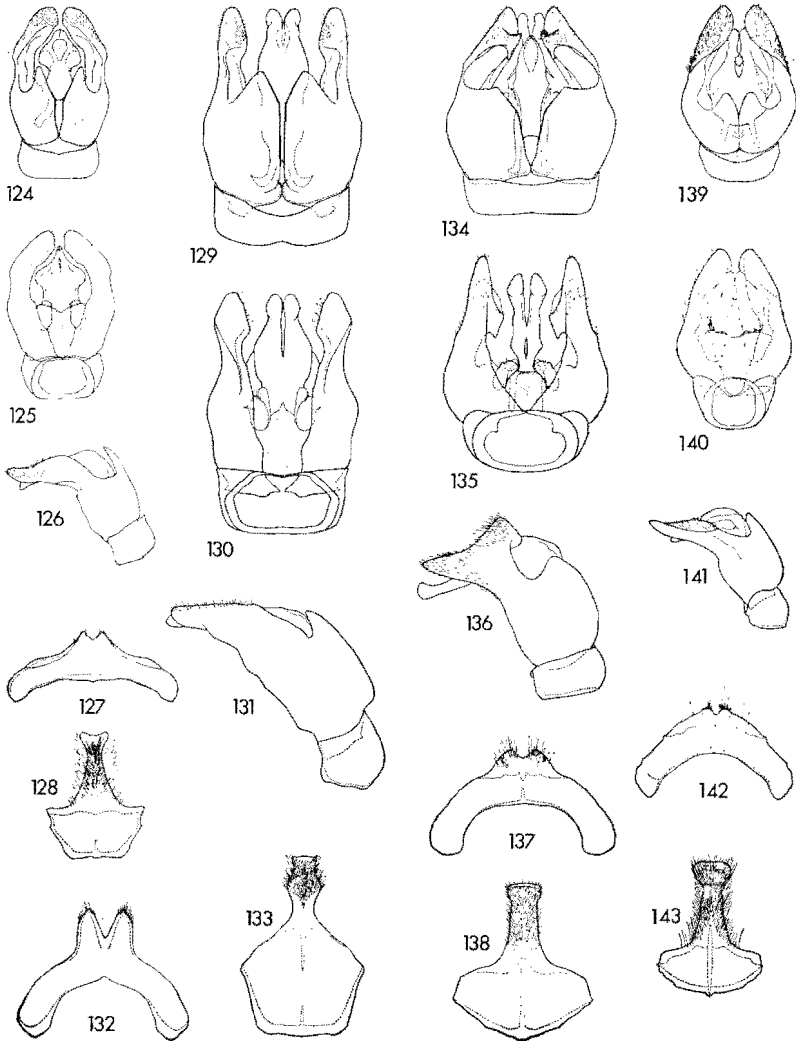


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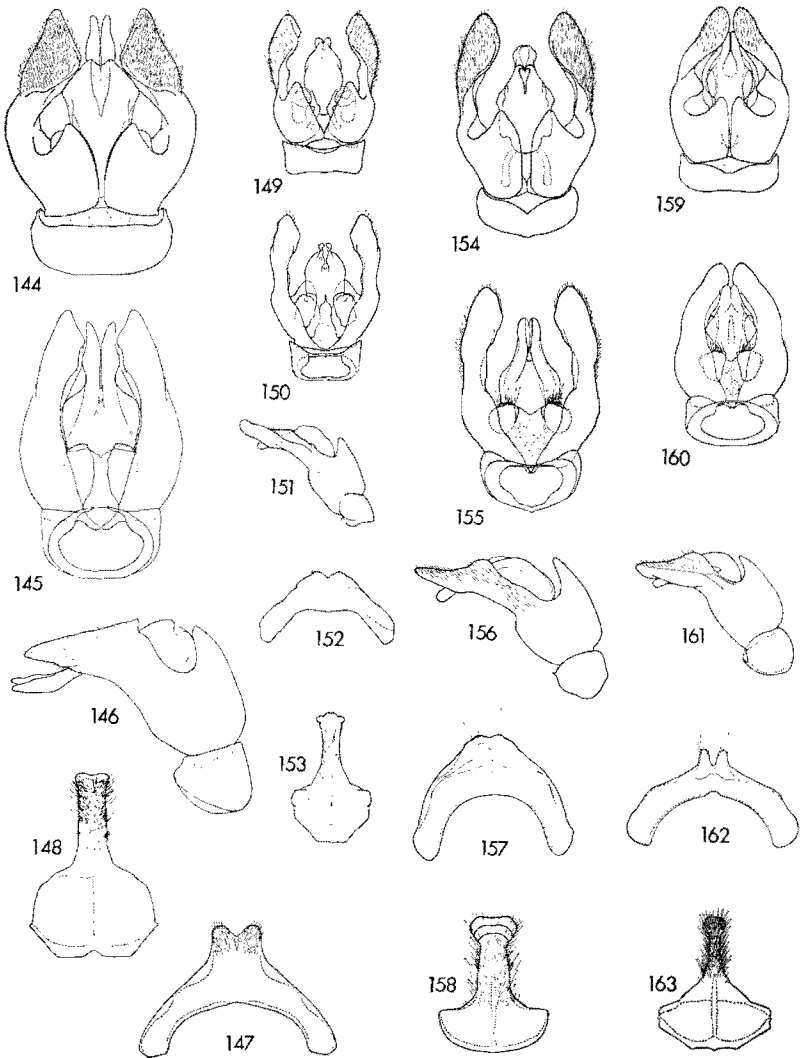


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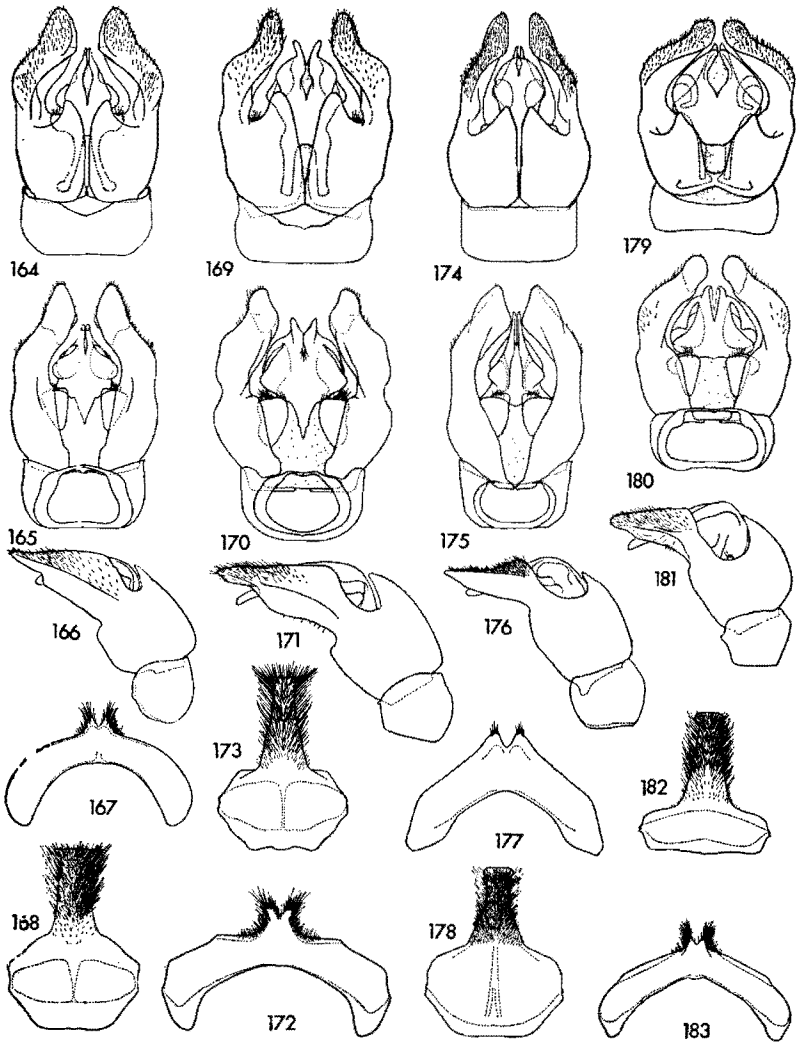


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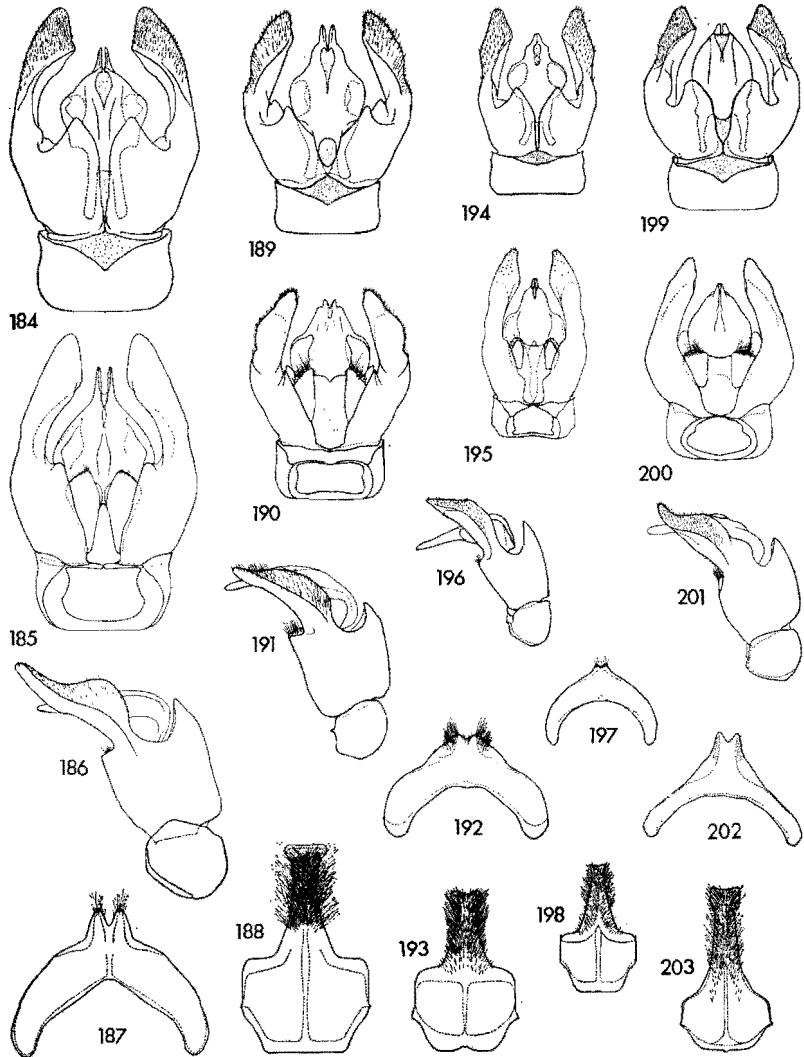


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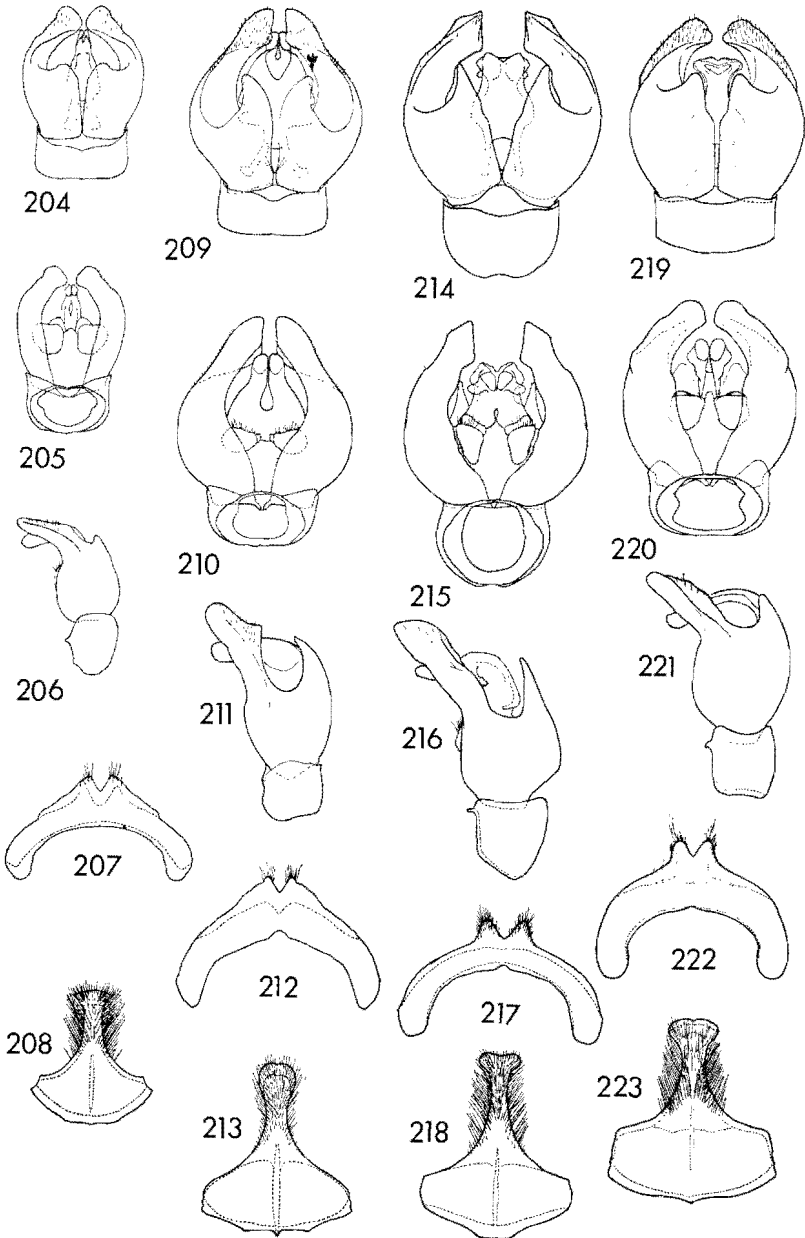
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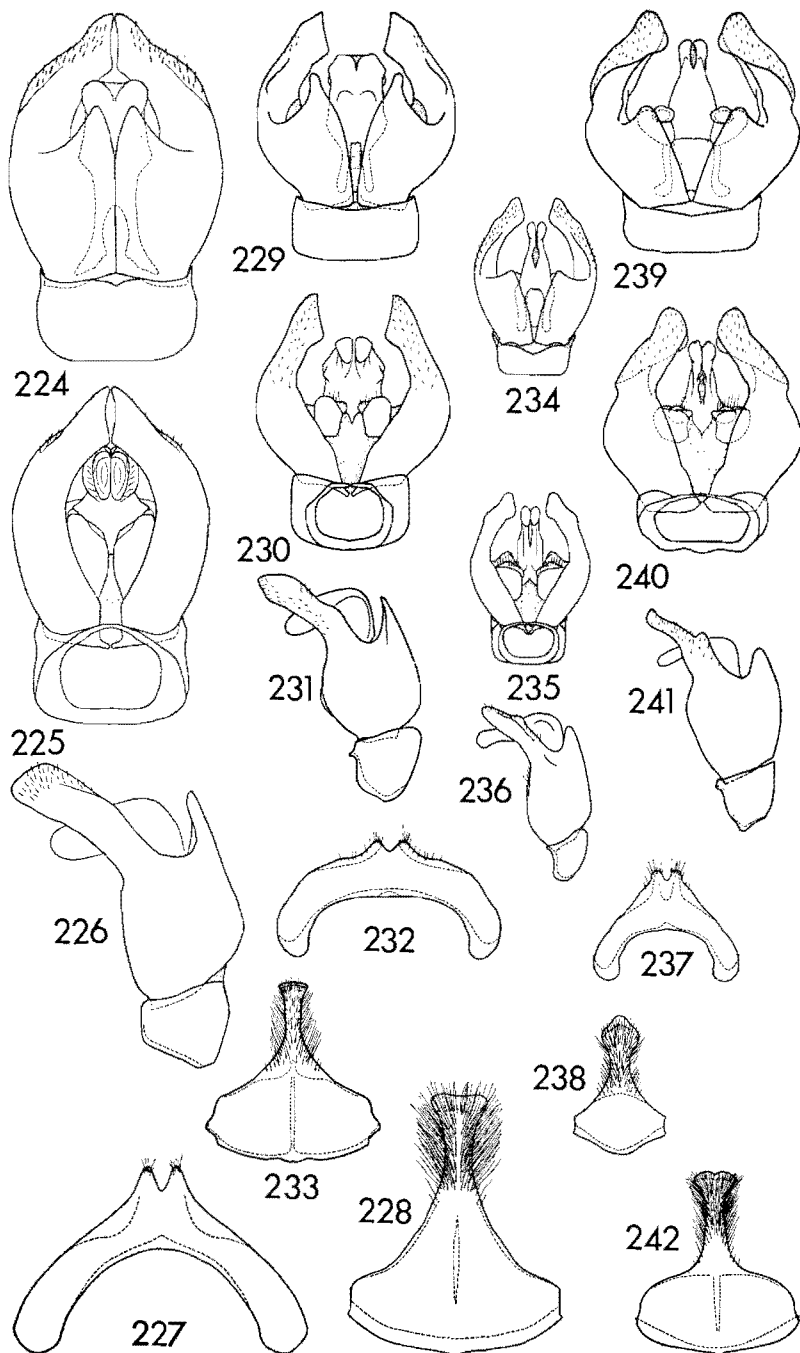
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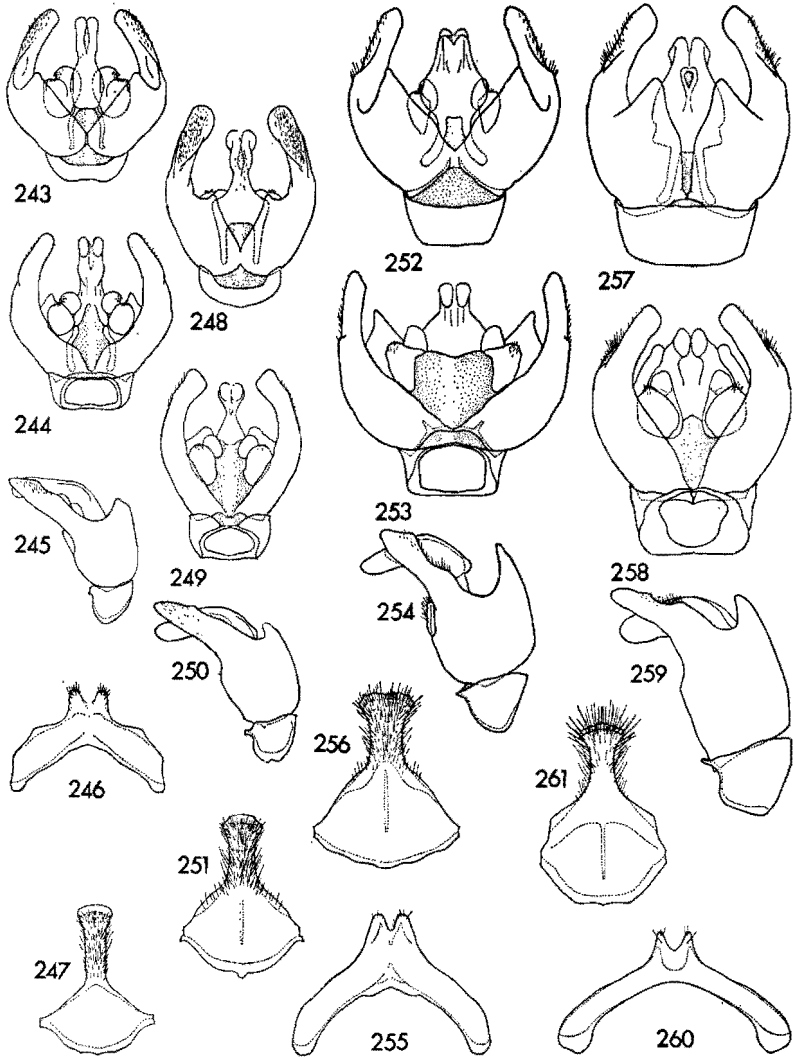
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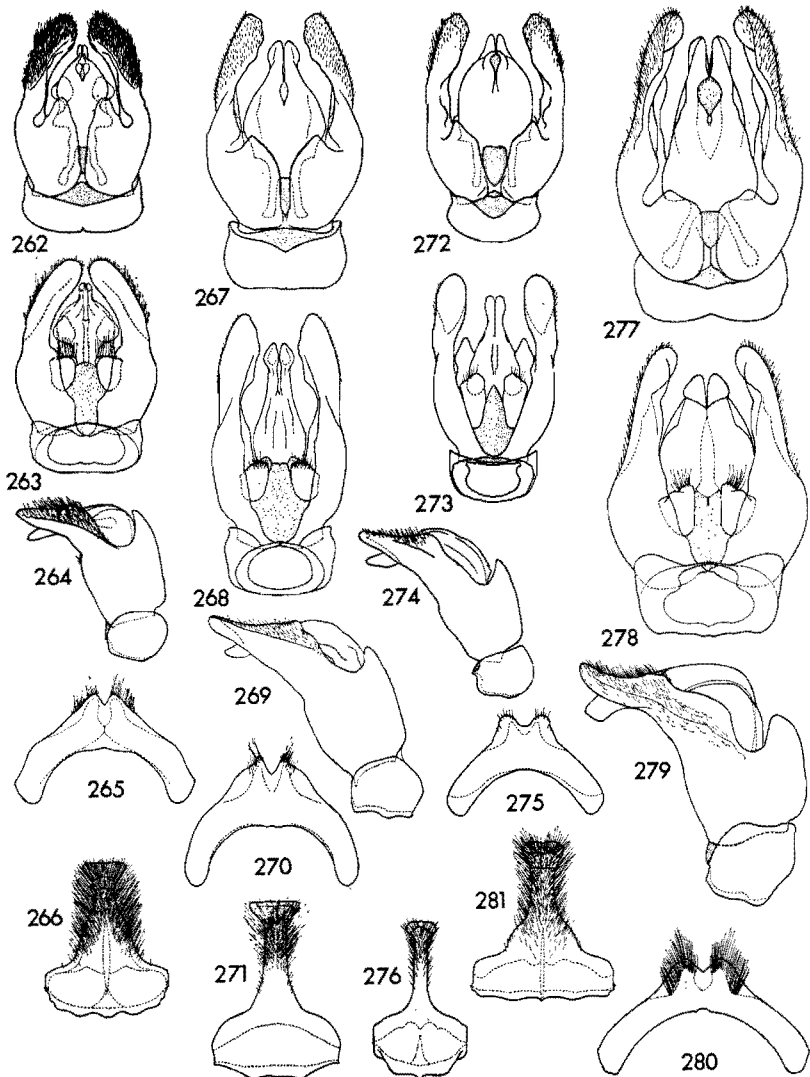
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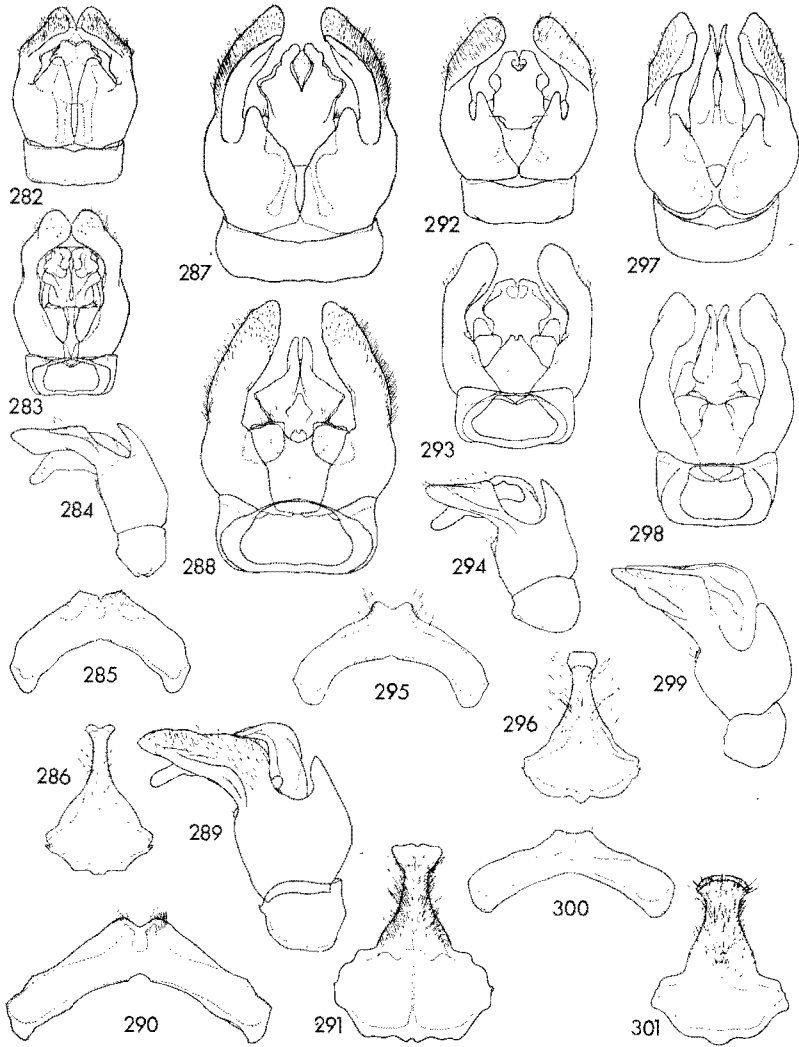


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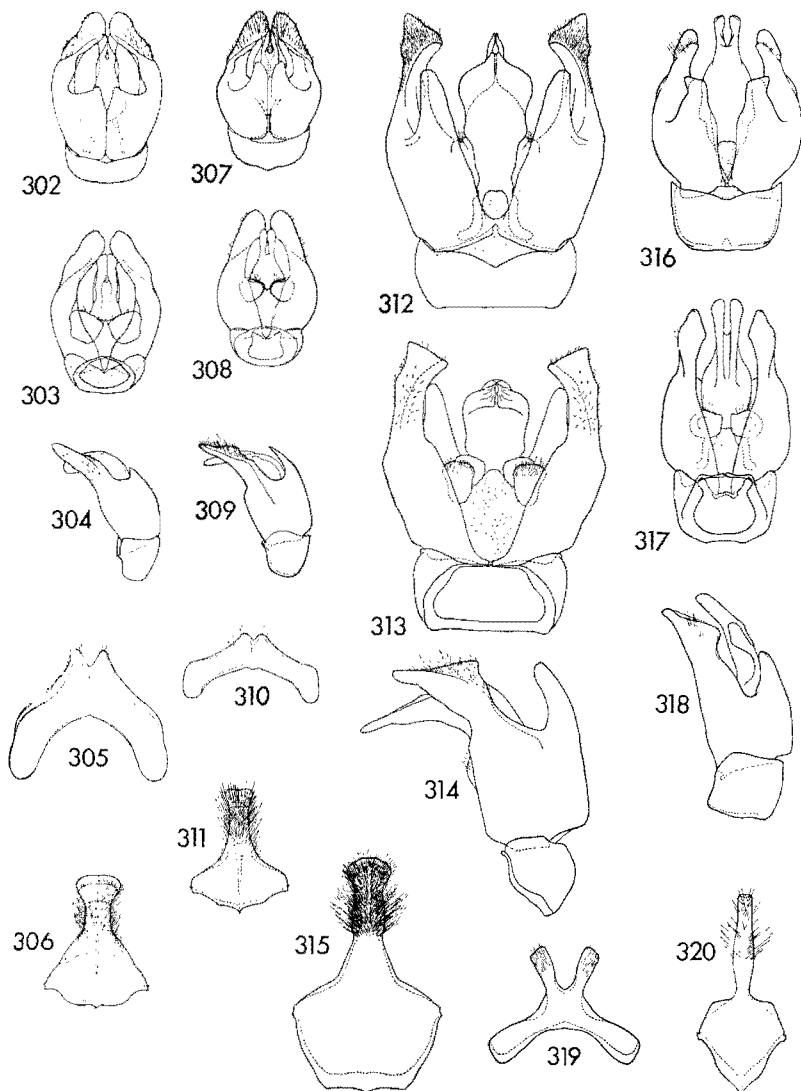


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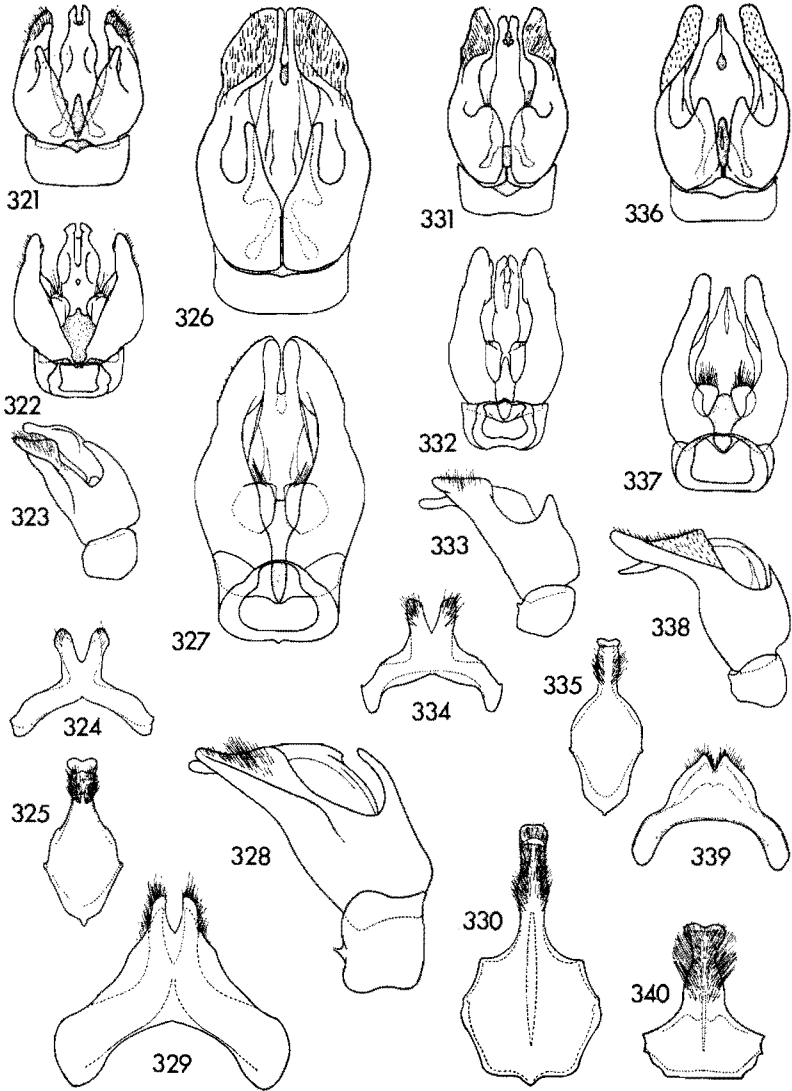
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