

A REVISIONAL STUDY OF THE BEES
OF THE GENUS PERDITA F. SMITH, WITH
SPECIAL REFERENCE TO THE FAUNA OF
THE PACIFIC COAST

(Hymenoptera, Apoidea) Part I

BY

P. H. TIMBERLAKE

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P. H. TIMBERLAKE

THE GENUS *Perdita* forms one of the most interesting groups of bees of the North American fauna, and is one to which the author has devoted much attention during the last twenty-five years. The privilege of examining specimens of *Perdita* belonging to the United States National Museum, the American Museum of Natural History, the California Academy of Sciences, the University of California, and the University of Kansas is gratefully acknowledged, as well as the help of many individuals, who during this time have placed their specimens at the author's disposal. Special mention should be made of J. C. Bridwell, J. Chester Bradley, Herman A. Scullen, E. Gorton Linsley, Charles D. Michener, George F. Knowlton, Richard M. Bohart, George E. Bohart, and Paul D. Hurd, Jr., all of whom have contributed many specimens and have discovered at least one particular species that in many cases would have otherwise remained unknown.

The author is also much indebted to Mrs. Celeste Green for expert help in inking the drawings and arranging the plates that accompany this paper.

The genus *Perdita* is easily distinguished from other panurgine bees by the wing venation. The marginal cell is short, always extending less than half way from the apex of stigma to apex of the wing, and is more or less broadly truncate at apex, either obliquely or almost squarely. The first submarginal cell is also much longer than the second and usually at least twice as large in expanse. In a few species of *Perdita* there is also a small intercalary submarginal cell interposed between the two normal cells.

Up to the present time, fifteen names have been proposed either as subgenera of *Perdita* or as distinct genera allied to *Perdita*, and in the following pages several others are added. A few of these groups might be regarded as distinct genera, but on the whole I think that they should be considered subsidiary, since the species of *Perdita* are very numerous and apparently few, if any, of the evolutionary ramifications of the genus have been lost. The many diverse groups, therefore, are usually connected by intergradient species, sometimes in a most puzzling manner.

In comparison with many other genera of bees, the genus *Perdita* appears to be relatively recent and still actively undergoing evolution. It is entirely restricted to North America, and the center of distribution seems to be the highlands of northern Mexico and contiguous area in the United States. From this center a few species have extended the range to the Atlantic Coast and the southern borders of Canada, and in the tropics at least one species has penetrated as far south as Guatemala.

8. Marginal cell subequal to first submarginal, a little obliquely truncate at apex; stigma more or less narrowly lanceolate; facial foveae distinct9
 Marginal cell more or less shorter and smaller than first submarginal and squarely truncate at apex; stigma small and slender, but more or less rounded out beneath; mandibles simple and tapering in both sexes; facial foveae small and inconspicuous; very small bees with a satiny luster and appressed white pubescence*Heteroperdita*, n. subg.
9. Glossa ordinary10
 Glossa elongate, reaching middle coxae in repose; stigma slightly widened at middle and tapering at apex; facial foveae of female considerably widened at anterior end; abdomen of male at most moderately broadened; mandibles of male simple ..*Glossoperdita* Cockerell
10. Stigma slender and tapering, hardly wide enough to show a central pale streak; mandibles of both sexes with a blunt inner tooth near apex; facial foveae of female elongate and slightly widened anteriorly; abdomen of male not broadened, the front and middle femora subincrassate, and apical joint of tarsi unusually large, with large claws
Hesperoperdita, n. subg.
 Stigma moderately slender; facial foveae of female elongate and very narrow; mandibles in female with a small inner tooth, in male usually simple and tapering; abdomen of male moderately depressed and broadened, the legs ordinary *Epimacrotera*, n. subg.
11. Scopa of hind tibiae copious, the hairs long, often more or less crinkly or minutely branched and adapted for carrying the pollen at least partly dry; claws of female always simple; sides of pronotum of male more or less deeply furrowed, the disk abbreviated laterally, with posterior corners more or less prominent; abdomen of male sometimes depressed and broader than thorax; eighth ventrite of male with a bilobate articulating base12
 Scopa of hind tibiae composed of long, curved, simple, and widely spaced hairs, adapted for carrying agglutinated pollen; claws of female more or less distinctly dentate within; sides of pronotum of male usually not grooved and eighth ventrite with a simple, median articulating lobe at base17
12. Usually large species 5 to 9 mm. long; mandibles of female dilated on inner margin and abruptly bent inward before the apex, the incurved part tapering and simple; abdomen of male no wider than thorax; claws of male cleft, except those of hind tarsi which are simple13
 Smaller, hardly ever exceeding 6 mm. in length; mandibles of female ordinary, or only moderately expanded within and but little incurved at apex; abdomen of male usually moderately broad and depressed; claws of male all cleft14
13. Maxillary palpi six-jointed; stigma of wings moderately wide, sometimes less than half as wide as marginal cell; thorax green, never black on mesonotum and scutellum, but sometimes yellow; abdomen of male elongate-oval, the mandibles long, slender, tapering, and curved*Cockerellia* Ashmead
 Maxillary palpi three- to five-jointed; stigma considerably larger and broader, and more than half as wide to fully as wide as marginal cell; mandibles of male long, simple, abruptly bent inward before the middle, and slightly dilated beyond the bend; thorax green, with the disk of mesoscutum and scutellum black*Procockerellia*, n. subg.
14. Maxillary palpi five-jointed15
 Maxillary palpi six-jointed16
15. Metallic blue or green species, usually with white face marks; tibial scopa of female unusually copious; abdomen of male depressed, considerably broader than thorax and usually without light markings; aedeagus with only one pair of volsellae
Pentaperdita Cockerell and Porter
 Large robust yellow species, with black or nearly black markings on head and thorax; head of male very large, quadrate, the cheeks broad; malar space short but evident (almost obliterated in allies); disk of clypeus small, much less in width than the lateral extensions or the enormous lateral plates of face; antennae slender, the scape about five times as long as thick, the first joint of flagellum longer than the preceding or following joint
Xeromacrotera, n. subg.

16. Large robust bees, the abdomen broader than thorax in both sexes; mandibles tapering, acute at apex, those of female with a triangular process on inner margin at about one-fourth of length from base; abdomen with yellow bands and a definite pygidial plate in both sexes; tibial scopa copious for a *Perdita* and distinctly plumose

Callomacrotera, n. subg.

Small species of ordinary form, the abdomen of male broader than thorax, without distinct light markings, and subpygidiform at apex; mandibles of female more or less dilated within, and tapering and acute in male; tibial scopa moderately copious, the hairs simple and curved, except those on dorsal margin which are mosslike with close-set, very short branches *Hexaperdita*, n. subg.

17. Marginal cell never excessively shortened and oblique; second submarginal cell not triangular 18

Marginal cell extremely short and oblique beneath the short broad stigma; metacarpus very short, sometimes shorter than the apical truncation of marginal cell; second submarginal cell triangular, with the first and second intercubiti uniting on radius; clypeus of male produced into a sharp tooth or slender lobe on each side of base of labrum

Perditella Cockerell

18. A small intercalary cell usually present between the normal first and second submarginal cells; mandibles of male with a small tooth on inner margin at apex . . . *Alloperdita* Viereck

A small intercalary cell never present; mandibles of male usually simple and acute at apex

Perdita F. Smith

The species remaining in the typical subgenus are very numerous and diversified, but the characters separating them are more intergradient or of less phylogenetic importance than those brought out in the above table. Many species groups are recognizable under the subgenus *Perdita*, mainly by color characters and sculpture, and in many cases the groups are best distinguished by the characters of the male genitalia. Some of these groups have been named, that is, *Zaperdita* Robertson, *Neoperdita* Ashmead, and *Tetraperdita* and *Geoperdita*, both of Cockerell and Porter. The type species of *Perdita*, itself, unfortunately is rare and little known, and its male when discovered may reveal characters that would change the subgeneric use of the name.

Subg. *Xerophasma* Cockerell

Xerophasma Cockerell, 1923, Amer. Mus. Novitates, 66:1.

Type of subgenus.—*Xerophasma bequaerti* Cockerell.

Large pallid nocturnal species with large ocelli. Head no wider than thorax, the eyes and ocelli large, the inner orbits parallel. Antennae inserted distinctly above middle of face, so that the frons is greatly reduced, and the clypeus and other parts below the antennae enlarged. Lateral plates of face broad below but contracted opposite the subantennal plates, at which point they are equaled or exceeded by the latter. Antennae long and slender, the joints of flagellum slightly longer than thick. Mandibles slender and tapering to the acute apex. Mouth parts moderately long, ordinary in structure, the maxillary palpi composed of six long and nearly equal joints. Facial foveae shallowly impressed, linear and rather long, considering the reduced size of the frons. Wings ample, the stigma large and as broad as the first submarginal cell; marginal cell as long as stigma but not quite reaching half way to apex of wing; a small, triangular, and peliolate submarginal cell intercalated between the normal first and second cells. Pygidial plate broadly trigonal and more or less acute at apex. Tibial spurs long, straight, and slender; tarsal claws toothed within. Pubescence fine and mostly short and inconspicuous, that of mesonotum rather dense and sericeous. Scopal hairs of hind tibiae long, straight, and rather sparse, the hairs on outer side of hind basitarsi similar but somewhat shorter.

Male.—Similar to female in almost every way except in the primary sexual characters. Claws bifid.

KEY TO SPECIES

1. Eyes and especially the ocelli comparatively enormous; testaceous yellow species, with a fuscous or brownish shading on the frons and vertex and a narrow brownish band subapically on tergites 1 to 5; length, about 10 mm. *bequaertiana* Cockerell
 Eyes and ocelli considerably less enlarged; pale testaceous or flesh color, without dark shading on the frons or vertex and only a slight banding on abdomen; length, 8-9 mm. (male 6.5-7.5 mm.) *pallida*, n. sp.

Perdita bequaertiana Cockerell

Xerophasma bequaerti Cockerell, 1923, Amer. Mus. Novitates, 66:2, ♀ (not *Perdita bequaerti* Viereck).

Perdita bequaertiana Cockerell, 1951, U. S. Dept. Agric., Monogr., 2:1089.

This species was described from a single female captured at about 10 P.M., July 9, 1917, at a light at Fabens, El Paso County, Texas.

Elsewhere I am recording new material from Big Spring, Texas, and describing the male. The following new species may prove eventually to be merely a race, as the male genital characters are virtually identical with those of *bequaertiana*.

Perdita pallida, n. sp.

Female.—Pale testaceous, the antennae, tegulae, and legs concolorous. Mandibles reddened at apex. Tergites 1 to 4 with a narrow, apical, pale ferruginous band, or the abdomen almost uniformly pallid. Wings hyaline, the nervures and stigma pale ferruginous, the subcosta somewhat piceous. Head about as wide as long, the facial quadrangle distinctly longer than wide. Summit of clypeus reaching level of middle of subantennal plates. Ocelli equal to about one-fifth, or a little less, of the width of the frons and much less than space between posterior pair; the latter somewhat more than half their diameter from nearest eye margin. The pale ferruginous foveae reaching from level of antennal sockets to level of anterior margin of the median ocellus. Body moderately shiny and minutely punctured, the punctures rather sparse except on frons where they are very minute and close. A broad area on middle of propodeum very minutely tessellate and dull. Length, 8-9 mm.; anterior wing, 6-7 mm.

Male.—Essentially like the female in most characteristics, but the margins of the stigma slightly infuscated. Length, 6.5-7.5 mm.; anterior wing, 5.6-6.5 mm.

Holotype female, allotype, and 3 males (paratypes), Hopkins Well, Riverside Co., California, on *Oenothera deltooides*, April 27, 1949 (J. E. Gillaspay). Paratypes as follows: 20 males, 21 females, at same flower, region of Hopkins Well, 18 miles west of Blythe, April 29, 1952 (Hurd, Rozen, and Timberlake); 7 males, 5 females, Borego Valley, San Diego Co., May 1, 1952 (Hurd, Rozen, and Timberlake); 1 female, Colorado Desert, May 15, 1933 (exact locality and collector not recorded); and 1 female, Yuma, Arizona, May, 1937 (R. C. Dickson).¹

Types in collection of the University of California at Riverside and paratypes at Berkeley.

Pseudomacrotera, n. subg.

Type.—*Perdita turgiceps* Timberlake.

This is a monotypical group based on a rather large species of the California deserts, flying in late spring and early summer. The male has the aspect of *Macrotera*, with a head that is usually enormous and a broad depressed abdomen. The mandibles of the male are peculiar in having a broad truncate dilation near middle of the inner margin, and the apical ventrite is greatly inflated and protruded.

Male.—Head in megacephalous phase much larger and broader, in normal phase only slightly broader, than thorax. Cheeks broad and simple. Eyes relatively small, somewhat diverging in

¹ Dr. Dickson informs me that the specimen was collected by his mother at light at her home near Yuma.

front. Mandibles arcuately tapering beyond the dilation and acute at apex. Glossa of ordinary length. Maxillary palpi with six, the labial palpi with four joints. Last three joints of labial palpi subequal and together about three-fourths as long as the first joint. Paraglossae reaching nearly to apex of first joint of labial palpi. Wings about normal in size, the stigma slender, but rounded out beneath. Marginal cell barely longer than the first submarginal, the metacarpus slightly longer than the stigma and twice as long as the apical truncation of the cell. Claws abruptly bent and cleft, with the inner tooth three-fourths as long as the outer one. Abdomen more or less broader than thorax and subdepressed, tergites 2 and 3 transversely grooved at base; tergite 7 simple and broad at apex. The venter with eight visible segments, the eighth having a large inflated apical plate that is strongly protruded. Head and thorax polished, with very minute sparse punctures. Pubescence thin and suberect, that of abdomen minutely sericeous.

Aedeagus large. Caulis about one-half longer than wide, convex above, without the usual deep and broad longitudinal furrow, but dividing dorsally slightly beyond the middle into two spreading lobes; the basal orifice large and vertical; inferior pair of volsellae extremely large, laminate, continuous with inferior wall of caulis, and reaching about level with apex of dorsal lobes; superior volsellae absent. Parameral lobes of stipes very slender, subterete, long, curved, and inserted on the sides of caulis between base of dorsal lobes and base of the inferior volsellae. Sagittae fused beyond the base, thick basally both in width and depth, and slightly tapering toward apex, which becomes depressed and mucronate with two fine points lying close together.

Female.—Like an ordinary *Perdita* in habitus, but marginal cell longer than usual and the hind knee plates distinct. Mandibles bidentate at apex. Pygidial plate narrow, subacute, but ovally widened on basal half. Pubescence of head, thorax, and legs considerably more abundant than in male. Scopal hairs of hind tibiae long, coarse, and most of them strongly curved, the scopa being adapted for carrying the usual agglutinated mass of pollen.

Perdita turgiceps, n. sp.

The male with its enormous head, white face marks, and broad reddish brown abdomen is a striking insect. The female is more ordinary and has creamy white bands on the abdomen.

Male.—Head dark brown with the frons and vertex more or less darker and slightly bluish. Mandibles except reddish inner margin and apex, clypeus, lateral, subantennal, and supraclypeal marks ivory white. Lateral marks about twice as broad as high and almost perfectly transverse on dorsal margin. Supraclypeal mark twice as broad as high. Sutures of face below antennae conspicuously blackish. Labrum testaceous. Thorax black, the prothorax, metapleura, and sides of propodeum more or less brown, the mesopleura with a slight greenish luster. Abdomen dark reddish brown, with tergites 4 to 6 sometimes somewhat darker. Inflated protruded part of eighth ventrite testaceous. Legs brown, becoming darker on posterior side of femora and tibiae; extreme apex of all the femora, front and middle tibiae anteriorly, and front tarsi pale yellow. Antennae brown, the under side of flagellum reddish, and the scape nearly black. Tegulae pale testaceous. Wings almost clear hyaline, the nervures pale brown, with subcosta and margins of stigma darker.

Form robust, with head much broader than thorax, distinctly quadrate, and about as broad as long. Cheeks broad and simple. Clypeus broad and low, the lateral extension long and slender, but the disk not greatly wider than high. Subantennal plates small and oblique, the lateral plates very broad below. Facial foveae finely linear and close to the eye margins. Thorax small in comparison with head or abdomen, the latter depressed and about one-half longer than wide. Head and thorax mostly smooth, with very minute, sparse punctures, but frons and vertex delicately tessellate, and the extremely fine punctures of the frons becoming more numerous on each side between antennal sockets and eyes. Abdomen shining and with very close microscopic punctures except on the apical margin of the segments. Pubescence whitish, short, and sparse; that of abdomen fine, short appressed, and sericeous, becoming a little longer and thinner on the venter. Hair on outer side of hind tibiae and basitarsi very fine and abundant. Length, about 5 to 6 mm.; anterior wing, 4.8 mm.

The smaller-headed phase may have the dark part of the head more or less completely dark

greenish blue, and the frons, vertex, and temples finely and distinctly tessellate and moderately shining.

Female.—Black, the frons, vertex, cheeks, mesopleura, and basal half of propodeum tinged with dark green. Flagellum brown, becoming yellowish brown beneath and almost fuscous above. Mandibles red, darker at apex. Large spot on base of mandibles, spot on lateral extensions of clypeus, median stripe on the disk, large lateral marks, and somewhat rounded subantennal marks creamy white. Lateral marks rounded below, oblique on inner side, and acutely angled on orbits at level of antennae. Band on hind margin of pronotum, interrupted medially, and spot on tubercles creamy white. A rather broad creamy white band across the middle of tergites 2 to 4, each slightly notched in front, or sometimes narrowly interrupted at middle, and broadly and shallowly emarginate behind on each side. Also a white spot on each side of tergite 5. Apical margin of tergites subhyaline but not conspicuously pallid. Legs dark, the apex of front femora, stripe on anterior side of front tibiae, and small spot at apex of middle femora yellowish; small spot at base of front and middle tibiae creamy white; and the small joints of tarsi ferruginous brown. Tegulae and wings as in male.

Head as long as wide, well rounded on sides and about as broad as thorax. Disk of clypeus slightly broader than high, the lateral extensions short and tapering. Facial foveae very long, longer than scape of antennae. Abdomen broadly oval, the apical depression of tergites broad. Inner tooth of claws about one-half as long as outer tooth. Head and thorax shining, the frons, vertex, and mesopleura minutely tessellate and slightly dullish. Punctures of face minute, numerous but not crowded on frons, sparser on vertex, and a little coarser and sparse on clypeus; those of mesoscutum very minute, moderately close on anterior half, and sparse behind and on scutellum. Abdomen shining, with very minute, almost dense punctures on disk of tergites 2 to 4. Pubescence white, fine, and moderately long, becoming rather abundant on anterior half of mesoscutum, on the mesopleura, and at apex of abdomen. Tergites 2 to 4 minutely sericeous. Hair on inner side of tarsi pale ferruginous. Length, about 6.75–7.3 mm.; anterior wing, 4.5 mm.

Holotype male and allotype, Palm Springs, California, the male collected May 20, 1917 (E. P. Van Duzee) and the female on *Acacia greggii*, May 11, 1935 (Timberlake). Paratypes as follows: 4 males taken with holotype (Van Duzee), 34 males, 5 females taken with the allotype (Timberlake); 1 male, Palm Springs, on *Cercidium floridum*, April 9, 1936; 1 female, 6 miles south of Palm Springs, on *Eriogonum trichopes*, June 8, 1937, 1 male on *Prosopis juliflora*, 2 females on *Eriodictyon crassifolium*, Andreas Canyon, near Palm Springs, April 11, 1936; 13 male, 3 females, 4 miles east of Edom, on *Dalea schottii*, April 17, 1937; 1 male on *Cryptantha barbiger*, 3 males on *Dalea schottii*, and 13 males, 6 females on *Cercidium floridum*, La Quinta, April 24, 1938; 1 female, near Cathedral City, on *Larrea divaricata*, April 26, 1941; 1 male, Palm Springs, on *Dalea schottii*, April 14, 1946; 3 males, 1 female, 4 miles south of Palm Springs, on *Larrea*, May 6, 1946; 2 males, 4 females, 4 miles southwest of Victorville, on *Larrea*, June 4, 1938; 1 female, near Oro Grande, in automobile, June 4, 1938; 6 males, 1 female, 6 miles south of Twentynine Palms, on *Dalea californica*, May 7, 1948 (Timberlake); 1 male, 4 females, Palm Springs, on *Dalea californica*, April 27, 1943; 5 males, near Thousand Palms Canyon, April 17, 1917 (Cockerell); 1 male, Box Canyon, near Shaver's Well, on *Hyptis emoryi*, April 14, 1935 (H. L. McKenzie); 23 males, 4 females, Painted Gorge, Imperial Co., on *Larrea*, April 12, 1949 (R. A. Flock); 1 male, Mazourka Canyon, Inyo Mts., on *Dalea*, May 25, 1937; 1 female, Westgaard Pass, Inyo Co., June 3, 1937; 1 female, Panamint Mts., Inyo Co., May 30, 1937 (N. W. Frazier); 9 males, 1 female, Westgaard Pass, June 3, 1937; 1 male, Panamint Mts., May 30, 1937 (E. C. Van Dyke); 2 males, 1 female, Darwin Falls, Argus Mts., Inyo Co., on *Euclide urens*, June 5, 1939 (R. M. Bohart); 4 males, 1 female, Darwin Falls, May 30, 1937; 2 males, Wild Rose Canyon, Panamint Mts., 7,000 feet, on *Cryptantha*, May 27, 1937; 3 females, Wild Rose Canyon, 7,500 feet, on *Cowania stansburiana*, June 19, 1937; 19 males, 5 females, Westgaard Pass, on *Dalea fremontii*, June 15, 1937; 1 female, 5 miles northwest of Kane Springs, June 6, 1939 (C. D. Michener); 7 males, 8 females, Borego, San Diego Co., April 24–25, 1949 (J. E. Gillaspay and L. W. Quate); 2 males, 7 females, Cathedral City, on *Larrea*, April 10, 1936; 14 males, 2 females, Edom, on *Larrea*, April 17, 1937 (E. G. Linsley); and 7 males, 4 females on *Dalea schottii* and 1 male on *Cryptantha augustifolia*, Box Canyon, Riverside Co., April 27, 1952 (Timberlake, Rozen, and Hurd).

Also 1 female, Rosarito Beach, Lower California, on *Baeria*, April, 1939 (Michener); and 1 male, Maricopa Mts., Arizona, April 13, 1947 (H. and M. Townes).

Holotype (no. 2992) in collection of California Academy of Sciences, San Francisco; allotype in collection of Citrus Experiment Station, Riverside; paratypes in collections of U. S. National Museum (no. 44121), University of California at Berkeley, University of Kansas, and in the personal collections of Messrs. Bohart and Michener.

Subg. *Macrotera* F. Smith

Macrotera F. Smith, 1853, Cat. Hym. Brit. Mus., 1:130.

Type of subgenus.—*Macrotera bicolor* F. Smith.

Although described as a discrete genus, *Macrotera* is essentially like other forms of *Perdita* in general characters.

Tongue very long and reaching hind coxae in retracted position. Stigma of fore wing small and very narrow. Marginal cell long, obliquely truncate at apex, reaching somewhat less than one-half of distance from apex of stigma to apex of wing. Scopa of hind tibia composed of close-set, rather coarse, long, recurved simple hairs, of nearly uniform length, although some from the under margin of the apical half of tibia are somewhat longer and more curved than others. Mandibles with a small inner tooth at apex. Labial and maxillary palpi ordinary.

Male with similar characters. Head usually much enlarged, much broader than long, with the eyes rather small and diverging in front. Mandibles moderately long, stout, bluntly edentate at apex, and strongly curved, or almost elbowed. Labrum much broader than long. Disk of clypeus short and very broad, the lateral extensions long and attenuate. Lateral plates of face extremely large and broad, with the subantennal plates relatively minute. Facial foveae elongate and widening at upper end. Abdomen broad and much flattened, but otherwise ordinary. Outer surface of hind tibiae and basitarsi invested with short, stout, mosslike setae. Spurs of middle and hind tibiae recurved or almost hooked at apex.

The three known species of this group have been found in Mexico and along the southern border of the United States in Texas and New Mexico.

KEY TO SPECIES

- | | |
|--|----------------------------|
| 1. Females | 2 |
| Males | 4 |
| 2. Clypeus rather coarsely punctured only at the sides or across the disk; thorax shining, with fine scattered punctures on disk | 3 |
| Clypeus with rather fine and well-scattered punctures; mesonotum shining, the punctures very fine and close; abdomen blackish, but often ferruginous on apical segments, and rarely almost entirely dark ferruginous; wings whitish hyaline, the nervures pale ferruginous; length, 8–9 mm. | <i>texana</i> (Cresson) |
| 3. Clypeus with irregular large punctures, scattered over the whole disk; abdomen elongate ovate, ferruginous, more or less fuscous at base; apical fimbria fulvous; length, about 9 mm. | <i>bicolor</i> (F. Smith) |
| Clypeus smooth in middle and with rather large punctures on each side; abdomen piceous, the broad apical depression of tergites and most of the fifth segment dark rufous; punctures of mesonotum scattered and not all of one size; length, 9 mm. | <i>secunda</i> (Cockerell) |
| 4. Head and abdomen ferruginous, or the head sometimes more or less infuscated; face without yellow markings; head and thorax shining, the middle of the frons and mesonotum with close minute punctures; wings whitish hyaline, the nervures pale ferruginous; length, 6–7 mm. | <i>texana</i> (Cresson) |
| Head blackish, somewhat reddened on vertex and cheeks; a broad yellow band across anterior border of face, including clypeus and transverse lateral marks; head and thorax dull, the fine punctures close on frons and dense on mesonotum; wings dusky hyaline; length 8–8.5 mm. | <i>bicolor</i> (F. Smith) |

Perdita texana (Cresson)

Macrotera texana Cresson, 1878, Trans. Amer. Ent. Soc., 7:70, ♀; *P. texana* Cockerell, 1896, Proc. Acad. Sci., Phila., 48:52.

Macrotera megacephala Cresson, 1878, *ibid.*:71, ♂.

I have seen a few specimens of this species from Texas and a large series of both sexes collected by J. W. MacSwain at flowers of *Opuntia*, Loving, New Mexico; also one male, Carlsbad Cavern, New Mexico (J. O. Martin).

Perdita bicolor (F. Smith)

Macrotera bicolor F. Smith, 1853, Cat. Hym. Brit. Mus., 1:130, pl. 5, fig. 20-22, ♀; Cockerell, 1905, Trans. Amer. Ent. Soc., 31:321.

Perdita bicolor Cockerell, 1896, Proc. Acad. Sci., Phila., 48:77.

This species was recorded from Mexico without further particulars and has been known only from the type. It is now possible to describe the male and record additional material. The male differs from the female considerably in sculpture, but the sexes have been taken together, so that the association seems assured.

Male.—Head and thorax black, the temples and vertex more or less piceous or reddened. Mandibles except reddish inner margin and red apex, labrum, and broad anterior border of face, including clypeus and transverse lateral marks, yellow. Abdomen dark ferruginous, the basal tergite somewhat infuscated; venter with a broad black band across segments 2 to 4. Antennae piceous, the flagellum ferruginous beneath. Legs blackish, the small joints of tarsi rufescent, and the front tibiae brownish yellow on anterior side. Tegulae pale amber color, with a piceous spot at base. Wings dusky hyaline, the nervures and stigma brown.

Head large and broad, with broad cheeks and vertex. Labrum about twice as broad as long. Mandibles rather long, stout, and almost elbowed. Apex of clypeus broadly and shallowly emarginate for reception of labrum. Subantennal plates very small. Ocelli small and remote from margin of eyes and occiput. Antennae rather long and slender, the joints of flagellum mostly about as long as thick. Abdomen wider than thorax, depressed, with apical depression of tergites broad but not sharply defined. Truncate apex of tergite 7 moderately wide, the disk carinate on each side to form a pygidial plate. Head and thorax minutely tessellate and rather dull, except face below antennae which is smoother and shining; the puncturation fine, sparse on face below antennae, rather dense on frons, moderately close on vertex and mesopleura, and dense on mesoscutum. Abdomen with an excessively minute sculpture and puncturation, and more shining than thorax. Pubescence whitish, rather long on under side of head and on pleura and mostly short and appressed on mesonotum. Pubescence of abdomen very short, fine, and sericeous, with the hairs at apex only a little lengthened (in *texana* hair at apex partly coarse and mosslike). Length, 8-9 mm.; anterior wing, 5.4-6.1 mm.

Aedeagus similar to that of *texana* in having the dorsal wall of caulis divided nearly to the base, the stipites being much produced above, with their tips hairy and divergent but without a lateral parameral lobe; differs from *texana* in the shape of volsellae and sagittae; inner pair of volsellae appearing long and slender in dorsal aspect in *bicolor* and much broadened in *texana*; sagittae greatly broadened apically in *bicolor*, with a thin apical process on each side, but tips acute and diverging in *texana*, appearing broad, oblique, and bent downward in lateral aspect.

The following material of *bicolor* has been examined: 2 males, Pachuca, Hidalgo, June 11, 1935; 2 males, 1 female, Tehuacan, Puebla, on *Baccharis*, June 23, 1951 (P. D. Hurd); and 4 females, Zimapan, Hidalgo, on *Opuntia*, collecting pollen, June 11-14, 1951 (Hurd).

Perdita secunda (Cockerell)

Macrotera secunda Cockerell, 1904, Ann. Mag. Nat. Hist. (7)14:205, ♀.

Known only from Mexico, the exact locality and the collector not recorded. The type, I presume, is in the British Museum.

Subg. *Cockerellula* Strand

Lutziella Cockerell, 1922, Amer. Mus. Novitates, 47:1 (not Enderlein).

Cockerellula Strand, 1932, Folia Zool. Hydrobiol., Riga, 4:196.

Type of subgenus.—*Perdita opuntiae* Cockerell.

This group is closely allied to *Macrotera*, and the female differs mainly only in the much shorter tongue. In *Cockerellula* the glossa hardly surpasses the galeae and reaches the front coxae, whereas in *Macrotera* it extends far beyond apex of galeae and reaches the hind coxae. Head slightly longer than wide, or at least as long as wide; facial foveae in type species much shorter than in *Macrotera*, but well impressed.

The male resembles *Macrotera*, but differs in the short tongue, modified ventral segments of abdomen, and in the broadly ending, more or less emarginate, or bidentate, apical tergite. Second ventrite much thickened on the middle portion of apical margin, the thickening dentate at each end, or second and third ventrites thickened on apical margin, and the first often with a medio-apical erect process or with a strong puckerlike fold. Head moderately enlarged in comparison with *Macrotera*, generally only slightly broader than long, and the eyes in relation to rest of head much longer than in *Macrotera*. Facial foveae several times longer than wide, but generally not elongate and not broadened at upper end as in *Macrotera*.

Aedeagus similar to that of *Macrotera*, but the divergent dorsal lobes of caulis much less produced and hairless at apex, and superseded by short, lateral parameral lobes. The inner pair of volsellae well developed and sometimes enormous, the outer pair sometimes vestigial as in the type species.

KEY TO SPECIES

- | | |
|--|--------------------------------|
| 1. Males | 2 |
| Females | 6 |
| 2. Basal ventrite without a medio-apical fold or process | 3 |
| Basal ventrite with a medio-apical process or puckerlike fold | 4 |
| 3. Second ventrite with a broad thickening on middle of apical margin, this thickening strongly dentate at outer ends; apical tergite broad, with a slender lobe at apical corners and evenly truncate between the lobes; head and thorax black, or blackish brown, the face marks yellow; abdomen ferruginous; length, about 5.5 mm. | <i>opuntiae</i> Cockerell |
| Second ventrite only slightly thickened apically, the third with a strong thickening, which is unarmed at outer ends and presents a transverse disk to view from behind; apical tergite quadrate, the apical corners slightly dentate, the disk a little concave and produced medially in a rounded angle a little beyond and below the lateral angles; head and thorax dark blue-green, the face below antennae yellow; abdomen ferruginous; length, about 4-4.5 mm. | <i>bidenticauda</i> Timberlake |
| 4. Tergite 7 either merely broadly truncate or bilobate at apex | 5 |
| Tergite 7 produced into a quadrate lobe on each side well before the apex, which itself is medially notched and bidentate; head and thorax dark green, the mesonotum partly black, the face below antennae yellow; abdomen dark red; length, about 5-6 mm. | <i>asteca</i> , n. sp. |
| 5. Tergite 7 extremely broad, transversely quadrate, not narrowed to apex, which is truncate with at most a small median notch; head and thorax dark blue-green, the face below antennae yellowish white; abdomen ferruginous; length, about 4 mm. | <i>laticauda</i> Timberlake |
| Tergite 7 similar, but more convex, distinctly grooved medially and emarginate at apex to form a broad, slightly oblique lobe on each side; head and pronotum brown, the face below antennae pale yellow; thorax otherwise dark blue-green, partly washed with brown; abdomen ferruginous; length, 4-4.5 mm. | <i>lobata</i> Timberlake |
| 6. Head and thorax dark green, the abdomen ferruginous | 7 |
| Head and thorax black, the abdomen ferruginous; mesoscutum shining, delicately tessellate and with minute, close punctures; length, about 6 mm. | <i>opuntiae</i> Cockerell |

7. Thorax entirely dark green; facial foveae hardly more than one-half as long as the space between antennal sockets and anterior ocellus 8
 Head and thorax dark green, the posterior half of mesoscutum and scutellum black; facial foveae hardly shorter than space between antennal sockets and anterior ocellus; supraclypeal area abruptly elevated and extending triangularly between antennae; length, 5.5–6 mm.
azteca, n. sp.
8. Mesoscutum tessellate, but shining, finely punctured, the punctures about two to three puncture widths apart; abdomen ferruginous; length, about 4–4.5 mm. *bidenticauda* Timberlake
 Similar and without good distinguishing characters in the female sex *laticauda* Timberlake

Perdita opuntiae Cockerell

Perdita opuntiae Cockerell, 1922, Amer. Mus. Novitates, 47:2, figs. 1–10, ♂, ♀; Custer, 1928, Psyche, 35:67–84, figs. 1–4, and pl. 2; Custer 1929, Canad. Ent., 61:50–51; Custer, 1929, Psyche, 36:294–295.

This bee was described from specimens collected in the vicinity of the White Rocks, near Boulder, Colorado, where it was first discovered by Dr. Frank E. Lutz. Later, Custer worked out the habits and biology of the bee which he found nesting in the soft sandstone rocks of the Laramie formation.

I have examined a series of *opuntiae* from White Rocks (Lutz and Custer) and also one male from Pine Ridge, Shannon County, South Dakota, June 20, 1928 (H. C. Severin).

Perdita azteca, n. sp.

Male.—Head and thorax dark green, the posterior half of mesonotum and scutellum black, abdomen dark red. Mandibles except rufous tips, labrum, face below level of antennae, and anterior margin of cheeks yellow, but sutures between sclerites of lower face slightly blackened. Lateral face marks irregularly quadrate, broadening below, somewhat broader than high, and truncate above between dorsal margin of antennal sockets and lower end of facial foveae. Base of tergite 1 and lateral margins of tergites 2 and 3 a little infuscated. Antennae fuscous, the scape narrowly yellow, and the flagellum dull yellowish beneath. Legs black, the front tibiae except a dark streak behind, and the front tarsi dull yellowish. Tegulae pale testaceous. Wings dusky hyaline, the nervures and stigma brown.

Head moderately enlarged, broader than long, with the eyes rather strongly diverging in front. Mandibles moderately long, gently curved, and bluntly edentate at apex. Face below antennae strongly convex from side to side, the outer ends of clypeal extensions strongly inflexed. Supraclypeal area abruptly elevated, the elevation angularly produced onto frons and medially sulcate above. Facial foveae narrow and elongate. Abdomen broad and depressed; first ventrite with a small, erect medio-apical process; second with a transverse swelling across the middle; third ventrite with the middle third of the apical margin thickened. Apical tergite twice bidentate, the medio-apical notch semicircular and the tooth on each side rather blunt; above the apical margin the disk is produced into a quadrate lobe on each side, each lobe distinctly longer than wide, obliquely truncate at apex, and separated by a quadrate emargination, which is nearly twice as wide as either lobe. Head and thorax finely tessellate and moderately shiny, the puncturation fine, close on mesonotum, sparse on vertex, and moderately close on frons. Abdomen minutely lineolate. Pubescence spare and whitish, short and subappressed on mesoscutum, and conspicuously white on lateral margins of dorsal face of propodeum. Hind tibiae with sparse coarse mosslike hairs, and tergites 6 and 7 each with three or four long mosslike hairs on each side, which, if not worn, have rather long and close-set branches. Length, about 5–6 mm.; anterior wing, 3.6–4 mm.

Female.—Colored nearly as in male, but yellow of face restricted to a spot at base of mandibles. Labrum, clypeus, anterior border of lateral face plates, and the elevated supraclypeal area black. Abdomen a little clearer red than in male, hardly infuscated at base. Antennae dark, the flagellum brown beneath. Legs blackish, the spurs and claws rufous.

Head about as long as wide, the inner orbits of eyes hardly divergent anteriorly. Supraclypeal

area much elevated and extending triangularly above antennae. Facial foveae hardly shorter than length of space between antennal sockets and anterior ocellus. Sculpture about as in male, but the frons and vertex uniformly and rather sparsely punctured. Clypeus with coarse, rather close punctures. Pubescence similar to that of male, the white hair of propodeum a little longer and denser; apical fimbria of abdomen slightly infuscated. Length, about 5-6 mm.; anterior wing, 3.7-4 mm.

Holotype male and allotype at flowers of *Opuntia*, Zimapan, Hidalgo, Mexico, June 11-14, 1951 (P. D. Hurd); 15 males, 24 females (paratypes) taken with the types on *Opuntia*, except 7 of the females, which were at flowers of *Eysenhardtia polystachya*; and 1 male (paratype), at same place and time (H. E. Evans).

Types in collection of Citrus Experiment Station, Riverside; paratypes in collection of the University of California at Berkeley, and one in collection of the University of Kansas at Lawrence.

Perdita bidenticauda Timberlake

Perdita bidenticauda Timberlake, 1953, Univ. Kans. Sci. Bull., 35:965, ♂, ♀.

Perdita laticauda Timberlake

Perdita laticauda Timberlake, 1953, Univ. Kans. Sci. Bull., 35:967, ♂, ♀.

This and the preceding and following species were described from material collected in Texas.

Additional specimens of *laticauda* have been collected by the David Rockefeller Expedition in Coahuila, Mexico, as follows: 2 males, 1 female, Guadalupe, on *Gaillardia*, Aug. 23, 1947 (Spieth); 1 male, La Rosa, 5,300 feet, Aug. 22, 1947 (Michener); 1 male, 3 females, 25 miles southeast of San Pedro Colimas, 3,700 feet, Aug. 21, 1947 (Michener), in American Museum of Natural History.

Perdita lobata Timberlake

Perdita lobata Timberlake, 1953, Univ. Kans. Sci. Bull., 35:967, ♂.

Subg. *Macroteropsis* Ashmead

Macroteropsis Ashmead, 1899, Trans. Amer. Ent. Soc., 26:85; Cockerell and Porter, 1899, Ann. Mag. Nat. Hist. (7)4:417.

Type of subgenus.—*Perdita latior* Cockerell.

Wings with a small lanceolate stigma; marginal cell obliquely truncate and longer than in most *Perdita*, but not so long as in *Macrotera*, *Pseudomacrotera*, and *Cockerellula*, although nearly equal to first submarginal cell and large in comparison with the small stigma. Spurs of middle and hind tibiae nonserrate. Frons and mesonotum usually granular-tessellate, dull, and with minute, close punctures. Abdomen with a fine sericeous pubescence. Subantennal plates very small and more or less obscure. Maxillary palpi thin, usually four- to six-jointed, the apical joints more or less indistinct, or confused.

Female.—Mandibles with a blunt inner tooth near apex. Claws bifid, with the inner tooth much shorter than the outer one. Tibial scopa composed of sparse coarse hairs, those on upper edge of tibia somewhat mosslike, the rest a little longer and strongly curved. Head and thorax dark green, or sometimes more or less black on the mesonotum; abdomen blackish; no light markings on face or abdomen.

Male.—Peculiar in that the head is abbreviated and much truncated anteriorly. Eyes large, broader at anterior end. Mandibles stout, but tapering, very strongly curved, usually bidentate at apex, and inserted usually more or less below, instead of in front of anterior end of eye, so that when closed they are much less closely appressed to oral margin than usual, and thus fully exposing the labrum. Clypeus very short and broad, yet nearly reaching level of antennae. Hind tibiae, basitarsi, and last two tergites of abdomen with coarse mosslike setae. Coloration as in female, but yellow face marks usually present and the abdomen more or less reddened.

Aedeagus of the type of *Macrotera*, without parameral lobes, but the dorsal lobes of the caulis are short. The inner or ventral pair of volsellae are greatly enlarged. The sagittae are very stout, often dilated at apex and may bear a small group of short spiny setae on lateral margins before the apex.

KEY TO SPECIES

1. Males 2
 Females 6
2. Wings a little dusky or only slightly whitened; head dark green 3
 Wings milky hyaline, the nervures and stigma pale; head mainly ferruginous; thorax dark green, the disk of mesoscutum and scutellum black; abdomen reddish brown, the apical margin of tergites rufo-testaceous; length, about 4 mm. *portalis*, n. sp.
3. Mandibles simple at apex; head and thorax dark green, the abdomen dark brown or blackish. . 4
 Mandibles bidentate at apex; head and thorax dark green, the disk of mesoscutum and scutellum black; abdomen red; face nearly all yellow below level of antennae. 5
4. Head dark green, with only the labrum and mandibles yellow; frons, vertex, and mesonotum minutely tessellate, dullish, and finely punctured, length, 4-5 mm. *arcuata arcuata* Fox
 Similar, but clypeus as well as labrum and mandibles yellow; wings slightly whitened, the nervures and stigma testaceous yellow *arcuata dinognatha* Cockerell
5. Lateral face marks more or less narrowly transverse and not much widened toward eyes; frons and mesonotum moderately shining, finely and very closely punctured; ventrites 2 to 4 rather convex, the second without a median tubercle; length about 5 mm. *latior* Cockerell
 Similar, but abdomen broader, the second ventrite with a distinct small medio-apical tubercle; face all, or nearly all, yellow below level of antennae, the lateral marks widening toward eyes; cheeks more or less broadly yellow next to base of mandibles; length, 4-5 mm.
echinocacti, n. sp.
6. Wings at most slightly whitened 7
 Wings milky hyaline, with pallid nervures and stigma; head and thorax dark green, the disk of mesoscutum and scutellum black; frons and mesoscutum minutely punctured, shining, but not polished; head and thorax with abundant conspicuous white hair; mandibles rufo-testaceous, darker at tips; length, 4.5-5 mm. *portalis*, n. sp.
7. Head and thorax dull, dark green, the disk of mesoscutum and scutellum blackish; punctures of frons and mesoscutum minute and more or less obscure 8
 Head and thorax dark green or bluish green, dullish, the clypeus, scutellum, and posterior half of mesoscutum black; punctures of frons and mesoscutum very fine but distinct 9
8. Wings rather dusky hyaline; mesoscutum with close minute punctures; length, 4-5 mm.
arcuata arcuata Fox
 Wings slightly whitened; frons and mesoscutum more obscurely punctured
arcuata dinognatha Cockerell
9. Clypeus closely punctured, the punctures coarse and somewhat sulcate in comparison with the minute dense punctures of frons and mesonotum; abdomen black, the depressed margin of tergites more or less rufo-testaceous; length, about 5.5-6 mm. *latior* Cockerell
 Hardly distinguishable from *latior* in female sex, but more bluish green and punctures of frons and mesoscutum a little finer and shallower *echinocacti*, n. sp.

Perdita portalis, n. sp.

Although this species has the aspect and many characters of *Macroteropsis*, it differs from others of the group in having the maxillary palpi short, with only three or four joints, the marginal cell comparatively short, and mandibles in the male inserted in front of the eyes. It also differs in having milky white wings, conspicuous white pubescence covering head and thorax, and also in having the head of the male nearly all ferruginous. Probably closely allied to *P. haplura* Cockerell from Texas, but that species has much white hair only on the pleura, the mesonotum dullish and nearly bare, and mandibles dark with a red subapical spot.

Male.—Head including mandibles and antennae ferruginous, the occiput and posterior margin of vertex suffused with black, and a suffused black mark on the ocellar triangle extends back to occipital margin. No distinct face marks but outer surface of mandibles, except piceous tips, suffused with yellowish. Each side of face ornamented with a peculiar, oval whitish-testaceous mark, somewhat broadened above, extending from a point half way below level of antennae to level of middle of frons, and narrowly margined all around with a suffused duskiness. Thorax dark green, the mesoscutum except anteriorly, scutellum, and mesonotum black, the green color most apparent on propodeum. Pronotum dull ferruginous with posterior half of the dorsum suffused with black. Abdomen reddish brown, a little paler on venter, the broad apical depression of tergites rufo-testaceous (abdomen more reddened than in most males of *arcuata*, but much less than in *laticornis*). Legs mainly blackish; dorsal surface of front trochanters, apex of front femora, front tibiae except a slight duskiness on posterior margin, and all tarsi brownish yellow. Tegulae pale testaceous. Wings milky hyaline, the stigma and nervures yellowish white, the subcosta more yellow.

Head much broader than long and truncate anteriorly. Disk of clypeus twice as broad as high, its anterior margin slightly sinuate on each side of a small median tooth; lateral extensions sharply and broadly inflexed and little visible in frontal view except at outer ends. Subantennal plates broader than long. Facial foveae absent. Mandibles strongly tapering to apex, bidentate, with both teeth acute. Marginal cell about twice as long as wide, obliquely truncate at apex, and smaller than first submarginal cell. Head and thorax delicately and minutely tessellate and shining; the puncturation fine and rather close on frons, a little sparser on vertex, and a little closer and stronger on the mesoscutum and scutellum. Abdomen minutely lineolate and rather shiny. Head with fine, sparse appressed hair, but vertex and occiput, as well as thorax except dorsal face of propodeum, with moderately abundant erect white hair. Abdomen finely sericeous, the hair at apex not noticeably longer or coarser. Length 4 mm.; anterior wing, 3–9 mm.

Female.—Head and thorax dark olive green, the mesoscutum except anteriorly, scutellum, metanotum, and clypeus black. Labrum a little reddened, the mandibles rufo-testaceous, but piceous at apex. Antennae brown, much paler beneath, and the scape darker. Legs black, the apex of front femora and front tibiae, except outer side, brownish yellow; small joints of tarsi brownish. Abdomen black, the apical depression of tergites 1 to 2, or 3, rufo-testaceous, of other tergites more hyaline. Tegulae and wings as in male.

Head transversely oval, the inner orbits distinctly converging below. Mandibles with a small inner tooth. Facial foveae short, about twice as long as wide. Sculpture about as in male. Pubescence similar, but abundant, the head and thorax nearly covered with conspicuous coarse white hair, which is longest on the vertex; hair on disk of mesoscutum short and subappressed, becoming a little longer and erect anteriorly. Propodeum nearly nude, except on lateral margins of disk. Abdomen with a fine sericeous pubescence, and with much longer mosslike hair at apex. Length, 4.5 mm.; anterior wing, 3.2 mm.

One male (holotype), 5 females (allotype and paratypes) about 1 mile east of Portal, Arizona, at flowers of *Sphaeralcea*, Aug. 12, 1940 (Timberlake); and 1 female (paratype), some data (C. D. Michener).

Types in collection of Citrus Experiment Station, Riverside.

Perdita arcuata arcuata Fox

Perdita arcuata Fox, 1893, Proc. Calif. Acad. Sci., Ser. 2, 4:18, ♂; Cockerell, 1896, Proc. Acad. Sci., Phila., 48:54.

The male was described by Fox from Calmali Mines, Lower California. The species is represented in the collection of the California Academy of Sciences by specimens also from San Julio, Todos Santos, Las Animas, Sierra Laguna, and 45 miles north of San Ignacio, Lower California. The type was collected in April, but more recent specimens have been taken on July 27, 1938, by Michelbacher and Ross, and October 10 and 12, 1941, by Ross and Bohart.

This and *P. dinognatha* Cockerell are so similar that I have no hesitation in

placing them as races of one species. The male of *arcuata* differs principally from *dinognatha* in lacking yellow face marks; the female is very similar to *dinognatha* but has more dusky wings and slightly more distinctly punctured mesoscutum.

Perdita arcuata dinognatha Cockerell

Perdita dinognatha Cockerell, 1922, Proc. U. S. Nat. Mus., 60 (Art. 18): 19, ♂.

Described from a male collected in San Diego County, California, in April, by Coquillett. The female is similar to *P. latior* Cockerell, but has the wings perhaps a little whiter, and the mesonotum duller, with much more obscure punctures.

Female.—Head and thorax very dark olive green, the mesoscutum except anterior border, scutellum, and metanotum black. Abdomen blackish, the apical depression of tergites rufo-testaceous. Clypeus and supraclypeal area black. Mandibles rufo-testaceous, becoming redder at apex. Legs and antennae dark. Tegulae pale testaceous. Wings somewhat whitish hyaline, the nervures and stigma pale yellowish.

Head broader than long, with inner orbits of eyes parallel. Facial foveae broad, shallow, and rather indistinct. Pygidium acutely triangular. Head and thorax granular tessellate and dull, the mesonotum almost opaque and with minute, indistinct punctures. Face below antennae more shining, with distinct shallow punctures. Pubescence white, mostly coarse and short; mesonotum with extremely fine appressed pubescence, intermixed with coarse erect hairs. Length, 5–6 mm.; anterior wing, 4.5–4.9 mm.

Numerous specimens of both sexes have been examined from the following localities.—CALIFORNIA: Palm Canyon, Borego, San Diego Co.; Coyote Well and Beal's Well, Imperial Co.; Chuckawalla Mts., 15 and 16 miles south of highway 60; Lost Palm Canyon; Palm Springs, and the near-by Andreas, Murray, and Palm canyons. Piñon Flat and Ribbonwood, San Jacinto Mts.; and Joshua Tree National Monument, Riverside Co.; Michel's Cavern; Cave Springs, and the Mohave Desert, south of the Arawatz Mts., San Bernardino Co.; Mazourka Canyon, Inyo Mts.; Mountain Springs Canyon, Argus; Wild Rose Canyon, Panamint Mts.; and 5 miles north of Wild Rose Canyon; Westgaard Pass Plateau; Lone Pine and near Kearsarge, Inyo Co. NEVADA: Kyle Canyon, up to about 6,000 feet, Charleston Mts., Clark Co. ARIZONA: Tempe, Maricopa Co.

This desert bee is abundant at flowers of *Sphaeralcea ambigua*, and only strays have been taken on *Eriogonum fasciculatum polifolium* and on *Encelia frutescens*. In the Palm Springs region it has been taken from March 21 to May 20, and at higher elevations it flies also in June.

Perdita latior Cockerell

Perdita latior Cockerell, 1896, Proc. Acad. Sci., Phila., 48:53, fig. 6, ♂, ♀; Cockerell, 1897, *ibid.*, 49:353.

Macroteropsis latior Cockerell and Porter, 1899, Ann. Mag. Nat. Hist. (7)4:417.

Cockerell described this bee from specimens taken at Las Cruces, New Mexico, in August at flowers of *Sphaeralcea augustifolia*. It is common in many parts of New Mexico and Arizona during the summer months at flowers of *Sphaeralcea*. The earliest date is June 7 for a female collected by Cockerell at Mesilla, New Mexico, at flowers of *Sida hederacea*.

Specimens have been examined from the following localities.—NEW MEXICO: Las Cruces and Mesilla, Dona Ana Co.; Jemez Springs, Sandoval Co.; Continental Divide, on highway 66, 7,250 feet, McKinley Co. ARIZONA: 6 miles east of Douglas; Portal and Cave Creek, 4 miles above Portal; Rustlers Park, Chiricahua Mts.; and 10 miles west of Bisbee, Cochise Co.; Prescott, 5 miles north of Prescott, and 16 miles northwest of Prescott, Yavapai Co. NEVADA: Kyle Canyon, 7,500 feet, Charleston Mts., Clark Co.

It will be noticed that the Kyle Canyon locality in the Charleston Mountains, Nevada, is the only known place where the range of this species and *dinognatha* overlap, but the flight season may differ, although both visit flowers of *Sphaeralcea*.

Perdita echinocacti, n. sp.

This species is similar to *P. latior* Cockerell and not distinguishable with much certainty in the female sex, but the male is easily separable by the more extensive yellow face marks and especially by the small tubercle on the second ventral segment.

Male.—Head and thorax dark blue-green, the mesoscutum except broad anterior border, scutellum, and metanotum, black. Mandibles except reddish tips, labrum, clypeus, lateral, sub-antennal, and supra-clypeal marks yellow, with the face virtually all yellow below level of antennae. Checks rather broadly yellow near base of mandibles. Antennae dark ferruginous, a little darker on outer side of flagellum, and somewhat yellowish on under side of scape. Abdomen red, the first tergite more or less infuscated on disk. Legs blackish; apex of front femora and anterior side of front tibiae brownish yellow; front tarsi slightly yellowish, the other tarsi more brownish. Tegulae testaceous. Wings hyaline, the nervures and stigma pale brown.

Head strongly truncate anteriorly. Disk of clypeus nearly twice as broad as high, its anterior margin slightly emarginate between the slightly produced points on each side of base of labrum. Mandibles stout, little tapering toward apex and with a small blunt inner tooth. Second ventrite with a small discal tubercle at middle of apical margin. Head and thorax a little dullish from a minute tessellation and puncturation, the punctures very close on frons and mesoscutum and sparser on vertex. Pubescence whitish, but rather sparse and inconspicuous, that of mesoscutum fine and subappressed, with short, coarse erect hairs interspersed, especially around the margin. Abdomen with a sericeous pubescence and coarse mosslike hairs at apex. Length, 4.8–5.5 mm.; anterior wing, 3.4–3.6 mm.

Female.—Perhaps not certainly distinguishable from *latior*, unless taken with the male, but more bluish green, and the punctures of frons and mesoscutum slightly more minute. Length, 5–6 mm.; anterior wing, 3.5–3.8 mm.

Twelve males, 5 females (holotype male, allotype, and paratypes) 4½ miles above Pepper Sauce Canyon, Santa Catalina Mts., Pinal Co., Arizona, one male at flowers of *Kallstroemia grandiflora*, the rest at flowers of barrel cactus, *Echinocactus wislizeni*, Aug. 14, 1940; and 6 males, 1 female (paratypes) near Patagonia, Santa Cruz Co., Arizona, at flowers of *Kallstroemia*, Aug. 8 and 9, 1940 (Timberlake) in collection of Citrus Experiment Station, Riverside. Two males, 1 female (paratypes) from type locality (E. S. Ross) in collection of California Academy of Sciences; and 1 male (paratype), Carbo, Sonora, Mexico, Sept. 24, 1933, in collection of R. M. Bohart.

Macroterella, n. subg.

Type.—*Perdita mortuaria* Timberlake.

Macroterella includes five small species of *Perdita*, of which three are known only from California, one from New Mexico and Arizona, and one that has been found in the deserts of Arizona, southern California, and Lower California.

Tongue rather short, the galea of maxillae tapering toward apex but not attenuate. Maxillary palpi six-jointed. Stigma moderately slender, relatively longer and broader than in *Macrotera* and about as in *Pseudomacrotera*, or small and lanceolate. Marginal cell short, nearly as usual in *Perdita*, the apical truncation broad and only slightly oblique, the substigmatal and post-stigmatal portions of cell about equal. Eyes of medium size, not appreciably broadened anteriorly.

Male.—Head only slightly enlarged and hardly wider than thorax. Mandibles simple, tapering, and inserted more or less low in relation to eyes, so that a line drawn along inferior margin of

***Perdita mortuaria*, n. sp.**

Male.—Head and thorax black. Mandibles except ferruginous apical half, labrum, and face below level of antennae yellowish white. Clypeus with the usual pair of black dots on disk. Supraclypeal area sometimes not quite completely yellow below antennae. Lateral marks rounded on their inner side, somewhat higher than broad and obliquely truncate above. Tubercles and sides of pronotum more or less brown. Abdomen reddish brown, sometimes with a fuscous tinge across the middle of the tergites, the venter paler and more reddish than the tergum. Legs fuscous, tinged with brown, the tarsi rather pale brown; apex of front femora and anterior side of front tibiae dull yellow. Antennae brown, the scape darker but with a pale streak beneath, the flagellum dull ferruginous beneath, or sometimes all around on first five joints. Tegulae pale testaceous. Wings whitish with a slight opacity, the margins of stigma pale brown, the nervures yellowish.

Head a little wider than long, slightly broader than thorax, and broadly truncate anteriorly. Face including frons evenly convex. Cheeks about as broad as the moderately small eyes. Subantennal plates about equaling the antennal sockets in size. Dorsum of pronotum strongly sloping forward from posterior margin, not at all prominent at posterior corners and the sides only slightly creased (all much as in *Macrotera*). Antennae ordinary, the joints of flagellum mostly about as long as thick. Head and thorax very finely and delicately tessellate, the disk of mesoscutum more shiny than other parts. Puncturation extremely fine, obscure, and sparse, but the minute punctures become close on anterior border of mesoscutum and on lateral margins over the tegulae. Base of propodeum more coarsely granular-tessellate than other parts. Abdomen minutely lineolate and shining. Pubescence very sparse and inconspicuous, the abdomen minutely sericeous, with a few longer hairs at apex. Length, about 3 mm.; anterior wings, 2.3–2.5 mm.

Female.—Mainly black. Mandibles brownish yellow except reddish tips. Labrum shining brown. Apical depression of tergites 1 to 4 slightly pallescent and apex of venter reddish brown. Legs blackish; front and hind tarsi yellowish brown, the middle pair darker; extreme apex of front femora and anterior side of front tibiae brownish yellow. Scape of antennae nearly black, the flagellum ferruginous beneath and fuscous above. Tegulae and wings as in male.

Head similar to that of male, but the eyes considerably larger and facial foveae about one-half as long as space between antennae and ocelli. Head and thorax minutely, but more strongly, tessellate and duller than in male. Clypeus with sparse fine punctures. Mesoscutum with a few scattered punctures, visible only under high magnification. Base of propodeum more coarsely and strongly tessellate than other parts. Abdomen slightly dullish, the broad apical depression of tergites 1 to 4 more delicately sculptured and more shining. Pubescence inconspicuous, but a few fine hairs present on face, vertex, lower part of pleura, and on sides of propodeum. Apex of abdomen with coarse white hair, similar to scopal hair of hind tibiae. Mesoscutum apparently nude, the sparse very fine hair hardly visible except in profile. Length, 3.25 mm.; anterior wing, 2.8 mm.

Four males, 1 female (holotype male, allotype, and paratypes) from flowers of *Euclide urens*, Furnace Creek, Death Valley, California, April 23, 1935 (A. L. Melander); and 3 males (paratypes), Box Canyon, Riverside Co., on *Eschscholtzia minutiflora*, var. *darwinensis*, March 24, 1953 (Timberlake).

Types in collection of Citrus Experiment Station, Riverside.

***Perdita nigrella*, n. sp.**

From *mortuaria* this species differs in its larger size, nearly clear wings, more evident pubescence, and the greenish tinge of face.

Male.—Head and thorax black, rather shining. Clypeus except ends of lateral extensions, and very small transverse lateral marks at anterior corners of face, yellowish white. Labrum testaceous. Mandibles testaceous yellow, paler at base, and reddened at apex. Antennae black, the flagellum dull yellowish beneath. Abdomen piceous, the venter and apex of tergites 1 to 3 reddish brown. Legs black, the front knees briefly yellowish. Tegulae testaceous, paler exteriorly. Wings very slightly dusky hyaline, the nervures and margins of stigma brown.

Structural characters similar to *mortuaria*, but the tongue distinctly longer. Punctures of mesoscutum less sparse and more distinct. Pubescence scanty as in *mortuaria*, the hair of mesoscutum moderately long and erect. Venation of wings similar, but marginal cell slightly longer, with the substigmal portion slightly longer than the poststigmal. Length, 3.5 mm.; anterior wing, 2.8 mm.

Female.—Similar to male, but face, as well as thorax and abdomen, without light markings. Head black, but a small depressed area on each side of face contiguous to outer margin of antennal sockets and lower end of foveae with a greenish tinge. Mandibles and very narrow contiguous margins of cheeks rufo-testaceous, the apex of mandibles more reddened. Abdomen black, the apical depression of tergites 1 to 3 dark reddish brown, but venter considerably darker than in male. Antennae, legs, tegulae, and wings as in male.

Pubescence scanty and whitish, yet much longer and more evident than in *mortuaria*, that of mesoscutum sparse, rather short and erect, the scutellum with a few still longer hairs. Hair about the hind knee plates golden ferruginous. Scopal hair of hind tibiae rather short and depressed. Length, 4–4.5 mm.; anterior wing, 3.2 mm.

One male (holotype), 2 females (allotype and paratype) from flowers of *Phacelia*, Artist Drive, west side of Death Valley, California, April 7, 1939 (E. G. Linsley); and 3 females (paratypes) on *Phacelia crenulata*, Box Canyon, Riverside Co., April 27, 1952 (Timberlake).

Types in collection of Citrus Experiment Station, Riverside.

Perdita tristella, n. sp.

Most similar to *nigrella*, but smaller with slightly whitened wings, the male with head less broad, the face marks more testaceous, and the female duller throughout, with the greenish luster of face more evident.

Male.—Head and thorax black, the abdomen reddish. Sides of first two or three segments of abdomen more or less infuscated. Labrum, mandibles, and clypeus testaceous yellow, sometimes also (as in holotype) the supraclypeal area and lateral marks to level of summit of clypeus. Antennae brown, becoming paler and more yellowish beneath. Legs testaceous yellow, the coxae except at apex, femora, and middle and hind tibiae piceous. Tegulae testaceous. Wings with a slight whitish opacity, the nervures yellowish brown, with subcosta and margins of stigma a little darker.

Structure much as in *mortuaria*. Head about as long as wide, narrowed behind the eyes, the temples broad. Mandibles nearly straight, broad, and tapering from beyond the middle to the acute apex. Cheeks, vertex, and sides of face below antennae minutely tessellate and dullish, the frons more shining and with excessively minute sparse punctures. Thorax minutely tessellate, moderately shining, the mesoscutum with very minute sparse punctures. Pubescence whitish, very short and sparse. Length, about 3 mm.; anterior wing, 2.3–2.5 mm.

Female.—Black, without light markings, the frons, vertex, and sides of face distinctly tinged with dark blue-green. Apical depression of tergites 1 to 3 slightly testaceous, or rufo-testaceous, especially on each side of tergite 2. Mandibles rufo-testaceous. Antennae dark, the flagellum reddish brown beneath. Legs black, the tarsi a little brownish. Tegulae testaceous, darker at base. Wings slightly reddened, but showing a slight whitish opacity in some aspects. Nervures and margins of stigma yellowish brown, the subcosta darker.

In structure and sculpture similar to *mortuaria*. Punctures of mesoscutum very sparse but larger and more distinct than in *mortuaria*. Pubescence similar, except that the mesoscutum is invested with evident although very short, sparse, erect hair. Facial foveae somewhat more than one-half as long as the space between antennae and ocelli. Length, about 3.5 mm.; anterior wing, 2.6 mm.

Five males, 1 female (holotype male, allotype, and paratypes), The Gavilan, Riverside Co., California, all from flowers of *Eriogonum fasciculatum*, May 8 and 12, 1950 (Timberlake); 2 females (paratypes), same locality, on *Hugelia virgata*, and *Calochortus splendens*, June 9, 1950, and May 28, 1952 (Timberlake); and 3 females (paratypes), Piñon Flat, San Jacinto Mts.,

one supposed to have been taken at flowers of *Sphaeralcea*, but carrying pollen probably derived from *Eriogonum*, May 30, 1937 (E. G. Linsley), one, May 21, 1940 (collector unknown), and another at flowers of *Eriogonum fasciculatum*, May 21, 1940 (C. D. Michener).

Types in collection of Citrus Experiment Station, Riverside; one paratype each in collection of the University of Kansas and the University of California at Berkeley.

Perdita mellea, n. sp.

This is an unusually distinctive little species, the male peculiar in being mainly dull ferruginous, and the female black, with a ferruginous abdomen and extensive whitish markings on head and thorax. All other species of *Perdita* with a ferruginous abdomen known to the author lack extensive light markings on the thorax.

Male.—Dull ferruginous, or dark honey yellow, the thorax a little darker than other parts, the mesoscutum sometimes more or less infuscated. Mandibles except reddish tips, labrum, and face below level of antennae yellowish white. Lateral face marks obliquely truncate from antennae sockets to foveae, but with a slender extension along orbits to summit of eyes and there expanding opposite the ocelli. The white also extending slightly onto frons, but the pale color not sharply defined. Tubercles and two large ill-defined marks on hind margin of pronotum yellowish white. Antennae and legs concolorous, the scape of antennae, apex of front femora, front tibiae, base of middle tibiae, and front and middle basitarsi pale yellowish. Tegulae pale testaceous. Wings dusky hyaline, the nervures brown, with subcosta and stigma a little fuscous.

Form robust, the abdomen moderately depressed and broadened. Head not enlarged and much broader than long. Labrum transverse, enclosed laterally by the clypeus. Disk of clypeus twice as broad as high, the lateral extensions broad and not inflexed. Cheeks rather broad and simple. Facial foveae punctiform. Mandibles stout, nearly straight, simple, and acute at apex. Antennae rather short, the joints of flagellum mostly broader than long. Posterior corners of pronotum slightly elevated but not prominent. Hind tarsi much longer than the middle pair. Stigma of wings small and lanceolate. Head and thorax minutely tessellate and dullish, but vertex and middle of mesoscutum more shiny. Puncturation minute, close and obscure on frons, and distinct and rather close on mesoscutum, but lacking on lateral margins. Pubescence short and white, rather dense on occiput and pleura, and sparse elsewhere; that of abdomen sericeous, with longer fine hair at apex. Length, 2.6 to nearly 3 mm.; anterior wing, about 2 mm.

Female.—Head and thorax black. Mandibles except reddish tips, labrum, and face below antennae yellowish white. Clypeus entirely pale except usual pair of dots, or with two narrow, curved brownish stripes on middle of disk, more or less uniting at either end. Subantennal plates more or less dark at lower end, or sometimes nearly all brownish or black. Extensions of the markings above antennae yellower, the lateral marks extending obliquely from antennal sockets to foveae, continuing between foveae and eyes, and then expanding triangularly above foveae from summit of eyes to lateral ocelli. In median line a broad light stripe extends almost to anterior ocellus, but is constricted just above antennal level. Sometimes, as in allotype, the marks on vertex are united by a narrow transverse extension behind ocelli. (The black residue on frons in form of a thick-armed U, extending from ocelli to antennal sockets, and expanding exteriorly below to coalesce with the dark foveae.) Tubercles, anterior margin except in middle, and two large marks on hind margin of pronotum yellowish white. Disk of scutellum and metanotum, with a narrow line extending laterally on hind margin of each, large mark on base of propodeum, and usually a small transverse streak on middle of hind margin of mesoscutum yellowish. Sides of propodeum suffused with red or distinctly reddish. Abdomen bright ferruginous red, sometimes with a small whitish streak on lateral margins of tergites 2 to 4. Legs black, the trochanters, middle and hind coxae, and base of hind femora often more or less reddened; and hind tibiae and tarsi pale ferruginous brown; apex of femora, rather broadly on front pair, front and middle tibiae except more or less behind, and tarsi pale yellow, with small joints of tarsi more ferruginous. Antennae ferruginous brown, the scape yellow. Tegulae pale testaceous, with a yellowish-white spot at base. Wings as in male.

Form robust, the head very slightly longer than wide, with cheeks strongly receding. Mandibles

retuse at apex. Facial foveae about three times as long as wide and separated from eye margin by a space equal to their width. Hind tarsi normal. Inner tooth of claws very small. Head and thorax delicately tessellate and moderately shiny, but the pleura more strongly tessellate, with the upper half of mesopleura minutely and densely granular-tessellate and opaque. Abdomen a little dullish. Pubescence as in male, but the pleura less hairy, the opaque area nude. Length, 3.5 mm.; anterior wing, 2.1 mm.

Two males, 4 females (holotype male, allotype, and paratypes) at flowers of *Euphorbia*, Picacho Pass, Arizona, August 7, 1940 (Timberlake). Paratypes as follows: 4 males, 7 females, same data as types (C. D. Michener); 4 males, 3 females, on *Euphorbia polycarpa*, var. *hirtella*, Twentynine Palms, California; 1 female, on *Euphorbia polycarpa*, 2 miles north of Rancho Mirage, Riverside Co., July 27, 1950 (Timberlake); 2 males, 4 females, Midland, Riverside Co., Aug. 26, 1947 (J. W. MacSwain); 1 male, 1 female, Coyote Cove, Concepcion Bay, Lower California, Oct. 1, 1941; and 3 females, Canipole, Lower California, Oct. 2, 1941 (Ross and Bohart).

Types in collection of Citrus Experiment Station, Riverside; paratypes in collections of California Academy of Sciences, University of California at Berkeley, and the University of Kansas.

Perdita solitaria Cockerell

Perdita solitaria Cockerell, 1897, Trans. Amer. Ent. Soc., 24:152, ♀; Cockerell, 1922, Amer. Mus. Novitates, 33:1.

This little species was described from two specimens collected in Soledad Canyon, Organ Mountains, New Mexico, and later recorded by Cockerell from the Sabino Basin, Santa Catalina Mountains, Arizona. In both localities the specimens were collected about the middle of August. I have one of the original specimens.

Heteroperdita, n. subg.

Type.—*Perdita rhodogastra* Timberlake.

Seven species of this group have been discovered, six of which occur on the Colorado Desert of California and one in New Mexico and Coahuila, Mexico. It is probable that the species collect pollen exclusively from flowers of the boraginaceous genera *Coldenia* and *Heliotropium*.

Small species, usually about 2.5 to 4 mm. long, with an excessively fine sculpture, a satiny luster, and usually a conspicuous, appressed white pubescence. Head about as long as wide, the face convex in middle but depressed on sides to above level of antennal sockets, so that the clypeus is rather prominent. Inner margin of cheeks next to proboscis cavity with many long coarse hairs directed backward and inward. Mandibles simple and acute. Mouth parts rather long, the maxillary palpi long, slender, and six-jointed. Wings small, the stigma small and slender, but not excessively so. Tarsal claws very small, virtually simple, or with a small inner tooth. Tibial scopa sparse, the hairs rather long and mosslike, with fine, rather close short branches.

Male similar to female, except that abdomen is much recurved at apex, the cheeks without the long hairs on each side of proboscis cavity, and the claws deeply cleft. Aedeagus subquadrate, about twice as long as wide and convex above. Basal orifice of caulis small, the dorsal surface deeply emarginate from apex basad, with two acute, somewhat converging lobes. Caulis also provided with short and rather slender lateral parameral lobes. Sagittae with a completely fused and enormously swollen basal part that fills the greater portion of the interior of caulis, and in this way very different from other groups. Apical part of sagittae with a fine, rodlike lobe on each side of the broad, more membranous median part, the former bent outward at apex and in type species notched on inner margin. Basal articulating part of eighth ventrite expanded at end and with two diverging arms, resembling condition in the groups allied to *Cockerellia*.

KEY TO SPECIES

1. Females 2
Males 7
2. Thorax dark except light marks on tubercles and pronotum 3
Basal area of propodeum and sometimes metapleura and sides of propodeum marked with yellow 6
3. Abdomen dark reddish ferruginous, or black with white transverse bands 4
Abdomen pale yellow, or creamy white; mandibles except tips, labrum, clypeus, transverse lateral marks and a supraclypeal mark creamy white *bellula*, n. sp.
4. Abdomen black, with white bands 5
Abdomen reddish ferruginous; small, transverse lateral marks and three small spots on clypeus white *rhodogastra*, n. sp.
5. Abdomen with five white bands, that on tergite 5 narrow; and those on tergites 2 to 4 slightly and broadly emarginate on each side in front *optiva*, n. sp.
Abdomen with a white band on tergites 1 to 4, each band with a small emargination on each side behind *trifasciata* Timberlake
6. Metapleura and sides of propodeum dark; abdomen creamy white, with a broad pale ferruginous band at base of tergites 2 to 5, each band having a rounded posterior lobe on each side; a ferruginous mark on each side of tergite 1, sometimes resolved into two or three spots *coldeniae*, n. sp.
Metapleura and sides of propodeum yellow; face marks and abdomen whitish; the latter with small fuscous spots, which form a sublateral row on each side; also a dark dot on lateral margins of tergites 2 to 4 at base, and a larger median spot on base of tergites 2 to 5 *arenaria*, n. sp.
7. Thorax dark except light marks on tubercles and pronotum 8
Thorax green, basal area and sometimes metapleura and sides of propodeum marked with yellow 12
8. Abdomen black, with white bands 9
Abdomen pale orange or reddish ferruginous, with creamy white markings 10
9. Slender species; a yellowish white band on tergites 1 to 6, each band, except on tergite 1, emarginate on each side in front; clypeus and triangular lateral marks pale yellow *sexfasciata*, n. sp.
Abdomen broad and depressed, with a white band on tergites 1 to 3 (or 4), emarginate in each side behind, or that on tergite 2 sometimes interrupted (that on tergite 4 when present abbreviated); clypeus and transversely linear lateral marks creamy white, the former usually with two brown stripes on disk *trifasciata* Timberlake
10. Abdomen reddish ferruginous 11
Abdomen pale orange ferruginous, with a whitish band on tergites 1 to 6; head and thorax with conspicuous white pubescence *bellula*, n. sp.
11. Abdomen reddish ferruginous, with whitish markings restricted to a narrow, abbreviated, or interrupted band on tergites 1 and 2; clypeus, small, triangular lateral marks, and supraclypeal mark yellowish white *rhodogastra*, n. sp.
Robust species with broad depressed abdomen, and the head generally broader than long; abdomen ferruginous with a whitish apical band on tergites 1 to 6, and a blackish blotch on each side of tergite 1 and a transverse preapical fuscous spot on each side of tergites 2 to 6 (sometimes the dark spots on tergites 1 and 2 become enlarged and replace the ferruginous color at base of segments) *optiva*, n. sp.
12. Except for yellow mark at base of propodeum color nearly as in *bellula*, but front and middle femora black except at apex and supraclypeal mark small or absent; white pubescence less dense *coldeniae*, n. sp.
Mark at base of propodeum and usually metapleura and sides of propodeum, as well as pronotum and legs in large part, yellow; abdomen creamy white, with a row of dark spots on each side of tergites 1 to 5 (or 6), and a blotch or band at middle of base of tergites 2 to 5 *arenaria*, n. sp.

Perdita rhodogastra, n. sp.

In color characters this species is rather similar to *P. chamaesarachae* Cockerell but the female differs in having the clypeus partly dark and frons and mesonotum more or less black, and the male differs in the much more restricted face marks.

Female.—Head and thorax dark green, or bluish green, but frons, disk of mesoscutum, the scutellum, and metanotum usually more or less blackish. Mandibles except reddish tips, part of clypeus, and transverse lateral marks, not or hardly extending above level of summit of clypeus, creamy white. Anterior margin of clypeus and a broad stripe on each side of its disk, brown or blackish. Often a small, more or less distinct, nubilous whitish spot on middle of supraclypeal area. Tubercles and spot on posterior corners of pronotum white. Abdomen reddish ferruginous, sometimes slightly suffused with black; tergite 1 blackish at base and sometimes with a small transverse white mark on disk. Antennae brown, the flagellum yellowish beneath. Legs dark brown or blackish, the extreme apex of front femora, front tibiae except behind, front tarsi, base and line on under side of middle tibiae, and base of hind tibiae yellow; middle tarsi pale brown, sometimes yellow at base. Tegulae pale testaceous. Wings nearly clear hyaline, nervures brown, with subcosta and margins of stigma darker.

Head about as wide as long, the inner orbits slightly converging below. Clypeus broad and low, the disk much broader than high, truncate above and showing no trace of dentiform angles on each side of base of labrum. Subantennal plates small and pointed below. Facial foveae one-half as long as space between antennal sockets and ocelli. Abdomen oval, the pygidium rapidly tapering to an acute point. Head and thorax minutely tessellate and moderately shining; frons with sparse minute, obscure punctures and mesonotum nearly impunctate. Pubescence white and mostly appressed, conspicuous on sides of face, cheeks, pleura, margins of mesoscutum, and sides of propodeum; hair at apex of abdomen rather long and moderately coarse. Length, about 3–4 mm.; anterior wing, 2.1–2.4 mm.

Male.—Head and thorax uniformly dark green or bluish green, the markings a little more extensive than in female and more yellowish. Labrum pale testaceous brown or yellowish. Dark marks of clypeus sometimes nearly absent except usual pair of dots, but usually a narrow pale brown stripe present on each side of disk. Supraclypeal mark triangular to quadrate, not much wider than high, but sometimes faint or absent. Tubercles, cuneate mark on each side of pronotum, and usually the anterior margin of its dorsum yellow. Abdomen sometimes a little paler ferruginous than in female; tergite 1 more or less blackish at base; tergites 1 to 3 with a narrow subapical, abbreviated creamy white or pale yellow band, more nubilous and sometimes absent on tergites 2 and 3; these bands always short and frequently terminating in a small fuscous spot on each side far from lateral margins. Antennae as in female, except scape and pedicel distinctly yellow beneath. Legs brown, the femora darker; apex of front and middle femora, front and middle tibiae except behind, front and middle tarsi, and base of hind tibiae yellow. Tegulae and wings as in female.

Head small, as long as wide, the cheeks narrow and simple. Apex of abdomen much recurved toward venter; seventh tergite tapering to the rather broadly rounded apex. Claws abruptly bent at middle and deeply cleft. Sculpture and pubescence about as in female; frons and disk of mesoscutum thinly covered with white hair; cheeks beneath with rather short, erect hair. Length, 2.5–3 mm.; anterior wing, 2 mm.

Holotype female and allotype at flowers of *Coldenia palmeri*, near Westmoreland, Imperial Co., California, May 31, 1930 (Timberlake). Paratypes as follows: 47 females, 17 males, taken with the types, but at flowers of *Heliotropium oculatum*; 1 female, on *Pluchea sericea*, Imperial Co., probably near Meloland, May, 1911 (J. C. Bridwell); 1 male, on *Heliotropium oculatum*, at the University of California Experiment Farm, Meloland, June 6, 1912 (Bridwell); 1 male, 2 females, on *Coldenia palmeri*, 5.4 miles south of Seeley, May 4, 1947 (R. C. Dickson); 2 females, on *C. palmeri*, 3.5 miles north of Mount Signal Corner, April 28, 1947 (Dickson); and 1 female, on *Pectis papposa*, 7 miles south of Ripley, Riverside Co., Oct. 19, 1951 (Timberlake).

Types in collection of Citrus Experiment Station, Riverside; paratypes in collection of U. S. National Museum (no. 43422).

***Perdita coldeniae*, n. sp.**

Male.—Head and thorax dark bluish green, the green luster little apparent on under side of thorax. Mandibles except red tips, labrum, clypeus, transverse lateral marks, and sometimes a supraclypeal mark creamy white, or disk of clypeus pale yellow. Tubercles, anterior margin of pronotum, transverse marks on hind margin of pronotum, and triangular mark on base of propodeum pale yellow. Abdomen orange ferruginous, with a narrow, sinuate creamy-white band before the apical depression on tergites 1 to 6, the ground color produced on each side into a projecting, rounded lobe (sometimes ground color more brownish orange, and bands on tergites 1 to 3 broadened, the projecting lobes cut off to form transverse, oval, enclosed orange brown spots). Scape and pedicel of antennae pale yellow, the flagellum pale brown, slightly darker above. Legs dark brown or blackish at base, the apex of femora, tibiae, and tarsi pale yellow; front femora varying from nearly all dark, except apex, to almost all yellow; hind tibiae with a broad dark ring. Tegulae testaceous hyaline. Wings slightly whitish hyaline, the nervures brown, stigma pallid except inner margin.

In structural characters agreeing closely with *rhodogastra*. Head somewhat broader than long. Seventh tergite tapering to narrow apex. Marginal cell a little shorter than in *rhodogastra*, the poststigmatal part shorter than substigmatal portion. Head and thorax impunctate, very minutely tessellate and shining with a satiny luster. Pubescence of head and thorax white and conspicuous, the hair coarse, mosslike, moderately long and mostly depressed, but that on lateral margins of propodeum erect. Length, 2–2.9 mm.; anterior wing, 1.4–2 mm.

Female.—Color and markings similar to male, but under surface of head and disk of mesoscutum black. A supraclypeal mark usually present. Abdomen orange ferruginous, with a white subapical band on tergites 1 to 5, each band indented on each side in front by a short rounded lobe of the darker ground color; tergite 1 pale dusky yellow on basal half, rather than ferruginous, except for a darker spot on each side at summit of basal declivity. Legs rather pale yellow, the coxae and femora, except more or less at apex, blackish; front femora almost entirely yellow behind; hind femora as dark as middle pair, or sometimes nearly all yellow; hind tibiae more or less faintly tinged with brown at middle. Antennae, tegulae, and wings as in male, except nervures more yellowish brown, and stigma entirely pallid.

Structural characters much as in male. Head as long as wide, the facial foveae normally concealed by pubescence. Pygidial plate subacute at apex. Sculpture and pubescence as in male, but most of frons and a large quadrate area on mesoscutum nude. Length, about 3 mm.; anterior wing, 2 mm.

Holotype male and allotype at flowers of *Coldenia palmeri*, near Westmoreland, Imperial Co., California, May 31, 1930 (Timberlake). Also the following paratypes: 1 male, 4 females, taken with the types; 2 males, 5 females, on *Coldenia palmeri*, 3.5 miles north of Mount Signal Corner, Imperial Co., April 28, 1949 (R. C. Dickson); 3 males, 4 females, on same flower, 5.4 miles south of Seeley, May 4, 1949 (Dickson); 1 female, on *Pectis papposa*, 7 miles south of Ripley, Riverside Co., Nov. 19, 1951 (Timberlake); 9 males, 7 females, on *Coldenia palmeri*, 2.5 miles north of Plaster City, Imperial Co., May 1, 1952 (Timberlake and Hurd); and 1 male, on same flower, Box Canyon, Riverside Co., April 27, 1952 (Timberlake).

Types in collection of the Citrus Experiment Station, Riverside, and paratypes in the University collection at Berkeley.

***Perdita arenaria*, n. sp.**

Very similar to *P. coldeniae*, but easily distinguished by the creamy white abdomen, with a row of black dots on each side.

Male.—Head and thorax dark green, the pleura and sternum of thorax with the green luster less apparent. Markings of head and thorax similar to those of *coldeniae*, but more extensive, creamy white on face and pale yellow on thorax. Supraclypeal mark present and much less rounded above. Lateral face marks widened toward sides and ending acutely on orbits a little above level of antennal sockets. Pronotum except dark central streak on the sides, the metapleura, and contiguous half of sides of propodeum, and triangular mark on base of propodeum yellow. (In Snow Creek paratypes, the sides of propodeum dark, and yellow on metapleura reduced to a spot at dorsal end.)

Abdomen creamy white, more or less tinged with orange at apex; on tergite 1 a small black mark, emarginate within, present on each side of summit of basal declivity, and between these and apex a black dot on each side; on tergites 2 to 6 a black dot on each side, about equally distant from base and apex, these dots forming sublateral rows, and more or less faint on tergite 6; on tergites 2 to 5 a similar black dot on basal middle, which in the type series tends to become enlarged, or to form an abbreviated band, more or less broadened in middle, especially on tergites 3 and 4; and on tergites 2 and 3 a black dot on each basal corner. Antennae brown, the flagellum paler beneath, and the pedicel and scape pale yellow. Legs pale yellow with a small fuscous spot near apex of front femora on anterior side, a broad black ring on hind tibiae, and a small brownish streak on middle tibiae, or the legs sometimes almost entirely yellow. Tegulae pale testaceous. Wings slightly clearer hyaline than in *coldeniae*; nervures pale brown, the stigma pallid, except inner margin.

Structurally similar to *coldeniae*. Head as long as wide. Mesoscutum showing a tendency to become slightly ridged on each side of the middle, just inside the parapsidal lines, and distinctly concave between the ridges. Tessellation of head and thorax slightly coarser than in *coldeniae* and the luster less satiny; middle of mesoscutum distinctly more coarsely tessellate than ridges on either side. Pubescence white, denser than in *coldeniae*; the frons almost entirely covered, and the mesoscutum nude only on the submedian ridges. Length, 2.6–3 mm.; anterior wing, 1.9–2.2 mm.

Female.—Similar to male, the green color becoming slightly brassy on vertex and middle of mesoscutum, and the nude part of frons and nude ridges of mesoscutum blackish. Lateral face marks transverse, but with a narrow orbital extension passing slightly above level of antennae. Pronotum except dark streak on sides, triangular mark on base of propodeum, and entire sides of propodeum and metapleura pale yellow. Abdomen creamy white, the sublateral dots brownish and restricted to tergites 1 to 3; a similar dot on basal corners of tergites 2 to 4; mediobasal spots on tergites 2 to 5 subtriangular and blackish, but more or less faint on tergite 5; emarginate marks at summit of basal declivity of tergite 1 blackish. Legs yellow, the base of front and middle coxae blackish, and a brownish dot at apex of hind femora above. Antennae, tegulae, and wings as in male, with the nervures slightly paler brown.

Structural characters much as in *coldeniae*. Sculpture and pubescence as in male, but the frons with a large nude area. Length, about 3.5 mm.; anterior wing, 2.1 mm.

Holotype male and allotype at flowers of *Coldenia palmeri*, 4 miles east of Edom, Riverside Co., California, April 17, 1937 (Timberlake). Paratypes, all taken on *Coldenia palmeri*, as follows: 3 males, taken with the types; 5 males at the little sand dunes, near Snow Creek bridge, about 5 miles north of Palm Springs, April 23, 1933; 7 males, 2 females, Truckhaven, April 15, 1949; 3 females, 6.3 miles east of Bond's Corner, Imperial Co., April 14, 1949; and 50 males, 22 females, 2.5 miles north of Plaster City, Imperial Co., May 1, 1952 (Timberlake and Hurd).

Types in collection of the Citrus Experiment Station, Riverside, and paratypes in the University collection at Berkeley.

Perdita bellula, n. sp.

Similar to *P. coldeniae* and *P. arenaria*, but thorax entirely dark except for usual marks on tubercles and pronotum.

Male.—Head and thorax dark. Mandibles except tips, labrum, clypeus, transverse lateral marks, and small supraclipeal mark pale yellow. Broadly interrupted band on hind margin of pronotum and spot on tubercles yellowish white. Abdomen orange ferruginous, with a creamy-white band on tergites 1 to 5, that on 5 very narrow and abbreviated; these bands interposed between ferruginous base and the subhyaline apical depression, and broadly and shallowly emarginate in front on each side; or the bands on tergites 1 and 2 (and sometimes 3) broadened and the emargination replaced by enclosed oval spots tinged with brown. Flagellum of antennae pale brown, tinged with yellow beneath, the scape clear pale yellow. Legs yellow, the middle femora tinged with fuscous on dorsal margin, and hind femora except at apex, and apical two-thirds of hind tibiae brownish black. Tegulae pale testaceous. Wings clear hyaline, the nervures and stigma pale brownish yellow.

Head slightly longer than wide, the inner orbits weakly divergent above. Otherwise very similar to *coldeniae*. Length, 2.5–3 mm.; anterior wing, 2–2.2 mm.

Female.—Head and thorax dark green, but disk of mesoscutum and scutellum almost black. Mandibles except reddish tips, labrum, clypeus, transverse lateral marks, and triangular supraclypeal mark pale yellow or creamy white. Transverse mark on each side of hind margin of pronotum and spot on tubercles white. Abdomen creamy white or flesh color, marked with pale ferruginous or fuscous dots, and a curved or angulate mark on each side of summit of basal declivity of tergite 1; the dots in two series, of which those of the first are subapical on each side of tergites 1 to 5 and form sublateral rows, and those of the second smaller, fainter, and placed close to the basal corners of tergites 2 to 5. Legs pale testaceous yellow with a brown cloud on outer side of hind tibiae; sometimes the femora and base of coxae variably clouded with brown. Antennae, tegulae, and wings as in male.

In structure, sculpture, and pubescence similar to *coldeniae*; apex of pygidial plate rather bluntly rounded. Length, 2.9–3.75 mm.; anterior wing, 2–2.3 mm.

Holotype male and allotype, at flowers of *Coldenia plicata*, 4 miles north of Palm Springs, California, June 28, 1941 (Timberlake). Paratypes include 3 males, 16 females, taken with the types and 1 male, on *Coldenia palmeri*, near Westmoreland, May 31, 1930 (Timberlake).

Types in collection of the Citrus Experiment Station, Riverside.

Perdita sexfasciata, n. sp.

This species is a little more slender and elongate than other members of the group and is easily distinguished by the black abdomen with six white bands.

Male.—Head and thorax dark blue-green, the markings very pale yellow or creamy white. Face markings include spot on basal half of mandibles, labrum, clypeus, lateral and supraclypeal marks; clypeus with the usual pair of dark dots; lateral marks broad on the orbits and end acutely above at level of summit of antennal sockets; supraclypeal mark transverse and rounded above. Thorax dark except spot on tubercles, cuneate mark on each side of pronotum and a transverse mark on middle of its anterior margin. White bands of abdomen subapical and delimited by the apical depression of the segments, that on tergite 1 rather broad, and those on following segments successively a little narrower; each band, except the first one or two, bluntly indented by the black on each side in front. Antennae dark brown, the flagellum paler beneath, and the scape broadly pale yellow beneath. Legs black, extreme apex of all femora, basal third and narrow apex of hind tibiae, and all basitarsi yellowish white; front and middle tibiae pale yellow except for a large dark blotch; small joints of front tarsi whitish, of middle pair pale brown, and of hind tarsi fuscous. Tegulae very pale testaceous, with an opaque yellowish spot at base. Wings nearly clear hyaline, the nervures brown, subcosta darker, and stigma with a central pallid streak.

Head and thorax similar to *rhodogastra* and *coldeniae*, the abdomen more elongate and less recurved at apex. Seventh tergite tapering to a blunt point, which is more produced and narrower than in *rhodogastra*. Head and thorax with the usual minutely tessellate and satiny sculpture and virtually impunctate. Pubescence white, sparse in comparison with *coldeniae* and about as in *rhodogastra*. Length, 3–3.2 mm.; anterior wing, 2.3–2.4 mm.

Two males (holotype and paratype) at flowers of *Coldenia palmeri*, 4 miles east of Edom, Riverside Co., California, April 17, 1937 (Timberlake).

Types in collection of Citrus Experiment Station, Riverside.

Perdita trifasciata Timberlake

Perdita trifasciata Timberlake, 1953, Univ. Kans. Sci. Bull., 35:969, ♂.

This species was based on two males collected by R. H. Beamer at White Sands, New Mexico. Additional material now at hand includes the female.

Female.—Similar to male in the robust form and in sculpture and color. Head and thorax dark green, the middle of disk of mesoscutum and the scutellum almost black. Basal half of mandibles, labrum, and clypeus pale yellow, the transverse lateral marks white. The usual pair of dots on clypeus black and between the dots two, broad pale-brown stripes which enclose a yellow oval spot; small contiguous mark on supraclypeal area also pale brown. Apical half of mandibles

reddish. Lateral marks about twice as broad as high, concavely arcuate above, and rounded at inner ends. Antennae brown, the scape pale yellow beneath. Legs black, tinged with brown, the apex of femora, tibiae, and tarsi testaceous yellow, but hind tibiae and tarsi brown except at base of each, and front tibiae slightly blotched with brown behind. Abdomen black, becoming brown at base and beneath and on apical tergite; a rather broad, white, subapical band on tergites 1 to 4, each band with a small rounded emargination on each side behind. Tegulae pale testaceous, becoming pale brownish within. Wings somewhat clouded with brownish, the stigma and nervures brown.

Head as broad as long, the cheeks less than the eyes in width. Facial foveae shallowly impressed, lying close to eye margin and about two-thirds as long as the space between anterior ocellus and antennal sockets. Pygidial plate moderately broad and tapering slightly to the rounded apex. Tarsal claws virtually simple. Length, 3.75 mm.; anterior wing, 2.6 mm.

Three males, 1 female, 25 miles southeast of San Pedro de Colonias, Coahuila, Mexico, Aug. 21, 1947 (C. D. Michener), in American Museum of Natural History.

Perdita optiva, n. sp.

This is a small robust species, resembling *P. sexfasciata*, but the abdomen is ferruginous with six white subapical bands. In the female the abdomen is black with five white bands.

Male.—Head and thorax dark green. Mandibles except rufous tips, labrum, clypeus, transverse lateral marks, narrowly transverse supraclypeal mark, scape of antennae, interrupted band on pronotum, and the tubercles pale yellow or nearly white. Antennae otherwise brown above and more or less yellow beneath. Legs black, the apex of femora, tibiae, and tarsi pale yellow, except three or four apical joints of hind tarsi more or less infuscated. Abdomen orange ferruginous, with a white band before the apical depression on tergites 1 to 6; these bands broader across the middle of segments and broadly emarginated on each side in front of oval black spot; these black spots on tergite 1 large and covering the sides or the whole surface of the basal declivity, and those on tergite 2 frequently enlarged to form a quadrate mark on each side of the base of segment. Tegulae pale yellow at base and testaceous hyaline on outer margin. Wings nearly clear hyaline, the nervures and margins of stigma pale brown.

Head rather large, subquadrate, broader than thorax, and a little broader than long. Cheeks equal to anterior part of eyes in width. Mandibles rather long, curved, tapering; and acute at apex. Facial foveae faintly impressed, between two and three times longer than wide. Marginal cell subequal to first submarginal cell, obliquely truncate at apex and with the parts beneath and beyond stigma equal. Stigma narrowly lanceolate, and rather definitely longer and slenderer than in *sexfasciata*. Abdomen broad, subdepressed, and much recurved toward apex, with apex of the last tergite narrow and truncate. Head and thorax minutely tessellate, with a satiny luster, and impunctate. Pubescence white, coarse, subdepressed, and abundant on face, cheeks, margins of mesoscutum, metanotum, sides of propodeum, and mesopleura. Length, 2.5–3 mm.; anterior wing, 2–2.3 mm.

Female.—Similar to male but more slender. Head and thorax very dark green, the frons and disk of mesonotum black. Mandibles except rufous tips, labrum, clypeus, and narrowly transverse lateral marks creamy white. Clypeus with the usual pair of black dots and just inside the dots two broad pale-brown stripes. A brownish supraclypeal mark faintly developed. Pronotum almost all dark, but the tubercles white. Abdomen black, with a subapical creamy-white band on tergites 1 to 5, the last band being narrow and all except the first shallowly emarginate on each side in front. Antennae brown, the flagellum soiled yellowish white beneath, and the scape almost entirely yellowish white. Legs black at base, the apex of femora, tibiae, and tarsi pale yellow, but small joints of hind tarsi pale fuscous and the hind tibiae with a broad pale brown annulus or posterior blotch on apical half. Tegulae and wings as in male.

Head no broader than long. Facial foveae obscure, faintly impressed, about one-half as long as space between anterior ocellus and antennal sockets. Mandibles with a small inner tooth. Tarsal claws very small, virtually simple. Abdomen elongate oval, fully twice as long as broad. Pygidial

plate broad at base but tapering to acute apex. Sculpture and pubescence as in the male. Length, about 3.6 mm.; anterior wing, 2.3 mm.

Holotype male, allotype, and 12 males, 1 female (paratypes), 2.5 miles north of Plaster City, Imperial Co., California, at flowers of *Coldenia palmeri*, May 1, 1952 (Timberlake and Hurd).

Types in collection of the Citrus Experiment Station, and paratypes in collection of University of California at Berkeley.

Subg. *Glossoperdita* Cockerell

Glossoperdita Cockerell, 1916, Jour. Ent. and Zool., 8:43.

Type of subgenus.—*Glossoperdita pelargoides* Cockerell.

Head more or less longer than wide, with very long mouth parts. Glossa extremely slender and elongate, and in repose reaching middle coxae; galeae of maxillae also very long and attenuate, although much more normal in *giliae* than in *pelargoides*. Wings small, the stigma rather narrow, but not excessively so, being larger and broader in the type species than in *Macrotera* and *Hesperoperdita* (small and lanceolate, however, in *blaisdelli*, but considerably broader in *giliae* than in *pelargoides*). Marginal cell about as long as the first submarginal cell and more or less squarely truncate at apex.

Female with the facial foveae elongate, either linear or widened at anterior end. Mandibles with a small inner tooth. Small joints of tarsi very slender, the claws small and simple. Tibial scopa composed of sparse, strongly curved simple hairs. Pygidial plate rather broadly triangular and blunt at apex (in *blaisdelli* much narrower and acute at apex).

Male with the cheeks broad and unarmed. Facial foveae several times longer than wide, but not elongate. Mandibles rather stout, blunt at apex in *pelargoides*, and abruptly narrowed and acute beyond a blunt inner tooth in *giliae*. Abdomen slightly to moderately depressed and broadened, the seventh tergite narrowed to the simple apex. Apical joint of tarsi slightly enlarged, the claws rather large and strongly bifid. Aedeagus less distinctive than in other subgenera, and more similar to condition in some of the typical groups of *Perdita*. Caulis with a rather small transverse basal orifice, the dorsal median furrow little developed, but the apex deeply and angularly emarginate and produced on each side into a more or less distinct slender lobe; the usual parameral lobes also present, slender, and but little hairy at apex. Volsellae well exposed, the outer pair with a few short, fine setae. Sagittae fusiform in apical half, or sometimes swollen, the tips of rods triangularly knobbed, with apex of knobs turned outward.

Three species of this group have been discovered, two in California and one in Arizona, and so far as known the bees visit only the flowers of the polemoniaceous genus *Gilia* in a broad sense, including the groups *Hugelina* and *Navarretia*, to which the type species is restricted. The slender form of the bees and the long tongue are adaptations to obtain nectar and pollen from the long tubular flowers of the Phlox family.

KEY TO SPECIES

- | | |
|---|--------------------------------|
| 1. Females | 2 |
| Males | 4 |
| 2. Head much longer than wide; mesoscutum dull or dullish, facial foveae linear | 3 |
| Head not much longer than wide; facial foveae distinctly widened anteriorly; mesoscutum delicately tessellate and shining; large triangular lateral marks, often a median mark on clypeus, marks on pronotum and tubercles white; abdomen usually ferruginous, but sometimes more or less infuscated or entirely blackish | <i>pelargoides</i> (Cockerell) |
| 3. Head about one and one-half times longer than wide; abdomen pale orange-yellow, with a creamy-white preapical band on basal segments, or nearly all white with a fuscous spot preapically on each side of tergites 1 to 4 | <i>blaisdelli</i> , n. sp. |
| Head nearly twice as long as wide; abdomen blackish brown; no light markings on head, thorax, or abdomen | <i>giliae</i> , n. sp. |

4. Head barely longer than wide; almost entire face below level of antennae, marks on pronotum and tubercles white; abdomen ferruginous brown or blackish, with a creamy-white preapical band, broadly interrupted on each side, on tergites 1 to 5. *pelargoides* (Cockerell)
 Head distinctly longer than wide; clypeus and lateral marks white; abdomen depressed, broader than thorax, ferruginous brown; no light markings on thorax and abdomen. . . . *giliae*, n. sp.

Perdita pelargoides (Cockerell)

Glossoperdita pelargoides Cockerell, 1916, Jour. Ent. and Zool., 8:43, ♀.

Male.—Head and thorax dark blue-green, the mesonotum almost black. Mandibles except reddish apical half, labrum, and almost entire face below level of antennae white, the clypeal sutures finely black. Lateral face marks squarely or obliquely truncate above and reaching a little above level of antennae. Tubercles and hind margin of pronotum, except at middle, creamy white. Abdomen ferruginous brown or blackish, with a creamy-white band just before the apical depression on tergites 1 to 5, these bands reaching lateral margins and broadly interrupted on each side. Antennae dark brown, paler toward apex, the scape with a creamy-white stripe beneath, and flagellum yellowish brown beneath. Legs blackish, the tip of front and middle femora, their tibiae except behind, and base of their tarsi yellowish white. Tegulae pale testaceous, with a dark spot at base. Wings dusky hyaline, the nervures and margins of stigma fuscous.

Head slightly longer than wide, the cheeks rapidly narrowing anteriorly, the clypeus rather prominent. Facial foveae about three times as long as wide. Abdomen oval, convex, only slightly wider than thorax. Frons finely tessellate, moderately dull, and with rather close minute punctures. Thorax delicately tessellate, shining, and sparsely punctate. Pubescence rather sparse and whitish. Length, 3.5–4.75 mm.; anterior wing, 2.5–2.75 mm.

The type locality of this little bee is Claremont, California. I have examined specimens from Claremont (Baker), and from Lytle Creek Wash, Altadena, Riverside, 1½ miles west of Perris, and Green Valley, 5 miles south of Cuyamaca, San Diego Co., California. The dates of capture range from June 6 to July 4, except that the specimens from Green Valley were taken August 8, but the elevation there is more than 4,000 feet. The flower visited is usually *Hugelgia virgata*, but at Lytle Creek Wash on June 6, 1926, the bees were also visiting the flowers of *Navarretia atractyloides*.

Perdita blaisdelli, n. sp.

Female.—Head and thorax dark blue-green, the mesonotum and metanotum black. Face below antennae black or brownish black, the mandibles and lateral extensions of clypeus rufo-testaceous; a small spot at base of mandible, more or less nubilous spot at base of clypeus, either transverse or somewhat longitudinal, and obliquely triangular lateral face marks, reaching level of antennae, creamy white. Tubercles and large cuniform marks on pronotum also white. Abdomen pale orange yellow, with a creamy-white preapical band on tergites 1 to 3 and a faint band on 4 and 5; each band indented behind on each side close to lateral margins by a small bulging of the darker color of apical margin; or abdomen mainly whitish, except base of tergite 1, and the sublateral bulgings represented by small enclosed fuscous spots on tergites 1 to 4. Antennae blackish, the flagellum reddish brown toward apex and brownish yellow beneath. Legs brownish black, the front and middle knees and stripe on upper side of front and middle tibiae dull yellow, the tarsi brown. Tegulae hyaline with a white spot at base. Wings dusky hyaline, the nervures brown, subcosta fuscous.

Head about one and one-half times longer than wide, the face very convex and the clypeus prominent. Labrum unusually large. Disk of clypeus considerably broader than long, the lateral extension broad and strongly inflexed and concealed in frontal aspect. Facial foveae elongate and linear. Form more slender than ordinary, the abdomen elongate oval, with the pygidium narrow and acute at apex. Wings small, with a small and narrow stigma. Claws with a minute inner tooth.

Head and thorax finely tessellate and moderately dull, the white area of sides of face polished; puncturation fine and sparse, the punctures becoming slightly coarser on scutellum. Pubescence short, sparse, and whitish. Length, about 5 mm.; anterior wing, 2.9 mm.

Two females (holotype and paratype), Mokelumne Hill, 1,500 feet, Calaveras Co., California, June (F. E. Blaisdell).

Type in collection of California Academy of Sciences (no. 2991) and paratype retained at Riverside.

Perdita giliae, n. sp.

Easily distinguished from other species of *Perdita* by the slender form, with elongate head and glossa, and by the absence of light markings in the female.

Female.—Head and thorax dark green, the pleura and propodeum more bluish; clypeus, tumid part of lateral face plates, mesoscutum except anterior border, and scutellum blackish. Abdomen brownish black, darker on apical segments. Antennae and legs brownish black, the flagellum more brownish beneath. Tegulae pale testaceous. Wings dusky hyaline, the nervures brown, the stigma with a pallid central streak.

Head nearly twice as long as wide, the face below antennae strongly convex, and the clypeus prominent. Lateral face plates strongly tumid near sides of clypeus. Facial foveae long and linear. Stigma rather large and moderately slender (distinctly broader than in *pelargoides*). Pygidial plate blunt at apex. Head and thorax finely tessellate and moderately shiny, but the mesonotum dull; clypeus and tumid part of sides of face polished. Punctures minute and sparse, a little more evident on mesonotum than on the frons. Pubescence whitish, fine, and rather short and sparse. Length, about 5–5.5 mm.; anterior wing, 3.5 mm.

Male.—Head and thorax dark green, a little more bluish on pleura and propodeum, the disk of mesoscutum and scutellum hardly blackened. Spot at base of mandibles, clypeus, and lateral marks, a little broader than high and hardly reaching above level of summit of clypeus, white. Mandibles otherwise testaceous, reddened on inner margin and at apex; labrum testaceous; clypeus lacking the usual pair of dots. Tubercles and sometimes adjacent parts of pronotum brown. Abdomen ferruginous brown, sometimes infuscated on basal tergite, and without light markings. Antennae, tegulae, and wings as in female. Legs dark brown, the tarsi lighter; spot at apex of front femora, front and middle tibiae on anterior side, and more or less of their tarsi yellowish; or these markings sometimes restricted mainly to front tibiae.

Head and thorax about one and one-half times longer than wide, the face less convex, and clypeus less prominent than in female. Lateral extensions of clypeus visible in large part in frontal aspect. Mandibles rather stout and curved, and with a subapical notch and tooth. Facial foveae about three times as long as wide. Abdomen broadly ovate, subdepressed, and broader than thorax. Pubescence and sculpture similar to that of female, but mesonotum hardly duller than other parts. Length, about 4.5 mm.; anterior wing, 3.3 mm.

Holotype female and allotype, Prescott, Arizona, visiting a small decumbent, perennial *Gilia*, with slender, tubular, reddish flowers (perhaps a form of *G. aggregata*), Aug. 31, 1930 (Timberlake). Also the following paratypes: 14 females, 19 males taken with the types, Aug. 31 and Sept. 1; 2 males, Oak Creek Canyon, 6,000 feet, Aug. (F. H. Snow); and 2 females, southern Arizona, Aug. 1902 (Snow).

Types in collection of Citrus Experiment Station, Riverside; the paratypes collected by Snow in collection of the University of Kansas.

Hesperoperdita, n. subg.

Type.—*Perdita ruficauda* Cockerell.

This is a group of California species which restrict their flower visits to plants of the leguminaceous genus *Lotus*. Three nominal species are included of which *ruficauda* is the only one well known.

Perdita trisignata Cockerell

Perdita trisignata Cockerell, 1896, Proc. Acad. Sci., Phila., 48:76, fig. 14, ♀.

Described from a single specimen from California, the collector, date, and exact locality unknown. I examined the type at Philadelphia in August, 1928, and was impressed with its similarity to *ruficauda* but unfortunately had no specimens of the latter at hand for comparison.

*Perdita pyrifer*a Cockerell

*Perdita pyrifer*a Cockerell, 1925, Proc. Calif. Acad. Sci. (4)14:192, ♀.

The types of this species were collected by Van Duzee, May 22, 1920, at Pleyto, Monterey County, California. From this source I have examined one paratype female and one male. Although remarkably similar to *ruficauda*, this species is apparently distinct on account of differences in sculpture and genitalia.

Male.—Head and thorax dark bluish green. Mandibles except reddish tips, labrum, and face below antennae except supraclypeal area yellow. A small mark on each side of posterior margin of pronotum and tubercles yellow. Abdomen probably yellowish ferruginous (but reddened by cyanide in the specimen examined), with fuscous blotch on each side of basal half of first tergite. Antennae blackish, the flagellum dull yellowish beneath. Legs black, the trochanters, apex of front and middle femora, front tibiae except a dark blotch beneath, anterior side of middle tibiae, and front and middle tarsi yellow. Tegulae testaceous, the basal margin fuscous. Wings dusky hyaline, the nervure brown, the stigma too slender to show a pallid streak.

In most structural characters similar to *ruficauda*. Frons, vertex, and disk of propodeum tessellate and moderately dull; cheeks, pleura, and mesonotum delicately tessellate and shining; puncturation sparse and minute on frons and mesonotum. Pubescence whitish, fine, and moderately long. Apical plate of eighth ventrite quadrate, slightly longer than wide and truncate at apex (in *ruficauda* moderately narrowed to the rounded apex). Parameral lobes of aedeagus are curved inward and taper to an acute point at apex. Sagittal rods much as in *ruficauda* but not thickened along ventral edge and at apex. Length, about 3.8 mm.

Perdita ruficauda ruficauda Cockerell

Perdita ruficauda Cockerell, 1916, Jour. Ent. Zool., Pomona, 8:44, ♀; Cockerell, 1922, Proc. U. S. Nat. Mus., 60(18):17, ♂.

This is a common species in southern California and has been found visiting the flowers of the following species of *Lotus*: *L. scoparius*, *L. davidsonii*, *L. argophyllus*, *L. strigosus*, and *L. americanus*; occasionally it visits other flowers, such as *Cryptantha*, for nectar. It has been recorded by Cockerell from Claremont, Los Angeles County, and La Mesa, San Diego County, California.

Specimens have been examined from the following localities: West Hollywood hills, Whittier, Altadena, Riverside, Verdmont, 1 and ½ miles west of Perris, The Gavilan; Idyllwild, Stone Creek, Dark Creek, Fern Basin, Marion Mountain Camp, and Santa Rosa Peak (7,500 feet), in the San Jacinto Mountains; Sky Forest in the San Bernardino Mountains; and Sheep Creek and Tanbark Flat in the San Gabriel Mountains. In the collection of the California Academy of Sciences is a pair collected at San Vicente, Lower California, May 11, 1938 (Wm. E. Simonds). At Riverside it flies from April 14 to June 24 and has been taken as late as June 28 at Altadena; in the mountains it flies at least from June 7 to August 16.

***Perdita ruficauda ornata*, n. subsp.**

This more northern race of *ruficauda* differs mainly in the yellow-banded abdomen and the pale legs.

Female.—Similar in most respects to typical *ruficauda*. Abdomen paler ferruginous, with a more or less broad yellow band on tergites 1 to 4 or 5. Legs yellow, except a dark cloud on posterior side of front femora. Clypeus yellow, with two dark submedian stripes on disk; sub-antennal plates more or less yellow (almost entirely so on one side in holotype) and scape of antennae yellow beneath; but in localities from which a series has been examined the face marks vary to virtually the condition found in the southern race. In specimens from Badger and Coffee Camp face, antennae, and legs colored about as in typical *ruficauda*, but abdomen banded with yellow. In structural characters agreeing with the southern race except mesonotum slightly more delicately tessellate and less dull. Length 4.5–5.5 mm.; anterior wing, 3.3–3.5 mm.

Male.—Abdomen suffused or banded with yellow. Tibiae and tarsi more or less all yellow, or the hind tibiae sometimes clouded with brown on outer sides. Scape with a yellow line beneath. In specimens from Badger and Coffee Camp there is little difference from the southern race except that the basal tergites are suffused with yellow. Mesonotum more delicately tessellate and more shining as in female. Length, about 4–5 mm.; anterior wing, 2.9–3.3 mm.

Nine females (holotype and paratypes) Green Valley, Solano Co., California, on *Lotus scoparius*, June 9, 1933 (Timberlake); 7 males (allotype and paratypes) Hastings Natural History Reservation, San Lucia Mts., near Jamesburg, Monterey Co., June 3, 1938 (C. D. Michener). Additional paratypes as follows: 1 female, Mt. Diablo, May 12, 1939 (collector not known); 2 females, 2 males, Coffee Camp, on *Lotus scoparius*, June 8, 1925; 2 females, 1 male, Badger, on *L. nevadensis*, June 26, 1929 (Timberlake); 1 female, Potwisha, Sequoia National Park, June 2, 1929 (E. C. Van Dyke); and 7 males, 8 females, Strawberry, Tuolumne Co., June 18–29, 1951 (J. W. MacSwain).

Types in collection of Citrus Experiment Station, Riverside; paratypes in collections of C. D. Michener, California Academy of Sciences, and the University of California at Berkeley.

***Epimacrotera*, n. subg.**

Type.—*Perdita ainsliei* Crawford.

Epimacrotera comprises a group of ten western and southwestern species, which range from Iowa to Lower California. Except for the tongue of ordinary length this group is similar and closely allied to *Glossoperdita* Cockerell.

Male.—Head variable in shape, usually not much enlarged, the temples broad, but cheeks usually much narrowed anteriorly, and not or hardly dentate. Mouth parts ordinary, the glossa when folded in repose not extending much beyond posterior end of head. Maxillary palpi six-jointed, the joints rather elongate, as are the three apical joints of labral palpi. (In *euphorbiae* and *polycarpae* which visit *Euphorbia*, the tongue and palpi are much shorter.) Facial foveae usually short and shallow but more distinct and rather elongate in *namatophila*. Abdomen moderately broad, subdepressed, and usually unicolorous (light markings present in *polycarpae* and *namatophila*). Legs normal, the femora and apical joint of tarsi not enlarged, the claws bifid. Stigma moderately narrowly lanceolate, but variable as in *Glossoperdita*. Sculpture variable, but the abdomen tends to be duller than usual and is sometimes minutely and densely punctate.

Stipital or parameral lobes elongate, slender, and usually very acute at apex. Sagittae with a fusiform body, the rods abruptly bent outward at tip and often invested with a group of hairs beneath near apex. Volsellae usually small and reduced to one pair in *peculiaris* and *diversa*.

Female.—Mostly lacking striking characters that may serve to distinguish the group from ordinary species of *Perdita*, but the more or less narrow stigma and better defined hind knee plate may be useful. Mandibles with a small inner tooth. Facial foveae well impressed and more or less elongate. Claws with a small inner tooth. Scopa of hind tibiae composed of sparse, more or less coarse hairs, of which those on lower margin are strongly curved upward.

KEY TO SPECIES

1. Females 2
 Males 7
2. Abdomen dark 3
 Abdomen ferruginous, with dusky nubilous cross bands; median mark on clypeus and lateral face marks, about as wide as high, pale yellow; head and thorax dark green, distinctly tessellate but not dull; tubercles white; wings nearly clear hyaline, the nervures yellowish brown; length, about 5 mm. *ainsliei* Crawford
3. Small species with narrow stigma; mesoscutum shining, with minute, moderately close punctures; head broader than long 4
 Mesoscutum more or less tessellate, or if shining with rather sparse punctures, the stigma rather wide and head longer than wide; abdomen dark, without markings 5
4. Abdomen rather dullish black, except for the shining apical depression of tergites 1 to 5; head and thorax dark green, the clypeus black; face with small, transverse, white lateral marks, not reaching above level of clypeus; wings slightly dusky; length, about 3.5 mm. *euphorbiae*, n. sp.
 Similar, but abdomen shining, the apical depression of tergites not bandlike; tergites 1 to 3 each with a pale yellow mark on lateral margins, those on tergite 1 very small; lateral face marks generally very small and sometimes absent; length, about 3.5 mm. *polycarpae*, n. sp.
5. Head about as broad as long; mesoscutum more or less tessellate 6
 Head distinctly longer than wide; head and thorax shining, with minute, rather sparse punctures; dark blue-green, the disk of mesoscutum and scutellum black, the abdomen blackish; no light markings; wings clear hyaline, the stigma rather wide; length, about 5 mm. *nigriventris*, n. sp.
6. Frons shining and closely punctate; mesoscutum faintly tessellate, moderately shining, and with minute close punctures; dark green, with rather small, white lateral face marks; wings dusky hyaline, the stigma moderately narrow; length, about 4 mm. *binotata*, n. sp.
 Head and thorax strongly tessellate, dullish, minutely obscurely punctate, and dark green, the clypeus black, more strongly punctate and shining; no light markings; wings slightly dusky, the stigma moderately narrow; length, about 4.5 mm. *diversa*, n. sp.
7. Abdomen ferruginous 8
 Abdomen dark or mostly dark (with pale yellow markings in *polycarpae*) 9
8. Abdomen unicolorous; head and thorax dark green, the base of mandibles, labrum, clypeus, and rather large quadrate lateral marks creamy white; frons and mesonotum tessellate and rather dull, the mesoscutum with well-separated, fine punctures; legs mostly pale brown; length, 4 mm. *ainsliei* Crawford
 Abdomen rather dark ferruginous, the first tergite much infuscated, the second with two oval yellowish spots forming an abbreviated, interrupted subbasal band; head and thorax blue, the base of mandibles, clypeus except dorsal margin, and transverse lateral marks white; face below antennae convex, the disk of clypeus prominent; wings ample, clear hyaline; length, about 4 mm. *namatophila*, n. sp.
9. Thorax shining, polished, or delicately tessellate, or sparsely punctate 10
 Thorax strongly tessellate and dullish, or closely punctate 14
10. Small species, with head broader than long; scape beneath and tubercles white 11
 Also small, but head quadrate or longer than wide; scape and tubercles dark 12
11. Head and thorax dark green, the abdomen brownish fuscous without markings; mandibles except tips, labrum, clypeus, and lateral marks a little broader than high, white; front tibiae except behind and the tarsi pale yellow; wings a little dusky; length, about 3 mm. *euphorbiae*, n. sp.
 Similar, but a white mark on each side of tergites 2 to 4; white markings of face extending over subantennal plates, the lateral marks higher than wide and reaching level of antennae; anterior tibiae, middle tibiae except behind, base of hind tibiae, and all tarsi pale yellow; length about 3 mm. *polycarpae*, n. sp.

12. Head longer than wide; lateral face marks quadrate, at most a little broader than high; clypeus not dentate 13
 Head about as broad as long; clypeus strongly and acutely produced on each side of the large labrum; dark blue, the mandibles except tips, part of labrum, clypeus except dorsal margin of disk, and lateral marks about twice as broad as high, white; abdomen blackish; length, 4 mm. *dissimulans*, n. sp.
13. Dark blue, the disk of mesoscutum and scutellum black; head rather large, the cheeks broad; mandibles except tips, labrum, clypeus, and quadrate lateral marks white; abdomen dark brown, the apex reddish ferruginous; wings clear hyaline; length, 4.5 mm.
nigrocaerulea, n. sp.
 Head and thorax dark blue-green, the head flat dorsoventrally, the cheeks narrow; mandibles except tips, labrum, clypeus, and rather small lateral marks broader than high, white; abdomen black; wings clear hyaline; length, 3.5-4 mm. *nigriventris*, n. sp.
14. Mesoscutum moderately shining and closely punctate 15
 Mesoscutum distinctly tessellate, dull and with sparse, minute obscure punctures; abdomen minutely, densely, but not very distinctly punctate; dark blue-green, the abdomen blackish; length, about 3.5 mm. *diversa*, n. sp.
15. Mesoscutum with strong, fine, very close punctures, the posterior border dull; abdomen dull, minutely and densely punctate; face below antennae convex, the clypeus prominent; head and thorax dark blue-green, the base of mandibles and transverse band on clypeus white; wings a little dusky; length, 3.5-4 mm. *peculiaris*, n. sp.
 Mesoscutum slightly dullish, with minute, rather faint, close punctures; abdomen hardly punctate; head and thorax dark blue-green, the base of mandibles, labrum, clypeus, and lateral marks much higher than wide and reaching level of antennae, white; wings dusky hyaline; length, 3.5 mm. *binotata*, n. sp.

Perdita ainsliei Crawford

Perdita ainsliei Crawford, 1932, Proc. Ent. Soc., Wash., 34:74, ♂, ♀.

This species is known only from Sioux City, Iowa, where it was discovered and collected during the month of July by C. N. Ainslie, for whom the species is named.

Perdita namatophila, n. sp.

Similar to *ainsliei* but abdomen darker ferruginous with two yellow marks on tergite 2, and the lateral face marks much more transverse.

Male.—Head and thorax dark blue, the tubercles and face marks white. The latter include a spot on base of mandibles, the labrum, clypeus except dorsal border of disk, and transverse lateral marks not reaching above level of clypeus. Mandibles otherwise testaceous, becoming reddish at apex. The black area of clypeus deeply and narrowly notched in the middle and emitting two triangular lobes on each side, which half encircle the usual pair of dots. Abdomen dark ferruginous, the basal tergite strongly infuscated except at middle of apical margin. Tergite 2 with two transversely oval yellow spots across the middle part of disk. Antennae brown, the flagellum yellowish brown beneath, the pedicel and scape blackish. Legs blackish, the front knees, front tarsi, and middle basitarsi white, the tarsi otherwise brown. Tegulae testaceous hyaline. Wings clear hyaline, the nervures pale brown, the subcosta and margins of stigma darker.

Head as wide as long, rather truncate anteriorly, the cheeks posteriorly broad, and the face below antennae convex and prominent. Mandibles strongly curved and tapering to acute apex. Glossa and galeae moderately long and about equal. Maxillary palpi long, the joints of nearly equal length, except the third which is shorter. Facial foveae about four to five times longer than wide. Abdomen subdepressed, slightly broader than thorax. Apical joint of tarsi rather large, the claws strongly bent and bifid. Stigma moderately large, about two-thirds as wide as marginal cell. Head and thorax tessellate, moderately dull, the sculpture of frons and meso-

notum similar, the puncturation very fine, close on sides of face between antennal sockets and upper half of eyes, and sparse on mesonotum. Pubescence whitish, sparse, fine, and moderately long. Aedeagus differs from that of others of this group in having dorsal lobes of caulis virtually absent, and the parameral lobes rather short and blunt at apex. Length, 4 mm; anterior wing, 2.9 mm.

One male (holotype) 7.5 miles south of Twentynine Palms, Riverside Co., California, at flowers of *Nama demissum*, May 7, 1948 (Timberlake), in collection of Citrus Experiment Station, Riverside.

Perdita euphorbiae, n. sp.

This and *polycarpae* are small dark green species, with head broader than long, the tongue short, the stigma rather small and slender, and face markings of female restricted to small lateral marks.

Female.—Head and thorax dark green, the small lateral face marks white, transversely quadrate and not reaching above level of clypeus. Labrum and clypeus black. Mandibles rufotestaceous, more rufous at apex. Thorax dark except the white tubercles. Abdomen blackish, the apical depression of tergites subhyaline, the pygidial plate rufotestaceous. Antennae brown, the flagellum pale brown beneath, the scape blackish. Legs blackish, the anterior side of front tibiae except small whitish spot at base, and all the tarsi brownish. Tegulae testaceous subhyaline, with a whitish spot at base. Wings dusky hyaline, the nervures yellowish brown, with subcosta and margins of stigma darker brown.

Form rather robust, the head distinctly broader than long. Disk of clypeus transverse, the subantennal plates barely longer than wide. Facial foveae linear, rather elongate. Mandibles stout, gently curved, with a small inner tooth. Abdomen rather broadly oval, depressed, and a little broader than thorax; pygidial plate broadly triangular and narrowly obtuse at apex. Claws with a small inner tooth. Wings small; marginal cell somewhat smaller than first submarginal, with poststigmatal portion longer than the portion below stigma; stigma rather small and slender, but not of the extreme lanceolate type. Head and thorax minutely tessellate, shining, and with minute well-separated punctures. Abdomen dullish except on apical depressions, the sides of tergites 2 to 4 minutely punctate, the disk of tergite 5 smoother and more shining than preceding segments and with comparatively coarse sparse punctures. Pubescence whitish, moderately short and erect on head and thorax; some of the scopal hairs of hind tibiae microscopically plumose. Length, 3.25–4 mm.; anterior wing, 2.5–2.7 mm.

Male.—Similar to female but smaller, the mandibles except rufous tips, labrum, clypeus except usual pair of dots, and large lateral marks white. Lateral marks as broad as high, rounded within, and reaching level of antennae. Extreme apex of front femora, front tibiae except behind, and small spot at base of middle tibiae pale yellow; tarsi whitish, with one or two apical joints pale brown. Scape slightly or completely white beneath, the flagellum more yellowish brown beneath than in female.

Head more distinctly broader than long than in female, the clypeus very low and transverse, with the lateral extensions fully visible in frontal aspect. Mandibles with a blunt inner tooth. Facial foveae small and faint. Claws bifid, the two teeth nearly equal. Apical tergite with a pygidiform area, which is very broad across the base, flat on the disk, and obtusely narrow at apex. Sculpture nearly as in female, but frons closely and comparatively coarsely punctate; second tergite of abdomen shining, with a few scattered punctures laterally; tergites 3 to 5 duller than preceding segments and minutely, almost densely punctate except on apical depression. Pubescence as in female, the apical punctate segments of abdomen with minute appressed hair; hair on outer side of hind tibiae sparse and rather coarse. Aedeagus like that of *ainstiei*; parameral lobes slightly widened on basal half; tips of sagittal rods triangularly knobbed at apex and produced outward; volsellae prominent, the tips of each pair closely opposed, with the inner pair rather hammerhead-shaped at apex, the tubercled area facing outward. Length, 2.75–3 mm.; anterior wing, 2.3 mm.

Five females, 6 males (holotype female, allotype, and paratypes), Picacho Pass, Arizona, at flowers of *Euphorbia*, Aug. 7, 1940 (Timberlake), in collection of Citrus Experiment Station,

Riverside. Also the following paratypes: 3 females, 6 males, same data, but collected by E. S. Ross, in collection of California Academy of Sciences; and 7 females, 6 males, same data, collected by C. D. Michener, in collection of University of Kansas.

Perdita polycarpae, n. sp.

Similar to *euphorbiae*, but abdomen with pale yellow or whitish markings in both sexes. It is the only species of the group, except *namatophila*, that has light markings on abdomen.

Male.—Dark olive green, with under side of thorax more bluish; the abdomen brownish fuscous. Mandibles except red tips, labrum, and face below level of antennae except supraclypeal area creamy white; the pair of dark dots on clypeus minute. Tubercles pale yellow. A rather large, irregularly quadrate yellowish-white mark on lateral margins of tergites 2 and 3, and often a small white spot on each side of tergite 1; tergite 7 testaceous brown. Antennae brown, the flagellum paler beneath and whitish toward base, the pedicel and scape broadly white beneath. Legs brownish fuscous, the extreme apex of femora, front and middle tibiae, base of hind tibiae, and all tarsi pale yellow. Tegulae testaceous hyaline, the basal margin pale yellow. Wings dusky hyaline, the nervures pale brown, with subcosta and margins of stigma darker brown.

Head broader than long by about one-fifth, the cheeks strongly receding. Mandibles stout and dentate within near apex. Glossa and galeae very short. Clypeus with the lateral extensions fully exposed, the disk about twice as broad as high, and shallowly emarginate to receive the transverse labrum. Inner orbits very slightly diverging above. Facial foveae a little more than twice as long as wide. Abdomen subdepressed, slightly broader than thorax, the seventh tergite broadly triangular and subacute at apex. Stigma about one-half as wide as marginal cell, which is somewhat smaller than the first submarginal cell. Claws deeply bifid. Head and thorax tessellate and dullish, the frons considerably duller than other parts except the hind margin of mesoscutum; punctures of frons very fine and close, and those of mesoscutum moderately close. Abdomen very minutely lineolate and impunctate. Pubescence white, moderately sparse, and mostly short and erect. Aedeagus similar to that of *euphorbiae*; dorsal lobes of caulis a little more produced, the parameral lobes dilated for a short space on dorsal margin near middle; tubercled apex of inner pair of volsellae directed more basad than outward. Length, 2.3–3 mm.; anterior wing, 1.9–2.2 mm.

Female.—Dark green, the mesonotum a little brassy, and abdomen black. Mandibles testaceous with reddish tips, the labrum and clypeus brownish fuscous. A small, roundish yellowish-white spot on each side of face, adjacent to sides of clypeus and subantennal plates, and sometimes faint or absent. Tubercles pale yellow. A rather large, subquadrate yellowish-white mark on lateral margins of tergites 2 and 3 and often a much smaller white spot on sides of tergite 1. Antennae brownish black, the flagellum reddish beneath. Legs blackish, the outer side of front tibiae and a streak on middle tibiae yellow, the anterior side of front tibiae and the front tarsi brown. Tegulae and wings as in male.

Head somewhat broader than long, the face slightly and almost evenly convex. Mandibles with a small inner tooth. Facial foveae barely widened at anterior end and about as long as two-thirds of space between antennal sockets and anterior ocellus. Claws with a small inner tooth. Sculpture similar to that of male, but frons no duller than disk of mesoscutum; punctures of frons fine, but distinct, and moderately close, those of vertex remote, and those of mesonotum rather close; disk of clypeus with comparatively coarse, well-separated punctures. Pubescence similar to that of male, the hair of frons and mesonotum short and erect. Length, 3.6–4 mm.; anterior wing, 2.3–2.5 mm.

Holotype male and allotype, at flowers of *Euphorbia polycarpa*, just north of Cathedral City, California, Oct. 8, 1945 (Timberlake). Paratypes as follows: 21 males, 23 females, Oct. 8, and 1 male, 14 females, Nov. 13, 1945, at type locality; 11 females, 2½ miles south of Cathedral City, Nov. 14, 1945; 10 males, 3 females, 6 miles south of Palm Springs, Nov. 14, 1945, and Oct. 5, 1948; 1 female, 2 miles north of Rancho Mirage, July 27, 1950; and 2 males, 1 female, 1 mile north of Palm Desert, Oct. 14, 1951 (Timberlake), all on *Euphorbia*, except one female at

flowers of *Pectis papposa*. Also 1 female, Las Animas, Sierra Laguna, Lower California, Oct. 12, 1941 (Ross and Bohart).

Types in collection of Citrus Experiment Station, Riverside, and paratypes in collections of the University of California at Berkeley and the California Academy of Sciences.

Perdita dissimulans, n. sp.

Only the male of this species is known, which is distinctive in having the anterior border of the face transversely white, the clypeus acutely produced on each side of labrum, and the mesonotum polished and impunctate.

Male.—Head and thorax dark blue-green, the middle of mesoscutum black. Mandibles except reddish tips, labrum, clypeus, and transverse lateral marks white. Dorsal margin of disk of clypeus narrowly black, the usual pair of dots very close to lateral margins. Antennae dark, the flagellum brown beneath. Legs black, becoming more brownish apically, a small white spot on front knees, and the anterior side of front tibiae and the front tarsi brownish yellow. Abdomen black, tinged with brown, the venter more brownish; both abdomen and thorax without light markings. Tegulae testaceous brown. Wings slightly dusky, the nervures and stigma sepia brown, the subcosta darker.

Head slightly enlarged and as broad as long, the cheeks moderately broad behind and abruptly angulate and slightly dentate in front as seen from side. Clypeus strongly produced into triangular, slightly divergent lobes, which enclose the labrum. Mandibles long, curved, tapering to acute tips, and rather dilated on outer margin at base. Wings reaching a little beyond apex of abdomen, the stigma large and moderately narrow, the outer discoidal cell distinct. Abdomen nearly normal in shape, the pygidial area narrowly truncate at apex. Frons delicately tessellate and shining, with rather numerous minute punctures, the vertex similar, but punctures very sparse. Cheeks and thorax polished, with a very delicate tessellation on mesopleura, the mesoscutum almost impunctate. Abdomen shining. Pubescence whitish, fine, rather sparse and moderately long. Aedeagus with dorsal lobes of caulis very short and truncate, the parameral lobes long, attenuate and acute; outer pair of volsellae very finely acute at apex, with a single tubercle, the tubercled apex of inner pair directed obliquely outward and basad. Length, 4 mm.; anterior wing, 3.1 mm.

One male (holotype), La Laguna, Sierra Laguna, Lower California, Oct. 14, 1941 (Ross and Bohart), in collection of the California Academy of Sciences.

Perdita nigrocaerulea, n. sp.

This species approaches the *Glossoperdita* group in many ways and the aedeagus is remarkably similar to that of *P. giliae*, but the tongue is less than one-half as long as in *giliae*.

Male.—Head and thorax dark blue, the disk of mesoscutum and scutellum black. Base of mandibles, labrum, clypeus, and quadrate lateral marks extending a little above level of clypeus yellowish white. Usual pair of dots on clypeus minute and faint. Mandibles whitish at base, testaceous in middle, and reddish at apex, the three colors intergrading. Thorax entirely dark, although the tubercles are brownish. Abdomen dark brown, blackish at base, and reddish ferruginous at apex, the apical depression of tergites and the venter rufo-testaceous. Antennae brown, the flagellum paler beneath, the pedicel and scape fuscous. Legs brownish fuscous, the front tibiae yellowish on anterior side, the tarsi brown, with basitarsi dull yellowish except on dorsal margin. Tegulae testaceous hyaline, with an opaque whitish spot at base. Wings clear hyaline, the nervures pale brown, the margins of stigma and nervures enclosing marginal cell darker, the subcosta fuscous.

Head about one and one-third times longer than wide, the cheeks broad behind and much narrowed anteriorly. Mandibles stout, simple, and acute at apex. Disk of clypeus not much broader than high, deeply emarginate to receive the labrum, the lateral extension broadly but not abruptly reflexed. Facial foveae hardly more than twice as long as wide. Abdomen oval, sub-

depressed, and broader than thorax, the apex of pygidial area very acute. Claws deeply bifid, with nearly equal teeth. Head and thorax delicately tessellate and shining, the fine punctures rather close on frons, virtually absent on vertex, and widely spaced on mesoscutum. Abdomen dullish, impunctate. Pubescence whitish, moderately long and erect on frons and mesonotum; hair on outer side of hind tibiae and hind basitarsi long, mosslike, and pale ochreous. Dorsal lobes of cæulis narrow and rather long, the parameral lobes elongate and acute at apex; sagittae fusiformly swollen at middle and a little constricted before the outturned apices; inner pair of volsellae sharp-edged above and armed with a single row of four or five black tubercles. Length, about 4.5 mm.; anterior wing, 3 mm.

One male (holotype), on *Salazaria mexicana*, Oro Grande Wash, 11 miles south of Adelanto, California, May 26, 1941 (Timberlake), in collection of Citrus Experiment Station, Riverside.

Perdita nigriventris, n. sp.

The female of *nigriventris* differs from other known species of the group in having the head longer than wide, the stigma rather large, and the color dark, without light markings. The male is similar but has a white clypeus and small lateral face marks.

Female.—Head and thorax dark blue-green, the clypeus, anterior ends of lateral plates of face, mesoscutum except anterior border, scutellum, and abdomen black. Pygidial plate reddish. Labrum and mandibles piceous. The latter dark red at apex and suffused with yellow in middle. Antennae dark brown, the scape blackish, the flagellum yellowish brown beneath. Legs blackish brown, the front knees with a minute pallid spot. Tegulae almost clear hyaline, yellowish at base. Wings clear hyaline, the nervures pale brown, with subcosta and margins of stigma infuscated; stigma with a broad pallid streak.

Head somewhat longer than wide and no wider than thorax. Face below antennae gently convex and not prominent, the clypeus strongly produced, and the lateral plates with a small tumescent area on each side of clypeus. Facial foveae well impressed and elongate. Maxillary palpi rather long, the joints subequal. Claws bifid at tips, the inner tooth small. Wings of normal size, the stigma moderately wide; marginal cell rather large with the poststigmatal portion considerably longer than the part below stigma. Pygidial plate flat, broadly triangular, and almost acute at apex. Head and thorax shining, with a delicate tessellation and fine sparse punctures. Abdomen except for the paler and smoother apical depression of tergites with a minute granular lineolation and somewhat dullish, but sides of tergites 2 to 4 and disk of tergite 5 smoother and minutely punctate, the punctures of tergite 5 coarser than those elsewhere. Pubescence moderately abundant, rather long, erect, and white on head and thorax. Scopal hairs of hind tibiae sparse and curved. Length, 4.5–5 mm.; anterior wing, 3–3.2 mm.

Male.—Similar to female, but mandibles except rufous tips, labrum, clypeus except usual pair of dark dots, and rather small lateral marks white. Lateral marks broader than high and rounded at inner ends, with the blue color of face intruding part way between them and the clypeus. Small spot on front knees, front tibiae on anterior side, and all tarsi yellowish white, the claws reddish. Apex of tergite 7 of abdomen testaceous yellow.

Frons strongly tessellate and dullish, the sculpture otherwise about as in the female. Facial foveae short and very faint. Claws deeply bifid. Apical tergite gradually narrowing to the projecting and obtusely pointed apex, its base distinctly punctured like the preceding segment. Aedeagus with dorsal lobes of caulis diverging, obtuse at apex, the parameral lobes slender and very acute at apex; sagittae fusiform at middle, much contracted before the acute outturned points of apex; inner pair of volsellae with two rows of dark tubercles on dorsal margin. Length, 3.5–4 mm.; anterior wing, 2.5–3 mm.

Four females, 4 males (holotype female, allotype, and paratypes), 15 miles north of San Ignacio, Lower California, Sept. 29, 1941 (Ross and Bohart); and 1 female (paratype), San Pedro, Lower California, on *Euphorbia*, Oct. 7, 1941 (Ross and Bohart).

Types in collection of California Academy of Sciences except a pair of paratypes retained at Riverside.

***Perdita diversa*, n. sp.**

This species will be known from other species of the group, that have a blackish abdomen, by the dull mesoscutum, with minute, rather sparse, minute punctures. It is most closely allied to *P. peculiaris* which is known only from Terrell County, Texas.

Male.—Dark blue-green, the abdomen blackish. No light markings anywhere, except that the mandibles are yellow, with reddish tips, although sometimes more or less infuscated at base. Flagellum of antennae brown, paler beneath, the scape black. Labrum and clypeus blackish. Legs black, the tarsi a little brownish. Tegulae pale testaceous, with the base brownish. Wings somewhat dusky hyaline, the nervures and margins of stigma brown, the subcosta more fuscous.

Head a little broader than long, truncate anteriorly at level of anterior end of eyes, except for the projecting, semioval, anterior half of disk of clypeus, which is slightly angulate at the middle. Mandibles simple, tapering, and strongly bent at middle, so that the tips are almost at a right angle with axis of the bases. Lateral extensions of clypeus strongly reflexed, the visible portion in frontal view very narrow but extending to base of mandibles. Facial foveae poorly defined and about three times as long as wide. Cheeks simple and somewhat less than the eyes in width. Marginal cell considerably shorter than first submarginal cell, with the parts below and beyond the stigma about equal. Stigma rather narrow, about one-half as wide as marginal cell, and with a distinct central pallid streak. Claws deeply bifid. Abdomen broadly ovate, distinctly wider than thorax, and subdepressed; tergite 7 gradually tapering from base to acute apex. Mesoscutum dull, with a minute tessellation, and with numerous, but well-separated, minute, and rather obscure punctures. Abdomen slightly dullish and with close, minute, and rather obscure punctures. Pubescence abundant, but not dense, the hairs fine, moderately long, erect, and whitish on head and thorax; abdomen with a fine appressed sericeous pubescence; hair of hind tibiae and tarsi and apex of abdomen coarse and mosslike. Length, about 3.5 mm.; anterior wing, 2.7 mm.

Caulis of aedeagus short, with short, rather blunt, and diverging dorsal lobes; lateral parameral lobes elongate, slender, abruptly bent inward before the tips, a little thickened at and just before the bend and ending in a small rounded knob; sagittae fusiform, flaring apart at tips, which are less bent outward than usual in the group and not invested with hair beneath near apex; volsellae reduced to one pair, which are rather long, acuminate, and armed on dorsal margin with six to eight dark tubercles in two rows.

Female.—Dark blue-green, the clypeus and abdomen black. No light markings on face, thorax, and abdomen. Mandibles black at base but nearly the whole apical half red. Antennae black, the flagellum dark brown, becoming paler toward apex and beneath. Legs black, the tarsi a little brownish. Tegulae and wings as in male. Head rotund, as broad as long. Mandibles with a small, blunt inner tooth. Facial foveae narrow, elongate, a little more than three-fourth as long as space between anterior ocellus and antennal sockets. Abdomen twice as long as wide, the pygidial plate acute. Tarsal claws with a small inner tooth. Sculpture and pubescence similar to that of female. Length, about 4.5 mm.; anterior wing, 2.6–2.9 mm.

Holotype male, allotype, and 2 males, 7 females (paratypes) from flowers of *Coldenia greggii*, Cabos, Coahuila, Mexico, 4,000 feet, Aug. 21, 1947 (C. D. Michener); 5 males, 5 females (paratypes), Vallecillo, Nuevo Leon, June 2–5, 1951 (P. D. Hurd); and 1 male (paratype), with head missing, Mt. Franklin, El Paso, Texas, July 6, 1914 (J. C. Bradley).

Types in collection of the American Museum of Natural History, and paratypes in the collections of Cornell University and the University of California at Berkeley and Riverside.

***Perdita peculiaris* Timberlake**

Perdita peculiaris Timberlake, 1953, Univ. Kans. Sci. Bull., 35:970, ♂.

This is a dark blue-green species, with a black abdomen and the light markings restricted to the mandibles and a narrow band on anterior margin of disk of

clypeus. It is based on two males from Terrell County, Texas, collected at flowers of *Chamaeraracha*.

Perdita binotata, n. sp.

The female of *binotata* has the abdomen blackish and the face marks restricted to rather small lateral spots; the male has extensive white face marks, but none on abdomen; the mesonotum in both sexes is dullish with minute close punctures.

Female.—Head and thorax dark green, the labrum, clypeus, and abdomen dark brown to blackish. Mandibles on basal half (changing gradually to red at apex) and rather small lateral marks white; the latter rounded on inner side and reaching not quite to level of antennae on orbits. Tubercles white. Antennae brown, the flagellum pale brown beneath, the scape blackish. Legs brownish, the tibiae and tarsi pale brown, with anterior side of front tibiae yellow. Tegulae testaceous with basal margin brown. Wings dusky hyaline, the nervures and margins of stigma brown.

Head barely wider than long and well rounded, the face below antennae strongly convex. Facial foveae close to eye margin, elongate oval, and about four times as long as wide. Claws minutely dentate on inner margin. Marginal cell almost as long, but not as wide, as first submarginal cell, with part beyond the stigma barely longer than the part beneath. Stigma moderately wide. Head and thorax faintly tessellate, slightly dullish, with close minute punctures on frons and mesoscutum; mesopleura almost impunctate. Abdomen dullish, with a minute lineolation and shallow, obscure punctures. Pubescence white and erect, rather dense on cheeks and sternum, and very short on disk of mesoscutum; middle tergites with fine, very short, appressed pubescence; scopal hair of hind tibiae coarse, sparse, rather short and strongly curved. Length, about 4 mm.; anterior wing, 2.8 mm.

Male.—Dark blue-green, the abdomen dark brown or blackish. Mandibles except red tips, labrum, clypeus except usual pair of dots, and lateral marks white. Lateral marks large, usually nearly twice as high as wide, more or less obtuse above and reaching level of antennae. Antennae brown, the flagellum pale brownish yellow beneath, and the scape white beneath. Legs brownish black, the front and middle knees, front tibiae except the pale brown posterior side, middle tibiae on anterior, and all tarsi pale yellow. Tubercles, tegulae, and wings as in female.

Head rounded, slightly broader than long, the cheeks narrow. Clypeus large, not dentate anteriorly, the lateral extensions well exposed in frontal aspect. Mandibles short and gently curved. Claws bifid. Abdomen oval, about twice as long as wide. Head and thorax minutely tessellate and shining, the frons and vertex a little duller than other parts, the puncturation very fine and close, but fainter and sparser on mesopleura; abdomen dullish but not distinctly punctate. Pubescence as in the female, the hairs of hind tibiae and basitarsi rather long and mosslike. Aedeagus with dorsal lobes of caulis extremely short and broadly rounded at apex, the parameral lobes moderately long, curved inward, and acute at apex; sagittae fusiform, contracted before the outturned points which are shorter and blunter than usual; volsellae very small and without the usual dark tubercles. Length, 3–3.5 mm.; anterior wing, 2.7 mm.

Holotype female and allotype, Coyote Cove, Concepcion Bay, Lower California, Oct. 1, 1941 (Ross and Bohart). Also the following paratypes: 3 males, taken with the types; 1 male, 10 miles south of Coyote Cove, Oct. 1, 1941 (Ross and Bohart); 1 female, Yuma, Arizona, at flowers of *Physalis*, Oct. 3, 1947 (R. C. Dickson); and 1 female, 2 males, Tucson, Arizona, Aug. 13, 1950 (R. S. Beal).

Types in collection of California Academy of Sciences; paratypes in collection of the Citrus Experiment Station, Riverside, and the University of California at Berkeley.

Subg. *Cockerellia* Ashmead

Cockerellia Ashmead, 1898, *Psyche*, 8:284; Cockerell and Porter, 1899, *Ann. Mag. Nat. Hist.* (7)4:414, 415.

Philoxanthus Ashmead, 1898, *Psyche*, 8:285.

Type of subgenus.—*Perdita hyalina* Cresson.

Beginning with *Cockerellia* and including the five following subgenera (*Procockerellia*, *Pentaperdita*, *Hexaperdita*, *Callomacrotera*, and *Xeromacrotera*) we pass to a congeries of closely related groups that evidently have been derived from a common ancestral stock, and that are more remotely related to all other groups of *Perdita* except possibly *Heteroperdita*. This congeries has the following common characters: an unusually copious tibial scopa and simple claws in female, and in the male a narrow, more or less densely pubescent medio-apical plate of the eighth ventral segment, which has a broad and bilobate articulating basal part (in contrast to almost all other *Perdita*, excepting *Heteroperdita*, which have the articulating base more or less narrow and the apical plate broad and variously shaped). In connection with the more copious scopa the female has the habit of collecting the pollen partly dry with some of the load carried by the hairs of the trochanters, femora, and basitarsi, but when the mass of pollen begins to extend beyond the tips of the scopal hairs, then additional layers are superimposed by a process of agglutination as in other *Perdita*.

The species of *Cockerellia* are rather large bees, up to about 9 mm. in length. Marginal cell shorter than first submarginal and extending about one-third, or a little less, of the distance from apex of stigma to apex of wing. Stigma moderately wide and usually about one-half as wide as marginal cell. Glossa moderately elongate, extending in repose to hind margin of head or a little beyond to reach the front coxae; glossa and galeae of nearly equal length. Maxillary palpi six-jointed, the joints nearly equal; maxillary palpi elongate, the first joint very long, the next three subequal and together less than half as long as the first.

Female.—Head usually about as long as wide, the clypeus more or less prominent. Mandibles very broadly dilated on inner margin, with the apical fourth abruptly bent inward and tapering to acute apex. Facial foveae well impressed, a little widened above and about two-thirds as long as the space between antennal sockets and anterior ocellus. Scopa dense for a *Perdita*, the hairs long, finely and closely crinkled, and sometimes minutely plumose. Claws simple, curved, and gradually thickened to base. Pygidial plate large, flat, and more or less broadly truncate at apex.

Male.—Head usually quadrate, with very broad cheeks that are abruptly narrowed and angulate anteriorly. Mandibles long, tapering, and acute. Pronotum deeply furrowed perpendicularly on the sides, the dorsal disk abbreviated, with the hind margin more or less ridged and prominent at outer ends. Abdomen oval, about twice as long as wide, subdepressed, and only slightly wider than thorax; apical tergite with a broad, nude medio-apical area, but not otherwise pygidiform, the apex obtuse or broadly truncate. Legs long, the hind tarsi slender and much longer than the hind tibiae; claws of hind tarsi simple as in female, those of front and middle tarsi bifid.

Caulis of aedeagus no longer than wide, with two blunt dorsal lobes, beneath the apical margin of which projects an acute spurlike process; parameral lobes broadly dilated at base and tapering to a more or less narrow or acute apex. Sagittae fused, moderately slender or slightly fusiform, the copulatory eversible sac emitted from a slit at apex. Volsellae about normal in size, the outer pair slender and curved, the inner pair dilated. Aedeagus in lateral view somewhat resembling a slipper with a high instep, the caulis forming the heel and the parameral lobe the toe.

KEY TO SPECIES

- | | |
|---|------------------------|
| 1. Females | 2 |
| Males | 30 |
| 2. Head and thorax mainly yellow | 3 |
| Head and thorax mainly green | 4 |
| 3. Head, thorax, and abdomen yellow, the lower half of pleura green; usual pair of dots on clypeus, facial foveae, and flagellum above blackish; mesonotum with short, dense, erect yellow hair | <i>beata</i> Cockerell |

- Similar to *beata* but with large, irregular, more or less broken green mark on frons and two narrow green stripes on mesoscutum. *signata*, n. sp., var.
4. Large supraclypeal or subantennal marks present; propodeum or dorsum of thorax sometimes marked with yellow 5
 Face marks restricted to lateral and clypeal marks (except a vestigial supraclypeal mark sometimes present in *utahensis*); light marks of thorax restricted to pronotum. 7
5. Both supraclypeal and subantennal marks present. 6
 No supraclypeal mark; lateral marks extending upward between foveae and eyes; face marks, scape of antennae, entire pronotum and legs, propodeum, part of metanotum, apical line on scutellum, and entire abdomen canary yellow; mesonotum minutely and densely punctate and hairy *pulchella*, n. sp.
6. Mesonotum shining, rather sparsely punctate, and thinly hairy; pronotum and legs dark with yellow markings; propodeum with a large yellow mark on each side behind; abdomen yellow, with five broad black bands; wings a little dusky, with dark nervures. *propodealis*, n. sp.
 Mesonotum finely and densely punctate and hairy; pronotum and legs partly dark to almost entirely yellow; yellow markings on thorax otherwise frequently absent, but small marks on posterior surface of propodeum, on metanotum, and scutellum, and two thin stripes on mesoscutum sometimes present; abdomen yellow, with five narrow black bands (for extreme end variation see couplet 3); wings milky hyaline with pallid nervures. *signata*, n. sp.
7. Clypeus usually all yellow or white, except usual dots; lateral marks triangular, reaching level of antennae 8
 Face marks more restricted, the lateral marks more or less transverse and not extending above level of clypeus 13
8. Wings faintly dusky or yellowish, with pale brownish nervures. 9
 Wings milky hyaline, with pallid nervures and stigma. 12
9. Mesonotum minutely and densely punctate, the punctures not much more than their own diameter apart; supraclypeal area entirely dark. 10
 Mesonotum polished, with numerous fine punctures that are several times their own diameter apart; clypeus, triangular lateral marks, and often a vestigial supraclypeal mark yellowish white; pronotum, legs in large part and abdomen yellow, the latter with four black bands
utahensis Cockerell
10. Head and thorax brassy green, the mesonotum faintly tessellate and dullish between the punctures 11
 Head and thorax dark blue-green; mesonotum shining, the dense punctures very minute; base of mandibles, clypeus, lateral marks, pronotum and legs in large part, and abdomen yellowish white, the abdomen with five black bands; pubescence white. *bailoyae* Cockerell
11. Clypeus and lateral marks white; pronotum and legs in large part and abdomen pale yellow or yellowish white; abdomen with five rather broad black bands and the basal declivity of tergite 1 black down the middle. *perpulchra perpulchra* Cockerell
 Similar, but light parts of thorax, legs, and abdomen bright yellow, and the first tergite entirely yellow, except for a narrow, apical dark band. *perpulchra flavidior* Timberlake
12. Brassy green; clypeus, lateral marks, and sometimes a small supraclypeal mark yellowish white; pronotum, legs, and abdomen in large part yellow, the dark bands of abdomen poorly developed; mesonotum very densely and minutely punctate, with very short, coarse, erect white hair *albihirta albihirta*, n. subsp.
 Similar, but more bluish green; femora dark, except broadly at apex; abdomen with dark bands and tergite 1 nearly all dark; clypeus with two dark spots on upper part of disk besides the usual pair of dots; mesonotum comparatively sparsely punctate
albihirta geracae, n. subsp.
13. Frons dull or opaque, more or less obscurely punctured or impunctate. 14
 Frons at most merely dullish and distinctly, although minutely, punctured. 21
14. Wings dusky hyaline, the nervures and stigma pale brown or testaceous; hair of hind tibiae more or less fuscous. 15
 Wings milky hyaline, the nervures pale yellowish or nearly colorless, the stigma frequently yellow or pale orange; hair of hind tibiae usually only slightly darkened. 16

15. Wings pale fuliginous; the nervures and stigma pale brown; clypeus except two dark stripes that are abbreviated anteriorly and more or less widened above, transverse lateral marks, and a broad band on tergites 2 to 5, narrowly interrupted on 2 and 3, yellow
bequaerti bequaerti Viereck
Wings more faintly dusky, the nervures more testaceous; dark marks on clypeus often enclosing a median yellow stripe, which expands anteriorly.*bequaerti indianensis* Cockerell
16. Frons obscurely punctured, dull but hardly opaque; abdomen entirely dark or with yellow bands that are usually interrupted (rarely entire on one or more segments) 17
Frons comparatively opaque and virtually impunctate; abdomen usually with broad, entire yellow bands 19
17. Clypeus more produced and prominent, the apical truncation hardly wider than length of the oblique sides to base of mandibles. 18
Clypeus less produced and prominent, the apical truncation considerably broader than length of the oblique sides to base of mandibles; small streak on middle of clypeus, thin transverse marks curved around anterior end of lateral plates of face, scape of antennae beneath, and rather narrow interrupted band on tergites 2 to 5 yellow.*fractineta* Timberlake
18. Glossa and galeae hardly reaching beyond the proboscis fossa; mesonotum moderately closely punctured, the distance between contiguous punctures usually three or four times greater than their diameter; median streak on clypeus, narrowly transverse lateral marks, and bands on abdomen yellow; the latter sometimes entire on tergites 2 to 5, but usually more or less contracted or absent.*verbesinae* Cockerell
Glossa and galeae extending beyond proboscis fossa to base of front coxae; mesonotum more closely punctured, the punctures usually not much more than two or three times their own diameter apart; pubescence of mesonotum shorter, denser, coarser, and more ochreous; markings variable, but face marks very small or absent, and abdominal bands often absent, and usually interrupted, if present, on tergites 2 to 5.*heliophila* Cockerell
19. Face marks small or absent. 20
Clypeus, except triangular black mark on each side of upper part of disk, and lateral marks yellow; marks on pronotum and tubercles large; abdominal bands rather narrow, not quite reaching lateral margins and narrowly interrupted on tergites 2 and 3, or broader and entire in more southern localities.*lacteipennis pallidipennis* Graenicher
20. Median stripe on clypeus, transverse lateral marks, spot on tubercles, and two marks on pronotum yellow; abdominal bands broad, entire, and usually reaching lateral margins
lacteipennis lacteipennis Swenk and Cockerell
Face entirely dark; abdominal bands more or less interrupted in northern localities, and broad and entire southward.*lacteipennis canadensis* Crawford
21. Wings milky hyaline 22
Wings pale fuliginous, the nervures and stigma dark brown; clypeus, except black mark on each side of disk above, and transverse lateral marks yellowish white; four broad bands on abdomen yellow*obscuripennis*, n. sp.
22. Clypeus more produced and prominent, the lateral extensions strongly inflexed on each side of labrum and hardly visible in frontal aspect. 23
Clypeus less produced and prominent, the lateral extensions very broad except close to base of mandibles, nearly as wide opposite the apex as opposite the base of labrum, and not fully concealed in frontal aspect. 25
23. Frons minutely and delicately tessellate and minutely punctate; yellow bands on tergites 2 to 5 usually broad and a yellow spot or mark present on each side of disk of tergite 1. 24
Frons more strongly tessellate, more dullish, and more strongly punctate than in *albipennis*; tergites 1 and 5 immaculate, or sometimes two yellow spots present on 5, but these usually small and faint, a rather narrow yellow band, not reaching lateral margins, on tergites 2 to 4; otherwise like *albipennis*, but somewhat smaller.*tricincta* Timberlake
24. Dark olive green; clypeus and lateral face marks pale yellow, the clypeus with two dark blotches on upper half of disk, which usually outline a yellow T; abdominal bands broad and usually reaching lateral margins; hair of legs light, the scopal hair of hind tibiae pale yellowish*albipennis* Cresson

- Similar but wings less dusky, the nervures pale ferruginous brown; markings similar, but lateral spots on tergites 2 and 3 lacking. *bequaerti indianensis* Cockerell
35. Face marks obsolete or nearly so. 36
 Anterior margin of clypeus and narrowly transverse, lateral marks yellow; scape of antennae usually more or less yellow beneath; yellow markings of abdomen usually restricted to small lateral spots on tergites 2 and 3. *lacteipennis pallidipennis* Graenicher
36. Abdomen rather broad and dullish, the apical depression of tergites whitish subhyaline; traces of yellow markings sometimes present on face, especially a fine median line on clypeus; markings of abdomen evanescent, generally restricted to extreme lateral margins or to reflexed sides of tergites; length, 7-8 mm. *lacteipennis lacteipennis* Swenk and Cockerell
 The male of *canadensis* Crawford not certainly distinguishable from *lacteipennis*.
 Abdomen narrower and more shining; no yellow markings except on reflexed lateral margins of tergites; length, about 6.5-7 mm. *heliophila* Cockerell
37. Abdomen microscopically lineolate and comparatively shiny; apical depression of tergites usually conspicuously whitish hyaline. 38
 Abdomen opaque black, with a minute granular sculpture, the apical depression of the tergites smoother and more shining but hardly lighter in color than disk; head and thorax somewhat brassy green; tarsi yellow and sometimes a small yellow spot on each side and at middle of clypeus and on each side of hind margin of pronotum. *scopata*, n. sp.
38. Tongue comparatively long, the glossa and galeae reaching well beyond the proboscidal fossa. 39
 Glossa and galeae in repose hardly surpassing the proboscidal fossa. 44
39. Larger and not at all brassy green species, with the frons more shining and distinctly punctured. 40
 Smaller, brassy green species, with frons duller and rather obscurely punctured. 41
40. Frons tessellate, moderately shiny and moderately closely punctate; mandibles except tips, clypeus except a black patch on each side of upper part of disk, and transverse lateral marks yellow; pronotum dark except an interrupted yellow line on hind margin of notum; flagellum of antennae orange yellow beneath, more ferruginous above, or slightly darkened toward base, the scape yellow beneath; abdomen with evanescent yellow bands just in front of the apical depression of tergites. *albipennis* Cresson
 The var. *helianthi* Cockerell has the flagellum more or less blackish and the yellow bands of abdomen present, but never strongly developed.
 Similar, but frons a little more strongly and closely punctured; flagellum orange yellow and hardly darkened above; abdomen duller and virtually without markings
tricincta Timberlake
41. Yellow markings of face, pronotum, and abdomen comparatively extensive. 42
 A small yellow spot on lateral extensions of clypeus and a dot at anterior corners of face; tubercles and pronotum with only a trace of yellow; yellow bands of abdomen evanescent or absent; front and middle knees, anterior side of front and sometimes of middle tibiae yellow. *coreopsidis obscurior* Timberlake
42. Clypeus yellow, with two black marks on upper part of disk, between which the yellow intrudes; lateral marks large and a yellow spot on cheeks at anterior end of eyes. 43
 Clypeus with a large black mark, which usually reaches anterior margin of disk and sometimes encloses a thin median yellow line on upper part of disk; lateral marks generally small, or narrowly transverse. *coreopsidis coreopsidis* Cockerell
43. Abdomen mainly yellow, with a black band at base of tergites 2 to 5, and a small, transverse dark spot subapically on each side of tergites 2 and 3; apex of femora and the tibiae yellow, except a small blotch on middle tibiae and most of posterior side of hind tibiae; antennae entirely yellow or orange yellow. *coreopsidis kansensis* Timberlake
 Abdomen black with preapical yellow bands, more or less interrupted on each side, especially on tergites 2 to 4, by a broad lobe projecting from the dark base; hind margin of pronotum yellow from one tubercle to the other; antennae yellow, with apex of scape, pedicel, and first flagellum joint fuscous above; hind femora except at apex and the hind tibiae dark
coreopsidis collaris Cockerell

44. Frons comparatively shiny and more distinctly punctured. 45
 Frons dullish, with the punctures minute and rather obscure in some aspects; clypeus, except two large black marks on disk, and transverse lateral marks bright yellow; pronotum and tubercles usually dark; abdomen with narrow preapical yellow bands, which tend to be evanescent *verbesinae* Cockerell
45. Brassy green species, with disk of clypeus partly dark. 46
 More or less blue-green species, with clypeus all, or nearly all, light. 48
46. Wings milky hyaline, with pallid nervures. 47
 Wings subfuliginous, the nervures and stigma brown; clypeus except two dark marks, one on each side of upper part of disk, transverse lateral marks, two spots on hind margin of pronotum, spot on tubercles, and mark on each side of tergites 1 to 5 yellow; apical depression of tergites hardly lighter than the disk. *obscuripennis*, n. sp.
47. Abdomen blackish, with evanescent yellow bands, the apical depression of tergites whitish subhyaline; mandibles except tips, labrum, clypeus except two large black marks narrowly separated on disk, and transversely linear lateral marks bright yellow; frons somewhat dullish, with numerous fine punctures. *lepachidis lepachidis* Cockerell
 Similar, but frons more shining and more distinctly punctured
lepachidis levifrons Timberlake
48. Wings milky hyaline, with pallid nervures. 49
 Wings faintly dusky, the margins of stigma and nervures enclosing marginal cell pale brownish; mandibles except tips, labrum, clypeus, and triangular lateral marks, as high as wide, bright yellow; abdomen with yellow subapical bands, broadly emarginate or interrupted on each side *utahensis* Cockerell
49. Lateral face marks large, triangular, somewhat broader than high, but generally reaching level of antennae 50
 Lateral face marks transverse, reaching no higher than clypeus, except for a slender linear extension on orbits to level of antennae; mandibles except tips, labrum, clypeus, lateral marks, and small spot at anterior end of cheeks pale yellow; abdominal bands broad, yellowish white, usually emarginate or enclosing a dark spot on each side; mesoseutum with very fine close punctures *baileyae* Cockerell
50. Mesoseutum closely punctate and with short mosslike white pubescence; face markings yellow, the lateral marks usually confluent with an oblique streak across subantennal plates to antennal sockets, or sometimes the subantennal plates entirely yellow as well as a transverse supraclypeal mark; yellow bands of abdomen broad, usually enclosing a fuscous spot on each side of tergites 2 and 3; femora more or less broadly yellow on anterior side
albihirta albihirta, n. subsp.
 Mesoseutum polished, moderately closely punctate and pubescent; face markings more or less creamy white, the subantennal plates and supraclypeal area dark; abdominal bands rather broad but often nearly interrupted on each side, or with a small enclosed black spot, the apical depression of tergites conspicuously whitish subhyaline; femora dark except at apex *albihirta geraeae*, n. subsp.

The species *P. sparsa* Fox and *P. aureovittata* Cockerell, whose position in *Cockerellia* was indicated by Cockerell, do not belong to this group. *P. pasonis* Cockerell described as a variety of *albipennis* (Proc. Acad. Sci., Phila., 48:105) is unknown to me. It is similar to *P. hyalina* Cresson, and because of its dull frons it is certainly distinct from *albipennis*.

Perdita beata Cockerell

Perdita beata Cockerell, 1895, Psyche 7, Suppl., 1:10; Cockerell, 1896, Proc. Acad. Sci., Phila., 48:9, ♀.

This beautiful bee was described from Las Cruces, New Mexico, where it was found at the flowers of *Verbesina encelioides*. The only specimen of this rare species

that has passed through my hands during the last twenty-five years is a female collected July 26, 1914, at El Paso, Texas, by J. C. Bradley.

Perdita signata, n. sp.

Allied to *P. beata* Cockerell and possibly intergrading therewith, but the actual relationship will remain uncertain until *beata* becomes better known.³

Female.—Dark bluish green, with extensive pale yellow markings. Quadrate spot at anterior end of cheeks, mandibles except reddish tips, labrum, clypeus, lateral, supraclypeal and subantennal marks yellow. Lateral marks obliquely truncate from near the middle of outer margin of subantennal plates to orbits at level of lower end of facial foveae, and often with a slender extension upward between foveae and margins of eyes. Face thus mainly but not quite entirely yellow below level of antennae. Pronotum yellow except a dark line in the depth of the crease on each side and a broader dark band across the disk. Thorax otherwise entirely dark, or frequently marked with yellow as in holotype as follows: a spot or transverse band at apex of scutellum, another spot or band on metanotum, and two spots on the truncate area of propodeum. Antennae yellow, the apex of scape, the pedicel, and following joint each with a blackish spot above, the remainder of flagellum blackish above and gradually changing to brownish yellow beneath. Legs brownish black, the apex of femora, anterior side of front and middle tibiae, and generally the front tarsi yellow. Abdomen yellow, with a black band at apex of tergites 1 to 3 or 4, the bands on tergites 2 and 3 (or 4) with a quadrate or oval thickening on each side in front (the bands frequently obsolescent except for these bulgings, especially on tergites 3 and 4); band on tergite 1 generally broader than others and sometimes accompanied by two submedian dark spots at base of disk and by two or three marks across the middle of the basal declivity. Tegulae yellow, becoming hyaline on outer margin. Wings milky hyaline, the stigma and nervures pale yellow.

Structure that of a typical *Cockerellia*, with a rather prominent clypeus and rather long mouth parts that moderately surpass the proboscoidal fossa. Pygidial plate moderately broad at apex, which is slightly emarginate. Frons shining, with a delicate tessellation and rather close, fine distinct punctures. Mesoscutum shining, with moderately dense punctures (these punctures considerably less dense than in *pulchella* or *perpulchra* and much closer than in *propodealis*). Pubescence whitish, a little tinged with ochreous above, the hair of mesonotum short, erect, and rather dense. Length, about 6.5–7.5 mm.; anterior wing, 4.4–5 mm.

Var. a.—Yellow marks of thorax enlarged to include the posterior face of propodeum, apex of basal area, triangular mark on scutellum, a dot on each axilla (or axillae, scutellum, and posterior and dorsal face of propodeum in entirety), lateral margins of mesoscutum, band across middle part of posterior margin of scutum, and a thin line from outer corners of this band to anterior margin of scutum. Pronotum entirely yellow. Legs and abdomen mainly yellow, the latter usually with three or four narrow dark bands.

Var. β.—Mainly yellow, but a green mark between antennal sockets, a more or less broken green mark on frons between the foveae and around the ocelli (dark marks of face sometimes confluent), two narrow green stripes on mesoscutum, widened anteriorly and pointed behind, and a large green mark covering most of mesosternum.

Male.—Head and thorax dark green, the face mainly yellow below level of antennae, but the lateral marks obliquely truncate above, with the green descending on each side to touch the outer, upper corners of the subantennal plates rather broadly. Frequently a yellow dot in the green on upper margin of antennal sockets. Pronotum yellow, with a broad green or blackish band from outer edge of one side to the other. Antennae yellow, the flagellum brownish fuscous above, brownish beneath at apex, and the dark color of its joints 2 to 4 partly invading the yellow sides (but its joint 1, pedicel, and apex of scape dark only above). Legs yellow, including apex of coxae, but the femora fuscous behind except broadly at apex, and tibiae also frequently blotched with fuscous beneath and behind, and the hind tarsi brownish.

³ It is possible that *P. beata* and *P. perpulchra* are forms of one species, since they were both taken at flowers of *Verbesina* at Las Cruces in the fall. If this proves true and if my present identification of *perpulchra* is correct, then *signata* is distinct from *beata*.

Abdomen (allotype) mainly black, with narrow yellow bands broadly interrupted on each side, sometimes with the yellow on tergites 1 and 2 restricted to lateral marks; or abdomen varying to mainly yellow, with first tergite fuscous except around the margins and sometimes two dark oval subapical spots on tergite 2 and traces of basal dark bands on other segments. Tegulae and wings as in female.

Head somewhat broader than long, the cheeks broad, frequently angulate anteriorly. Sculpture and pubescence similar to that of female, but mesonotum a little less densely punctured and its pubescence finer and whiter. Length, 5.75–7 mm.; anterior wing, 4.3–4.9 mm.

Holotype female and allotype, Guadalupe, Coahuila, Mexico, Aug. 23, 1947 (C. D. Michener). Paratypes as follows: 29 females, 12 males taken with the types (Michener, Spieth, and Cazier); 2 females, 1 male, Paila, Coahuila, 3,900 feet, Aug. 21, 1947 (Michener and Gertsch); 3 females, 3 males, Cabos, Coahuila, 4,000 feet, on a yellow composite, Aug. 21, 1947 (Michener and Gertsch); 1 female, 8 males, 25 miles southeast of San Pedro de Colonias, Coahuila, 3,700 feet, Aug. 21, 1947 (Michener); 2 females, Pedricina, Durango, 4,500 feet, Aug. 1947 (Michener); and 1 male, Catarinas, Chihuahua, 5,800 feet, July 26, 1947 (Gertsch).

Types in collection of American Museum of Natural History, New York; three pairs of paratypes in collection of Citrus Experiment Station, Riverside.

Perdita pulchella, n. sp.

Female.—Head and thorax dark green, the light markings and abdomen canary yellow. Mandibles except dark red apical third, clypeus except usual pair of dots, lateral and subantennal marks, and a large quadrate mark anteriorly on cheeks pale yellow. Lateral marks gradually narrowed above and continued as a thin line on orbits to slightly above middle of eyes. Subantennal marks margined by a thin green line. Pronotum entirely, narrow apical margin of scutellum, band on metanotum, upper end of metapleura, and the propodeum except a thin arcuate line at base and small blotch on each side of disk bright yellow. Lateral foveae of tergite 2 black, and apical depression of tergites 1 to 5 conspicuously hyaline, with a silvery sheen in some aspects. Pygidial plate reddish brown, but paler on the margins. Antennae yellow, the scape and pedicel with a fuscous dot above, the flagellum changing to ferruginous at apex and dark fuscous above. Legs, including coxae, yellow, with middle and hind tarsi and a short streak on posterior edge of middle tibiae fuscous. Tegulae yellow, the outer margin subhyaline. Wings slightly dusky, the nervures and stigma dull yellow.

Clypeus rather less prominent than in *albipennis*. Apical part of mandibles slender and very acute. Pygidial plate broader than in *albipennis* or *beata* and emarginate at middle of apex. Frons and vertex minutely granular-tessellate and dullish, with fine obscure punctures on the frons. Mesonotum very finely, almost densely punctate, and shining between the punctures. Abdomen microscopically lineolate and slightly dull. Pubescence unusually abundant, brownish ochreous on vertex and notum, and whitish on face and underparts, that on mesonotum rather dense and very short, with a few, somewhat longer, more erect hairs intermixed. Length, about 7 mm.; anterior wing, 4.5 mm.

One female (holotype), Carrizo Springs, Dimmit Co., Texas, June 29, 1928 (W. R. Frazier), in collection of Citrus Experiment Station, Riverside.

Perdita propodealis, n. sp.

Female.—Head and thorax dark green, marked with bright yellow as follows: mandibles except reddish tips, labrum, nearly all of face below level of antennae, slightly interrupted band on hind margin of pronotum, broad band on anterior part of sides of pronotum, more or less confluent with the yellow elevated anterior rim of disk of pronotum, large spot on tubercles, and two large patches on propodeum. Clypeus with the usual pair of black dots and often with two thin blackish stripes on middle of disk, which converge above but fail to meet and end far from either the anterior or posterior margin. Upper margin of the yellow on face very uneven, with the supraclypeal mark transverse and rounded above, the sutures of the subantennal plates blackened, and the lateral marks truncate above but with a short spur that intrudes between fovea and eye margin. Marks of propodeum leaving the basal area green, or the latter may have

a small yellow spot on each side, the large marks narrowly separated apically and covering most of the pleural regions. Abdomen yellow, with a broad blackish band, somewhat narrowed at outer ends, on tergites 1 to 5. Pygidial plate brownish fuscous. Antennae blackish, the scape yellow, and the flagellum reddish brown beneath. Legs brownish fuscous, with apex and most of posterior side of front femora, anterior side of front tibiae, similar but more restricted marks on middle femora and tibiae, and spot on inner margin of hind coxae yellow. Tegulae pale testaceous, the base yellowish. Wings dusky hyaline, the nervures and stigma dark brown, the subcosta blackish.

Mandibles expanded about one-half as much as in *albipennis*, and not much hooked at apex. Pygidial plate broad at base and much narrowed to the rounded apex. Frons and vertex minutely tessellate and rather shining, the fine punctures moderately close on the frons. Mesonotum almost polished, with moderately close punctures (the punctures considerably more separated than in *albipennis*). Pubescence rather thin and whitish. Scopa of hind tibiae sparse for this group, the hairs rather stiff and coarse, and those on dorsal margin a little tinged with brown. Length, 6.45–7.5 mm.; anterior wing, 5–5.4 mm.

Five females (holotype and paratypes), San Pedro, Lower California, Mexico, at flowers of Compositae, Oct. 7, 1941 (Ross and Bohart). An achene attached to one of the specimens indicates that the composite belonged to *Stephanomeria* or some related genus.

Types in collection of the California Academy of Sciences; two paratypes in collection of the Citrus Experiment Station, Riverside.

Perdita utahensis Cockerell

Perdita utahensis Cockerell, 1896, Proc. Acad. Sci., Phila., 48:106, ♀.

Elsewhere I am recording this species from southern Arizona and describing the male. The type locality is southwestern Utah, presumably Washington County.

Additional material. CALIFORNIA: 1 male, Palo Verde, Imperial Co., on *Pectis papposa*, Aug. 20, 1946 (P. D. Hurd); 2 females, Blythe, Riverside Co., Aug. 19, 1946 (J. W. MacSwain); 1 female, 1½ miles west of Hopkins Well, Riverside Co., on *Pectis papposa*, Oct. 19, 1951 (Timberlake); and 4 females, 18 miles west of Blythe, on *Pectis papposa*, Oct. 24, 1951 (Timberlake and Hurd).

Perdita baileyae Cockerell

Perdita baileyae Cockerell, 1909, Canad. Ent., 41:151, ♂.

The original material consisted of two males taken at flowers of *Baileya* at Mesilla, New Mexico, on June 30, 1897 (Cockerell). I have examined 2 males, 1 female, San Xavier Mission, south of Tucson, Arizona, October 15, 1936 (E. P. Van Duzee); 1 male, Rice County, Kansas, July 3, 1923 (C. H. Martin); 1 male (cotype), Mesilla; and 1 male, Nombre de Dios, Durango, Mexico, on *Asclepias*, August 6, 1951 (P. D. Hurd).

Female.—Head and thorax blue-green. Mandibles except rufous tips, clypeus, triangular lateral marks reaching level of antennae, scape of antennae, and under side of the following three or four joints ivory white. Antennae otherwise fuscous above, a little paler toward apex and pale ferruginous beneath, the dark color including a small spot at apex of scape above. Pronotum creamy white, except a transverse green band on disk and an oblique streak on each side. Abdomen creamy white with five blackish apical bands, that on tergite 1 covering the disk, except for a triangular notch on each side, and those on following segments moderately wide; venter mainly blackish brown; pygidial plate rufous. Legs white, with front coxae, inner side of front trochanters and femora, blotch on posterior side of front femora and tibiae, blotch on middle trochanters and femora beneath, middle tibiae except at base and on dorsal and anterior sides, blotch on anterior side of hind femora, hind tibiae except at base beneath, and middle and hind tarsi brown or fuscous. Tegulae pale testaceous, with a large white spot at base. Wings slightly dusky hyaline, the nervures and stigma pale yellowish brown.

Clypeus moderately prominent, with lateral extensions hardly visible in frontal aspect. Glossa and galeae barely surpassing the proboscoidal fossa. Pygidial plate broadly truncate at apex, with a minute median notch. Head and thorax delicately tessellate with the frons and vertex more strongly sculptured and dullish, the mesonotum shining. Punctures of frons fine and moderately close, and those of mesonotum minute and dense. Pubescence white, that of mesonotum very short and dense, with somewhat longer, erect, coarse hairs intermixed; scopal hair of hind tibiae dingy ochreous. Length, 8.5 mm.; anterior wing, 4.9 mm.

Male.—Wings milky hyaline, and in spite of this distinct difference from the female, the sexes appear to be correctly associated.

Perdita perpulchra Cockerell

Perdita perpulchra Cockerell, 1896, Proc. Acad. Sci., Phila., 48:99, ♀; Cockerell, 1897, Ann. Mag. Nat. Hist. (6)19:398, ♂; Cockerell, 1917, Ann. Mag. Nat. Hist. (8)20:436.

This species was recorded by Cockerell from the Mesilla Valley, New Mexico, where it was taken on flowers of *Verbesina encelioides*, and from Aguascalientes, Mexico. In another article I am recording a female of *perpulchra* from 15 miles west of Holbrook, Arizona, and describing the female of the new race, *P. perpulchra flavidior* from Great Bend, Kansas.

Perdita albihirta albihirta, n. subsp.

Female.—Head and thorax dark yellowish green, the propodeum slightly bluish. Mandibles except reddish tips, labrum, clypeus, large triangular lateral marks reaching slightly above level of antennae, and small mark at anterior end of cheeks creamy white. Supraclypeal area with a small transverse or triangular white mark, often absent, and subantennal plates rarely with a small white spot on upper margin. Pronotum yellow, with a dark streak, slightly widened below, in the lateral creases. Abdomen pale canary yellow, or yellowish white, with a narrow fuscous band at junction of tergites 1-2 to 3-4, the first of which is the most distinct, and the portion at apex of tergites 2 and 3 tending to be reduced to a transverse oval spot on each side. On tergite 1 also a small fuscous mark on lateral margins at summit of basal declivity and a pair of smaller submedian and subapical spots, which may be confluent with a dark streak in the median crease of the basal declivity. Legs yellow with a pale brown streak on posterior side of middle tibiae, and hind tibiae brownish on outer side except at base. Antennae brown, the flagellum yellowish brown beneath, the scape except a small dark spot at apex above and under side of the next two joints yellow. Tegulae yellow at base and subhyaline on outer margin. Wings milky hyaline, the nervures very pallid, the stigma slightly yellowish.

Head slightly broader than long, with the clypeus moderately prominent. Facial foveae only slightly widened at upper end. Pygidial plate moderately wide at apex, which is submarginate. Frons delicately tessellate, shining, and with minute, rather close punctures; vertex more strongly tessellate and nearly impunctate. Mesonotum shining, almost polished, with moderately dense punctures (the punctures considerably denser than in *albipennis*, but not as dense as in *perpulchra* and *pulchella*). Pubescence white, rather dense, that of mesonotum very short, coarse, and mosslike. Length, 6-7 mm.; anterior wing, 4.5-4.8 mm.

Male.—Head and thorax dark green, the markings sulphur yellow. Mandibles except reddish tips, labrum, clypeus, lateral marks, mark at anterior end of cheeks, and sometimes supraclypeal and subantennal marks yellow. Lateral marks large, subquadrate, truncate above and not quite reaching level of antennae; subantennal marks when present usually small and adjacent to antennal sockets, rarely covering the plates; supraclypeal mark a small, transverse, or triangular spot. Pronotum dark, with a yellow band from one tubercle to the other, dilated on each posterior corner of the disk, the anterior margin also narrowly yellow on the disk and more narrowly yellow on each side. Abdomen pale yellow, the apical depression of tergites whitish subhyaline, and the following parts fuscous: tergite 1 except the lateral margins, and a basal band on tergites 2 to 6, the bands on apical segments successively weaker, and the others more or less widened in middle or with a median lobe, especially on tergites 2 and 3, which also have a

subapical spot on each side, sometimes more or less confluent with the median lobe or widening. Venter pale, with the first segment and a basal band, rounded behind, in segments 2 to 5, brownish fuscous. Legs yellow, the base of coxae, blotch on posterior side at middle of the tibiae, and blotch behind and above on femora, fuscous.

Head quadrate, with broad cheeks. Clypeus with about half of the disk projecting in front of a line tangent to anterior margin of lateral plates of face, and rather strongly and sharply dentate on each side of labrum. Sculpture and pubescence similar to that of female, but punctures and hair of mesonotum less dense. Length, 5-6 mm.; anterior wing, 3.8-4.8 mm.

Holotype female and allotype, Edom (now Thousand Palms), Riverside Co., California, at flowers of *Geraea canescens*, March 28, 1936 (Timberlake). Paratypes as follows: 1 female, Edom (Cockerell); 7 females, 11 males, Edom, on *Geraea*, March 28, 1936 (E. G. Linsley and Timberlake); 1 male, Thousand Palms Canyon, Riverside Co., March 25, 1935 (F. R. Platt); 2 males, Thousand Palms Canyon, on *Geraea*, April 25, 1936 (Timberlake); 3 females, Fish Spring, Imperial Co., April 20, 1935 (R. M. Bohart), 2 males, Colorado Desert, May 12, 1935 (Bohart); 20 females, 12 males, 6 miles northwest of Indio, on *Melilotus*, April 30, 1949 (Linsley, MacSwain, and R. F. Smith); 2 females, 1 male, Box Canyon, Riverside Co., on *Geraea*, April 17, 1952; 7 females, 7 males, Box Canyon, on *Geraea*, April 27, 1952 (Timberlake, Rozen, Marsh, and Hurd); and 1 female, Meloland, Imperial Co., May 24, 1912 (J. C. Bridwell).

Types in collection of Citrus Experiment Station, Riverside; paratypes in collections of R. M. Bohart, the University of California at Berkeley, California Academy of Sciences, and the U. S. National Museum.

Perdita albihirta *geraeae*, n. subsp.

This is similar to *albihirta*, with the light markings less extensive and the puncturation of mesonotum sparser. On account of the close agreement with *albihirta* in most characters and in habits, it is expedient to consider the two forms as races of one species, although there is as yet no proof of intergradation.

Female.—Similar to *albihirta* in color and markings, but clypeus usually with two short fuscous streaks or spots on upper part of disk. Supraclypeal area and subantennal plates always dark. Pronotum with a broad green band from one side to the other. Tergite 1 fuscous, except lateral margins and a preapical notch on each side; dark bands on following segments broader and better developed than in *albihirta*, the apical portion of band reduced to sublateral spots on tergite 4, the basal portion present on tergites 2 to 5, and a little produced backward at outer ends on 3 to 5. Fuscous part of legs include front and middle coxae and trochanters, hind coxae except apex, all femora except rather broadly at apex, and a blotch on posterior side of all tibiae. Antennae a little darker above, with a dark streak above on apical half of scape.

Structural characters, sculpture, and pubescence essentially as in *albihirta*, except punctures and pubescence of mesonotum distinctly less dense. Length, 6-7 mm.; anterior wing, 4.4-4.8 mm.

Male.—Similar to male of *albihirta*, but clypeus with two short dark streaks on upper part of disk, the dark basal bands of tergites broader and blacker, with a small posterior lobe on each side on tergites 3 to 6 (the lobes sometimes cut off to form enclosed dark spots on tergites 3 and 4), and markings of legs blacker, with the dark color encircling the femora. Punctures of the mesonotum moderately close and distinctly sparser than in *albihirta*. Length, 5-6 mm.; anterior wing, 3.8-4.5 mm.

Holotype female and allotype, Yermo, San Bernardino Co., California, at flowers of *Geraea canescens*, June 2, 1941 (Timberlake). Paratypes as follows: 3 females, taken with the types; 1 female, 1 male, 14.7 miles west of Barstow, on *Acamptopappus sphaerocephalus*, var. *hirtellus*, June 4, 1938; 6 females, 2 males, 9 miles east of Yermo, on *Geraea*, June 2 and 7, 1941 (Timberlake); 1 female, Mojave, April 30, 1937; 1 female, 1 male, Ludlow, on *Geraea*, April 30, 1937 (Cazier collection); 1 male, Hopkins Well, Riverside Co., on *Larrea*, Oct. 23, 1951 (Linsley); and 1 female, State Line, Nevada, highway 91, June 7, 1941 (Van Dyke).

Types in collection of Citrus Experiment Station, Riverside; paratypes in collections of American Museum, California Academy of Sciences, and the University of California at Berkeley.

Perdita bequaerti bequaerti Viereck

Perdita bequaerti Viereck, 1917, Bull. Amer. Mus. Nat. Hist., 37:241, ♀, ♂; Timberlake, 1928, Proc. Haw. Ent. Soc., 7:152; Timberlake, 1928, Amer. Mus. Novitates, 321:2; Michener, 1947, Amer. Midland Nat., 38:446.

The type locality of *bequaerti* is Ramsey, New Jersey, and it has been recorded from localities in North Carolina, Georgia, Alabama, and Mississippi.

Perdita bequaerti indianensis Cockerell

Perdita pallidipennis indianensis Cockerell, 1922, Amer. Mus. Novitates, 33:2, ♂, ♀.
Perdita wickhami Cockerell, 1922, Amer. Mus. Novitates, 33:13, ♀.
Perdita bequaerti Timberlake, 1928, Amer. Mus. Novitates, 321:2 (part).

Elsewhere I am giving reasons for considering *indianensis* a race of *bequaerti* rather than a form of *pallidipennis*.

The type locality of *indianensis* is Lafayette, Indiana, and that of *wickhami* is South McAlester, Oklahoma. It is possible that the record of *bequaerti* (s. lat.) from Knoxville, Tennessee, actually belongs here.

Perdita fracticincta Timberlake

Perdita fracticincta Timberlake, 1953, Univ. Kans. Sci. Bull., 35:976, ♂.

The type locality of *fracticincta* is 29 miles south of Sarita, Willacy County, Texas.

Perdita verbesinae Cockerell

Perdita verbesinae Cockerell, 1896, Proc. Acad. Sci., Phila., 48:102, ♀, ♂; Cockerell, 1899, Psyche, 8:323; Cockerell, 1906, Entomologist, 39:179; Cockerell, 1922, Amer. Mus. Novitates, 33:2.

In the original description Cockerell also included the varieties *nigrior*, *intermedia*, *maculata*, and *cyanella*, which all appear to fall within the limits of normal variation of this species.

Cockerell has recorded *verbesinae* from Las Cruces, New Mexico; Barstow, Texas, and Tucson, Arizona. It usually visits *Verbesina encelioides*, but it has been recorded also from *Helianthus*. I have examined material from Las Cruces, New Mexico (Cockerell); Deming, New Mexico (W. W. Jones); Douglas, Arizona (W. W. Jones); Portal, Arizona (Michener, Ross, and Timberlake); Santa Rita Mountains, Arizona (E. C. Van Dyke); and Samalayuca, Chihuahua, Mexico (C. D. Michener). The season of flight ranges from June 13 to October 20.

Perdita heliophila Cockerell

? *Perdita hyalina* Cresson, 1878, Trans. Amer. Ent. Soc., 7:68, ♂.

Perdita heliophila Cockerell, 1916, Ann. Mag. Nat. Hist. (8)17:281, ♀; Cockerell, 1922, Amer. Mus. Novitates, 33:2.

Cockerell described this entirely dark *Cockerellia* from Mesilla, New Mexico, and later recorded it from Mesa Verde National Park, Colorado, the specimens in both cases having been collected at flowers of *Helianthus*. He considered it distinct from the entirely dark form of *verbesinae* because of its somewhat larger size. I have not seen the type of *heliophila*, but a female from La Junta, Colorado, August 3, 1949 (J. R. White), one from Zion National Park, Utah, August 13,

1929 (R. H. Beamer), and another from Mt. Carmel, Utah, July 14, 1948 (G. F. Knowlton and S. L. Wood), agree well with the description and have the mesoscutum more closely punctured and more densely pubescent than in *verbesinae*. Apparently to be associated with such specimens is the following material, of which the females have virtually no face marks, but a narrow, more or less interrupted band on tergites 2 to 4, and two yellow marks on tergite 5. With such females were taken males that are entirely, or almost entirely, dark. The material includes one female from Kanarraville, Utah, July 14, 1948 (Knowlton and Wood); one female, three males, from New Harmony, Utah, July 14, 1948 (Knowlton and Wood); one male from Johnson, Utah, on sunflower, June 22, 1950 (Knowlton and G. E. Bohart); one male from Poverty Flat, San Juan County, Utah, June 9, 1948 (Knowlton and Wood); and one pair from Albuquerque, New Mexico, on *Helianthus*, September 1-3, 1935 (C. D. Michener).

Such specimens are distinct from *verbesinae*, although difficult to distinguish in the female sex. The males differ in lacking the conspicuous yellow face marks of *verbesinae*. From *lacteipennis* the females differ in their smaller size, in having the frons possibly a little less dull, and the yellow abdominal bands comparatively narrow, more or less abbreviated and interrupted, or absent. The males hardly differ from some forms of *lacteipennis* except in their smaller size. More material is needed to clarify the status of this form, and there is need to compare the males with the type of *hyalina*. The males, however, agree excellently with the description of *hyalina* and it now seems likely that this name may have to be used in place of *heliophila*.

Perdita lacteipennis lacteipennis Swenk and Cockerell

Perdita lacteipennis Swenk and Cockerell, 1907, Ent. News, 18:51, ♀, ♂; Cockerell, 1908, Entomologist, 41:294; Cockerell, 1922, Amer. Mus. Novitates, 33:2; Cockerell, 1923, Ent. News, 34:47; Timberlake, 1928, Amer. Mus. Novitates, 321:2; Cockerell, 1930, Amer. Mus. Novitates, 397:1.

Perdita albipennis Cockerell, 1897, Ent. News, 8:23 (not Cresson).

In addition to the material of *lacteipennis* that I am recording in another paper, I have specimens also from Imperial, Nebraska, June 23, 1905 (Swenk); Sand Hills, Nebraska, July; Grand Junction, Colorado, August 3, 1920 (Lutz); La Junta, Colorado, August 12, 1920 (Lutz); White Rocks, near Boulder, Colorado, on *Hymenopappus*, June 28, 1939 (Timberlake); and Dickinson, North Dakota, July 28, 1912 (C. H. Waldron). In the American Museum collection is a small series from Big Spring, Howard County, Texas, on *Helianthus*, June 21, 1947 (Michener), and one female from Boracha, Texas, on *Nolina*, June 22, 1947 (Michener).

Perdita lacteipennis canadensis Crawford

Perdita canadensis Crawford, 1912, Canad. Entom., 44:360, ♀; Stevens, 1919, Canad. Entom., 51:205, ♀, ♂; Cockerell, 1922, Amer. Mus. Novitates, 33:2.

This was described from Medicine Hat, Alberta, and later recorded by Stevens from Sheldon, Pleasant Lake, Williston, and Dickinson, North Dakota. The difference between it and *lacteipennis*, however, is slight and may not be constant enough to justify the continued recognition of *canadensis* as a separate subspecies. A specimen from Dickinson now before me is in fact not distinct from *lacteipennis*, and a

small percentage of females with the face entirely dark may be expected to occur throughout the range of *lacteipennis*.

The following material from Utah agrees with *canadensis* although it is possible that larger series might show that it is more properly assigned to *lacteipennis*: 3 males, 3 females, Roosevelt, Wasatch Co., July 28, 1949 (G. F. Knowlton and S. L. Wood); 1 male, Roosevelt, Aug. 9, 1951 (Knowlton); 1 male, Vernal, Uinta Co., July 28, 1949 (Knowlton and Wood); and 1 male, Fort Duchesne, Uinta Co., July 28, 1949 (Knowlton and Wood).

Perdita lacteipennis pallidipennis Graenicher

Perdita pallidipennis Graenicher, 1910, *Canad. Entom.*, 42:101, ♀, ♂; Graenicher, 1911, *Bull. Milwaukee Mus.*, 1:238; Graenicher, 1914, *Canad. Entom.*, 46:52.

Perdita lacteipennis Timberlake, 1928, *Proc. Haw. Ent. Soc.*, 7:152.

In another paper I am recording this race from the eastern part of Kansas and Nebraska. One female from Grand Teton National Park, Wyoming, July, 1937 (R. M. Bohart), agrees with *pallidipennis* in having large face marks, but it is probable that a series from that locality would agree better with *lacteipennis*.

Perdita obscuripennis, n. sp.

Superficially like *bequaerti*, but wings more fuliginous, with a smaller stigma, and the frons shining and distinctly punctured.

Female.—Very dark green, the mesonotum with a rich brassy luster. Spot at base of mandibles, band across clypeus with a triangular lobe in middle reaching to dorsal margin of disk where it is crossed like a T, transverse lateral marks, and under side of scape of antennae pale yellow. Mandibles otherwise bright rufo-testaceous, with the apex red. Labrum, anterior margin of clypeus, and two blotches on upper part of disk black (the latter sometimes small enough to expose the usual pair of dark dots). Band on hind margin of pronotum, narrowed in middle, and the tubercles yellow. Abdomen black, with a small spot on lateral margins of disk of tergite 1, and a broad band on tergites 2 to 5 bright yellow. Band on tergite 2 notched in middle behind or narrowly interrupted. Antennae black except scape yellow beneath, and flagellum a little reddish brown beneath and at apex. Legs blackish, the front and middle knees and a streak on anterior side of front tibiae, not reaching apex, yellow. Tegulae testaceous, the base broadly yellow. Wings pale fuliginous, the nervures and stigma rather dark fuscous, outer margin of stigma nearly black.

Head as long as wide, with face below antennae convex, and the clypeus rather prominent. Anterior part of face polished, the cheeks and frons delicately tessellate and shining, the vertex dullish. Thorax mostly very delicately tessellate and shining, but basal middle of propodeum minutely rugulose and dull. Puncturation fine and distinct, moderately close on frons and rather dense on mesonotum, where the punctures are mostly about two puncture widths apart. Pubescence ochreous, of about the usual density for this group, but that of mesonotum rather dense, short, coarse, mosslike, and fulvous. Scopal hair of hind tibiae and basitarsi pale brown, and the hair on outer side of middle tibiae and basitarsi more or less pale fuscous. Length, 7.5–8 mm.; anterior wing, 5–5.5 mm.

Male.—Dark green, the abdomen brownish black. Basal half of mandibles (shading into rufous on margins and at apex), labrum, clypeus except two black marks on upper half of disk (the pale intrusion between them nearly parallel sided), transverse lateral marks twice as broad as high, and under side of scape and of first two joints of flagellum yellow. Antennae otherwise blackish, the flagellum brown beneath. Large cuneate marks on hind margin of pronotum and spot on tubercles yellow. Large, irregularly triangular mark on lateral margin of tergites 2 and 3, and smaller marks on tergites 1, 4, and 5 yellow. Apical tergite pale yellowish, suffused with brown. Legs brownish black, the front knees, anterior side of front tibiae, and small spot on middle knees yellow; tarsi brown, the front pair paler. Tegulae and wings as in female.

Head quadrate, a little broader than long, the cheeks very broad and subangulate anteriorly.

Clypeus obtusely dentate on each side of labrum. Head and thorax minutely tessellate, the vertex more tessellate and duller than other parts, the frons faintly tessellate, the mesonotum polished. Punctures of head and thorax very fine but distinct, moderately close on frons and a little closer on mesoscutum, where they are mostly about two to four puncture widths apart. Abdomen minutely lineolate and slightly dullish. Pubescence whitish, but otherwise like that of female, except that the hair of mesonotum is sparser and a little longer. Length, 6.5–7.5 mm.; anterior wing, 4.6–5 mm.

Seven females, 4 males (holotype female, allotype, and paratypes), Tecolutla, Veracruz, Mexico, June 19, 1951 (P. D. Hurd); 6 females, 3 males (paratypes), Veracruz, Veracruz, June 20, 1951 (Hurd); and 5 females, 1 male (paratypes), same data (H. E. Evans).

Types in collection of Citrus Experiment Station, Riverside; paratypes in collections of the University of California at Berkeley and the University of Kansas at Lawrence.

Perdita tricincta Timberlake

Perdita tricincta Timberlake, 1953, Univ. Kans. Sci. Bull., 35:978, ♀, ♂.

This species occurs in the three southernmost counties of Texas. It may possibly prove to be a race of *albipennis*.

Perdita albipennis Cresson

Perdita albipennis Cresson, 1868, Trans. Amer. Ent. Soc., 1:386, ♀; Cresson, 1872, Trans. Amer. Ent. Soc., 4:261; Cockerell, 1896, Proc. Acad. Sci., Phila., 48:104, ♀, ♂; Cockerell, 1901, Entomologist, 34:190; Viereck, 1905, Canad. Entom., 37:277; Swenk and Cockerell, 1907, Ent. News, 18:51; Cockerell, 1911, Canad. Entom., 43:390; Cockerell, 1922, Amer. Mus. Novitates, 33:2; Cockerell, 1923, Ent. News, 34:47, 48; Timberlake, 1928, Proc. Haw. Ent. Soc., 7:152; Timberlake, 1928, Amer. Mus. Novitates, 321:2; Timberlake, 1929, Pan-Pac. Ent., 6:56; Cockerell, 1934, Amer. Mus. Novitates, 697:8.

Macrotera albipennis Cresson, 1875, Wheeler Exped., Zool., 5:724.

Perdita albipennis var. *helianthi* Cockerell, 1896, Proc. Acad. Sci., Phila., 48:104, ♂, ♀; Cockerell, 1900, Entomologist, 33:217; Cockerell, 1922, Amer. Mus. Novitates, 33:2.

Perdita albipennis var. *lingualis* Cockerell, 1896, Proc. Acad. Sci., Phila., 48:10, ♀; Cockerell, 1922, Amer. Mus. Novitates, 33:2.

In 1916 (Jour. Ent. Zool., Pomona, 8:44) Cockerell recorded *albipennis* from Los Angeles, California, but the record is spurious. I have seen another specimen of *albipennis*, together with one of *P. lacteipennis canadensis* and one of *P. zebra* Cresson, labeled "Los Angeles, Cal." in the same handwriting and since these are all species of the Rocky Mountain region and otherwise unknown from southern California, there must be an error in the labeling.

In 1922, Cockerell, in discussing the relationship of the various forms of *albipennis*, considered the form of southeastern Colorado and northern New Mexico the typical *albipennis* and intermediate between *lingualis* and *lacteipennis*, and concluded that both *helianthi* from southern New Mexico and *lingualis*, described from Fort Collins, Colorado, should stand as races. However, in my own study of *albipennis*, no tendency to subspeciation has been detected, unless *tricincta* should finally prove to intergrade.

The following records of *albipennis* appear to be new.—TEXAS: Alpine, July 8, 1942 (E. C. Van Dyke). WYOMING: Grand Teton National Park, July, 1937 (R. M. Bohart). IDAHO: Lewiston, July 14, 1925 (C. L. Fox). UTAH: Jensen, July 28, 1949 (Knowlton and Wood); Enterprise, July 27, 1950 (Knowlton); Far West, Sept. 14, 1934 (Lowell Cutler); Logan, Aug. 15, 1947 (B. H. Popov); west of Utah Lake, on *Helianthus*, Aug. 11, 1949 (G. E. Bohart); Holden, July 5, 1947 (Knowlton and H. F. Thornley); Petersboro, on *Helianthus*, Aug. 11, 1947 (Bohart);

Indianola, Aug. 12, 1947 (Knowlton); Joseph, July 15, 1948 (Knowlton and Wood); Thistle, Aug. 12, 1947 (Knowlton); Provo, Aug. 12, 1947 (Knowlton); Clover, Aug. 12, 1949 (Knowlton); Cove Fort, Aug. 4, 1949 (Knowlton); and Marysville, July 15, 1948 (Knowlton and Wood).

Perdita scopata Timberlake

Perdita scopata Timberlake, 1953, Univ. Kans. Sci. Bull., 35:980, ♀, ♂.

This species, which is a close ally of *albipennis*, occurs in the coastal region of Texas from Galveston to Brownsville.

Perdita lepachidis lepachidis Cockerell

Perdita lepachidis Cockerell, 1896, Proc. Acad. Sci., Phila., 48:106, ♂.

Perdita lepachidis lepachidis Timberlake, 1953, Univ. Kans. Sci. Bull., 35:982, ♀.

The typical form of *lepachidis* is now known from New Mexico, Colorado, Texas, and Kansas.

One female from 8 miles north of Hamilton, Hamilton County, Texas, May 31, 1951 (P. D. Hurd) is peculiar in having the yellow of abdomen restricted to an interrupted, or almost interrupted, band on tergites 2 to 4.

Perdita lepachidis levifrons Timberlake

Perdita lepachidis levifrons Timberlake, 1953, Univ. Kans. Sci. Bull., 35:983, ♀, ♂.

The race *levifrons* is known only from Brownsville, Texas.

Perdita coreopsidis coreopsidis Cockerell

Perdita coreopsidis Cockerell, 1906, Entomologist, 39:126, ♀, ♂.

The typical race, together with *kansensis* and *obscurior*, is treated in another paper. Typical *coreopsidis* ranges from Coahuila, Mexico, at least as far north as Kansas. The following record is new: 23 males, 13 females, Guadalupe, Coahuila, on *Gaillardia*, August 23, 1947 (Spieth), in American Museum of Natural History.

Perdita coreopsidis obscurior Timberlake

Perdita coreopsidis obscurior Timberlake, 1953, Univ. Kans. Sci. Bull., 35:984, ♀, ♂.

This is known from the coast of Texas from Galveston to Brownsville. One male, from Lytle, Atascosa County, Texas, June 1, 1951 (P. D. Hurd) agrees closely with *obscurior*, although taken rather far inland.

Perdita coreopsidis kansensis Timberlake

Perdita coreopsidis kansensis Timberlake, in press, Univ. Kans. Sci. Bull.

Known only from Gove and Ford counties, Kansas, and from Van Horn, near the western extremity of Texas.

Perdita coreopsidis collaris Cockerell

Perdita verbesinae collaris Cockerell, 1916, Ann. Mag. Nat. Hist. (8)17:281, ♂.

This was described from a male collected at Rito de los Frijoles, New Mexico. I have examined also a pair taken 18 miles west of Jiminez, Chihuahua, Mexico, August 10, 1951 (P. D. Hurd). It thus occupies a territory west and south of the

habitat of the race *kansensis*, but in Mexico it probably intergrades with typical *coreopsidis* somewhere either in Chihuahua or Coahuila.

Male.—Although Cockerell placed *collaris* as a race of *verbesinae*, its comparatively long tongue, the minutely and more sharply punctate frons, and the more yellowish or brassy green color indicate that it belongs with *coreopsidis*. From typical *coreopsidis* the male differs chiefly in having larger face marks, the clypeus yellow with a black mark on each side of upper half of disk, and the yellow intrusion between the two marks narrow and reaching, or nearly so, the dorsal margin. From *kansensis* it differs in the mainly dark legs and abdomen, which are nearly as in the typical race.

Female.—Like the typical form of *coreopsidis*, but with more yellow on the legs and abdomen. Dark preapical band of tergite 1 very narrow and a little arcuate with the outer ends ovally enlarged, darker in color but not discrete. Preapical band of tergite 2 narrow and brownish, with the darker ends hardly widened and not discrete. This band on tergite 3 obsolescent, with the darker ends fairly distinct but narrow and not distinctly discrete. Dark markings of tergites 4 and 5 obsolete. Tergite 1 with a distinct black blotch on each side of the basal declivity, but the usual dark connection on each side with the preapical band reduced to a small, brown oval spot. A blotch behind or beneath on all the femora except at apex, posterior side of front and middle tibiae, hind tibiae, and all the tarsi fuscous.

Puncturation and pubescence of mesonotum a little denser than in other races, the hair more ochreous. Length, 7.5 mm.; anterior wing, 4.8 mm.

Procockerellia, n. subg.

Type.—*Perdita albonotata* Timberlake.

In most characters similar to *Cockerellia*, but tongue longer, maxillary palpi three- to five-jointed, stigma broader, and middle of lower part of face and disk of mesonotum black.

Female.—Mandibles moderately dilated and less strongly hooked at apex than in *Cockerellia*. Glossa and galeae in repose reaching apex of front coxae, or a little beyond, the galeae much longer than first joint of labial palpi and very attenuate at apex. Facial foveae not much widened at upper end. Stigma large, fully as long as in *Cockerellia* and broader, being nearly as broad at least as first submarginal cell. Pygidial plate broad, more or less roundly subtruncate at apex. Scopa of hind tibiae and basitarsi dense as in *Cockerellia*, the hairs long, fine and minutely and closely crinkled. Claws simple.

Male.—Head a little broader than long, with very broad cheeks that are widest opposite the upper end of eyes. Mandibles long, stout, tapering, abruptly and rather strongly bent inward before the middle, with a slight dilation on inferior margin beyond the bend, and simple and acute at apex. Facial foveae small, but twice as long as wide. Sides of pronotum moderately grooved, the disk of pronotum strongly ridged behind, with the corners prominent. Apical plate of eighth ventrite slender, narrowed from base to apex, with a median sharp crest, its pubescence very short and sparse (in *Cockerellia* the apical plate is nipple-shaped and clothed with long plumose hair). Claws of front and middle tarsi bifid, those of hind tarsi simple.

Aedeagus basically similar to that of *Cockerellia*, but the caulis rather deeply emarginate above; parameres inserted rather low on the sides of the caulis, greatly dilated near the middle, provided with a laminate crest on inner surface and broadly rounded at apex except for a sharp, inner toothlike process; volsellae moderately large; and the sagittae united, depressed, and widest near apex.

KEY TO SPECIES

1. Females 2
 Male with head and thorax dark blue-green, the disk of mesoscutum and scutellum black;
 base of mandibles, labrum, and nearly the whole of face below level of antennae white;
 maxillary palpi five-jointed *albonotata*, n. sp.

2. Sides of clypeus and lateral marks white, the middle of face below antennae black, like disk of mesoscutum; abdomen black, with a yellow band on tergites 2 to 5, and a yellow spot on each side of tergite 1; legs dark, the front and middle tibiae on anterior side and their tarsi pale yellow; maxillary palpi five-jointed. *albonotata*, n. sp.
 Similar, but abdomen with a pale-yellow, slightly interrupted band on tergites 2 to 4; middle tibiae entirely dark; maxillary palpi short and three-jointed. *stephanomeria*, n. sp.

Perdita albonotata, n. sp.

Female.—Head and thorax blue-green, the posterior half of mesoscutum, the scutellum, and metanotum black. Spot on base of mandibles, mark on lateral extensions of clypeus extending slightly onto disk, and large lateral marks a little higher than wide and ending acutely on orbits at level of antennae white. Mandibles otherwise testaceous yellow, changing to rufous at apex. Labrum and disk of clypeus black. Tubercles yellowish white. Abdomen brownish black with an arcuate band on tergites 2 to 4, a shorter band, broad in middle and pointed at ends, on tergite 5, and small spot on lateral margins of tergite 1 bright yellow. Legs blackish, the front and middle knees very narrowly, front and middle tibiae except behind and except a blotch at middle of outer side of middle pair, base of hind tibiae, and all tarsi yellowish white. Antennae fuscous above, white on under side of first four or five joints, and yellowish beyond. Tegulae testaceous hyaline, fuscous at base, with a whitish spot interposed. Wings milky hyaline, the nervures whitish, and stigma yellow.

Head as long as wide, with the clypeus moderately prominent. Glossa and galeae in repose reaching a little beyond front coxae, the galeae distinctly more than twice as long as the first joint of labial palpi. Maxillary palpi five-jointed. Mandibles only moderately expanded on inner margin, with the moderately incurved apex rather wide at base and acute at apex. Facial foveae slightly wider than the space between them and eye and about as long as three-fourths of the space between antennal sockets and anterior ocellus. Stigma large, slightly less broad than the first submarginal cell. Portions of marginal cell beneath and beyond the stigma subequal. Pygidial plate broad, with the rounded apex moderately wide. Head and thorax shining, the mesonotum polished, the frons and sides of thorax delicately tessellate, and the base of propodeum with a large finely rugulose area. Punctures of mesonotum and face below antennae fine and moderately close, those of frons stronger and closer. Pubescence long, erect, rather thin and white. Scopa of hind legs dense, the hairs fine, long, straight, and minutely and closely crinkled. Length, 6–8 mm.; anterior wing, 4.6–5 mm.

Male.—Dark blue-green, the mesoscutum, except anterior third, and the scutellum black. Large mark at anterior end of cheeks, mandibles except tips, labrum, and most of face below level of antennae white. Lateral marks broader than high, at inner end reaching to middle of subantennal plates and a little above level of antennal sockets on orbits. Subantennal plates narrowly margined with black and the transverse supra-clypeal mark often narrowly interrupted in middle. Tubercles pale yellow. Abdomen brownish black, the lateral margins of tergites and a narrow preapical band on tergites 2 to 6 pale yellow. The preapical bands usually restricted to lateral marks on tergites 2 to 3 or 4, and broadly emarginate or interrupted on each side on tergites 4 or 5 to 6. Venter pale yellow, with the basal segment and a broad band, broadened at middle, at base of next four segments, blackish. Antennae fuscous above and white beneath, the flagellum more yellowish beneath toward apex, with apical half of last joint also pale yellow above. Legs black, the front coxae except base, ring at apex of trochanters, apex of femora, tibiae except a blotch on inner side extending also more or less on outer side on middle and hind pair, and the tarsi pale yellow. Tegulae and wings as in female.

Head a little broader than long, subquadrate, a little narrowed behind the eyes, the temples and cheeks very broad. Hind basitarsi a little curved, about as long as the next four joints combined. Sculpture and pubescence about as in the female, the frons, however, considerably more closely punctured. Length, 6–7 mm.; anterior wing, 4.6–4.8 mm.

Holotype female, allotype and 46 females, 33 males (paratypes), Morongo Valley, San Bernardino Co., California, all collected at flowers of *Stephanomeria exigua*, between 7 and 8 o'clock, A.M., Sept. 26–30, 1944, except one male taken at flowers of *Eriogonum plumatella* in the

afternoon of Sept. 3, 1941 (Timberlake); and 1 male (paratype), on *Stephanomeria*, Cabazon, Riverside Co., July 27, 1950 (Timberlake).

Types in collection of Citrus Experiment Station, Riverside.

At the same flowers on September 26-30 another species of *Perdita* was taken, but this flew a little later in the morning and was most abundant between 8 and 9 o'clock, after which time the flowers began to close.

Perdita stephanomeriae, n. sp.

Female.—Head and thorax dark blue-green, becoming bluer on the propodeum; mesoscutum, except anterior third, and scutellum black. Mandibles testaceous yellow, reddened on inner margin and at apex. Labrum and disk of clypeus black. Mark on lateral extensions of clypeus, extending slightly onto disk, and lateral marks white. The latter hardly higher than broad, except for a short slender extension on the orbits. Tip of tubercles white, the thorax otherwise dark. Abdomen blackish, the pygidial plate ferruginous. A moderately wide, pale-yellow band, slightly interrupted medially, on tergites 2 to 4, that on 3 a little more arcuate than the others. Antennae testaceous white beneath and blackish above, the flagellum more brownish toward apex. Legs black, the anterior side of front tibiae and front tarsi pale yellow, the other tarsi pale brownish. Tegulae pale testaceous, becoming fuscous at base. Wings milky hyaline, the nervures pallid, the stigma tinged with yellow.

Apical incurved part of mandible short and blunt (but probably worn in type). Maxillary palpi three-jointed. Stigma large, fully as long and as broad as first submarginal cell. Sculpture and pubescence about as in *albonotata*, but the base of propodeum smooth. Length, about 6 mm.; anterior wing, 4.7 mm.

One female (holotype) collected at flowers of *Stephanomeria pauciflora*, about 12 miles south of Ocotillo, San Diego Co., California, Nov. 12, 1939 (Timberlake).

Type in collection of Citrus Experiment Station, Riverside.

Subg. *Pentaperdita* Cockerell and Porter

Pentaperdita Cockerell and Porter, 1899, Ann. Mag. Nat. Hist. (7)4:414.

Type of subgenus.—*Perdita albivittata* Cockerell.

Allied to *Cockerellia*, but the five-jointed maxillary palpi and the broad abdomen and bifid claws of hind tarsi of the male are distinctive.

Female.—Head rotund, the clypeus hardly prominent. Glossa and galeae in repose hardly surpassing the proboscoidal fossa. Mandibles strongly expanded on inner margin, evenly curved from base to apex on outer margin, with the narrowed apical part short and more or less blunt. Facial foveae linear, close to eye margin and about two-thirds as long as space between anterior ocellus and antennal sockets. Pygidial plate flat, triangular, with apex narrowly rounded. Stigma rather slender or about one-half as wide as the first submarginal cell. Scopa of hind legs rather dense, the hairs long, fine, and finely crinkled. Claws slender and simple.

Male.—Head but little enlarged, the cheeks moderately wide and more or less receding. Mandibles moderately long, tapering, simple, sometimes somewhat elbowed between base and middle. Facial foveae two or three times longer than wide, but poorly defined. Pronotum nearly normal, or the sides somewhat furrowed, the disk usually flat, but in one species ridged posteriorly, and elevated but hardly flanged on the anterior margin. Claws of all tarsi strongly bifid. Abdomen ovate, subdepressed, broader than thorax, and usually unicolorous except for the pallescent apical depression of tergites. Apical tergite large, broad at base, with a well-defined pygidial plate that has the apex narrowly truncate. Apical plate of eighth ventrite nipple-shaped, or tapering to an acute apex in one species, sparsely clothed with short hair.

Caulis of aedeagus broadest at the base, the proximal orifice strictly basal, or slightly emarginating the ventral wall, the dorsal rift extending for about two-thirds of the length, the parameres usually broad toward apex, although narrowed and acute in the type species. Volsellae reduced to one pair. Sagittae more or less depressed, generally ovals widened before the apex and considerably fused except for the basal rods and the extreme apex.

- in lateral view; dark blue or blue-green, the disk of mesoscutum and scutellum black; clypeus and transverse lateral marks white, the disk of clypeus with two abbreviated brown stripes *bradleyana*, n. sp.
11. Similar to *bradleyana*, the disk of clypeus with two broad brown or black stripes, or sometimes all dark except on each side anteriorly; caulis of aedeagus without a projecting fold or lobe medially at apex above *melanochlora* Cockerell
Like the two preceding species, but dark markings on disk of clypeus sometimes evanescent; base of mandibles generally with a white spot; caulis of aedeagus with a projecting vertical fold of the dorsal wall at apex on each side of the median fissure *coahuilensis*, n. sp.
12. Apical tergite extremely large, tapering from the broad base to moderately narrow apex, which is emarginate to form two teeth, a little longer than their basal width; dark blue, the mesonotum except margins black; mandibles except reddish tips, clypeus, and broad transverse lateral marks white *megapyga*, n. sp.
Apical tergite moderately enlarged and narrowly truncate at apex; dark green or blue-green, the disk of mesoscutum and scutellum black; lateral marks generally broad enough to reach level of antennal sockets, and face sometimes nearly all white below level of antennae *albovittata* Cockerell
13. Dark blue or blue-green, the clypeus and scutellum black or a little tinged with brown; frons and vertex delicately tessellate and shining, the punctures of frons very minute and sparse; mesoscutum faintly tessellate; cheeks very broad behind posterior half of eyes *chrysophila* Cockerell
Head and thorax dark green, more bluish on propodeum, the clypeus, mesoscutum except anterior border, and scutellum black; frons and vertex almost polished, the puncture of frons closer and more apparent than in *chrysophila*; mesonotum polished *nigroviridis*, n. sp.

Perdita nigrifacies, n. sp.

Female.—Head and thorax dark blue-green, the most of face below antennae, mesoscutum except anterior fourth, and the scutellum black. Labrum and mandibles dark rufous, the latter piceous at apex. Antennae black, the flagellum brown except toward base above. Thorax entirely dark. Abdomen black, somewhat tinged with reddish brown toward base and beneath, the pygidial plate rufous. A small triangular spot adjacent to the foveae on each side of tergite 2, and a narrow, arcuate, interrupted band on tergites 3 and 4, ending rather far from lateral margins, creamy white. Legs reddish brown, without pale markings. Tegulae testaceous hyaline, a little brownish at base. Wings slightly and uniformly dusky, the nervures and margins of stigma pale brown, the subcosta a little darker.

Head as broad as long, the inner orbits parallel. Mandibles stout and dilated on inner margin. Facial foveae elongate linear. Wings ample, the marginal cell almost as long as first submarginal cell, with the poststigmatal part nearly twice as long as the substigmatal part. Head and thorax finely tessellate, but shining, the disk of mesoscutum and scutellum becoming almost polished. Puncturation of head and thorax fine, but very distinct, the punctures rather close on frons, sides of face, and cheeks, and sparser elsewhere on head and thorax, the vertex impunctate. Abdomen minutely lineolate and punctate, the punctures rather close on tergites 3 to 5 and sparse on tergite 2. Pubescence ochreous white, rather thin except on legs and at apex of abdomen. Scopal hair of hind tibiae abundant, long and crinkly. Length, 6 mm.; anterior wing, 4.2 mm.

One female (holotype), Safford, Graham Co., Arizona, Sept. 17, 1933 (R. M. Bohart), in collection of Citrus Experiment Station, Riverside.

Perdita chrysophila Cockerell

Perdita chrysophila Cockerell, 1896, Jour. New York Ent. Soc., 4:206, ♂; Cockerell, 1904, Entomologist, 37:6.

This was described from one male taken at Organ, New Mexico, 5,100 feet, Sep-

tember 28, on *Verbesina encelioides*. Later Cockerell recorded another male from Pecos, New Mexico, August 21, at flowers of *Picradenia floribunda*. This specimen, now at Riverside, is much bluer than the type.

Perdita nigroviridis, n. sp.

This species and the preceding are entirely devoid of light markings in the male sex, in which they differ from almost all other species of *Perdita*. The two species are very much alike, but the genitalia are distinctive.

Female.—Head and thorax blue-green, the disk of mesoscutum and scutellum black. Disk of clypeus black, with a spot on lateral extensions and triangular lateral marks, only slightly higher than wide, white. (In paratype the sides of disk of clypeus white, the black area somewhat broken up, and traces of a supraclypeal mark present.) Thorax dark except a white streak on each side of hind margin of disk of pronotum and on the anterior margin of the sides of pronotum. Abdomen dark brown, suffused with piceous, the pygidial plate ferruginous. A narrow, interrupted yellowish-white band on tergites 2 to 4, that on tergite 2 reduced to a short thin streak on each side of base, that on 3 nearly reaching lateral margins and bent backward at outer ends, and that on 4 somewhat abbreviated and very narrowly interrupted. (In paratype the band on tergite 2 similar to one on tergite 3.) Legs dark brown. Antennae brown, the flagellum yellowish brown beneath, the scape black. Tegulae pale testaceous, darker at base. Wings whitish hyaline, the nervures nearly colorless, the subcosta brown, the margins of stigma slightly brownish.

Head as long as wide, the cheeks receding. Mandibles strongly dilated on inner margin. Facial foveae linear, about as long as space between posterior ocelli. Pygidial plate moderately broad at base and narrowed to subacute apex. Marginal cell a little shorter than the first submarginal, with the portion beyond the stigma much longer than the part beneath. Scopa of hind tibia similar to that of *albovittata*, although distinctly sparser. Head and thorax polished, with a faint tessellation on the vertex, pleura, and propodeum. Puncturation fine but very distinct, the punctures rather close on frons, still closer on the mesopleura, and moderately sparse on the mesonotum. Abdomen minutely lineolate, somewhat dullish and obscurely punctate. Pubescence white, erect, moderately long and abundant on head and thorax, the apical fimbria of abdomen more ochreous. Length, 6.5 mm.; anterior wing, 4.4 mm.

Male.—Dark blue, the frons and vertex blue-green, the disk of mesoscutum and scutellum black. Face below level of antennae except supraclypeal area, and the postgenal region of undersurface of head blackish. Mandibles except rufous tips and the labrum dark testaceous. Abdomen dark brown, more blackish on the first tergite, the apical depression of tergites rather conspicuously whitish subhyaline. Legs dark brown, the tarsi pale yellowish brown. Antennae brown, a little paler beneath, the scape more blackish. Tegulae and wings as in female.

Head moderately large, subquadrate, slightly widened anteriorly, with the inner orbits of eyes just perceptibly divergent in front. Cheeks very broad, evenly rounded beneath and unarmed. Anterior margin of head truncate except for the slightly protruding clypeal disk. Clypeus gently convex, with disk much broader than high and the lateral extensions not visible in frontal aspect. Mandibles long, stout, gently curved, and simple. Facial foveae shallow, about twice as long as wide. Mouth parts rather elongate, the tongue reaching front coxae but the galeae hardly surpassing the proboscis cavity. Sides of pronotum moderately furrowed. Abdomen ovate, depressed, broader than thorax. Sculpture and pubescence similar to that of female. Aedeagus differs from that of *chrysophila* in having the parameral lobes of caulis very broad and not narrowed to an acute apex; sagittae as seen from above widest opposite apex of volsellae, much compressed just beyond, then ovally wider before the apex, but not nearly so broadly as in *chrysophila*. Length, 5.5 mm.; anterior wing, 4.4 mm.

Holotype female and allotype, San Antonio, Bexar Co., Texas, June, 1942 (E. S. Ross); and 1 female (paratype), 5 miles south of George West, Live Oak Co., Sept. 26, 1942 (Ross) in collection of the California Academy of Sciences.

Perdita melanochlora Cockerell

Perdita melanochlora Cockerell, 1922, Amer. Mus. Novitates, 33:7, ♀.

Female.—Head and thorax blue-green, the disk of mesoscutum and scutellum black. Lateral extensions and sometimes sides of disk of clypeus, and transverse lateral marks, not or barely reaching above level of clypeus, white. Disk of clypeus otherwise black or sometimes white, with the black area resolved into two dark stripes. Labrum more or less piceous, the mandibles rufo-testaceous, more or less piceous at base and red at apex. Small spot at posterior corners of pronotum and tubercles white. Abdomen brownish black, with three yellowish-white bands, arcuate and broadly interrupted on tergite 2, less broadly interrupted and arcuate on tergite 3, and broader, abbreviated, and narrowly interrupted on tergite 4. Antennae brown, the flagellum a little reddish beneath, and the scape blackish. Legs brownish, the tarsi paler, the front tibiae sometimes with a small white spot at base. Tegulae pale testaceous, subhyaline, with a small white spot at base. Wings milky hyaline, the subcosta brown, margins of stigma and sometimes nervures of marginal cell tinged with brown, the nervures otherwise pallid.

Head as wide as long, rotund. Mandibles strongly dilated on inner margin. Glossa and galeae shortly surpassing the proboscis fossa. Facial foveae elongate linear and close to eye margin. Pygidial plate broad at base and narrowed to the rounded apex. Head and thorax shining, the frons, disk of mesoscutum, and scutellum polished, the mesopleura and propodeum delicately tessellate, the vertex rather strongly tessellate and a little dull, and the basal border of the mesoscutum minutely, rugulose tessellate. Frons and mesonotum with fine, moderately sparse punctures. Pubescence whitish, fine, erect, and moderately long. Abdomen lacking the minute sericeous pubescence on middle tergites seen in *albovittata*. Tibial scopa rather dense and composed of long, fine, crinkly hairs. Length, 4.5–5.5 mm.; anterior wing, 3.5–3.8 mm.

Male.—Colored like female, but abdomen blackish with apical depression of tergites whitish subhyaline and almost bandlike. The black or brownish median area of clypeus sometimes with an enclosed white stripe, or resolved into two dark stripes. Labrum and mandibles rufo-testaceous, the latter rufous at apex. Thorax without light markings.

Head sometimes slightly enlarged and wider than long, subquadrate, with broad, simple cheeks. Mandibles rather long and stout, but acute and simple at apex. Sides of pronotum only slightly grooved. Abdomen rather broadly ovate, subdepressed, and wider than thorax; apical tergite large, triangular, flat on the disk, slightly convexly arcuate laterally, and rounded at apex. Sculpture and pubescence similar to that of female, but hair of mesonotum somewhat longer and a little more copious, and that at apex of abdomen fine and sparse. Apical plate of eighth ventrite moderately elongate nipple-shaped and with a fine sparse pubescence. Caulis of aedeagus broad at base and without an apical lobe above on either side of the very narrow median rift; the parameres widest toward the base and rather narrowly truncate at apex. Sagittal rods strongly hooked at proximal end, the fused subapical part ovally swollen and rather thick dorsoventrally. Volsellae large, laminate, broadly rounded on dorsal margin and there armed with a group of about twenty to twenty-five tubercles. Length, 4–5 mm.; anterior wing, 3–3.7 mm.

Material of *melanochlora* has been examined as follows: CALIFORNIA: 4 females, 1 male, Palm Canyon, near Palm Springs, on *Encelia farinosa*, April 5, 1925; 1 female, 1 male, Andreas Canyon, near Palm Springs, on *Encelia*, April 11, 1936; 2 females, 1 male, Box Canyon, Riverside Co., on *Bebbia juncea*, April 13, 1934; 1 female, Clark Mountain, 4,500 feet, San Bernardino Co., on *Viguiera nevadensis*, July 7, 1938; 1 female, Palm Springs, California, April 5, 1925 (probably collected at Palm Canyon by F. H. Wymore). NEVADA: 14 females, 2 males, Kyle Canyon, Charleston Mts., on *Baileya multiradiata* (except one male that was taken on *Sphaeralcea*), about 20 miles from Las Vegas, June 3, 1941; 1 male, Kyle Canyon, about 23 miles from Las Vegas, on *Viguiera deltoidea*, June 4, 1941; 1 male 11 miles west of Arden, on *Baileya*, June 6, 1941 (all Timberlake); 1 male, Kyle Canyon, June 3, 1941 (E. C. Van Dyke). ARIZONA: 1 female, Tucson, Oct. 16, 1935 (O. Bryant).

Through the kindness of Herbert F. Schwarz, the type of *melanochlora* has been

compared with the above material. The type is a female from the Santa Rosa Valley, near the Comobabi Mountains, Arizona, where it was taken by Lutz on August 10, 1916.

***Perdita bradleyana*, n. sp.**

In almost all characters this is hardly distinguishable from *melanochlora*, but the genitalia are distinctive.

Male.—Head and thorax dark blue-green, with the frons distinctly green and the propodeum blue; disk of mesoscutum and scutellum black. Spot at base of mandibles, clypeus except usual pair of dots and a triangular dark mark on each side of upper part of disk, and transverse lateral marks, about twice as broad as high, white. Mandibles otherwise testaceous, becoming rufotestaceous at apex. Labrum testaceous. Antennae brown, more or less fuscous above, especially on scape and pedicel. Thorax entirely dark. Legs brownish fuscous, with the tarsi yellowish brown. Abdomen brownish fuscous, the apical depression of tergites whitish subhyaline. Tegulae pale testaceous. Wings whitish hyaline, the nervures pallid, the inner margin of stigma and the subcosta pale yellowish brown.

Head only slightly enlarged, with the cheeks moderately wide, rather receding, and widest at the middle. Face below antennae evenly convex from side to side. Disk of clypeus about as high as wide and the lateral extensions visible in frontal aspect. Sides of pronotum normal, the disk flat, with the posterior corners not at all prominent. Apical tergite of abdomen narrowly obtuse at apex. Head and thorax shining, mostly polished, but the vertex, cheeks, and thoracic pleura minutely and delicately tessellate. The mesonotum minutely and sparsely and the frons moderately closely punctate. Pubescence white, short, erect, and rather sparse, that of abdomen very minute and sericeous. Apical plate of eighth ventrite elongate nipple-shaped and sparsely clothed with very fine short hairs. Caulis of aedeagus with a short dorsoapical lobe on each side of the median rift, the parameres much broader on apical half than at base. The laminate volsellae armed with a group of about fifteen dark tubercles. Sagittal rods hooked forward very strongly at proximal end, with the fused distal part ovate, depressed, and thin in profile. Length, about 4 mm.; anterior wing, 3 mm.

Holotype male, El Paso, Texas, July 26, 1914 (J. C. Bradley), in collection of Cornell University.

***Perdita coahuilensis*, n. sp.**

This new species from Coahuila, Mexico, is closely allied to *melanochlora* and not easily distinguishable except by the male genitalia.

Female.—Dark blue, the disk of mesoscutum and scutellum black, the clypeus and lateral marks white. Disk of clypeus with two brown or blackish stripes, which are sometimes broad and enclosing a median white stripe but usually more or less thin and abbreviated. Lateral marks a little less transverse than in *melanochlora*, usually broadening at outer ends and frequently concavely arcuate on dorsal margin. Labrum and mandibles testaceous brown, the latter red at apex and sometimes with a small white spot at base. An interrupted band on hind margin of pronotum and tubercles white. Abdomen black, with an interrupted white band on tergites 2 to 4; band on tergite 2 usually narrowly interrupted medially and strongly bent backward at outer ends, but sometimes represented by two widely separated, transverse spots; bands on tergites 3 and 4 generally narrowly interrupted medially, and reaching lateral margins, where they are bent backward, but sometimes abbreviated laterally, and that on 4 generally broader than the others. Antennae brown, the flagellum fuscous above toward base, and the scape black. Legs blackish, gradually changing to pale testaceous brown on tarsi, the base of front and middle tibiae with a small white spot. Tegulae testaceous hyaline, darker at base and with a small white spot anteriorly. Wings milky hyaline, the stigma and nervures pallid, the subcosta slightly brownish.

Structure, sculpture, and pubescence nearly as in *melanochlora*, but punctures of frons and mesoscutum a trifle closer, and the middle tergites of abdomen sericeous with a fine subappressed whitish pubescence, nearly as distinct as in *albivittata*. Length, 4.5–5 mm.; anterior wing, 3.5–3.7 mm.

Male.—Dark blue-green, the disk of mesoscutum and scutellum black. Usually a spot at base of mandibles, the clypeus except usual pair of dots and two brown or black stripes or spots, and narrowly transverse lateral marks white. The dark marks on clypeus generally in the form of slender abbreviated stripes and sometimes obsolescent. Lateral marks usually strongly transverse, but sometimes widest at outer ends, with an upward spur along orbits, and more or less emarginate on dorsal margin. Mandibles, except whitish spot and reddish tips, more or less testaceous brown like the labrum. Thorax entirely dark. Abdomen black or tinged with brown on apical segments, the last tergite testaceous yellow, and the broad apical depression of preceding segments whitish hyaline. Antennae brown, the pedicel and scape blackish. Legs blackish, the tarsi becoming testaceous yellow; a small white spot at base of front and middle tibiae. Tegulae and wings as in female. Length, 3.25–4.24 mm.; anterior wing, 3–3.4 mm.

Structural characters similar to those of *melanochlora*, but the genitalia distinctive because of a distinct apical projection on each side of the dorsal rift of the caulis, formed by a strong vertical fold; sagittae also less broadly ovably expanded before the apex, more depressed as seen from side, and having the free apical styles more slender and acute.

Holotype female and allotype, 25 miles southeast of San Pedro de Colonias, Coahuila, Mexico, 3,700 feet, Aug. 21, 1947 (C. D. Michener), and the following paratypes: 8 females, 12 males, taken with the types; and 1 female, Guadalupe, Coahuila, Aug. 23, 1947 (Michener).

Types in collection of American Museum of Natural History, New York; two pairs of paratypes in collection of Citrus Experiment Station, Riverside.

Perdita megapyga, n. sp.

This unusually distinct species is nearest *P. albovittata* Cockerell, but easily distinguished in the male by the enormous, tapering, and bidentate apical tergite, the size and structure of which is not duplicated elsewhere in the genus.

Male.—Dark blue-green, the disk of mesoscutum and scutellum black. Mandibles except red tips, clypeus, and broad transverse lateral marks white. Clypeus with the usual pair of dots, and the lateral marks nearly twice as broad as high and hardly extending above level of clypeus. Labrum testaceous yellow. Tubercles white, and also the elevated anterior margin of disk of pronotum and two evanescent spots on hind margin. Abdomen blackish, more tinged with brown toward apex and on the venter, the apical tergite testaceous yellow; the broad apical depression of tergites 1 to 6 whitish hyaline and just before the depression a thin yellowish-white line on each side on tergites 2 to 5, and also an interrupted white line across the disk of tergite 5. Antennae brown, paler beneath, the paler area extending to apex of scape, which is otherwise blackish. Legs fuscous, the tarsi testaceous yellow, and the base of tibiae with a small whitish spot. Tegulae testaceous hyaline, darker at base, and with a whitish spot anteriorly. Wings milky hyaline, the nervures pallid, the subcosta and stigma yellow.

Head large, subquadrate, broader than thorax, the cheeks very broad and simple. Mandibles as in *albovittata*, but slightly longer and perhaps a little more geniculate just beyond the expanded base. Lateral extensions of clypeus broadly reflexed but visible as a narrow strip in frontal aspect. Abdomen broadly obpyriform in shape, depressed, the apical tergite very large, broad at base, tapering to the bidentate apex, with the teeth somewhat longer than their basal width; lateral margins of this segment bisinuate, with a low rounded lobe between the two sinuses. Length, 5.25 mm.; anterior wing, 3.8 mm.

Aedeagus differs from that of *albovittata* in being nearly twice as large, and in the sharp-edged, projecting apical fold on each side of the dorsal rift of the caulis; stipital parameres gradually narrowed from the broad base to slender apex as seen from side; and the fused body of the sagittae much stouter both dorsoventrally and from side to side, with the oval expansion occupying more than half the total length, the internal sac projecting from a broad, oblique truncation on dorsal side of expansion, and the apical styles slender, curved, and directed downward.

Described from a single male (holotype), Guadalupe, Coahuila, Mexico, Aug. 23, 1947 (C. D. Michener).

Type in American Museum of Natural History, New York.

Perdita albovittata Cockerell

Perdita albovittata Cockerell, 1895, Proc. Acad. Sci., Phila., 47:15, ♀. Cockerell, 1896, Proc. Acad. Sci., Phila., 48:100, ♂; Cockerell, 1896, Jour. New York Ent. Soc., 4:206; Cockerell, 1902, Amer. Nat., 36:811; Timberlake, 1928, Amer. Mus. Novitates, 321:2.
 ?*Perdita laticeps* Cockerell, 1896, Proc. Acad. Sci., Phila., 48:98, ♂.

The type locality of *albovittata* is San Augustine, New Mexico, and it has been recorded previously from localities in New Mexico and Arizona. The type of *P. laticeps* Cockerell from Las Cruces, New Mexico, I have not examined, but there are no characters given in the description to indicate that it is really distinct from *albovittata*.

The following records are new.—ARIZONA: 10 miles south of Tucson, on *Verbesina encelioides*, Aug. 7, 1940; near mouth of Ramsay Canyon, Huachuca Mts., on *Verbesina*, Aug. 10, 1940; 10 miles north of Bisbee, on *Baileya multiradiata*, Aug. 10, 1940; 8 miles northeast of Douglas, on *Aplopappus spinulosus*, Aug. 11, 1940; 4 miles northwest of Tombstone, on *Verbesina*, Aug. 13, 1940; near Benson, on *Heterotheca subzillaris*, Aug. 13, 1940 (Timberlake); Portal, Chiricahua Mts., Aug. 12, 1940 (E. S. Ross). CALIFORNIA: Morongo, San Bernardino Co., on *Gutierrezia lucida* and *Isocoma acraenia*, Sept. 11 to Oct. 14 in different years; Yucca Valley, San Bernardino Co., on *Gutierrezia lucida*, Aug. 29, 1934 (Timberlake); Yucca Valley, Oct. 5, 1934 (A. J. Basinger, A. L. Melander); Twentynine Palms, on *Pectis papposa*, Sept. 5, 1946; 17.5 miles west of Twentynine Palms, on *Baileya pleniradiata*, Sept. 5, 1946; 18 miles east of Desert Center, Riverside Co., on *Pectis*, Oct. 23, 1951; 18 miles west of Blythe, on *Pectis*, Oct. 24, 1951 (Timberlake); Hopkins Well, Oct. 19, 1951 (P. D. Hurd); and San Felipe Creek, San Diego Co., on *Gutierrezia californica*, Sept. 10, 1938 (Timberlake).

Material collected by the David Rockefeller Expedition of the American Museum, in 1947, extends the range of *albovittata* far into MEXICO. CHIHUAHUA: 87 km. south of Ciudad Juarez, on yellow composite, July 1 (C. D. Michener); 80 km. north of Chihuahua, on *Aplopappus spinulosus*, June 30 (Michener); Parral, 5,500 feet, on *Cevallia sinuata*, July 17 (Michener); COAHUILA: 25 miles southeast of San Pedro de Colonias, 3,700 feet, Aug. 21 (Michener); Cabos, 4,000 feet, Aug. 21 (W. J. Gertsch) and on *Coldenia greggii*, Aug. 21 (Michener); Paila, 3,000 feet, Aug. 21 (Michener); La Rosa, 5,300 feet, Aug. 22 (Gertsch); Guadalupe, Aug. 23 (Michener); 192 km. south of Pedras Negras, 1,300 feet, Aug. 25 (G. M. Bradt); and DURANGO: La Loma, 4,000 feet, on *Physalis*, Aug. 20 (Michener).

Perdita mandibularis, n. sp.

This species is similar to *albovittata* but distinguishable by the larger and more modified mandibles in both sexes.

Female.—Head and thorax dark green, the frons and propodeum more blue-green, the disk of mesoscutum and scutellum black. Clypeus, lateral marks nearly in the form of equal-sided triangles, and a transverse supraclypeal mark creamy white. Clypeus with two broad, abbreviated, submedian black or brownish stripes on disk, the usual pair of dots minute. Labrum and mandibles testaceous, the latter more or less white at base and red at apex. An interrupted band on hind margin of pronotum and the tubercles white. Abdomen brownish black, with a broad yellowish-white basal band on tergites 2 to 5, and sometimes a small white spot on lateral margins of the disk of tergite 1; band on tergite 2 usually, and sometimes that on following segment or two, narrowly interrupted, and all reaching lateral margins and bent backward at outer ends so that the basal corners of the tergites remain black. Pygidial plate rufo-testaceous. Antennae brown, the flagellum only slightly darker above, but scape blackish above and whitish beneath, or sometimes all blackish except at base and apex. Legs brownish black, the front and middle knees yellowish, the apex of front and middle tibiae, hind tibiae, and all the tarsi testaceous brown. Tegulae pale testaceous, the basal margin yellowish white. Wings somewhat whitened, the nervures yellowish, the subcosta, and margins of stigma slightly brownish.

Head as broad as long, rotund, with the clypeus moderately produced and prominent. Labrum nearly as long as broad, somewhat convex exteriorly. Mandibles somewhat longer and more massive than in *albovittata*, strongly expanded on inner margin and with a short incurved simple apex. Facial foveae linear, about three-fourths as long as the space between antennal sockets and anterior ocellus. Pygidial plate with the base moderately broad and the sides straightly converging to the rather narrow rounded apex. Head and thorax polished, with a delicate tessellation visible on pleura, propodeum, and anterior border of mesoscutum, and a stronger tessellation on vertex. Puncturation fine and close on frons and anterior border of mesoscutum and sparse on the disk of latter. Abdomen minutely lineolate and a little dullish. Pubescence white, rather short and coarse, moderately abundant on head and thorax and longer and denser at apex of abdomen. Tergites 3 and 4, and tergite 2 only slightly, with a very fine, short, sericeous pubescence. Scopa of hind tibiae similar to that of *albovittata*. Length, 5-5.5 mm.; anterior wing, 3.5-3.8 mm.

Male.—Head and thorax dark green, the propodeum blue-green, the disk of mesoscutum and scutellum black. Mandibles except testaceous margins and rufous apex, labrum, and almost the entire face below level of antennae creamy white. A small spot on each side of hind margins of disk of pronotum and apex of tubercles white. Abdomen dark brown, the apical depression of tergites whitish subhyaline, the apical tergite testaceous yellow, and the venter somewhat paler brown than the tergum. A very small yellowish spot on extreme lateral margins subapically of tergites 1 to 5. Antennae blackish, the flagellum brown beneath toward base, and the scape narrowly yellow beneath. Legs colored nearly as in female except that the hind tibiae are as dark as the other tibiae. Tegulae and wings as in female.

Head slightly broader than long and subtruncate anteriorly. Mandibles rather stout, moderately sharply acute at apex, and abruptly elbowed at one-third of the length from base to form an angle of about 45°. Clypeus gently convex, the lateral extensions visible in frontal aspect. Facial foveae about three times as long as wide. Sides of pronotum only moderately creased, but the disk transversely abbreviated, with hind margin elevated and ridged. Abdomen ovate, depressed, with the apical tergite very broad at base and narrowly and squarely truncate at apex. Sculpture and pubescence much as in the female, but the hair in general finer and that at apex of abdomen very fine. Apical plate of eighth ventrite very narrow and pointed at apex (in *albovittata* more finger-like, with rounded apex). Aedeagus similar to that of *albovittata*, but the parameral lobes, as seen in lateral view, broad in basal half and thence gradually narrowed to the slender apex (in *albovittata* more abruptly narrowed in the apical third); sagittae with a large, oval apical expansion, the base of which forms a dorsal hump as seen from side (hump lacking in *albovittata*); volsellae armed on dorsal margin with about forty dark tubercles, arranged in sets of twos to fours, more or less abreast. Length, 5-6 mm.; anterior wing, 3.2-3.5 mm.

Holotype female and allotype, Thousand Palms Canyon, Riverside Co., California, both on *Geraea canescens*, April 28 and April 25, 1936; 4 females, 2 males (paratypes), Yermo, San Bernardino Co., on *Chaenactis carphoclinia*, June 2, 1941 (Timberlake); and 2 females, 2 males (paratypes) Box Canyon, Riverside Co., April 27, 1952, one female on *Dalea* (G. A. Marsh), one pair on *Chaenactis* and one male in spider's nest (Timberlake).

Types in collection of Citrus Experiment Station, Riverside; paratypes in collection of the University of California at Berkeley.

Xeromacrotera, n. subg.

Type.—*Macrotera cephalotes* Cresson.

This is a monotypic group seemingly most closely allied to *Pentaperdita* since the maxillary palpi tend perhaps to be five-jointed. The type, of which only the male is known, is a moderately large, robust bee, of yellow color, with a black band across the vertex and black marks on occiput, pleura, sternum, propodeum, and at base of abdomen.

Male.—Head large, quadrate, broader than thorax, the cheeks broad, rounded and but little receding. Anterior margin of head evenly truncate except for the projecting labrum. Disk of clypeus small, as broad as high, its width much less than that of the lateral extensions, which are

slender, elongate, and visible in frontal aspect. Lateral plates of face extremely broad. Mandibles stout at base and tapering to acute apex. Glossa and galeae in repose reaching about front coxae. Maxillary palpi thin and rather indistinctly jointed (five joints distinguished in one specimen, and six indistinctly in another). Sides of pronotum moderately furrowed, the disk deeply transversely grooved behind the elevated rim of anterior margin, and elevated but not carinately ridged at posterior border, the posterior corners rounded. Stigma of anterior wing almost as long and three-fourths as broad as first submarginal cell. Claws of all tarsi bifid. Abdomen broad, ovate, broader than thorax. Apical plate of eighth ventrite elongate nipple-shaped, rather densely pubescent, with the hair fine and rather short. Caulis of aedeagus with a very large proximal orifice which emarginates both the dorsal and the ventral walls; dorsal surface of caulis narrowly rifted almost to base and truncated at apex, although with two small teeth projecting below the apical edge as seen from the side. Stipital parameres very broad at base, narrowed to a rounded apex, and with a conical process on inner surface near base of lower margin. Volsellae large, armed with numerous dark tubercles, the inner pair very broad, and the outer pair slender and strongly curved. Sagittae fused except basally, the apical part swollen and projecting far beyond apex of parameres.

Perdita cephalotes (Cresson)

Macrotera cephalotes Cresson, 1878, Trans. Amer. Ent. Soc., 7:71, ♂.

Perdita cephalotes Cockerell, 1896, Proc. Acad. Sci., Phila., 48:78.

Only the type of this species, collected by Henry Edwards in Nevada, has been known previously, as the two specimens recorded by Riley from the Panamint Mountains belong to another species (North Amer. Fauna, 7:246, 1893). I have examined the type at Philadelphia, and can now record two additional male specimens, collected September 27, 1941, and September 29, 1944, at Morongo, San Bernardino County, California, at flowers of *Gutierrezia lucida*.

Callomacrotera, n. subg.

Type.—*Perdita maritima* Timberlake.

This is a group of two Mexican species that were found on the sea beach at San Blas and Acapulco. The large robust form, with a transverse head and a broad abdomen, the short maxillary palpi, and the rather small slender stigma in both sexes, the well-developed pygidial plate of male, and the plumose scopa of female are distinctive characters.

Female.—Head transversely oval, nearly twice as broad as long. Mandibles tapering to acute apex and armed on inner margin with a triangular process at about one-fourth of the length from base. Mouth parts ordinary, but maxillary palpi unusually short, although usually six-jointed, with the first joint longest and the fifth shortest (only five joints in one male). Subantennal plates large and about as broad as long. Lateral plates of face very broad. Facial foveae elongate, and very broadly and triangularly expanded above. Marginal cell of anterior wing as large as first submarginal, with the space beyond it to apex of wing about one and one-half times its length. Stigma rather slender and not more than one-half as wide as marginal cell. Tibial scopa rather copious and composed of long, slightly curved retrorse hairs, which are distinctly plumose, the branches, however, short and close set. Claws simple, gently incurved at apex. Pygidial plate large, convex in middle and grooved on each side except toward apex, which is moderately broadly truncate.

Male.—Similar to female. Mandibles longer than in the female, tapering to acute apex and not dilated on outer margin at base. Clypeus with a dense brush of stiff, antrorse hair. Facial foveae triangular and longer than wide. Sides of pronotum rather deeply grooved, the disk abbreviated, carinately ridged behind, and the posterior corners prominent. Hind tibiae with numerous, rather long, erect, and mosslike hairs. Claws of all tarsi moderately deeply bifid, with inner tooth shorter

than the outer one. Apical tergite with a distinct flat pygidial plate, which has the base very broad and the apex rather narrowly rounded. The exposed part of the apical plate of eighth ventrite laminately ridged in middle, and the basal articulating part bilobate. Caulis of aedeagus quadrate, subdepressed, a little longer than wide, with a deep rounded emargination above at apex; parameral lobes very broad and nearly straight except for subacute incurved tips. Sagittae elongate, rather slender, rapidly tapering apically and acute at tip, which is slightly curved upward. Volsellae large, the inner pair broad and reaching a little beyond middle of the parameral lobes.

KEY TO SPECIES

1. Males 2
 Female dark blue-green, the abdomen blackish; spot at base of mandibles, clypeus, lateral marks, small subantennal spots, and supraclypeal mark yellow, but the green reaching clypeus on each side of face; thorax entirely dark; abdomen with a narrow, interrupted yellow band on tergites 2 to 4, and a small spot on lateral margins of tergite 1; length, about 9 mm. *maritima*, n. sp.
2. Clypeus normal in form, convex, the hair brush covering disk; pygidium rounded at apex; mandibles except tips, labrum, clypeus, lateral marks, large subantennal and supraclypeal marks, and antennae yellow; abdomen with a broad yellow band on tergites 1 to 5, or 6, that on tergite 1 interrupted; length, 9 mm. *maritima*, n. sp.
- Clypeus rounded out and produced over base of labrum, the margin with a dense fringe, the disk above margin concave; apex of pygidial plate truncate; mandibles except tips, labrum, face below level of antennae except two black marks on base of clypeus, broad median stripe on frons bifurcating above to enclose anterior ocellus, a transverse quadrate mark between ocelli and eyes on each side of vertex, the antennae and legs yellow; abdomen flavo-ferruginous; length, about 7 mm. *acapulcona*, n. sp.

Perdita maritima, n. sp.

Female.—Dark blue-green, the abdomen blackish. Spot on base of mandibles, clypeus except lateral margins of disk and sometimes two small dark spots on dorsal margin, lateral marks strongly concavely emarginate within and extending narrowly on orbits above level of antennae, small spot on subantennal plates, and a supraclypeal mark yellow. Mandibles otherwise rufo-piceous, the labrum blackish, and the lower end of subantennal plates dark, so that the dark color of face extends to the clypeus on each side. Thorax entirely dark, with the tubercles rufo-piceous. A small spot on lateral margins of disk of tergite 1, and a narrowly interrupted band, somewhat widened at outer ends, on tergites 2 to 4, yellow. Legs black, a small spot at base of front, and middle tibiae yellow. Antennae blackish, the flagellum brown toward apex and yellowish brown beneath. Tegulae testaceous, darker at base. Wings dusky hyaline, the nervures brown, the subcosta blackish.

Head transversely oval, the cheeks very broad behind upper end of eyes. Antennae rather long, the flagellum subclavate, its first joint about as long as the next two together, the middle joints as long as thick. Frons and vertex strongly tessellate and dullish, the thorax delicately tessellate and shining. Punctures of head and mesonotum fine and rather close, becoming rather faint on vertex. Abdomen microscopically lineolate and shining. Pubescence rather abundant for a *Perdita*, fine and pale ochreous, that of mesonotum short and erect; scopal hair of hind tibiae very long, finely plumose and fuscous, that on dorsal margin dirty white to blackish. Length, about 9 mm.; anterior wing, 6 mm.; width of abdomen, 2.9 mm.

Male.—Dark green, with dark yellow markings, the abdomen mainly yellow. Mandibles except rufous tips, labrum, clypeus, lateral marks, subantennal and supraclypeal marks, line on posterior orbits from base of mandibles to middle of eyes, and antennae yellow. Green of face descending on each side to middle of subantennal plates, and the sutures of lower part of face narrowly black. Supraclypeal mark narrowly extended upward at outer ends so that the antennal sockets are more than half encompassed by yellow. Lateral marks narrowed above and intruding slightly between foveae and eyes. Flagellum slightly brownish, with a small fuscous spot at the base of the joints above, beyond the first, the spots becoming progressively fainter and hardly distinct beyond the fourth joint. Anterior margin of disk of pronotum, two spots on hind margin, and the tubercles

yellow. Abdomen yellow, with a brownish-black band at apex of tergites 1 to 6, those on tergites 5 and 6 more brownish; base and median stripe on tergite 1 black, the yellow forming an interrupted band, the inner ends of which are roundly dilated. Legs blackish, the apex of front and middle femora broadly yellow, as well as the front and middle tibiae and tarsi, apex of hind coxae, hind femora except a dark blotch on anterior and posterior sides, and base and under side of hind tibiae. Tegulae and wings as in female.

Head transversely oval, the cheeks very broad behind upper end of eyes. Mandibles long, tapering, and acute at apex. Disk of clypeus convex, the lateral extensions rather narrow and reflexed. Facial foveae rather large, triangular, but much longer than wide. First joint of flagellum a little shorter than the next two together. Pronotum abbreviated, the posterior corners distinctly closer together than the distance from either to summit of nearest tubercle. Sculpture nearly as in female, with the punctures of frons fainter and those of mesoscutum more widely separated. Pubescence much more fulvo-ochreous than in female, but in general of the same length and density; disk of clypeus with a dense brush of antrorse hair. Length, 7-8 mm.; anterior wing, 5-5.5 mm.; width of abdomen, 2.5-2.8 mm.

Four females, 4 males (holotype female, allotype, and paratypes) on sea beach at San Blas, Nayarit, Mexico, July 20, 1951 (P. D. Hurd).

Types in collection of Citrus Experiment Station, Riverside, and paratypes in collection of University of California, Berkeley.

Perdita acapulcona, n. sp.

Male.—Head and thorax dark green, the antennae, legs, and abdomen yellow. Mandibles except reddish margins and tip, labrum, most of face below level of antennae, broad median stripe on frons continuous with supraclypeal mark and bifurcate above to encompass anterior ocellus, transversely quadrate mark on each side of vertex between lateral ocelli and summit of eyes and about on level with anterior ocellus, and posterior orbits to a little above the middle of eyes yellow. A black mark on each side of disk of clypeus above, with the yellow sometimes intruding in an equal-sided triangle between the marks. Green of frons descending acutely on each side of face to middle of the subantennal plates. Pronotum yellow, except a rather narrow green cross band, but the sides dark except tubercles and a yellow mark on anterior margin above. Propodeum sometimes with a yellow band across the base. Front and middle coxae, base of hind coxae, base or under side of basal half of front and middle trochanters, and small blotch at base of hind trochanters and at base of front and middle femora beneath fuscous or black. Apical depression of tergites 1 to 6 and pygidial plate of tergite 7 pale ferruginous. Tegulae pale testaceous, the basal margin yellow. Wings moderately dusky hyaline, the nervures and stigma brown, the subcosta blackish.

Head broadly, transversely oval, the cheeks very broad but receding. Disk of clypeus somewhat concave in middle, with apical margin roundly produced, projecting over labrum and slightly angulate in middle. Mandibles long, tapering, and acute at apex. Antennae rather long, with the first joint of flagellum somewhat shorter than the next two joints together. Facial foveae shallowly impressed, widened above, and about two to three times longer than wide. Sides of pronotum much less impressed than in *maritima*, the disk not abbreviated, and the posterior corners considerably farther apart than distance from either to summit of nearest tubercle. Pygidial plate rather truncate at apex. Lamine ridge of eighth ventral plate with a rounded outline as seen in profile. Frons and vertex tessellate and moderately dullish, the thorax, except metanotum, indistinctly tessellate and shining, with posterior face of propodeum polished. Puncturation fine and moderately close on frons and mesonotum. Abdomen shining. Pubescence ochreous or yellowish, rather dense for a *Perdita*, that on the mesonotum short and erect. Fringe on anterior border of clypeus ochreous and longer on each side than in the middle. Caulis of aedeagus with a rather small proximal orifice and a deep triangular emargination above, which reaches nearly to the base; parameral lobes inserted low on each side, narrow at base, wide at middle, where they are sharply angulate on dorsal margin as seen from side, and thence rapidly narrowed to acute apex. Sagittae rather slender, depressed, and fused except for the curved basal rods, and hardly at all widened in apical part. Volsellae similar to those of *maritima*, the broad inner pair reaching the

angulate part of the parameral lobes. Length, 6.5–7 mm.; anterior wing, 4.8–5.1 mm.; width of abdomen, 2.5–2.7 mm.

Two males (holotype and paratype), Acapulco, Guerrero, Mexico, on sea beach, July 1, 1951 (P. D. Hurd). Also 1 male (paratype), same data (H. E. Evans).

Type in collection of Citrus Experiment Station, Riverside, and a paratype in collections of University of California at Berkeley and University of Kansas at Lawrence.

Hexaperdita, n. subg.

Type.—*Perdita ignota* Cockerell.

This is a group of medium-sized and small species allied to *Pentaperdita*, but having the maxillary palpi six-jointed, mandibles of females usually but little dilated within and comparatively weakly incurved at apex, and sides of pronotum of male more impressed, with the disk of pronotum more abbreviated and more deeply grooved behind and beneath the laminate expansion of the anterior margin.

Female.—Head usually about as broad as long, with the clypeus convex and moderately prominent. Mandibles usually rather long, generally but little dilated within and incurved at apex, these peculiarities being much less developed than in *Pentaperdita*. (In one species, *P. callicerata* Cockerell, the mandibles are slender and almost parallel-sided.) Glossa and galeae usually but little surpassing the proboscoidal fossa in repose. Facial foveae usually as wide as, or wider than, the space between them and eye margin, and sometimes distinctly broadened, and usually about two-thirds as long as length of space between anterior ocellus and antennal sockets. Marginal cell nearly as large as first submarginal cell and squarely truncate at apex. Stigma as long as marginal cell and moderately broad. Tibial scopa more copious than in groups of *Perdita* not allied to *Cockereilia*, but considerably thinner than in *Pentaperdita*, and having the hairs along the outer margin crinkly from extremely short and close-set branches, and occasionally more distinctly plumose. Pygidial plate moderately large, smooth, and with a moderately narrow truncate apex.

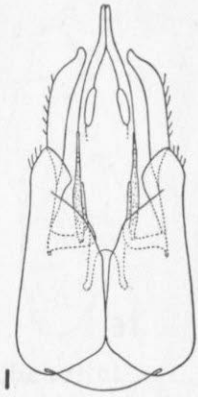
Male.—Head generally more or less quadrate, with the cheeks broad and sometimes armed anteriorly with a blunt tubercle. Mandibles long, tapering, acute at apex, and often with an abrupt, more or less quadrate expansion at base beneath. Facial foveae usually three or four times longer than wide. Sides of pronotum more or less deeply impressed, and the disk, which is more abbreviated than usual, transversely impressed across the anterior part, with the groove covered by the horizontal laminate expansion extending backward from the anterior margin. Abdomen moderately broadly oval, subdepressed, and ferruginous or dark colored, with light markings poorly developed or usually absent. Apical tergite small, with a small pygidial area differentiated merely by the absence of hair. Aedeagus in general rather closely similar to that of *Pentaperdita*, but having both pair of volsellae well developed.

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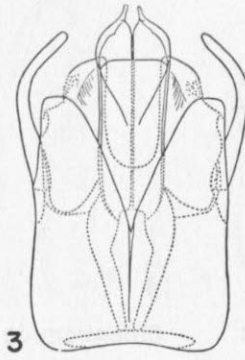
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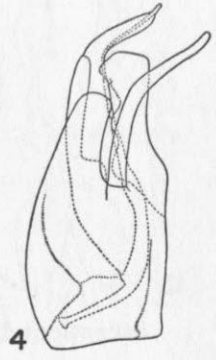
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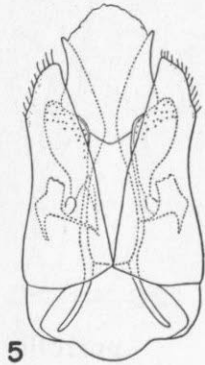
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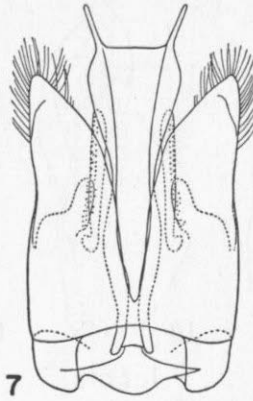
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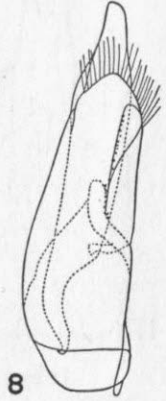
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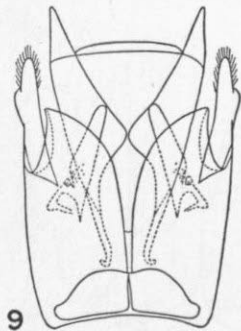
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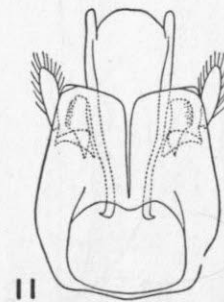
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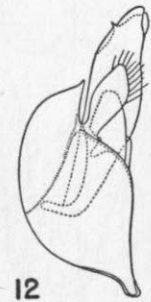
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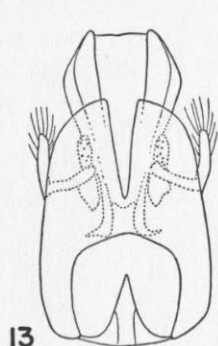
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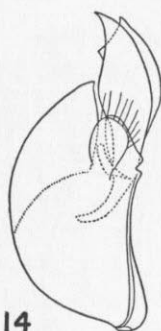


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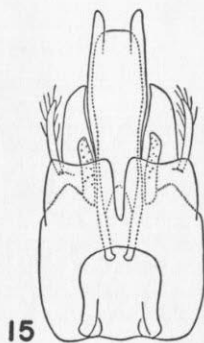
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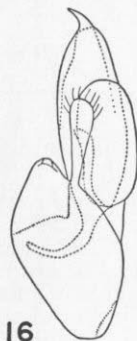
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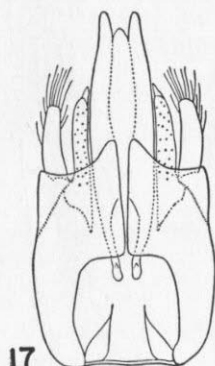
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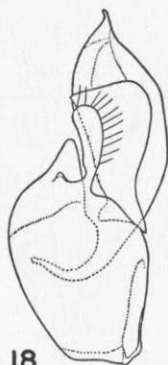
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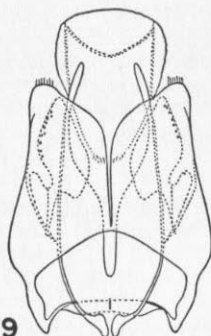
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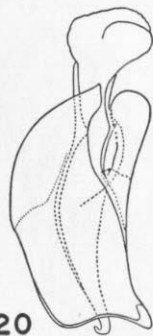
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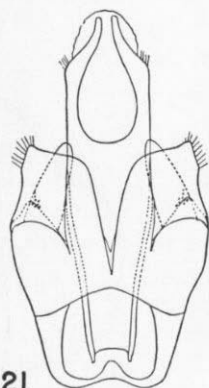
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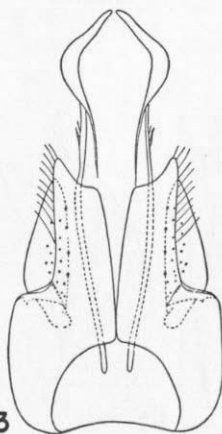
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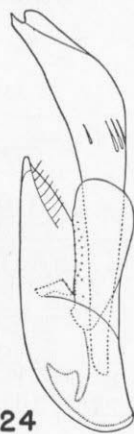
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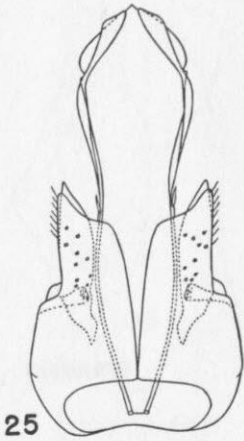
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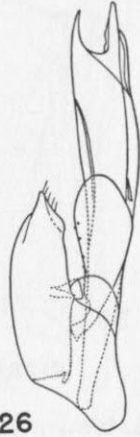


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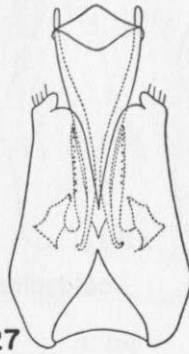
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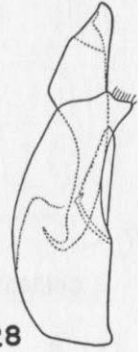
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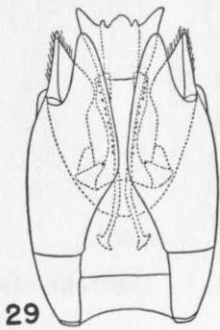
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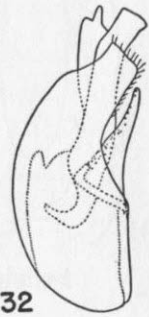
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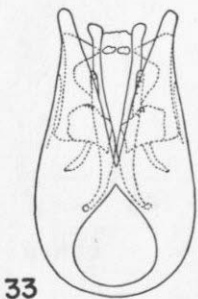
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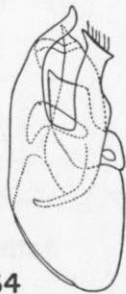
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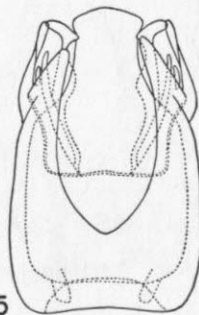
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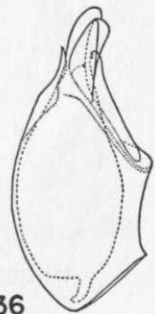
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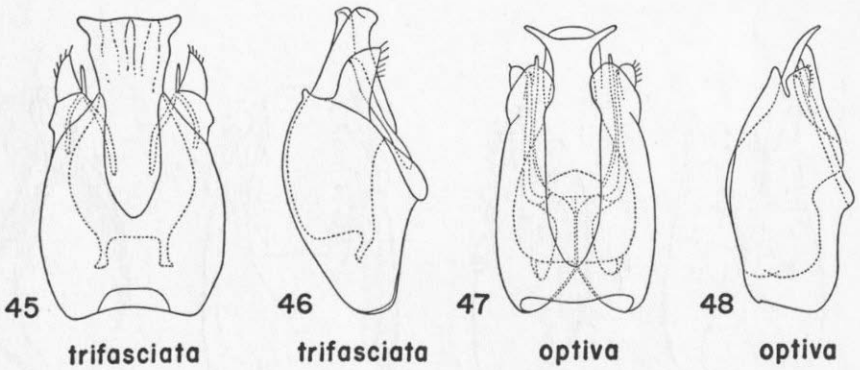
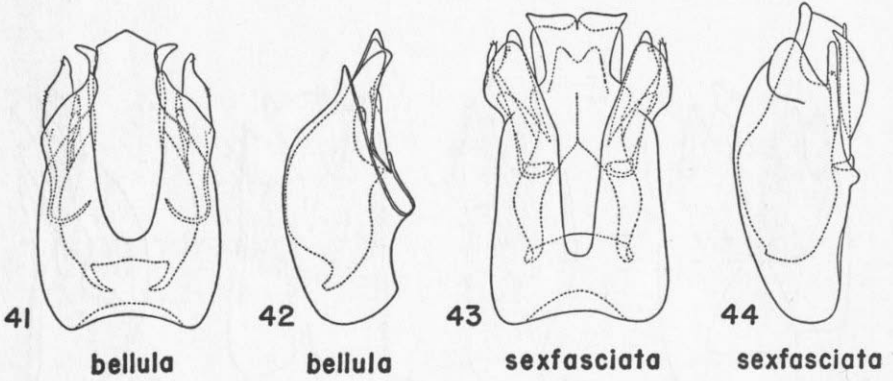
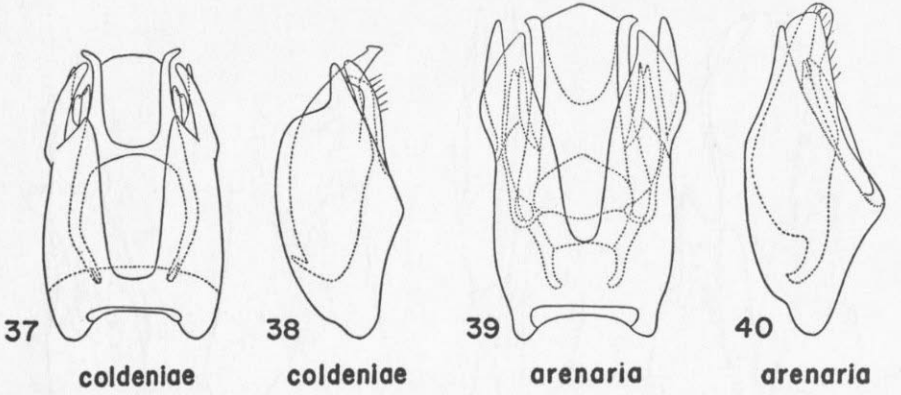
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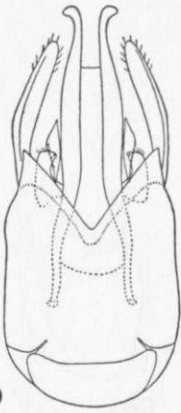


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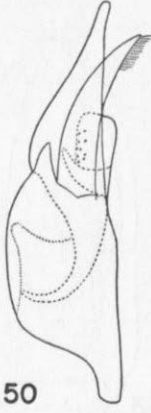
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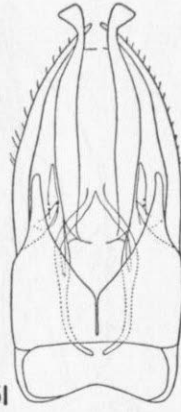
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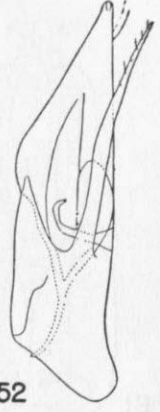
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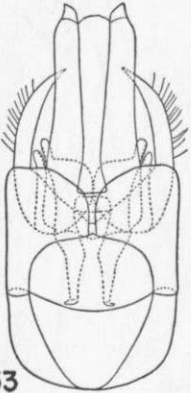
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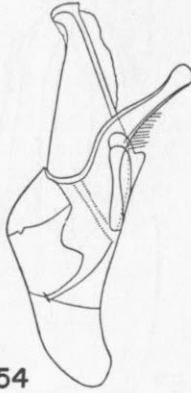
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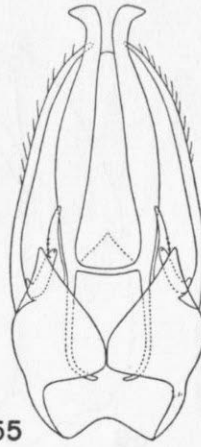
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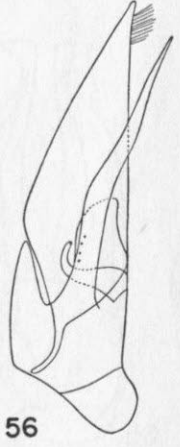
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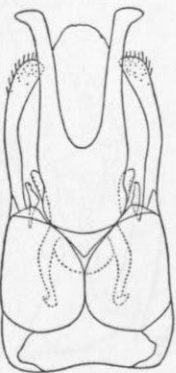
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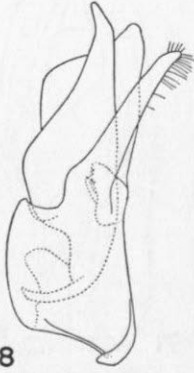
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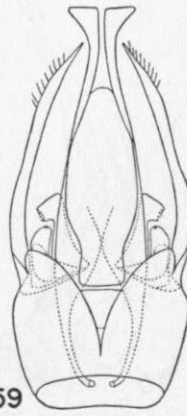
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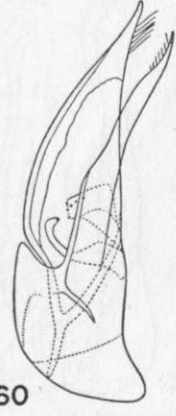
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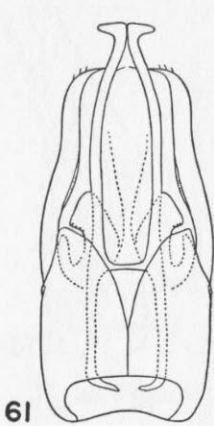
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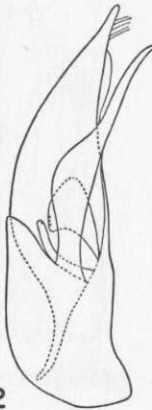
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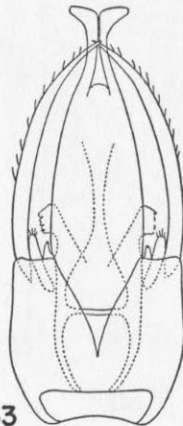
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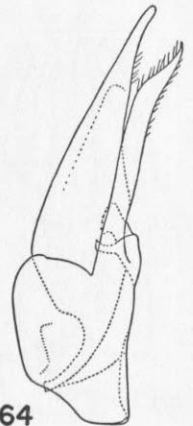
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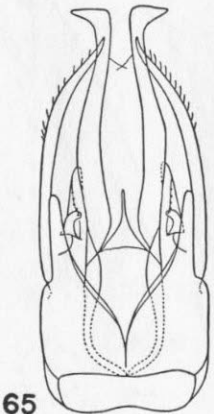
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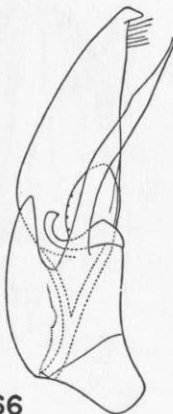
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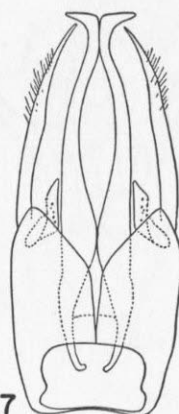
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nigrocaerulea



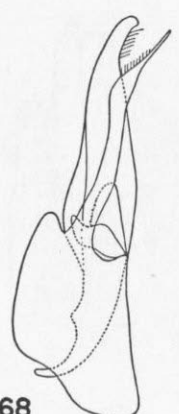
66

nigrocaerulea



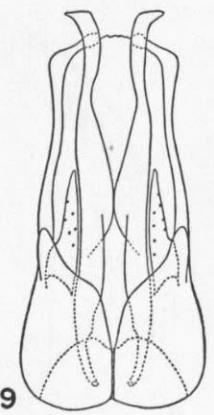
67

nigriventris



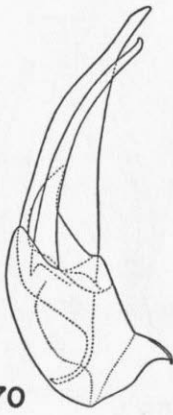
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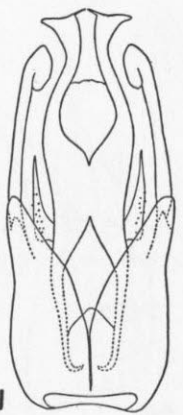
69

diversa



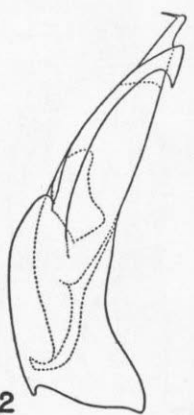
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diversa



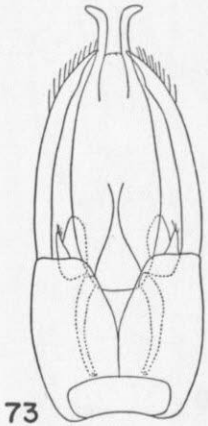
71

peculiaris

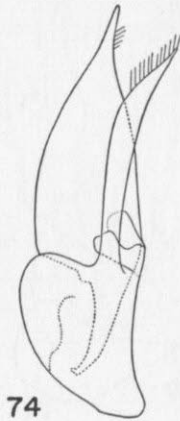


72

peculiaris



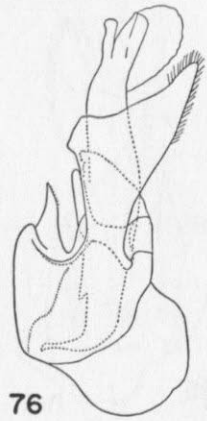
73
binotata



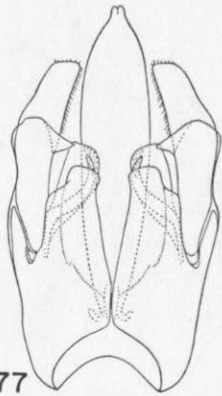
74
binotata



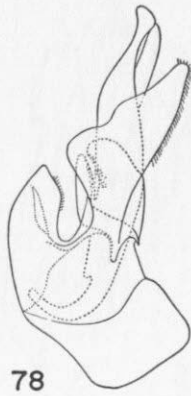
75
signata



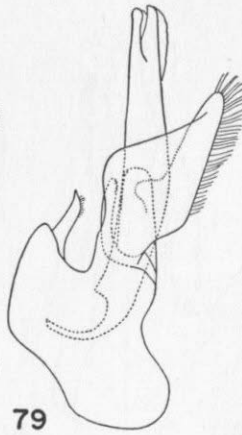
76
utahensis



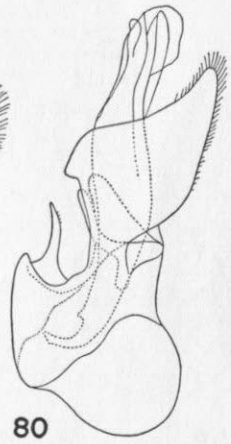
77
baileyae



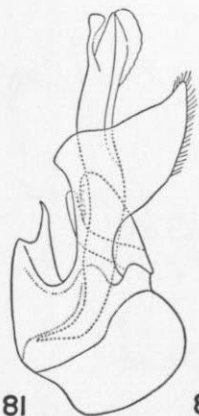
78
baileyae



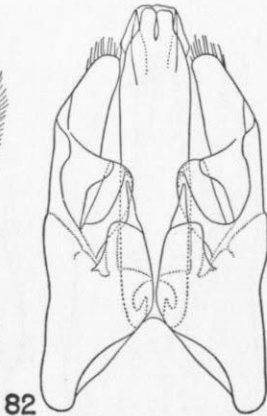
79
a. albihirta



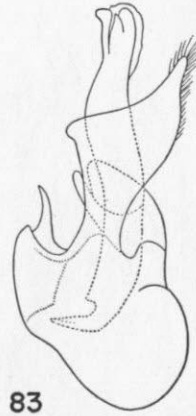
80
b. bequaerti



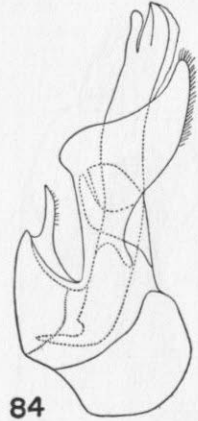
81
verbesinae



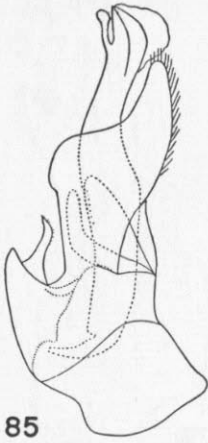
82
heliophila



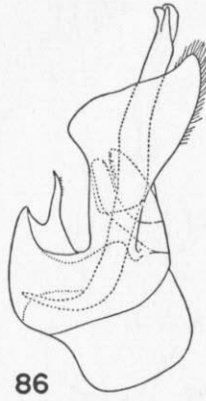
83
heliophila



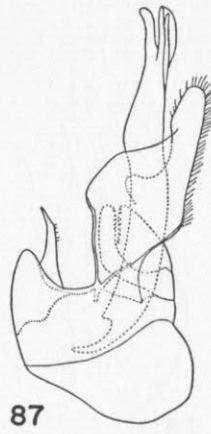
84
l. lacteipennis



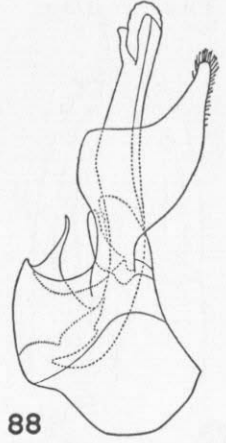
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obscuripennis



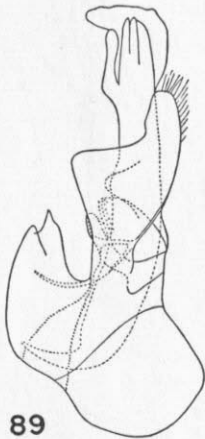
86
tricincta



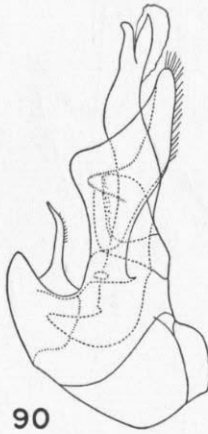
87
albipennis



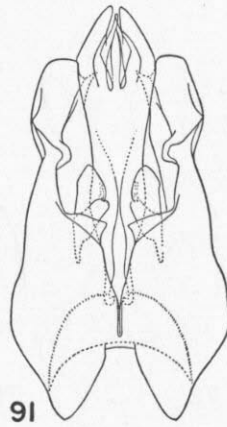
88
scopata



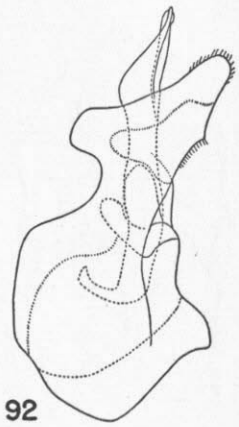
89
***l.* lepachidis**



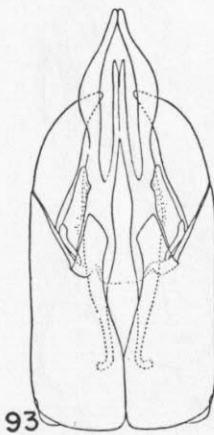
90
***c.* coreopsidis**



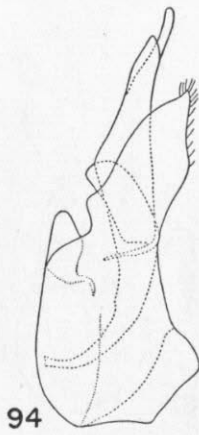
91
albonotata



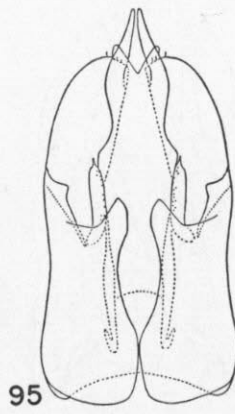
92
albonotata



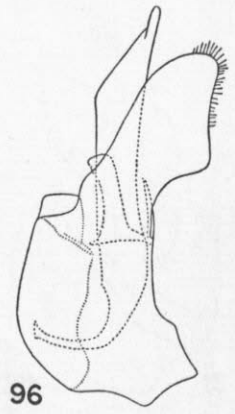
93
chrysophila



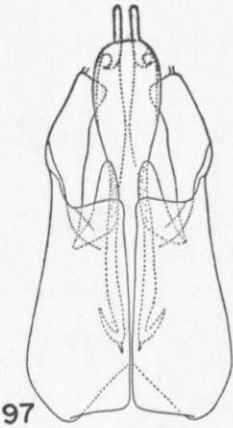
94
chrysophila



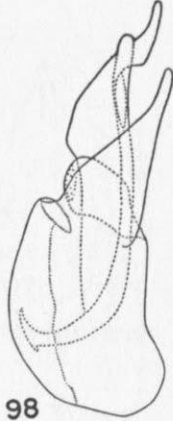
95
nigroviridis



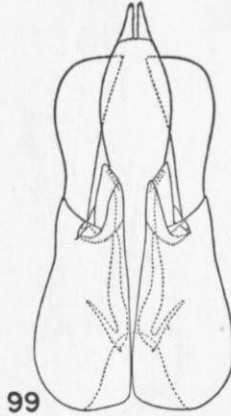
96
nigroviridis



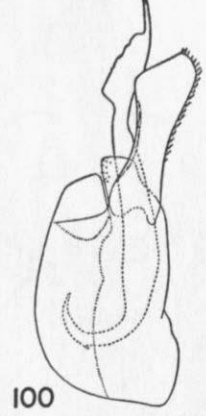
97
melanochlora



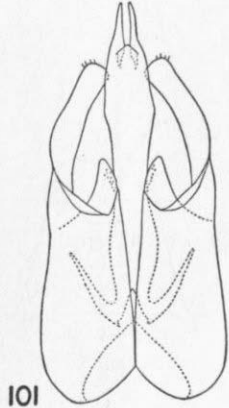
98
melanochlora



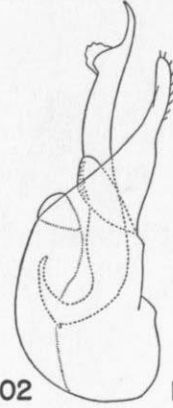
99
bradleyana



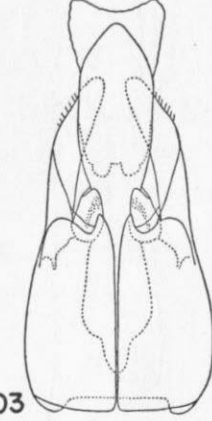
100
bradleyana



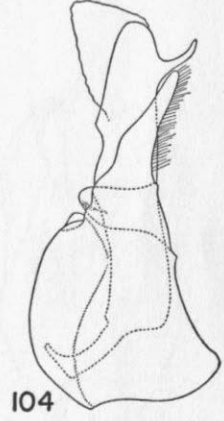
101
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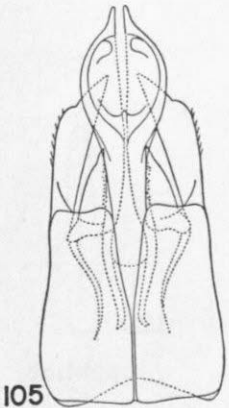
102
coahuilensis



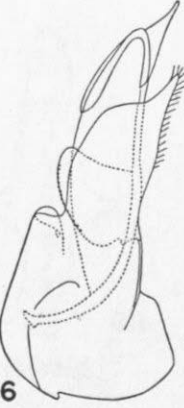
103
megapyga



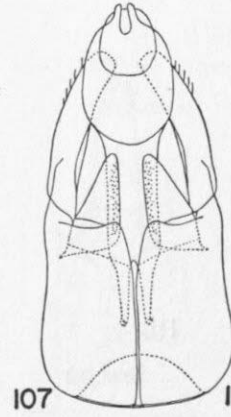
104
megapyga



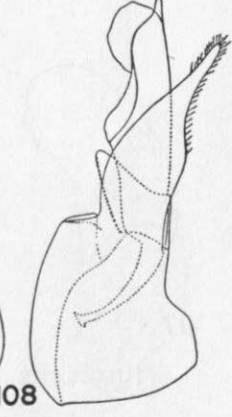
105
albovittata



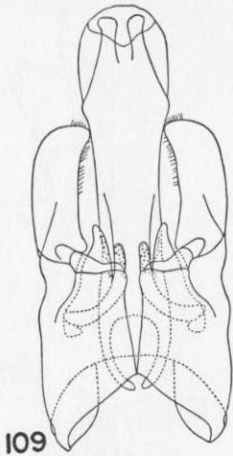
106
albovittata



107
mandibularis

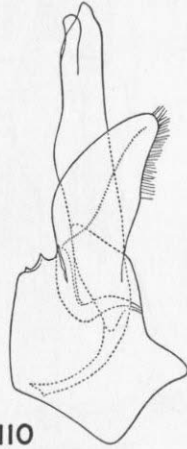


108
mandibularis



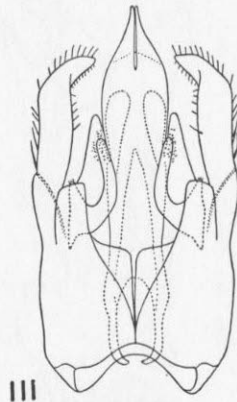
109

cephalotes



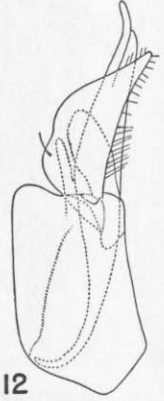
110

cephalotes



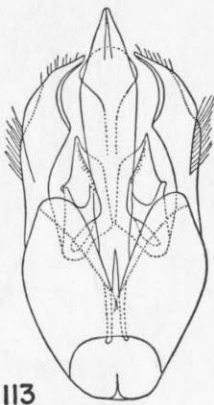
111

maritima



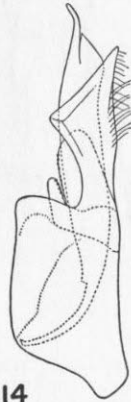
112

maritima



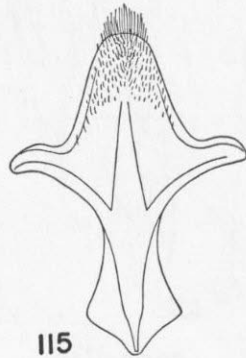
113

acapulcona



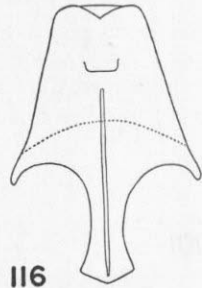
114

acapulcona



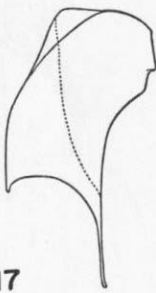
115

bequaertiana



116

turgiceps



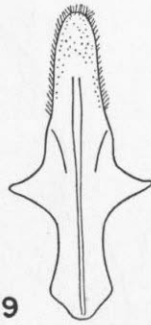
117

turgiceps



118

texana



119

bicolor



120

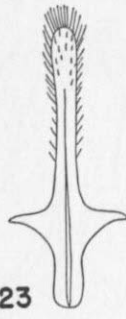
opuntiae



121
azteca



122
bidenticauda



123
laticauda



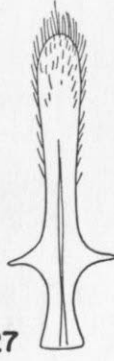
124
lobata



125
portalis



126
a. dinognatha



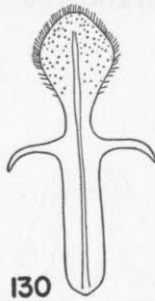
127
latior



128
echinocacti



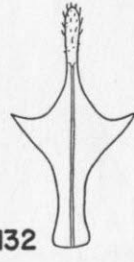
129
mortuaria



130
nigrella



131
tristella



132
mellea



133
rhodogastra



134
coldeniae



135
arenaria



136
bellula

