

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 II

BY

P. H. TIMBERLAKE

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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 II

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THIS IS the second in a series of revisional studies of the genus *Perdita*. Part I (Univ. Calif. Publ. Entom., 9:345-432, 1954) includes a key to the recognized subgenera, and *Xerophasma*, *Pseudomacrotera*, *Macrotera*, *Cockerellula*, *Macroteropsis*, *Macroterella*, *Heteroperdita*, *Glossoperdita*, *Hesperoperdita*, *Epimacrotera*, *Cockerellia*, *Procockerellia*, *Pentaperdita*, *Xeromacrotera*, *Callomacrotera*, and *Hexaperdita* are described or redescribed and, except in the last case when more than one species is represented, keys are provided and many of the species treated in some detail.

The present section includes the systematics of the subgenera *Alloperdita*, *Hexaperdita*, *Perditella*, and *Pygoperdita*, together with supplemental information on subgenera treated in Part I.

Subg. *Hexaperdita* Timberlake

Hexaperdita Timberlake, 1954, Univ. Calif. Publ. Entom., 9:348, 416.

Perditella Robertson, 1902, Canad. Ent., 34:321; Robertson, 1922, Psyche, 29:161 (not Cockerell).

This subgenus, characterized in the preceding part, contains about twenty-two species which visit the flowers of Compositae exclusively. Many of the nominal species are closely allied to each other, and some of them are here reduced to subspecies. As more material accumulates this process will probably be applied to more of the presently known species. Genera of Compositae visited by these bees include *Aphanostephus*, *Baileya*, *Chrysopsis*, *Grindelia*, *Heterotheca*, *Boltonia*, *Erigeron*, *Rudbeckia*, *Aster*, *Verbesina*, *Helenium*, *Bebbia*, *Coreopsis*, *Xanthisma*, *Helianthus*, and *Aplopappus* (*Isopappus*, *Prionopsis*, and *Sideranthus*).

KEY TO SPECIES

- | | |
|--|------------------------------|
| 1. Females | 2 |
| Males | 32 |
| 2. Abdomen creamy white, with dark markings | 3 |
| Abdomen dark (ferruginous or blackish), usually with yellowish or whitish bands..... | 4 |
| 3. Mesoscutum polished, with sparse punctures and fine erect hair; head much broader than long; clypeus and lateral marks creamy white, the latter with narrow extension along orbits to level of antennae; first two or three tergites of abdomen usually more or less fuscous; mandibles slender, nearly straight except for incurved tips..... | <i>callicerata</i> Cockerell |
| Mesoscutum dull, with moderately close punctures and short erect whitish hair; head not much broader than long, the clypeus prominent; face marks creamy white, including clypeus, lateral marks and often supraclypeal and sometimes subantennal spots, the lateral marks large and reaching level of foveae; abdomen with apical brown or fuscous bands; mandibles curved and a little dilated on inner margin | <i>xanthismae</i> Cockerell |
| 4. Large species, 6-7 mm. long; subantennal and supraclypeal marks developed, but disk of clypeus sometimes more or less black; abdomen with broad, entire, yellow or white bands; | |

- mandibles dilated within5
 More or less smaller species; subantennal and supraclypeal marks little developed and usually absent; abdominal light bands, if present, usually interrupted; mandibles usually not much dilated within7
5. Propodeum entirely dark; disk of clypeus black, or with two broad black stripes.....6
 Propodeum broadly yellow on each side; face below antennae nearly all yellow, abdomen yellow, with a black apical band on tergites 1 to 5*propodealis* Timberlake
6. Clypeus black, with a small yellowish-white spot on each side and a narrow median stripe not reaching anterior margin; subantennal and supraclypeal marks large, the latter entire; abdomen black, with a white band on tergites 1 to 5*bebbiae*, n. sp.
 Clypeus white with two broad black stripes on disk, these confluent on anterior margin; supraclypeal mark divided into two spots which are slightly larger than the subantennal marks; abdomen yellowish-white, with a very broad blackish band at apex of tergites 1 to 5*rossi*, n. sp.
7. Abdomen ferruginous or orange, without light bands8
 Abdomen fuscous or blackish, either with or without light bands, or if more or less brown or orange brown having whitish bands10
8. Mesoscutum tessellate and dullish; abdomen ferruginous9
 Mesoscutum polished; abdomen orange, with a pale-brown band on tergites 1 and 2; clypeus and lateral marks yellowish, the latter ending acutely above level of antennae; a transverse supraclypeal mark also present; wings whitish hyaline*callicerata* Cockerell
9. Wings a little dusky, the nervures and margins of stigma brown; clypeus and lateral marks reaching level of antennae, pale yellow, but upper border of disk of clypeus dark, notched medially by the yellow*cambarella cambarella* Cockerell
 Wings whitish hyaline, the nervures pallid; abdomen sometimes with small, indefinite fuscous markings; face marks similar, but more whitish, the clypeus sometimes with only a small brown spot on each side of summit of disk.....*cambarella platyura* Cockerell
10. Lateral marks of face large, triangular, and extending upward along orbits to or above level of antennae11
 Lateral marks more or less transverse, not or hardly reaching above level of summit of clypeus, or face sometimes entirely dark20
11. Face markings yellow12
 Face markings white13
12. Larger, about 6-7 mm. long; frons and mesoscutum tessellate but shining, the middle of mesoscutum almost polished; scopal hair of hind tibiae more distinctly plumose than usual; facial foveae linear; clypeus and lateral marks yellow, or the clypeus varying to entirely dark; abdomen with a yellow band, narrowly interrupted in middle, on tergites 1 to 4.....*pratti* Cockerell
 About 5 mm. long; frons and mesoscutum uniformly tessellate, but shining; scopal hair of hind tibiae not plumose; facial foveae much wider than interval between them and margin of eye; clypeus and triangular lateral marks pale yellow, or the markings reduced to a median spot on clypeus; abdomen with an interrupted yellow band on tergites 2 to 4, or these bands sometimes obsolete*foveata foveata*, n. subsp.
13. Yellow or white bands of abdomen, when present, straight and basal14
 Tergites 1 to 4 each with a creamy white band, broadly interrupted on tergite 1, less interrupted on other segments, and those on tergites 2 and 3 much broadened at outer ends and obliquely margined behind; lateral face marks ending acutely at level of the foveae, the clypeus with a dark blotch on each side above; frons and mesonotum tessellate and dull*blatchleyi* Timberlake
14. Abdomen with light bands15
 Abdomen entirely dark17
15. Mesoscutum strongly tessellate and dullish16
 Mesoscutum and frons delicately tessellate and shining; head and thorax dark blue-green, the clypeus and lateral marks white; abdomen blackish, varying to orange-brown, with a narrow, interrupted whitish band at base of tergites 2 to 4.....*heterothecae* Cockerell

16. Small species, with head much broader than long; lateral face marks with a narrow orbital extension to level of antennae, which is often more or less obsolete; basal band on tergites 2 to 4 well interrupted, narrow and yellowish-white, and a short, transverse white line far to each side on tergite 1 more or less broken into spots*foveata persimilis*, n. subsp. Larger species, about 5.5 mm. long, the head as long as wide; clypeus and large triangular lateral marks, and sometimes a transverse supraclypeal mark creamy white; tergites 2 to 4 (or 5) each with a broad creamy white band, sometimes notched medially or rarely interrupted (or abdomen white with brown or fuscous bands)*xanthismae* Cockerell
17. Wings whitish hyaline, the nervures pallid; tarsi white 18
 Wings dusky hyaline, the nervures brownish; tarsi dark; mandibles at base, clypeal and large lateral marks creamy white, but clypeus sometimes all dark.*georgica* Timberlake
18. Head and thorax shining, the mesonotum moderately hairy 19
 Mesoscutum tessellate and more dullish than the frons; mandibles except tips, labrum, clypeus, and large lateral marks creamy white, the clypeus with a small brown spot on each side of the summit*asteris* Cockerell
19. Clypeus white, except usual dots; flagellum entirely yellowish beneath.*vespertilio* Cockerell
 Clypeus dark brown, with a cuneiform white mark on each side; flagellum rather narrowly testaceous beneath, except toward base; tubercles tipped with white.*fedorensis* Cockerell
20. Abdomen with light bands more or less developed 21
 Abdomen entirely dark 28
21. Wings slightly dusky, or if milky hyaline with pallid nervures, the tarsi more or less dark. 22
 Wings milky hyaline, with pallid nervures, or if subcosta and margins of stigma a little brownish, the tarsi white or yellowish-white. 26
22. Head at most only a little broader than long; generally duller, more strongly tessellate species 23
 Head more distinctly broader than long; frons rather delicately tessellate and shining, the mesonotum somewhat duller; clypeus, except mark on anterior margin or two broad dark stripes, and transverse lateral marks, white; tergites 2 to 4 each with an interrupted yellowish-white band; wings white, the subcosta and margins of stigma brownish
foveata persimilis, n. subsp.
23. Wings more or less whitened 24
 Wings somewhat dusky hyaline, the nervures more or less dark 25
24. Wings whitish hyaline, the nervures pallid, subcosta and margins of stigma pale brownish; clypeus, except dark mark on each side of summit, and small lateral marks white; tergites 2 and 3 with a rather broad, interrupted, pale-yellow band, and sometimes two transverse spots on tergite 4 and a dot on lateral margins of tergite 1; frons and mesonotum rather strongly tessellate and dull; head slightly broader than long.*graenicheri* Timberlake
 Wings moderately whitened, the nervures testaceous, subcosta and margins of stigma pale brown; clypeus and lateral marks white; abdomen dark, or with a more or less evanescent band on tergites 2 and 3; frons and mesonotum with tessellation moderately strong; head usually as long, or nearly as long, as wide.*bishoppi planorum*, n. subsp.
25. Clypeus and lateral marks white, the latter generally separated from clypeus by a narrow dark interval; abdomen with a narrow, broadly interrupted pale-yellow band on tergites 2 and 3, or commonly entirely dark; legs entirely dark; head varying from about as long as wide (Texas) to somewhat broader than long (Atlantic Coast)
bishoppi bishoppi Cockerell
 Somewhat larger than *bishoppi*, with a more transverse head; abdomen with a pale-yellow or whitish band on tergites 2 and 3, and sometimes 4; clypeus and small lateral marks white, or the lateral marks absent; three marks on disk of pronotum and apex of tubercles white; anterior side of front tibiae pale yellow.*boltoniae boltoniae* (Robertson)
26. Lateral face marks large, involving more or less completely the space between clypeus and eye 27
 Lateral marks small and adjacent to the clypeus; tergites 2 and 3 with a narrow, interrupted creamy white band; frons and mesonotum tessellate and dullish
ignota isopappi Timberlake

27. Mesonotum strongly tessellate and dullish; tergites 2 to 3, or 4, with an interrupted, creamy white band, or the bands sometimes merely notched medially. *ignota crawfordi* Cockerell
Mesonotum faintly tessellate, or almost polished; frons polished and with minute, sparse punctures; bands of abdomen usually well interrupted *ignota ignota* Cockerell
28. Head distinctly broader than long; facial foveae more than twice as wide as interval between them and eyes; wings whitish, the subcosta and margins of stigma brownish. 29
Head not much broader than long; facial foveae at most moderately broadened 30
29. Mesoscutum usually weakly tessellate and shining; face and abdominal marks usually present and pale yellow, but sometimes entirely absent. *foveata foveata*, n. subsp.
Mesoscutum more or less strongly tessellate and dullish; face entirely dark, or lateral margins of disk of clypeus whitish, and lateral marks sometimes involving the space between clypeus and eye. *foveata brachycephala*, n. subsp.
30. Pygidial plate broadly rounded or truncate at apex; wings somewhat whitened or moderately dusky; facial foveae but little widened above; length about 4 mm. 31
Pygidial plate narrowly truncate at apex; facial foveae moderately broadened at upper end and wider than the interval between them and nearest eye; clypeus usually dark, with white streaks or blotches, or the disk white except usual dots; lateral marks small and adjacent to the clypeus; wings dusky hyaline, the nervures dark; length about 5 mm.
boltoniae chrysopsina Timberlake
31. Wings somewhat dusky, the nervures rather dark; clypeus white except usual dots, or with two dark stripes or a blotch on upper part of disk; lateral marks transverse, usually separated from the clypeus by a narrow dark interval, more rarely reduced
bishoppi bishoppi Cockerell
Wings somewhat whitish, the nervures rather pallid, with subcosta and margins of stigma pale brown; head usually as long as wide *bishoppi planorum*, n. subsp.
32. Clypeus strongly dentate on each side of base of labrum 33
Clypeus not dentate, the lateral extension broad and reflexed next to the labrum and narrowed outwardly 34
33. Mandibles, except reddish tips, and almost entire face below level of antennae, bright yellow; head large, subquadrate, the cheeks broad and subangulate behind upper end of eyes; length about 6.5 mm. *bidentata*, n. sp.
Head and thorax dark green, the anterior border of face black, the abdomen dark brown; no light markings; head moderately large, the cheeks broad but receding, and sometimes dentate anteriorly; length, about 4.5-5 mm. *pratti* Cockerell
34. If mandibles more or less dilated at base on outer margin, the labrum not notched at apex. 35
Mandibles rather broadly and almost squarely dilated on outer margin at base; labrum strongly notched at apex; mandibles at base, labrum, clypeus, and triangular lateral marks yellowish-white, abdomen brown or fuscous with preapical whitish bands
callicerata Cockerell
35. Face marks bright yellow, involving most, if not all, of face below level of antennae . . . 36
Face marks whitish or not involving nearly all of face below antennae. 37
36. Head barely longer than wide, the cheeks very broad behind upper end of eyes; subantennal plates large and nearly twice as long as wide; head and thorax, except face markings, dark blue-green, the abdomen brown, becoming darker at base; length, about 5 mm.
bebbiae, n. sp.
Head somewhat broader than long; subantennal plates not more than one and one-half times longer than wide; pygidial plate extremely broad and nearly truncate at apex; abdomen brown, with suffused yellowish markings on middle segments; length, 4.5 mm.
rossi, n. sp.
37. Face marks comparatively large, sometimes with subantennal and supraclypeal marks present; if the above-mentioned marks absent, the lateral marks reach level of antennae. 38
Face marks reduced, the lateral marks more or less transverse and hardly extending above level of summit of clypeus; or markings sometimes absent 47
38. Abdomen dark brown or fuscous 39
Abdomen ferruginous, or more or less yellowish, frequently more or less infuscated on basal segments, or, rarely, nearly all dusky ferruginous in *heterothecae* 43

39. Mesonotum smooth and shining; wings clear or whitish40
 Mesonotum and frons tessellate and dullish; wings a little dusky, the subcosta and margins of stigma brown; clypeus, except usually on upper margin, and large lateral marks yellowish-white*georgica* Timberlake
40. Face marks mainly restricted to clypeus and lateral marks, the subantennal marks evanescent or absent41
 Subantennal marks usually well developed, and sometimes a supraclypeal mark present...42
41. Lateral marks pale yellow, subquadrate, with the upper outer angle nearly opposite the antennal sockets; head and thorax shining, bluish-black; front and middle tibiae yellow, with a dark blotch behind, the tarsi yellowish testaceous.....*vagans* Cockerell
 Lateral marks creamy white, triangular; the usual dots of clypeus obscure; front tibiae yellowish, with a brownish blotch behind, the middle pair yellowish in front, the tarsi whitish; face more hairy.....*vespertilio* Cockerell
42. Wings hyaline; face marks pale yellow, the clypeus with a pair of small brownish spots on upper margin and the usual dark dots, lateral marks broad, subquadrate, margined with black on lower border; head and thorax dark green, almost blackish, the propodeum dark blue; legs dark, the knees, tarsi, and anterior side of front and middle tibiae testaceous
crassiceps Cockerell
 Wings white, the nervures whitish, the subcosta and margins of stigma sometimes pale yellow; face marks white, usually including well-developed subantennal marks and more rarely a transverse supraclypeal mark; lateral marks broader than high, broad on orbits, and narrowed to a rounded point toward clypeus; head and thorax dark blue-green; front and middle tibiae mostly pale yellow and the tarsi yellowish-white.*xanthismae* Cockerell
43. Face marks pale yellow, restricted to clypeus and lateral marks, even in macrocephalous specimens, and the upper margin of clypeus often with two more or less distinct dark marks; lateral marks broader than high, broad on orbits and narrowed to a rounded point toward clypeus; abdomen ferruginous, usually more or less infuscated on two basal segments, or with two dark bands44
 Mesonotum more polished; face marks whitish, with subantennal and supraclypeal marks usually present except in smaller specimens of *heterothecae*, where the lateral marks become a little higher than wide45
44. Wings with a whitish cast, although slightly dusky, the subcosta and margins of stigma brown; sides of pronotum in macrocephalous specimens deeply impressed, with the posterior corners of the disk very prominent*cambarella cambarella* Cockerell
 Wings more whitened, the subcosta and margins of stigma yellowish; sides of pronotum much less impressed and posterior corners of disk not prominent; upper margin of clypeus sometimes with a dark blotch and lateral marks transverse
cambarella platyura Cockerell
45. Abdomen more or less orange-yellow or banded with yellow, the apical depression of tergites nearly concolorous46
 Abdomen darker ferruginous, sometimes with a yellowish band at base of tergite 2, or often more or less banded with brownish fuscous, or mainly dark, the apical depression of tergites more whitish and conspicuous than in allied species; cheeks broad, but receding and widest opposite upper part of eyes.....*xanthismae* Cockerell
46. Subantennal and supraclypeal marks usually absent except in macrocephalous specimens; lateral mark usually about as broad as high, or higher than wide in smaller specimens; cheeks in macrocephalous specimens broad but receding, broadest and slightly angulate or protuberant opposite the upper end of eyes.....*heterothecae* Cockerell
 Macrocephalous specimens (the only phase known) with the head broader than long, the very broad cheeks evenly margined beneath, and the face white below level of antennae except for the supraclypeal area, which is only partly light.....*mellina* Cockerell
47. Lateral marks comparatively well developed, usually involving space between clypeus and eye and wider on the orbits than at inner end.....48
 Lateral marks more or less restricted to a small spot adjacent to the clypeus, or face entirely dark51

48. Wings dusky hyaline, or if whitish having the subcosta and margins of stigma distinctly brownish; mesoscutum tessellate and dullish.....49
 Wings milky hyaline, the nervures pallid, with subcosta and margins of stigma only slightly brownish50
49. Wings dusky hyaline, the nervures pale brownish, the subcosta and margins of stigma darker brown*bishoppi bishoppi* Cockerell
 Wings whitish hyaline, the nervures pallid, the subcosta and lower margin of stigma brownish
bishoppi planorum, n. subsp.
50. Frons and mesoscutum polished or faintly tessellate; front tibiae, middle and hind knees, and the tarsi yellowish-white*ignota ignota* Cockerell
 Frons and mesoscutum more distinctly tessellate; head of larger specimens often quadrate, with a blunt tooth on anterior part of cheeks*ignota crawfordi* Cockerell
51. Head quadrate or distinctly broader than long; or clypeus partly or entirely dark.....52
 Head rotund, only slightly broader than long; frons and mesoscutum delicately tessellate and shining; clypeus and usually small lateral marks, adjacent to clypeus, white; wings milky hyaline, the nervures pallid, with subcosta and margins of stigma slightly brownish
ignota isopappi Timberlake
52. Face entirely dark, or if face markings present, the head quadrate with a blunt tooth on anterior part of cheeks53
 Similar to *isopappi*, but face markings more yellowish, the upper border of clypeus dark, the head somewhat broader, and frons and mesoscutum minutely tessellate and dullish
graenicheri Timberlake
53. Mandibles moderately elongate, with a rounded dilation on inner margin before the middle and a quadrate expansion on outer margin at base; head quadrate, the cheeks broad, with a blunt tooth anteriorly; occipital margin of cheeks and temples sharply margined and a little more produced or flaring opposite the summit of eyes; face marks more or less developed, but small54
 Mandibles long, slender, and tapering, without a dilation on inner margin; head distinctly broader than long, the cheeks generally not much more than angulate anteriorly; face always entirely dark55
54. Clypeus often entirely and the lateral marks yellowish-white, the latter restricted to anterior border of lateral plates of face, or small and adjacent to the clypeus; scape of antennae whitish beneath; vertex and mesoscutum tessellate and somewhat dullish, the frons more shining; wings whitish hyaline, the subcosta and margins of stigma brown
boltoniae boltoniae (Robertson)
 Clypeus partly dark, the lateral marks very small or absent, or face sometimes entirely dark; scape of antennae dark; wings with a slight dusky cast, the nervures less pallid
boltoniae chrysopsina Timberlake
55. Mesoscutum weakly tessellate or almost polished and shining; tarsi dark.....56
 Mesoscutum distinctly tessellate and dullish, the frons moderately shining; head rounded, the cheeks moderately wide and strongly receding; flagellum yellowish-brown beneath; legs dark, except the yellowish-white tarsi.....*foveata persimilis*, n. subsp.
56. Mesoscutum almost polished, but slightly tessellate around the margins; head subquadrate, broader than long, the cheeks subdentate anteriorly; head and thorax dark blue, the abdomen blackish; wings whitish hyaline, the subcosta and margins of stigma pale brown
foveata foveata, n. subsp.
 Hardly distinguishable from *foveata*, but mesoscutum usually a little more tessellate, the mandibles longer*foveata brachycephala*, n. subsp.

Perdita pratti Cockerell

(Figs. 173, 174, 289)

Perdita pratti Cockerell, 1906, Entomologist, 39: 125, ♀; Timberlake, 1929, Jour. New York Ent. Soc., 37:125.

The type locality of *pratti* is Corpus Christi, Texas, and it was recorded as a

probable visitor of *Helianium*. In 1929 I recorded a female from Katherine, Texas, and now I have material of both sexes from localities in Texas, Oklahoma, and Kansas. The females are about 6 to 7 mm. long and have the clypeus more than half light or entirely dark.

Male.—Dark green; the pleura and propodeum bluer. Most of face below antennae, except subantennal plates, black, but the clypeal teeth sometimes testaceous. Abdomen black, tinged with brown, the venter more brownish. Legs blackish, the tarsi pale brown. Mandibles infuscated at base, testaceous in middle, and dark red at apex. Tegulae pale testaceous. Wings milky hyaline, the nervures white, subcosta and margins of stigma pale brown.

Head quadrate, as broad as long, with broad but receding cheeks, which are armed anteriorly with a small tubercle. Clypeus low, very broad and armed with a small sharp tooth on each side of the base of the labrum; these teeth a little closer together than to the outer end of the lateral extensions. Mandibles very long, slender, tapering, and the apex of one almost reaching base of the other. Face shining, the frons faintly tessellate and with sparse minute punctures. Vertex and temples comparatively strongly tessellate and dullish. Mesoscutum sparsely punctured and delicately tessellate, but becoming polished on the middle of disk. Mesopleura dullish and tessellate. Pubescence whitish, finer and somewhat sparser than in the female. Length, 4.5–5 mm.; anterior wing, 3.2–3.7 mm.

Specimens have been examined from the following localities.—TEXAS: Corpus Christi, Oct. 20, 1905 (F. C. Pratt), Oct. 16, 1908 (Mitchell and Bishopp); Big Spring, Howard Co., on *Helianthus*, June 21, 1947 (C. D. Michener); 13.5 miles south of Fairfield, Freestone Co., on *Helianthus cucumerifolius*, July 18, 1953 (L. H. Shinnars); near Chandler, Henderson Co., on same flower, July 19, 1953 (Shinnars); near Armstrong, Kenedy Co., on *Heterotheca latifolia*, Nov. 6, 1953 (Shinnars). OKLAHOMA: Anadarko, Caddo Co., Aug. 23, 1951 (E. L. Kessel). KANSAS: Pratt Co., 1,900 feet; Fowler, Meade Co., on *Heterotheca subaxillaris*, Sept. 6, 1949 (Michener and Beamer); Hutchison, Reno Co., July 28, 1945 (N. L. H. Krauss); same locality, on *Helianthus petiolaris*, July 28, 1950 (J. R. White); same locality and flower, Sept. 4, 1949 (Michener and Beamer); Chase, Rice Co., on *Prionopsis ciliata*, Sept. 4, 1949 (Michener and Beamer); and 5 miles west of Chase, on *Helianthus petiolaris*, July 23, 1950 (C. D. Michener).

Perdita bidentata, n. sp.

(Figs. 175, 176, 290)

The male of *bidentata* is distinctive in having the clypeus strongly lobate on each side of the labrum, and the face below antennae nearly all bright yellow. It was taken with the female of *P. propodealis* Timberlake, and it is not unlikely that the two belong together, but the differences in coloration of body and wings have caused some doubt. The placement of *propodealis* in *Cockerellia* was tentative, and if it proves to be female of *bidentata* the species must stand in *Hexaperdita*; hence *propodealis* has been incorporated in the preceding key to the females.

Male.—Dark blue; the mesonotum slightly blue-green. Abdomen blackish, the apical tergite ferruginous. Face almost entirely bright yellow below level of antennae, as well as the mandibles, except reddish tips, and the labrum. Supraclypeal mark transverse. Lateral marks very broad below and obliquely truncate above, so that the blue of frons involves upper outer corner of the subantennal plates. Cheeks narrowly yellow below anterior end of eyes. Thorax entirely dark, the tubercles brownish. Legs dark brown; the anterior side of front and middle tibiae, extreme apex of femora, and front tarsi yellow. Flagellum of antennae dark brown above, brownish-yellow beneath, and the scape bright yellow, except a dark streak above. Tegulae testaceous hyaline, but the yellow wing base imparts a yellowish cast. Wings slightly whitish hyaline, the nervures pale brown, subcosta and margins of stigma darker brown.

Head moderately enlarged, broader than thorax, and broader than long. Cheeks very broad behind, where they are obtusely angulate opposite the summit of eyes, but considerably narrowed anteriorly. Occiput broadly and deeply concave, so that the head appears acutely angled on each

side as seen from above and behind. Face below antennae convex, the clypeus with a projecting lobe on each side of the labrum, the lobes triangular, obtuse at apex and divergent (the clypeus thus resembles a hat, with a high crown and the outer part of the brim turned downward on each side). Mandibles long, slender, gently curved. Antennae large and elongate for a *Perdita*, with middle joints of flagellum as long as wide. Facial foveae shallow, about twice as long as wide. Sides of pronotum deeply grooved and posterior corners of the disk prominent. Abdomen narrowly ovate, the last tergite with a broad, rounded, apical lobe. Stigma long and rather narrow. Marginal cell as long as the first submarginal, with the parts beneath and beyond the stigma about equal. Head and thorax shining, minutely and sparsely punctured, the frons and vertex with a distinct, very fine tessellation. Pubescence whitish, fine and long, and rather sparse on face and notum of thorax. Length, 6.5 mm.; anterior wing, 4.5 mm.

Three males (holotype and paratypes), San Pedro, Lower California, Mexico, Oct. 7, 1941 (Ross and Bohart).

Types in collection of the California Academy of Sciences, except one paratype retained at Riverside.

Perdita rossi, n. sp.

(Figs. 177, 178, 291)

The female of *rossi* differs from most species of the group in having entire whitish bands on the abdomen, and the male is peculiar in having the abdomen elongate oval, with nubilous yellowish bands sometimes present on the middle segments.

Female.—Head and thorax dark blue-green. Mandibles except reddish tips, clypeus in part, lateral marks, a transverse supraclypeal mark, and sometimes a small spot on subantennal plates creamy white. Disk of clypeus with two broad brown or blackish stripes, which are united in front to form a U and usually confluent with the lateral dots, the central white stripe narrower than the dark bars. Lateral marks much higher than wide and ending acutely just above level of antennae. Labrum and antennae blackish, the flagellum brown toward apex and yellowish-brown beneath. Large spot on tubercles, interrupted band on hind margin of pronotum, the elevated collar, and spot on anterior margin of the flanks yellowish-white. Abdomen black with a broad white band at base of tergites 1 to 5, the band on tergite 1 covering the whole base, those on tergites 2 and 3 broadened at outer ends and all, except the one on tergite 5, reaching lateral margins. Legs blackish, with a small spot at apex of front and middle femora and the anterior side of front tibiae yellowish-white. Tegulae whitish at base and broadly testaceous hyaline at apex. Wings dusky, the nervures and margins of stigma sepia brown.

Head broader than long, the facial foveae linear and well impressed. Mandibles stout, much broadened within at middle. Wings small, the marginal cell almost equaling the first submarginal cell, with part beyond the stigma much longer than the part beneath. Head and thorax delicately tessellate and shiny, the tessellation on mesonotum very faint. Punctures of frons and mesoscutum minute and moderately close. Pubescence dull whitish, moderately dense, the hairs of mesoscutum short and erect. Scopa of hind tibiae pale brown, the hairs long and simple, with those on lower margin strongly curved upward. Length, 5.25–6 mm.; anterior wing, 4.2 mm.

Male.—Head and thorax dark blue, the face below level of antennae nearly all pale yellow, the labrum and mandibles except reddish tips also yellow. Thorax entirely dark, although anterior margin of pronotum and the tubercles are brownish rather than blue. Abdomen brown, sometimes entirely dark, except the pale brownish-yellow apical tergite, but more often with a nubilous, pale-yellow and interrupted band at base of tergites 3 and 4. Venter yellow, but broadly brownish down the middle. Legs blackish-brown, with front and middle knees and anterior side of front and middle tibiae yellow. Tegulae pale testaceous, somewhat yellowish at base. Wings with a whitish opacity, the nervures pale brown.

Head distinctly broader than long, thick at the temples but thin frontoöccipitally at anterior ends of eyes, with occiput broadly concave. Sides of pronotum strongly furrowed, the posterior corners of the disk rectangular but hardly prominent. Abdomen oval, subdepressed, and slightly wider than thorax when in a contracted condition. Tarsal claws small, minutely bifid at apex. Length, 4–4.6 mm.; anterior wing, 3–3.2 mm.

Holotype female and allotype, San Domingo, Lower California, Mexico, the female, July 17, 1938 (Michelbacher and Ross), the male, Oct. 23, 1941 (Ross and Bohart). Also the following paratypes: 1 female, 6 males, San Domingo, Oct. 23, and 1 female, 1 male, San Pedro, Lower California, Oct. 7, 1941 (Ross and Bohart).

Types in collection of the California Academy of Sciences, except two paratypes retained at Riverside.

Perdita bebbiae, n. sp.

(Figs. 179, 180, 292)

This new species is allied to *bidentata* and *rossi* but easily distinguished by the characters given in the table.

Female.—Dark blue, with pale-yellow markings. Labrum and clypeus black, the latter with a small spot on lateral margins of disk and a median stripe, not attaining anterior margin, yellow. Large, triangular lateral marks, higher than wide and reaching a little above antennae, large mark on subantennal plates, and a transverse supraclypeal mark also yellow. Lower end of subantennal plates black, and the blue color of frons descends in a narrow stripe to the clypeus to separate the subantennal marks from the yellow at sides of face. Interrupted band on hind margin of pronotum, the collar, mark on anterior border of the flanks, and the tubercles yellow. Abdomen brownish-black, with a moderately wide, pale-yellow band on tergites 1 to 5, those on 1 and 5 abbreviated, the others almost reaching lateral margins; tergite 1 also with an interrupted stripe on lateral margins. Pygidial plate ferruginous. Antennae and legs blackish, the flagellum slightly reddened beneath, the front knees, and short line on outer side of front tibiae pale yellow. Tegulae pale testaceous. Wings hyaline, the nervures pale testaceous, margins of stigma and subcosta brown, and the extreme wing base pale yellow.

Head as broad as long, the disk of clypeus prominent. Mandibles with a low, rounded dilation on middle of inner margin, and moderately incurved at apex. Facial foveae broader than interval between them and eyes and about three-fourths as long as space between antennal sockets and anterior ocellus. Pygidial plate broad at base, with converging sides and a narrowly rounded apex. Head and thorax polished, the frons delicately tessellate, the puncturation fine, rather close on frons, very sparse on vertex and moderately close on mesoscutum. Pubescence whitish, abundant, rather long and erect. Scopa of hind tibiae long, copious, and pale brownish. Venation much as in *rossi*, but stigma and marginal cell a little broader. Length, 7 mm.; anterior wing, 4.6 mm.

Male.—Head and thorax dark blue, the mandibles, labrum, and almost entire face below level of antennae yellow. Tips of mandibles red. Thorax and abdomen entirely dark, the latter brown, more blackish at base and yellowish-brown beneath. Antennae brown, the scape yellow beneath, the flagellum reddish-brown beneath. Legs dark brown, the front knees and anterior side of front tibiae yellow. Tubercles brown. Tegulae pale testaceous. Wings somewhat whitish, the nervures pallid, subcosta and margins of stigma pale brown.

Head subrotund, almost as broad as long, the temples very broad, but cheeks rapidly thinning anteriorly. Disk of clypeus about one and one-fourth times broader than long, the anterior reflexed corners short and rounded, the lateral extensions very narrow and concealed in frontal view of head. Sides of pronotum moderately impressed, the posterior corners of the disk subprominent. Head and thorax polished, becoming delicately tessellate on the frons, and the frons, mesonotum, and mesopleura with fine sparse punctures. Pubescence white and long, becoming longer and rather dense on cheeks, front femora, and the mesopleura. Length, about 5.3 mm.; anterior wing, 3.4 mm.

Three females, 1 male (holotype female, allotype, and paratypes) collected about 12 miles south of Ocotillo, San Diego Co., California, on *Bebbia juncea*, Nov. 12, 1939 (Timberlake).

Types in collection of Citrus Experiment Station, Riverside.

Perdita callicerata Cockerell

(Figs. 181, 182, 293)

Perdita callicerata Cockerell, 1897, Trans. Amer. Ent. Soc., 24:153, ♂; Cockerell, 1897, Proc. Acad. Sci. Phila., 49:354, ♀; Cockerell, 1899, Canad. Ent., 31:256; Cockerell, 1922, Amer. Mus. Novitates, 33:1; Timberlake, 1928, Amer. Mus. Novitates, 321:1.

Perdita callicerata var. *chrysocherus* Cockerell, 1897, Bull. New Mex. Exp. Sta., 24:43, ♂.

Perdita callicerata var. *leucura* Cockerell, 1909, Canad. Ent., 41:152, ♀.

Perdita lutzii Cockerell, 1922, Amer. Mus. Novitates, 33:7, ♀ (new synonymy).

Perdita callicerata was described from Las Cruces, New Mexico, where it was found on the flowers of *Baileya multiradiata*. The two varieties described by Cockerell occur in the type locality and have no significance except to show the wide variation in color of this species. The species is now known to range from western Texas to the deserts of California, and south to Durango in Mexico. The type of *Perdita lutzii* was collected by Lutz at the southwest end of the Coyote Mountains, about 3,500 feet elevation, Pima County, Arizona, at flowers of *Baileya*, August 5, 1916. I believe that the type is merely a specimen of *callicerata* reddened by cyanide, as is another specimen recorded below, that was taken presumably at the same spot.

Material of *callicerata* has been examined as follows.—TEXAS: El Paso, Aug. 12 and 21, 1908 (F. C. Pratt); Cooper's Store, Big Bend Park, on *Baileya multiradiata*, April 11, 1949 (Michener and Beamer). NEW MEXICO: Las Cruces, Aug. 21 (Cockerell), cotype; Mesilla, on *Dithyrea wislizenii*, May 7 (Cockerell) and on *Baileya multiradiata*, June 30, 1897, including type of *leucura*, and one male on *Isocoma wrightii*, Sept. 4 (Cockerell); Rincon, on *B. multiradiata*, Sept. 14, 1902 (Cockerell); Socorro, on same flower, Aug. 26, 1931 (Timberlake); 25 miles west of Tularosa, July 1, 1940 (D. E. Hardy); Organ, July 3, 1940 (R. H. Beamer). ARIZONA: Coyote Mts., 3,500 feet, Aug. 4-7, 1916 (Lutz); Douglas, May 14, 1934, and Aug. 12, 1935 (W. W. Jones); Tucson, Apr. 15, 1933 (A. Bryant), May 10, 1939 (R. H. Crandall), and May 2, 1954 (G. D. Butler); Continental, July 15, 1940 (R. H. Beamer); Turner, on *Baileya multiradiata*, Aug. 9, 1940 (C. D. Michener and Timberlake); 6 miles east of Douglas, Aug. 11, 1940 (Michener); 8 miles east of Douglas, on *Baileya multiradiata*, Aug. 11, 1940 (Timberlake and E. S. Ross); 10 miles west of Bisbee, on *Baileya*, Aug. 10, 1940 (Timberlake); Portal, on *Baileya multiradiata*, Aug. 12, 1940 (Timberlake and Ross); 2.5 miles east of Portal, on same flower, Aug. 12, 1940 (Timberlake); mouth of Cave Creek, Chiricahua Mts., on *Baileya*, Aug. 12, 1940 (Michener); Portal, June 1, 1952 (Cazier, Gertsch, and Schrammel) and Aug. 12, 1944 (W. W. Jones); 50 miles south of Phoenix, June 12, 1942 (H. A. Scullen); Maricopa, April 13, 1947 (D. and M. Townes); 7 miles south of Toltec, June 15, 1953 (T. R. Haig); 11 miles south-west of Eloy, July 5, 1953 (Haig); 7 miles west of Eloy, May 21, 1953 (Haig); 2.7 miles west of Salome, on *Baileya multiradiata*, Sept. 14, 1953 (Timberlake); 12 miles northeast of Cottonwood, on *Baileya*, May 26, 1954 (F. G. Werner). NEVADA: Kyle Canyon road, Charleston Mts., 20 miles from Las Vegas, on *Baileya multiradiata*, June 3, 1941 (Timberlake). CALIFORNIA: 20 miles west of Twentynine Palms, on *Baileya multiradiata*, Aug. 20, 1936 (Timberlake); Clark Mountain, on same flower, July 7, 1938 (Timberlake); 3 miles east of Valley Wells, on same flower, June 7, 1941 (Timberlake); Yucca Valley, on *Baileya pleniradiata*, Sept. 28, 1944 (Timberlake); 17.5 miles west of Twentynine Palms, on *B. multiradiata*, Sept. 5, 1946 (Timberlake); 18 miles west of Blythe, on same flower, April 29, 1952 (Timberlake, Hurd, and G. A. Marsh). MEXICO. CHIHUAHUA: Salaices, 5,200 feet, Aug. 20, 1947 (G. M. Bradt); 18 miles west of Jimenez, on *Baccharis*, Aug. 10, 1951 (P. D. Hurd, Jr.). DURANGO: San Juan del Rio, on *Baccharis*, Aug. 7, 1951 (Hurd).

Perdita cambarella cambarella Cockerell

Perdita cambarella Cockerell, 1906, Entomologist, 39:150, 179, ♀, ♂.

The types of *cambarella* were collected by F. C. Bishopp, August 26, 1905, at flowers of *Heterotheca subaxillaris*. The type locality is Paris, Lamar County, Texas.

Besides a cotype female in the Riverside collection, additional material of both sexes has been examined from the following localities. TEXAS: Paris, Aug. 5, 1904, and Aug. 26, 1915 (Bishopp), and Aug. 7, 1904 (C. R. Jones); Mineola, Wood Co., on *Heterotheca*, Oct. 2, 1906 (Bishopp);

Palestine, Anderson Co., on *Heterotheca*, Aug. 10-11, 1906 (Bishopp); Jacksonville, Cherokee Co., on *Isopappus divaricatus*, Oct. 11, 1905 (C. R. Jones and W. D. Pierce); and Aug. 11, 1906, without flower record (Bishopp); and 3.7 miles southeast of Ben Wheeler, Van Zandt Co., on *Croptilon divaricatum*, Oct. 12, 1952 (L. H. Shinnars).

Perdita cambarella platyura Cockerell
(Figs. 183, 184, 294)

Perdita platyura Cockerell, 1922, Ann. Mag. Nat. Hist. (9)10:547, ♀.

The type female from Las Trachas, Guadalupe County, New Mexico, is in the collection at Riverside. Comparison of the type and additional material from Kansas with *P. cambarella* leaves no doubt that *platyura* and *cambarella* are races of one species. The main difference is in the milky white wings, with pallid nervures, of *platyura* and the slightly dusky wings, with pale-brown nervures, of *cambarella*. The male genitalia have been compared and found to be nearly identical. One female from Somervell County, Texas, agrees with *platyura*, hence typical *cambarella* may be restricted to the more timbered northeastern part of Texas.

Male.—Dark blue-green, the abdomen ferruginous, with the first two or more tergites more or less banded with fuscous. Mandibles except tips, labrum, clypeus, and lateral marks pale yellow, the usual dots of clypeus very small, faint, or absent. Lateral marks broad enough on orbits to reach level of antennae and narrowed within, the rounded inner end not involving more than half of the lateral margin of the clypeal crown. Sometimes much of the lateral marks is replaced with brownish fuscous, reducing the yellow to a narrow anterior line or two spots, and at the same time the upper margin of disk of clypeus has two confluent, brownish-fuscous blotches. Scape of antennae pale yellow, the flagellum brown, becoming yellowish beneath. Front knees and tibiae, anterior side of middle tibiae, and all tarsi pale yellow. Tegulae pale testaceous. Wings milky hyaline, the nervures colorless, subcosta and margins of stigma yellowish.

Head more or less enlarged, quadrate and as broad as long. Cheeks broad, but receding and unarmed. Sides of pronotum moderately impressed, the posterior corners of the disk not prominent. Stigma rather narrow and nearly as long as first submarginal cell. Marginal cell with the parts beneath and beyond stigma about equal. Head and thorax shining, the face polished, the vertex and mesoscutum faintly tessellate. Frons with minute, moderately close punctures, and those of the mesoscutum sparser. Pubescence white, moderately fine and erect. Length, about 3.5-4 mm.; anterior wing, 2.7-3 mm.

The following material, besides the type from Las Trachas, has been examined.—KANSAS: 11 males, 11 females, Hutchinson, Reno Co., on *Isopappus divaricatus*, Sept. 4, 1949 (Michener and Beamer); 1 male, 3 females, Hutchinson, on same flower, July 14, 1949 (C. D. Michener); 1 female, Fowler, Meade Co., on same flower, Sept. 6, 1949 (Michener and Beamer). TEXAS: 1 female, 2.8 miles northeast of Glen Rose, Somervell Co., on *Heterotheca latifolia*, Oct. 5, 1952 (L. H. Shinnars).

Perdita georgica Timberlake
(Figs. 185, 186, 295)

Perdita georgica Timberlake, 1928, Proc. Hawaii. Ent. Soc., 7:158, ♀, ♂; Amer. Mus. Novitates, 321:1; Michener, 1947, Amer. Midland Nat., 38:447.

The type locality of *georgica* is Griffin, Spalding County, Georgia, and it was also originally recorded from De Funiak Springs, Walton County, Florida. Michener has recorded this species from near Hattiesburg, Forrest County, Mississippi, at flowers of *Aster*, *Chrysopsis microcephala*, and *Chrysopsis mariana*.

Additional records as follows.—SOUTH CAROLINA: Aiken, Aiken Co., on *Chrysopsis* and *Heterotheca*, Sept. 6-7, 1951 (T. B. Mitchell). NORTH CAROLINA: Hoffman, Richmond Co., on *Isopappus*, Sept. 8, 1951 (Mitchell); and Newton Grove, Sampson Co., Sept. 13, 1951 (Mitchell).

Perdita asteris Cockerell

Perdita asteris Cockerell, 1896, Proc. Acad. Sci. Phila., 48:93, ♀; Cockerell, 1900, Entomologist, 33:63.

Cockerell collected the types of *asteris* at Las Cruces, New Mexico, on flowers of *Aster canescens* in September, 1895, and later recorded the species from Tempe and Phoenix, Arizona, on *Heterotheca subaxillaris*. The species remains comparatively little known. The possibility that *P. mellina* Cockerell may be its mate has been considered, but *mellina* has the abdomen brownish-yellow or orange, the head and thorax smooth and shining, and the face nearly all yellowish-white below level of antennae. The range of *asteris* coincides with that of *mellina*, but we need more evidence before we can unite them.

Material of *asteris* examined as follows.—NEW MEXICO: Las Cruces, one female on *Aster canescens*, Sept. 19 (Cockerell), apparently one of the original specimens, but not labeled a cotype. ARIZONA: 2 females, Tempe, on *Heterotheca*, Oct. 11, 1943 (R. A. Flock); 2 females, 2 miles west of Globe, on *Heterotheca subaxillaris*, Sept. 16, 1953 (Timberlake). TEXAS: 1 female, Marfa, Presidio Co., June 5, 1908 (Mitchell and Cushman).

Perdita blatchleyi Timberlake

Perdita blatchleyi Timberlake, 1952, Proc. Ent. Soc. Wash., 54:201, ♀.

This is also another little-known species, which was collected by W. S. Blatchley at Dunedin, Florida.

Perdita xanthismae Cockerell

(Figs. 187, 188, 296)

Perdita xanthismae Cockerell, 1905, Ent. News, 16:331, ♀; Cockerell, 1914, Canad. Ent., 47:411. *Perdita xanthismae sideranthi* Cockerell, 1906, Entomologist, 39:178, ♀.

Cockerell described *xanthismae* from a series of females collected at Goldthwaite, Mills County, Texas, on *Xanthisma texanum*, and later he recorded the species from Clarendon, Donley County, on sunflower. In 1896 he described *sideranthi* as a subspecies of *xanthismae* from Ennis, Ellis County, Texas, on flowers of *Sideranthus rubiginosus*, and recorded it also from Handley, Tarrant County, at flowers of *Isopappus divaricatus*. In *xanthismae* the abdomen is creamy white with the brown bands at junction of tergites more or less reduced to sublateral spots or, according to Cockerell, sometimes entirely lacking. Cockerell described the ground color of the abdomen in the type series as honey color, but this was owing to discoloration by cyanide. In *sideranthi* the abdomen is dark brown or blackish, with a broad, creamy white band on tergites 2 to 4 or 5. It is evident, however, that *sideranthi* is not a geographical race, but merely a dark phase of *xanthismae*. The species extends north into Kansas, and even in the north some specimens are light enough to be considered typical *xanthismae*, but the dark form predominates in Kansas as well as in Texas.

Male.—Dark blue-green; the abdomen often blackish except the apical segment, but varying through intermediate stages to ferruginous, with the base of tergite 2 sometimes yellowish, and the broad apical depression of tergites always rather conspicuously whitish. Mandibles except the red apical third, labrum, clypeus, large lateral marks, often small, obliquely oval subantennal marks, and sometimes a transverse supraclypeal mark white. Clypeal dots usually absent. Lateral marks broad enough on orbits to reach level of antennae and narrowing within. Anterior end of cheeks and malar space testaceous or whitish. Thorax sometimes entirely dark, but tubercles

usually white, sometimes a white spot on each side of posterior margin of the pronotal disk, and the collar more testaceous than whitish. Scape of antennae pale yellow, usually with a brown streak above except at base, the flagellum brown, becoming more or less paler or yellowish beneath. Legs brown or fuscous, with apex of femora, front and middle tibiae except small blotch behind, base and apex of hind tibiae more or less broadly, and all tarsi pale yellow. Tegulae pale testaceous. Wings milky hyaline, the nervures pallid, the subcosta and margins of stigma usually pale yellow.

Head large, quadrate, with broad, receding, and unarmed cheeks, which are broadest opposite the upper part of eyes. Proboscis elongate, the galeae of maxillae reaching the front coxae when the parts are retracted in repose. Sides of pronotum moderately deeply impressed, the posterior corners of disk not prominent. Head and thorax shining, the vertex and mesonotum rather faintly tessellate, with middle of disk of mesoscutum sometimes polished. Punctures of frons very fine and moderately close, those of mesoscutum more widely spaced. Pubescence white, about as dense as usual in this group, and rather coarse and erect on mesonotum. Length, 4-5 mm.; anterior wing, 3.2-3.5 mm.

Material of *xanthismae* examined as follows.—TEXAS: Goldthwaite, on *Xanthisma*, Sept. 4, 1905 (J. C. Crawford); Ennis, on *Sideranthus*, Sept. 27, 1905 (F. C. Bishopp) including one labeled cotype of *sideranthi*; New Braunfels, Comal Co., June 26, 1917, and June 7, 1942 (E. S. Ross); 2.5 miles northwest of Mabank, Kaufman Co., on *Heterotheca pilosa*, July 19, 1953 (L. H. Shinnery); Stephenville, Erath Co., on *Xanthisma texanum*, June 5, 1953 (Shinnery); Gainesville, Cooke Co., on *Prionopsis ciliata*, Aug. 29, 1953 (Shinnery); 3.3 miles northwest of Grapevine, Tarrant Co., on *Prionopsis*, Sept. 28, 1953 (Shinnery); 5.6 miles west-northwest of Boyd, Wise Co., on *Xanthisma*, May 30, 1954 (Shinnery). KANSAS: Douglas Co., on *Heterotheca subaxillaris*, Aug. 15 and 18, 1949 (Michener and Beamer); Norton Co., 2,270 feet, Aug. 24, 1912 (F. X. Williams); Hodgman Co., July 17-25, 1917; Stafford Co., Aug. 4-11, 1917; Reno Co., Aug. 13-20, 1917; Hutchinson, Reno Co., on *Prionopsis ciliata* (series), *Isopappus divariatus* (one male), *Heterotheca* (one female) and *Croton monanthogynus* (one female), Sept. 4, 1949 (Michener and Beamer); Hutchinson, on *Heterotheca*, Aug. 1, 1950 (J. R. White and Michener); Chase, Rice Co., on *Prionopsis*, Sept. 4, 1949 (Michener and Beamer); Cullison, Pratt Co., on *Prionopsis* (series) and *Helianthus annuus* (one female), Sept. 6, 1949 (Michener and Beamer); Cunningham, Kingman Co., on *Heterotheca*, Sept. 6, 1949 (Michener and Beamer); and Great Bend, Barton Co., on *Heterotheca*, Sept. 9, 1949 (Michener and Beamer).

Perdita vagans Cockerell

Perdita vagans Cockerell, 1896, Proc. Acad. Sci. Phila., 48:101, ♂.

This species was described from one male, collected at Las Cruces, New Mexico, on *Verbesina encelioides*, September 28, 1895, and has not been recognized since. Cockerell rejected it as the possible male of *asteris*.

Perdita vespertilio Cockerell

Perdita vespertilio Cockerell, 1896, Proc. Acad. Sci. Phila., 48:95, ♂; Cockerell, 1906, Entomologist, 39:148, ♀.

Cockerell described *vespertilio* from one male taken at Las Cruces on flowers of *Chrysopsis villosa* in October, 1895, and later recorded both sexes from the sand hills at Mesilla, New Mexico, at flowers of *Aplopappus*, June 27, 1897. He described the female very briefly by comparing it with *bishoppi*. I have seen no material of this species.

Perdita fedorensis Cockerell

Perdita fedorensis Cockerell, 1916, Ann. Mag. Nat. Hist. (8)17:280, ♀.

This is another little-known species that I have not seen. The type was collected by Birkmann at Fedor, Lee County, Texas, April 29, 1898. Cockerell considered it to be close to *vespertilio* but distinct.

Perdita crassiceps Cockerell

Perdita crassiceps Cockerell, 1896, Proc. Acad. Sci. Phila., 48:97, fig. 15, ♂.

The type was collected at Albuquerque, New Mexico, June 30, 1895, on a yellow-flowered, unidentified species of Compositae. I have not studied this type, but I have a specimen determined by Cockerell, from Las Cruces, that differs from the description in having the abdomen brownish-yellow instead of dark brown. It is possible that *crassiceps* varies in the color of the abdomen much as does *xanthismae*, in which case the Las Cruces specimen may be correctly identified. This specimen, however, is separable from *mellina* only by minute differences, and I am recording it below under that name. Additional material is needed to demonstrate the unity or distinctness of *mellina* and *crassiceps*, and the possible relationship of either one or both to *asteris*.

Perdita mellina Cockerell

(Figs. 189, 190, 297)

Perdita mellina Cockerell, 1900, Entomologist, 33:62, ♂.

Cockerell described this from a single male collected at Phoenix, Arizona, on *Heterotheca subaxillaris*, October 15, 1899. The type is now at Riverside, and material recorded below is considered conspecific, although some small differences in the shape of the head and in the genitalia have been noticed.

Besides the type, the following specimens have been examined.—NEW MEXICO: 1 male, Las Cruces, Aug. 23 (Cockerell), determined by Cockerell as *crassiceps*. TEXAS: 2 males, Bangs, Brown Co., one by sweeping, Aug. 23, 1937, the other in peach orchard, June 8, 1938 (Christenson).

Perdita heterothecae Cockerell

(Figs. 191, 192, 298)

Perdita heterothecae Cockerell, 1900, Entomologist, 33:62, ♀, ♂.

Cockerell described *heterothecae* from specimens that he collected in October, 1899, at Tempe and Phoenix, Arizona. This species varies considerably in color. The females usually have the abdomen dark brown or fuscous, with a narrow, interrupted whitish band at base of tergites 2 to 4, but the ground color may become more or less pale brown or ferruginous, especially on the apical half, and the light bands may become broader and more or less entire. In the male the abdomen is usually light orange ferruginous, often more or less infuscated on basal half, and without light bands, although the base of tergites 2 and 3, or 2 to 4, in darker specimens may be more or less pallescent. The face marks are white and in the female usually restricted to the clypeus and lateral marks, with rarely a small supraclypeal mark and sometimes traces of subantennal spots. The lateral marks usually reach the level of antennae, or slightly above the antennae, and end inwardly in a broad, rounded point against the clypeus. The face marks of the male closely resemble those of the female.

Since the genitalia of *heterothecae* are nearly identical with those of *P. bishoppi* Cockerell, and since *heterothecae* and *bishoppi* both visit *Heterotheca*, it seems likely that the two forms will be found to intergrade when material from intervening territory is available.

Material has been examined from the following localities.—ARIZONA: Douglas, Aug. 6, 1933 (W. W. Jones); Phoenix, Sept. 28, 1943 (R. A. Flock); Tempe, Oct. 11, 1943 (Flock);

Tucson, Aug. 13, 1950 (R. S. Beal); Chandler Heights, Sept. 15, 1953 (Timberlake); 2 miles west of Globe, Sept. 16, 1953 (Timberlake), all on *Heterothea subaxillaris*, or presumably on that flower. CALIFORNIA: Blythe, May 12, 1937 (E. P. Van Duzee); 7 miles south of Ripley, on *Aster tephrodes*, Oct. 11, 1951 (Timberlake); 15 miles east of Calexico, on *Heterothea*, Oct. 2, 1947 (Flock); Riverside, Aug. 9, to Oct. 12 in different years, on *Heterothea grandiflora*, except one male on *Gutierrezia californica* before the *Heterothea* came into bloom. Mexico. LOWER CALIFORNIA: Ejido Chiapas (about 65 kilometers southeast of Mexicali), at flowers of *Tamarix*, July 20, 1953 (R. R. Snelling).

Perdita bishoppi bishoppi Cockerell

(Figs. 193, 194, 299)

Perdita bishoppi Cockerell, 1906, Entomologist, 39:148, 179, ♀, ♂; Cockerell, 1922, Amer. Mus. Novitates, 33:7; Timberlake, 1952, Proc. Ent. Soc. Wash., 54:201.

Perdita chrysoptina Michener, 1947, Amer. Midland Nat., 38:447 (in part).

Perdita bishoppi was described by Cockerell as having the usual abdominal markings of this group absent and the wing slightly dusky with sepia nervures. The type locality is Paris, Lamar County, Texas. The species is now known to range eastward to Florida, Georgia, and South Carolina. The abdominal markings are not always entirely absent in *bishoppi*, as a few specimens have a thin whitish mark on each side of the base of the second tergite.

Material of typical *bishoppi* has been examined as follows.—TEXAS: 1 female, Paris, Lamar Co., on *Heterothea subaxillaris*, Aug. 26, 1905 (F. C. Bishopp), a cotype; 2 females, Jacksonville, Cherokee Co., on *Isopappus divaricatus*, Oct. 11, 1905 (C. R. Jones), and 1 female, Aug. 11, 1906 (Bishopp); 2 females, Palestine, Anderson Co., on *Heterothea subaxillaris*, Aug. 11, 1906 (Bishopp); 1 male, Mineola, Wood Co., on *Heterothea*, Oct. 2, 1906 (Bishopp); 5 males, 6 females, 3.5 miles northwest of Tyler, Smith Co., on *Heterothea latifolia*, Oct. 12, 1952 (L. H. Shinnars); 2 females, 3.7 miles southeast of Ben Wheeler, Van Zandt Co., on (*Isopappus*) *Croptilon divaricatum*, Oct. 12, 1952 (Shinnars). MISSISSIPPI: 1 male, Hattiesburg, Sept. 8, 1943 (C. D. Michener). FLORIDA: south of Ponte Vedre Beach, Sept. 1, 1949 (T. B. Mitchell). GEORGIA: Saint Simons Island, Sept. 10, 1931 (Bradley and Knorr). ALABAMA: without further locality, 3 males (C. F. Baker), No. 1912. SOUTH CAROLINA: 5 males, 5 females, Aiken, on *Heterothea*, Sept. 7, 1951 (T. B. Mitchell).

Perdita bishoppi planorum, n. subsp.

Specimens of *bishoppi* from Dallas, Texas, and localities west of Dallas and north into Kansas, have whitish wings and not infrequently an interrupted, narrow, whitish band at base of tergites 2 and 3. The designation of type material will be restricted to specimens from Kansas.

Holotype female and allotype, Hutchinson, Reno Co., Kansas, on *Heterothea subaxillaris*, Sept. 4, 1949 (Michener and Beamer). Paratypes from Kansas: 5 males, 6 females taken with types; 17 males, 17 females, Hutchinson, on *Isopappus divaricatus*, Sept. 4, 1949 (Michener and Beamer); 2 males, 2 females, Hutchinson, on *Isopappus*, July 14, 1949 (C. D. Michener); 4 females, Fowler, Meade Co., on *Isopappus*, and 1 male, 4 females, on *Heterothea*, Sept. 6, 1949 (Michener and Beamer); 2 males, 4 females, Dodge City, Ford Co., on *Heterothea*, Sept. 5, 1949 (Michener and Beamer); 29 males, 51 females, Douglas Co., on *Heterothea*, Aug. 15, 1949, and 41 males, 88 females, on *Heterothea*, Aug. 18, 1949 (Michener and Beamer).

Additional material.—TEXAS: 2 females, Dallas, Dallas Co., Oct. 5, 1905 (F. C. Bishopp); 1 male, 1 female, Handley, Tarrant Co., on *Isopappus divaricatus*, Aug. 3, 1905 (J. C. Crawford); 1 male, 7 females, Arlington, Tarrant Co., on *Heterothea subaxillaris*, Aug. 6, 1908 (Bishopp); 1 female, Bangs, Brown Co., swept, Aug. 18, 1937 (Christenson); and 2 females, 2.8 miles northeast of Glen Rose, Somervell Co., on *Heterothea latifolia*, Oct. 5, 1952 (L. H. Shinnars).

Types in collection of University of Kansas at Lawrence, except for fourteen paratypes kept at Riverside.

Perdita ignota ignota Cockerell

Perdita ignota Cockerell, 1896, Ent. Mon. Mag., 32:220, ♀; Cockerell, 1922, Amer. Mus. Novitates, 33:6 (in part).

The type locality of *ignota* is Mesilla, New Mexico, where it was first found by Cockerell at flowers of *Aster spinosus*. Specimens from New Mexico and Arizona are typical *ignota*, but in Colorado the species presumably intergrades with *crawfordi*. A female from Glenwood Springs is shiny enough to be called *ignota*, but other females from Boulder and Big Thompson Canyon are quite as tessellate and dull as specimens of *crawfordi* from Lincoln, Nebraska. In the male of *ignota* the mesonotum is usually polished, and weakly tessellate and shining in *crawfordi*.

Material of *ignota* has been examined as follows.—COLORADO: Glenwood Springs, Garfield Co., July 22–29, 1919 (H. E. Schwarz). ARIZONA: 1 male, Prescott, Yavapai Co., on *Erigeron*, Sept. 1, 1930 (Timberlake); 1 female, near mouth of Ramsey Canyon, Huachuca Mts., Cochise Co., on *Sideranthus*, and 1 male on *Heterotheca*, Aug. 10, 1940 (Timberlake); 1 female, Tex Canyon, 3,700 feet, Chiricahua Mts., Cochise Co., Sept. 23, 1927 (J. A. Kusche); 2 females, 5 miles west of Benson, Cochise Co., on *Heterotheca*, Aug. 13, 1940 (C. D. Michener); 1 male, 6.3 miles west of Benson, on *Heterotheca*, Aug. 27, 1954 (Timberlake); 11 males, 17 females, 2 miles west of Sonoita, Santa Cruz Co., on *Chrysopsis rutteri*, Aug. 28, 1954 (Timberlake); 1 male, Onion Saddle, Chiricahua Mts., 7,600 feet, Cochise Co., on *Solidago*, Sept. 10, 1954 (Timberlake); 1 male, Douglas, Cochise Co., Aug. 1933 (W. W. Jones); 1 male, pine forest, 4 miles southwest of Forestdale, Navajo Co., Aug. 23–24, 1952 (H. B. Leech and J. W. Green); 2 males, 4 females, Mule Mts., 5,500 feet, 3 miles north of Bisbee, Cochise Co., Sept. 7, 1950 (T. Cohn, P. Boone, and M. Cazier); 2 males, 8 females, Mule Mts., 10 miles northwest of Bisbee, Sept. 7, 1950 (Cohn, Boone, and Cazier). TEXAS: 1 female, El Paso, El Paso Co., Aug. 18, 1908 (F. C. Pratt); 1 male, Laredo, Webb Co., Oct. 21, 1908 (Mitchell and Bishopp); 1 male, Brownsville, Cameron Co., June, No. 2427 (F. H. Snow); 2 males, 1 female, Brownsville, July 3, 1938 (R. H. Beamer). MEXICO. CHIHUAHUA: 1 male, 1 female, 18 miles west of Jimenez, on *Baccharis*, Aug. 10, 1951 (P. D. Hurd, Jr.).

Material of this species recorded above from the Rio Grande Valley agrees best with the subspecies *ignota* but is not typical. The female from El Paso has the lateral face marks slightly widened toward the eyes, but extending hardly above level of summit of clypeus, the basitarsi pale brownish, the creamy white band on tergite 2 not interrupted, and tergite 1 marked with two small quadrate spots placed close together at summit of the basal declivity. The female from Brownsville is similar but has the spots on tergite 1 reduced to fine dots and the band on tergite 2 interrupted. The subcosta and margins of stigma in these specimens are more brownish than usual in this species. The sculpture agrees much better with typical *ignota* than with *isopappi*. The presence of *ignota* at El Paso could be expected, but can it be possible that a nearly typical form of *ignota* extends down the Rio Grande to Brownsville?

Perdita ignota crawfordi Cockerell

(Figs. 195, 196, 300)

Perdita crawfordi Cockerell, 1901, Entomologist, 34:190, ♀, ♂; Swenk and Cockerell, 1907, Ent. News, 18:56; Timberlake, 1952, Proc. Ent. Soc. Wash., 54:200.

Perdita ignota Cockerell, 1897, Ent. News, 8:24; Swenk and Cockerell, 1907, Ent. News, 18:56; Cockerell, 1907, Univ. Colorado Studies, 4:247; Cockerell, 1922, Amer. Mus. Novitates, 33:6, in part (not Cockerell, 1896).

The above references under *ignota* relate to the more northeastern and duller race of *ignota* that Cockerell named *crawfordi* in 1901. Cockerell attempted to distinguish *ignota* and *crawfordi* by color characters and ignored the sculpture which seems to afford more natural means for separating them. The type locality of *crawfordi* is Lincoln, Nebraska, and the race extends westward to Colorado and south into Oklahoma.

Material examined.—MISSOURI: 3 females, Branson, Taney Co., Sept. 14, 1939 (E. C. Van Dyke). NEBRASKA: 3 males, 2 females, Lincoln, Lancaster Co., on *Grindelia*, Aug. 25, 1900 and Sept. 2, 1901 (J. C. Crawford), and Aug. 28, 1901 (M. A. Carriker). KANSAS: 1 male, Lane Co.; 3 females, Reno Co., Aug. 13–20, 1917; 1 male, Norton Co., 2,270 feet, Aug. 24, 1912 (F. X. Williams); 6 males, 24 females, Douglas Co., on *Heterotheca subaxillaris*, Aug. 15 and 18, 1949 (Michener and Beamer); 1 male, 1 female, Hutchinson, Reno Co., on *Prionopsis ciliata* and *Isopappus divaricatus*, Sept. 4, 1949 (Michener and Beamer). OKLAHOMA: 6 males, 6 females, Ardmore, Carter Co., on *Sideranthus rubiginosus*, Sept. 4, 1907 (F. C. Bishopp). COLORADO: 1 female, Golden, about 6,000 feet, Jefferson Co., Aug. 6, 1919 (Lutz); 1 male, South Boulder Canyon, Boulder Co., on *Grindelia*, Aug. 9, 1906 (Cockerell); 1 male, Boulder, about 5,500 feet, Aug. 7–12, 1919 (Lutz); 2 males, 3 females, Flagstaff, Boulder, on *Chrysopsis*, June 30, 1939 (Timberlake); 2 males, 1 female, Big Thompson Canyon, Larimer Co., on *Grindelia*, July 2, 1939 (Timberlake); 1 male, Dixon Canyon, Aug. 8, 1906.

The Ardmore specimens show the influence of *isopappi*, as one pair have the reduced face marks of that race. In 1952, I recorded *crawfordi* from Winnfield, Winn County, Louisiana; the material is not now at hand, and at any rate the series of three specimens is too small to indicate whether typical *crawfordi* extends that far south and east. In the westernmost counties, DeSoto and Beauregard, Louisiana, however, the species is represented by *isopappi* in a nearly pure condition.

Perdita ignota isopappi Timberlake

Perdita isopappi Timberlake, 1928, Proc. Hawaii. Ent. Soc., 7:152, ♀, ♂.

Perdita bishoppi (or *ignota*?), var. Cockerell, 1906, Entomologist, 39:149, ♀, ♂.

After a study of the material in the United States National Museum it now seems necessary to refer to the race *isopappi* all that population of *ignota* that occurs from the region of Clarendon, Texas, to the western border of Louisiana, and southward to Corpus Christi. The race *isopappi* differs hardly at all from *crawfordi* except that the tessellation is sometimes a little weaker and the lateral face marks are reduced to more or less small spots adjacent to the clypeus. In most localities in eastern Texas there is much variation in the size of the lateral marks; in some specimens they are nearly, or fully, as large as in typical *crawfordi*, but in considerably more than half the specimens the marks are generally small. As the marks are uniformly large in *crawfordi* from Nebraska and Kansas, it seems expedient to recognize *isopappi* as a weakly differentiated race, which has not reached full stability unless possibly on the western border of Louisiana and in the coastal region of Texas. Out of twenty-five specimens from DeSoto and Beauregard counties, Louisiana, only one approaches *crawfordi* in the size of the face marks, but out of seventeen specimens from Victoria, Texas, which is on the border of the coastal region, as many as five have rather large lateral marks.

Material examined.—TEXAS: 1 male, 1 female, Handley, Tarrant Co., on *Isopappus divaricatus*, Aug. 3, 1905 (J. C. Crawford), paratypes; 2 males, 1 female, Fedor, Lee Co., Aug. 6, 1899, May 7, 1901, and Oct. 11, 1899 (Birkmann); 5 females, Jacksonville, Cherokee Co., on *Chrysopsis*, Aug. 7, 1906 (F. C. Bishopp); 1 male, 6 females, Victoria, Victoria Co., on *Heterotheca subaxillaris*, Sept. 25, 1905 (A. J. Leister); 1 male, 3 females, Victoria, on *Aster*, Nov. 6, 1904 (Leister); 2 males, 3 females, Victoria, Oct. 25, 1907 (Mitchell and Jones), and 1 male, Oct. 1, 1907 (J. D. Mitchell); 1 male, 11 females, Rosser, Kaufman Co., on *Grindelia*, Aug. 23, 1905 (Bishopp); 5 females, Calvert, Robertson Co., on *Heterotheca*, Oct. 19 (Bishopp); 1 male, 1 female, Clarendon, Donley Co., Aug. 11, 1905 (W. D. Pierce) and 1 female on *Isopappus divaricatus*, Sept. 7, 1905 (C. R. Jones); 7 females, Athens, Henderson Co., on *Chrysopsis*, Aug. 6, 1906 (Bishopp); 4 males, 2 females, Mineola, Wood Co., on *Heterotheca*, Oct. 2, 1906 (Bishopp); 1 male, Palestine, Anderson Co., on *Isopappus*, Oct. 12, 1905 (R. C. Howell); 1 female, Sweetwater, Nolan Co., on *Aster*, June 15, 1909 (Bishopp); 1 female, Mason Co., on cotton, Oct. 20, 1905 (A. W. Morrill); 1 male, Paris, Lamar Co., Aug. 26, 1905 (Bishopp); 1 male, Corpus Christi, Nueces Co., April 13, 1906 (F. C. Pratt); 1 male, Bangs, Brown Co., in peach orchard, June 8, 1938 (Christenson); 1 male, Dallas, Dallas Co., Oct. 5, 1905 (Bishopp); 7 males, 1 female, San Antonio, Bexar Co., April 16, 1942 (A. L. Melander); 1 female, Dallas, on cultivated *Chrysanthemum*, June 7, 1952 (L. H. Shinnery); 2 males, 2 females, Dallas, on *Heterotheca latifolia*, May 29, 1953 (Shinnery); 5 males, 8 females, 2.6 miles east-southeast of Tredell, Bosque Co., on *Heterotheca latifolia*, and 2 males, 15 females on *Aphomostephus skirrhobasis*, June 5, 1953 (Shinnery); 1 male, 1 female, Stephenville, Erath Co., on *Xanthisma texanum* var. *Drummondii*, June 5, 1953 (Shinnery); 4 females, 2.5 miles northwest of Mabank, Kaufman Co., on *Heterotheca pilosa*, July 19, 1953 (Shinnery); 1 male, 2 females, Gainesville, Cooke Co., on *Prionopsis ciliata*, Aug. 29, 1953 (Shinnery); 5 females, Daingerfield, Morris Co., on *Heterotheca pilosa*, June 24, 1954 (Shinnery); 2 males, Ben Bolt, Jim Wells Co., May 12, 1952 (Cazier, Gertsch, and Schrammel); 1 male, 1 female, Bishop, Kleberg Co., on *Grindelia*, April 17, 1952 (Michener, Beamer, Wille, and LaBerge); 1 male, 10 miles north of Rockport, Arkansas Co., on *Aster tanacetifolius*, April 18, 1952 (Michener, Beamer, Wille, and LaBerge). LOUISIANA: 1 male, 1 female, Logansport, DeSoto Co., on *Chrysopsis nuttallii*, June 7, 1906 (W. D. Pierce); 2 females, Logansport, on *Aster*, June 7, 1906 (Pierce); 4 males, 2 females, Logansport, on *Helenium tenuifolium*, July 5, 1907 (Bishopp); 3 males, 3 females, Frierson, DeSoto Co., on *Helenium*, Sept. 9, 1907 (Bishopp); and 4 males, 4 females, De Ridder, Beauregard Co., July 6, 1906 (Bishopp).

Perdita ignota Cockerell, var.

A pair of *P. ignota* from nine miles northwest of Jalapa, Veracruz, Mexico, Dec. 3, 1949 (R. H. Beamer) cannot be placed in any of the named subspecies. These specimens have the strong tessellation and full face marks that characterize *crawfordi*, but the isolated habitat and dusky tarsi of the female preclude the possibility that they belong to that subspecies. Another male from Leon, Guajuato, Aug. 16, 1953 (C. and P. Vaurie) could pass for *P. ignota isopappi*, as the lateral face marks are very small and the mesonotum is polished. Much more material from Mexico is necessary to elucidate the nature and distribution of the races of *ignota* in that country.

Perdita graenicheri Timberlake

(Figs. 197, 198, 301)

Perdita graenicheri Timberlake, 1947, Proc. Ent. Soc. Wash., 49:82, ♀, ♂.

Perdita sp., Graenicher, 1930, Ann. Ent. Soc. Amer., 23:158, 168, 170, 173.

No additional material of this species has been seen, except a pair in the American Museum from Miami, Florida, where the types were collected by Graenicher at flowers of *Chrysopsis tracyi*.

Perdita boltoniae boltoniae (Robertson)

Perditella boltoniae Robertson, 1902, *Canad. Ent.*, 34:321, ♀, ♂; Robertson, 1914, *Ent. News*, 25:69; Robertson, 1922, *Psyche*, 29:161, 169.

Perdita chrysopsina Michener, 1947, *Amer. Midland Nat.*, 38:447 (not Timberlake, 1928).

A series of *Hexaperdita* from Tallulah, Louisiana, has given me the opportunity of understanding *boltoniae* better and has forced me to conclude that *chrysopsina* is merely an eastern race of this species. The bees recorded by Michener in 1947 from Mississippi agree better with *boltoniae* than with *chrysopsina* although the light abdominal bands of the female are poorly developed.

Material of *boltoniae* has been examined as follows.—ILLINOIS: Carlinville (Robertson), 1 male cotype. LOUISIANA: 5 males, 14 females, Tallulah, Madison Co., Sept. 24, 1929 (*Amer. Mus.*). MISSISSIPPI: 1 male, 2 females, Hattiesburg, Forrest Co., Oct. 10, 1943 and Sept. 17, 1944 (C. D. Michener).

Perdita boltoniae chrysopsina Timberlake

(Figs. 199, 200, 302)

Perdita chrysopsina Timberlake, 1928, *Proc. Hawaii. Ent. Soc.*, 7:155, ♀, ♂.

Perdita halictoides Viereck, 1917, *Bull. Amer. Mus. Nat. Hist.*, 37:241 (not Smith, 1853).

This bee has been recorded as occurring in the Atlantic seaboard states from New Jersey to Florida. The type locality is Bryson City, North Carolina.

The following material of *chrysopsina* has been examined.—MARYLAND: 1 female (paratype), Hyattsville, on *Chrysopsis mariana*, Sept. 24, 1916 (H. L. Viereck). NEW JERSEY: 1 male, 3 females, Haddon Heights, Sept. 18, 1933 (L. J. Bottimer). NORTH CAROLINA: 1 male, 2 females (types), Bryson City, on *Chrysopsis mariana*, Aug. 27, 1923 (J. C. Crawford); 2 males, 2 females, Marion, Aug. 16, 1938 (T. B. Mitchell). GEORGIA: 1 male, 1 female (paratypes), Griffin, Sept., 1902 (J. C. Bridwell).

Perdita foveata foveata, n. subsp.

(Figs. 201, 202, 303)

This species seems to be distinct and probably easily identified by the characters given in the preceding table. The facial foveae of the female are unusually broad for this or any other group of *Perdita*, and there is a remarkable range in the development of the light markings of the face and abdomen.

Female.—Head and thorax dark green, the face and propodeum more bluish. Clypeus black or tinged with brown, with a broadly oval, pale-yellow mark on middle of disk and sometimes a spot on each side of the anterior end of the median mark, or the three yellow marks of clypeus confluent so that the disk becomes light except on anterior border and except for an oblique dark streak on each side of summit. Lateral marks pale yellow, triangular, sometimes higher than wide, and reaching level of antennae, but both clypeal and lateral marks sometimes evanescent or absent. Mandibles testaceous except reddish tips. Thorax entirely dark. Abdomen blackish, the pygidial plate reddish-testaceous, and at base of tergites 2 to 4 a narrow, interrupted, pale-yellow band, or these bands sometimes absent. Antennae blackish, the flagellum hardly paler beneath. Legs entirely dark. Tegulae brownish-testaceous, darker at base. Wings whitish hyaline, the nervures pallid, margins of stigma pale brown, and subcosta somewhat darker.

Head distinctly broader than long, with inner orbits of eyes slightly diverging above. Facial foveae unusually broad on upper half, and three or more times as wide as the interval between them and the eyes. Mandibles long, stout, but not dilated within, abruptly narrowed, and

incurved at apex. Stigma rather large, a little shorter, and not quite as broad as first submarginal cell. Marginal cell with the parts beneath and beyond stigma about equal. Pygidial plate ogivally rounded at apex. Maxillary palpi short, about one half as long as the galeae. Frons and mesoscutum usually rather delicately tessellate and shining, the mesonotum sometimes nearly polished on middle of disk. Punctures of frons and mesonotum fine and rather sparse. Pubescence dull whitish, rather short and fine, the hair of legs very pale brownish. Length, about 5-5.5 mm.; anterior wing, 4 mm.

Male.—Dark blue; the abdomen blackish, except the reddish-testaceous apical segment and the brownish venter. No light markings on face, thorax, and abdomen. Mandibles testaceous, becoming reddish at apex and sometimes slightly yellowish at base. Antennae blackish, the flagellum dark brown beneath. Legs dark, the tarsi more brownish. Tegulae and wings as in the female.

Head generally much broader than long, the cheeks moderately broad, strongly receding and not or hardly angulate anteriorly. Mandibles long, slender, tapering, and when closed generally reaching no farther than to the distal end of the basal dilation of the opposite member. Flanks of pronotum deeply grooved but the disk not abbreviated nor prominent at posterior corners. Frons and mesonotum faintly tessellate and shining, the vertex more distinctly tessellate and dullish. Puncturation fine and sparse on frons and mesoscutum. Pubescence a little longer and sparser than in the female. Length, 3.5-4.25 mm.; anterior wing, 3.2-3.7 mm.

Holotype female and allotype, Boles, Scott Co., Arkansas, May 27, 1950 (R. H. Beamer). Paratypes as follows: 9 males, 30 females, taken with the types; 4 females, Medora, Reno Co., Kansas, June 24, 1936 (Beamer).

Types in collection of the University of Kansas, except eight paratypes retained at Riverside.

Perdita foveata brachycephala, n. subsp.

Female.—Like typical *foveata* except that the face and abdominal markings are usually entirely lacking and the mesoscutum is more strongly tessellate and dullish. In one female from Freestone Co., Texas, there are remnants of an interrupted band on tergites 2 and 3; in another female from the same locality the abdomen is dark, but the lateral margins of the disk of clypeus are white. In a female from Somervell Co., Texas, the abdomen has an interrupted band on tergites 2 to 4, and the clypeus and lateral marks are yellowish-white, the clypeus having the anterior margin of disk and two vertical stripes, pale brown. The face marks in this specimen are actually more extensive than in *foveata* from Arkansas, but the mesoscutum is strongly tessellate, and there is thus much agreement with the race *persimilis*. The flagellum in *brachycephala* entirely dark, or varying to pale brown beneath on apical half. Maxillary palpi very short in *brachycephala*, not more than one-third as long as the galeae, with joints beyond the first not much longer than thick; in *foveata* the maxillary palpi about one-half as long as the galeae. Length, 4.5-5.2 mm.; anterior wing, 3.2-3.8 mm.

Male.—Hardly separable from *foveata* in color, markings, and sculpture, but the mesonotum is generally a little more distinctly tessellate. The tarsi are usually dark, but white in specimens from Arlington, Victoria, and Corpus Christi. The shorter maxillary palpi and longer mandibles appear to be distinctive. At least in the larger-headed specimens the mandibles are long, sharply pointed, and each reaches when closed to the extreme base of the other; the cheeks, also, are slightly dentate near the anterior ends. Length, 4.5-5 mm.; anterior wing, 3.2-3.8 mm.

Holotype female and allotype, 13.6 miles south of Fairfield, Freestone Co., Texas, the female on *Aphanostephus skirrhobasis*, the male on *Coreopsis basalis*, May 2, 1953 (L. H. Shinnars). Paratypes all from Texas as follows: 1 male, 4 females, taken with the holotype, and 11 males, 2 females taken with the allotype; 1 male, 3 females, 2.8 miles northeast of Glen Rose, Somervell Co., on *Aphanostephus*, June 5, 1953 (Shinnars); 1 male, 2.5 miles north of Roans Prairie, Grimes Co., on *Coreopsis basalis*, May 3, 1953, 2 males, 2 females, Arlington, Tarrant Co., on *Aphanostephus*, June 12, 1907 (F. C. Bishopp); 3 males, Victoria, Victoria Co., April 27, 1912 (J. D. Mitchell); 1 male, Wolfe City, Hunt Co., on *Coreopsis*, June 17 (Bishopp); 2 females, Fedor, Lee Co., May 4, and May 12, 1899 (Birkmann); 1 male, 1 female, 29 miles south of Sarita, Willacy Co., on *Coreopsis*, April 14, 1950 (Beamer, Michener, Stephen, and Rozen); and 1 female, 10 miles north of Rockport, Aransas Co., on *Aster tanacetifolius*, April 18, 1952 (Michener, Beamer, Wille, and LaBerge).

A male, with abdomen lacking, comes from Corpus Christi, Nueces Co., April 13, 1906 (F. C. Pratt).

Types and eight paratypes in the University collection at Riverside; paratypes in collections of L. H. Shinnors, the United States National Museum, and the University of Kansas.

Perdita foveata persimilis, n. subsp.

This New Mexico race exhibits intergradation with *brachycephala*, as *brachycephala* does with *foveata*. It is distinguished mainly by the stronger tessellation of the mesonotum, the well-developed face marks and abdominal bands, and in the male by the white tarsi.

Female.—Dark green; the abdomen blackish. Clypeus, lateral marks, mark on each side of hind margin of disk of pronotum, tubercles, small joints of tarsi, broadly interrupted band at base of tergites 2 to 4, and preapical spot on lateral margins of tergite 3, and sometimes similar spots on tergite 4 creamy white. Disk of clypeus with a fuscous mark on anterior margin of disk, or in two paratypes mainly black except a white mark on each side of disk. Lateral marks transverse, but in two paratypes widened enough on orbits to reach level of antennae. Tergite 5 sometimes with an extremely narrow whitish band interposed between the dark base and the broad, subhyaline apical depression. Pygidium dark testaceous. Mandibles yellowish-testaceous, with the apex red. Antennae dark, but the flagellum broadly yellowish-brown beneath except at base. Tegulae subhyaline, with a whitish spot at anterior end. Wings milky hyaline, the subcosta and margins of stigma pale brown. Legs dark, a spot at base of front and middle tibiae, as well as small joints of tarsi white. Pubescence of mesonotum short and coarse, shorter than in *foveata* but about as in *brachycephala*. Otherwise like *brachycephala*, except mesonotum duller and more strongly tessellate. Length, about 4.5 mm.; anterior wing, 3 mm.

Male.—Dark blue; the abdomen blackish. Hardly differing from the male of *brachycephala* except in the distinctly tessellate mesonotum, white tarsi, and yellowish-brown flagellum. Length, 3 mm.; anterior wing, 2.6 mm.

Holotype female, allotype, and 5 paratype females, Kenna, Chaves Co., New Mexico, Aug. 9, 1941 (L. H. Banker, E. L. Todd, and Burt Hogden).

Types in collection of the University of Kansas, except one paratype kept at Riverside.

Subg. *Perditella* Cockerell

Perditella Cockerell, 1899. Psyche, 8:312

Type of subgenus.—*Perdita larreae* Cockerell.

Small bees, most easily distinguished by the venational characters as described by Cockerell. Stigma large, about as broad as first submarginal cell. Marginal cell tilted and oblique to the axis of the submarginal cells, the second abscissa of radius (or the part beyond the second submarginal cell) in rough alignment with the first transverse-cubital and first recurrent nervures; the part of marginal cell beyond the stigma about as wide as long and much shorter than the narrow part beneath the stigma. Second submarginal cell small, triangular, and coming to a more or less acute point on the radius, or even slightly petiolate. Tongue of moderate length, or sometimes very short; in the latter case, the galeae do not reach beyond middle of the proboscis cavity when the mouth parts are retracted.

Female.—Head generally a little broader than long. Facial foveae small, placed well above level of antennae and not more than one-fourth as long as space between antennal sockets and anterior ocellus. Mandibles simple and obtuse at apex, or with a partially developed inner tooth near apex. Pygidial plate at most moderately wide across the base and narrowed to the obtuse or acute apex. Legs slender, the apical tarsal joint hardly thickened, the claws small, with an abrupt narrow expansion at base, the outer corner of which simulates a small inner tooth. Tibial scopa of hind legs sparse, the hairs rather short and not much curved.

Male.—Head typically more or less enlarged, with very broad temples and cheeks; the latter with an acute tooth or a large triangular process below anterior end of eyes. Mandibles long, slender, and tapering. Disk of clypeus sometimes produced more than half its length in front of a line drawn tangent to anterior ends of eyes, and bearing on each side of base of labrum an acute tooth, or long slender porrect process; these processes when fully developed often divergent and as long as the disk of clypeus. Facial foveae punctiform. Tarsal claws bifid, the inner tooth much shorter than outer tooth.

In *P. minima* Cockerell and *P. cladothercis* Cockerell the head is generally but little enlarged without much development of the special characters noted above, although in *minima* the clypeus is armed with two porrect teeth. The facial foveae in these two species are very faint, being minute and punctiform in *cladothercis* and linear in *minima*.

KEY TO SPECIES

1. Females 2
Males 5
2. Tongue and palpi of normal length; mandibles abruptly narrowed near apex to form a partially developed inner tooth; first and second transverse cubital nervures either meeting or barely separated on the radius; mesoscutum with sparse, appressed, white squamiform hair 3
Slightly smaller species, about 3 mm. long; tongue and palpi extremely short; second submarginal cell shortly petiolate on radius; mesoscutum polished and nude, or with very sparse, fine, erect hair 4
3. Pygidial plate with the apex rounded and moderately narrow; sometimes entirely dark, but often with yellowish face marks and brownish abdomen, or the scutellum and metanotum yellowish, or the entire insect sometimes yellowish-brown; wings milky hyaline, more opaque on basal half; length, about 3.5 mm. *larreae* Cockerell
Pygidial plate acute at apex; probably always entirely dark, except that the clypeus may be brownish; mesoscutum, except anterior border, scutellum, metanotum, and abdomen black; propodeum and pleura bluish; wings and size as in *larreae*. *marcialis* Cockerell
4. Dark green, polished and shining, the disk of mesoscutum, scutellum, and metanotum black; abdomen blackish, usually with a white band on tergite 2; wings clear, the nervures testaceous, the stigma brownish except for a clear spot at base; length, about 3 mm. *cladothercis* Cockerell
Uniformly yellowish brown, shining; wings a little less clear hyaline and the stigma darker than in *cladothercis* *minima* Cockerell
5. Larger species, with more or less enlarged head and squamiform pubescence on mesoscutum. 6
Smaller, about 2-2.5 mm. long; head never much enlarged, the cheeks rarely dentate; second submarginal cell shortly petiolate on radius 7
6. Entirely yellow, except a small dark patch on each side of posterior end of mesosternum and an infuscation surrounding ocelli; length, about 3 mm. *larreae* Cockerell
Yellow, with patch on vertex, mesonotum except lateral margins of scutum, metanotum, propodeum except sides, and patch on each side of posterior part of mesosternum, dark and more or less greenish, or bluish. *marcialis* Cockerell
7. Dark green, the face below antennae white; abdomen brown, with a whitish band across base of tergites 2 and 3; clypeus and cheeks unarmed. *cladothercis* Cockerell
Uniformly brownish-yellow; clypeus with a sharp porrect tooth on each side of base of labrum *minima* Cockerell

Perdita larreae Cockerell

(Figs. 203, 204, 304)

Perdita larreae Cockerell, 1896, Proc. Acad. Sci. Phila., 48:62, fig. 8, ♂; Timberlake, 1928, Amer. Mus. Novitates, 321:11, ♀.

Perdita larreae var. *modesta* Cockerell, 1897, Proc. Acad. Sci. Phila., 49:355, ♂.

Perdita larrearum Cockerell, 1896, Proc. Acad. Sci. Phila., 48:63, ♀ (new synonymy).

The female of this species is remarkable for the range of variation in color, which does not seem to have racial significance, although the material at hand is too scanty for a just appraisal of this point. The female described by Cockerell was dark, with abdomen brown, and the clypeus and lateral marks yellow. A female from ten miles east of Douglas, Arizona, has the face marks, pronotum, scutellum, metanotum, marks on the pleura, and the abdomen brownish-yellow. Other specimens from Arizona are almost entirely brownish-yellow, or with the frons, vertex, anterior part of mesoscutum, and a patch on mesosternum dark. A specimen from Tucson, Arizona, and one from twelve miles west of Twentynine Palms, California, agree with Cockerell's description of *larrearum*. Other specimens from the deserts of California and from Lower California are more or less entirely dark. The type locality of *larreae* is San Marcial, Socorro County, New Mexico.

Material examined.—NEW MEXICO: 1 male, 1 female, San Marcial (Cockerell), Nos. 3081 and 3072, presumably cotypes of *larreae* and *larrearum*, but not so labeled. ARIZONA: 1 male, Wellton, Yuma Co., May 5-6, 1918 (J. C. Bradley); 1 female, 6 miles east of Big Horn Station, Pinal Co., May 12, 1953 (R. C. Bechtel and E. I. Schlinger); 1 male, 1 female, San Carlos, Gila Co., May 12-13, 1918 (Bradley); 2 males, Quijotoa, Pima Co., Aug. 27, 1927 (Cornell Univ., lot No. 542); 1 female, Santa Cruz village, Cobabi Mts., 3,100 feet, Pinal Co., Aug. 10-12, 1916 (F. E. Lutz); 1 female, Tucson, Pima Co., July 20, 1924 (A. A. Nichol); 1 female, Tucson, on *Tamarix*, May 1, 1938 (R. H. Crandall); 1 female, 10 miles east of Douglas, Cochise Co., Aug. 11, 1940 (E. S. Ross); 1 female, Aguila, Maricopa Co., on *Pectis papposa*, Sept. 20, 1953 (Timberlake); 1 female, 2.7 miles west of Salome, Yuma Co., on *Pectis papposa*, Sept. 20, 1953 (Timberlake); 1 female, Picacho Pass, Pinal Co., on *Euphorbia polycarpa*, Aug. 27, 1954 (Timberlake). CALIFORNIA: 1 female, 14 miles west of Barstow, San Bernardino Co., on *Eriogonum reniforme*, June 4, 1938 (Timberlake); 1 female, 12 miles west of Twentynine Palms, San Bernardino Co., on *Croton californicus*, Aug. 29, 1934 (C. D. Michener); 1 male, 17 females, Panamint Springs, Inyo Co., July 15, 1953 (E. I. Schlinger); 1 female, 18 miles west of Blythe, Riverside Co., April 29, 1952 (G. A. Marsh). MEXICO. LOWER CALIFORNIA: 2 females, 10 miles east of San Ignacio, on *Dicraurus*, Sept. 30, 1941 (Ross and Bohart). CHIHUAHUA: 1 female, 8 miles south of Camargo, on *Asclepias*, Aug. 10, 1951 (P. D. Hurd). COAHUILA: 3 females, 25 miles southeast of San Pedro de Colonias, 3,700 feet, Aug. 21, 1947 (C. D. Michener).

Perdita marcialis Cockerell

(Figs. 205, 206)

Perdita marcialis Cockerell, 1896, Proc. Acad. Sci. Phila., 48:62, ♂.

The type of *marcialis* was collected by Cockerell at San Marcial, New Mexico, on flowers of *Larrea*, together with the types of *larreae* and *larrearum*. Cockerell states that the spines of the clypeus are parallel, instead of divergent as in *larreae*, but in specimens now at hand the clypeal processes are small and triangular in small-headed specimens and become longer and spinelike in macrocephalous specimens, and in one in which the head is more than twice as wide as the thorax, the spines are strongly divergent and as long as the disk of the clypeus. The tooth at the anterior end of cheeks also varies greatly, and in one specimen becomes a broad laminate process that is about as broad across the base as the basal width of mandibles.

Female.—Head and anterior border of mesoscutum dark green, the pleura and propodeum blue, the rest of mesoscutum, the scutellum, metanotum, and abdomen black. Clypeus tinged with brown, becoming pale on anterior border. Mandibles testaceous, becoming more yellowish

at base and rufotestaceous at apex. Antennae yellowish-brown beneath, the flagellum and pedicel above, and a mark on dorsal margin of scape fuscous. Legs dark, the front tibiae yellow in front and more or less brown behind, the tarsi yellow or testaceous yellow. Tegulae testaceous

Head rotund, as broad as long. Facial foveae about three times as long as wide and about subhyaline. Wings milky hyaline, the nervures and stigma white.

their own width from margin of eyes. Pygidial plate moderately wide at base and tapering to the acute apex. Head and thorax tessellate, a little dullish, and obscurely punctured. Pubescence white, rather coarse and short, the hairs of mesoscutum subsquamiform and appressed. Length, about 3.5-3.75 mm.; anterior wing, 2.7 mm.

Material examined.—TEXAS: 1 female, El Paso, El Paso Co., July 24, 1914 (J. C. Bradley). NEW MEXICO: 2 males, Alamogordo, Otero Co., May 15 and June 7, 1902 (H. L. Viereck). ARIZONA: 6 males, 10 females, Dry Canyon, Sands' Ranch, southeast end of Whetstone Mts., Cochise Co., on *Aloysia wrightii*, Aug. 10, 1952 (H. B. Leech and J. W. Green). NEVADA: 1 male, Glendale, Clark Co., on *Chrysothamnus paniculatus*, Oct. 3, 1929 (David E. Fox). CALIFORNIA: 34 males, 15 females, Borego Valley, San Diego Co., all on *Eriogonum fasciculatum* var. *polifolium*, except 3 males, 1 female, on *Salvia vaseyi*, April 25 and 28, 1955 (Timberlake). MEXICO. COAHUILA: 1 male, 9 females, La Rosa, 5,300 feet, on *Larrea*, Aug. 22, 1947 (C. D. Michener); 3 females, Guadalupe, Aug. 23, 1947 (Michener); 20 females, 25 miles southeast of San Pedro de Colonias, 3,700 feet, Aug. 21, 1947 (Michener). SONORA: 1 female intercepted at Nogales, July 29, 1940.

Perdita cladothricis Cockerell

(Figs. 207, 208, 305)

Perdita cladothricis Cockerell, 1896, Proc. Acad. Sci. Phila., 48:82, ♀, ♂.

Cockerell stated that this species is abundant at Las Cruces, New Mexico, on *Cladotrix*, now known as *Tidestromia*, and he recorded stray examples from *Pectis papposa*, *Isocoma wrightii*, and *Gutierrezia microcephala*.

Material examined.—NEW MEXICO: 2 females, Las Cruces, Sept. 25, 1895 (Cockerell). TEXAS: 2 females, 16 miles northeast of El Paso, El Paso Co., on *Tidestromia lanuginosa*, Aug. 18, 1929; 1 female, intercepted at Mexican border, July 20, 1940. ARIZONA: 1 female, Huachuca Mts., Cochise Co., Sept. 17, 1938 (R. H. Crandall). MEXICO. SONORA: 1 male, Hermosillo, Sept. 9, 1938 (Crandall); 1 male, Guaymas, Sept. 10, 1938 (Crandall). LOWER CALIFORNIA: 2 females, 10 miles south of Coyote Cove, Oct. 1, 1941 (Ross and Bohart). ZACATICAS: 5 females, Guadalupe, on *Tidestromia lanuginosa*, Aug. 16, 1947 (C. D. Michener).

Perdita minima Cockerell

(Figs. 209, 210)

Perdita minima Cockerell, 1923, Amer. Mus. Novitates, 66:4, fig. 4, ♀; Cockerell, 1925, Pan-Pac. Ent., 1:179, ♂.

Perdita, n. sp., Bequaert, 1918, Jour. New York Ent. Soc., 26:126.

The type locality of *minima* is Tempe, Arizona, where it was discovered by Bequaert about the first of August, 1917. Cockerell briefly described the male in 1925 but a more detailed account is desirable.

Male.—Testaceous or brownish-yellow, without the reddish-brown tinge of the female, and entirely without markings, the antennae and legs concolorous. Tegulae testaceous subhyaline. Wings clear hyaline, the nervures testaceous, with subcosta, stigma except a basal spot, and nervures enclosing marginal cell brown.

Head somewhat broader than long, rotund or subquadrate when more enlarged, the anterior margin always truncate except for the porrect process on each side of base of labrum. These processes tapering, about twice as long as wide at base and subequal to the median length of disk. Lateral plates of face in macrocephalous specimens each much broader than the intervening space. Subantennal plates very small. Temples and cheeks broad, but unarmed. Mandibles

rather short, stout, little curved, and simple and acute at apex. Claws minutely bifid. Wing as figured by Cockerell, except that second recurrent and subdiscoidal nervures are very faint. (One specimen has abnormal venation, with only one submarginal cell, the second intercubitus being entirely absent.) Abdomen oval, no wider than thorax, and nearly twice as long as wide. Head and thorax shining, impunctate, and nude, with only very short, sparse pubescence on the cheeks. Thorax polished, the vertex and face minutely and faintly tessellate, but the tessellation on lateral plates of face becoming more distinct and coarse. Length, about 2-2.5 mm.

Material examined.—ARIZONA: 3 females, Picacho Pass, Pinal Co., on *Euphorbia*, Aug. 7, 1940 (E. S. Ross, Timberlake), and on *Euphorbia polycarpa*, Aug. 27, 1954 (Timberlake); 1 female, 21.7 miles south of Robles Ranch, Pima Co., on *Gutierrezia*, Aug. 30, 1954 (Timberlake); 1 male, Wenden, Yuma Co., on *Euphorbia polycarpa*, Sept. 13, 1954 (Timberlake); 1 female, Baboquivari Mts., Pima Co., Aug. 20, 1924 (O. C. Poling); 1 female, Roll, on *Euphorbia*, Aug. 11, 1954 (Bohart and Butler). CALIFORNIA: 45 males, 41 females, Riverside, on *Euphorbia albomarginata*, except one male on *Eriogonum gracile*, June 29 to Oct. 1 in different years; 1 female, Palm Springs, May 11, 1935, and 1 male, May 6, 1946; 2 males, 4 females, 4 miles south of Palm Springs, June 25, 1941 and June 11, 1954; 6 males, 13 females, Andreas Canyon, near Palm Springs, June 8, 1930, Oct. 24, 1952, and May 9, 1954; 4 males, 2 females, Cathedral City, Oct. 8, 1945, and May 6, 1946; 4 males, 17 females, 2 miles north of Rancho Mirage, July 27, 1950; 3 males, 3.7 miles east of Desert Center, Oct. 23, 1951; 1 male, 2 females, 10.5 miles west of Blythe, Oct. 2, 1954, all Riverside Co., on *Euphorbia polycarpa*, or var. *hirtella*, except one female on *Croton californicus* near Palm Springs (Timberlake); 1 female, 4 miles west of Desert Center, on *Euphorbia*, Oct. 23, 1951 (P. D. Hurd, Jr.); 2 males, 2 females, Highway 66, east of Barstow, Aug. 30, 1931; Yuca Valley, Aug. 30, 1936; 1 male, 3 females, Twenty-nine Palms, Sept. 5, 1946, all on *Euphorbia polycarpa*, or var. *hirtella*, San Bernardino Co. (Timberlake); 2 males, 4 females, Borego, San Diego Co., on *Euphorbia polycarpa* var. *hirtella*, April 29, 1954 (Timberlake), and 1 male, 4 females, April 25 and 30 (Hurd). LOWER CALIFORNIA: 2 males, Coyote Cove, Concepcion Bay, Oct. 1, 1941 (Ross and Bohart); 8 males, 10 miles south of Coyote Cove, on *Euphorbia*, Oct. 1, 1941 (Ross and Bohart); 1 male, 10 miles northwest of La Paz, Oct. 6, 1941 (Ross and Bohart).

Subg. *Alloperdita* Viereck

Alloperdita Viereck, 1917, Bull. Amer. Mus. Nat. Hist., 37:241; Cockerell, 1923, Amer. Mus. Novitates, 66:3, fig. 3.

Type of subgenus.—*Perdita novae-angliae* Viereck.

Bees of medium size for the genus *Perdita*, usually with a small intercalary submarginal cell and normal ocelli. Head thinner frontoöccipitally than usual, with the proboscoidal cavity very broad. Wings ample, the stigma large and broad, but not quite equaling the first submarginal cell in either length or width. Marginal cell large, obliquely truncate at apex, the parts beneath and beyond stigma about equal. The supernumerary cell, the second of the submarginal cells by position, varying from extremely small, or entirely obsolete, to a small triangle reaching halfway, or a little more, to the radius, and receiving the first recurrent nervure near the middle of its base. Mouth parts normal, the tongue usually rather long but short in *P. obscurata* Cresson, the palpi correspondingly short or very long, the maxillary pair six-jointed. Antennae rather long, the joints of flagellum as long as, or a little longer than, wide.

Female.—Facial foveae well impressed, linear, or sometimes widened at anterior end, and reaching from level of antennal sockets about one-half to five-sixths of the distance to level of anterior ocellus. Mandibles stout, slightly curved, and armed with a small inner tooth. Legs rather long, the tarsi longer than the tibiae, the claws large and with a distinct inner tooth. Hind knee plate moderately distinct. Scopal hairs of hind tibiae rather long, curved, and

moderately sparse, with those on outer margin straighter, closer set, and minutely plumose. Pygidium very broad across the base, the sides converging to the narrowly obtuse or acute apex, which is sometimes finely notched. Pubescence always fine and moderately dense for a *Perdita*, that of the mesosternum and front coxae no longer nor denser than elsewhere.

Male.—Facial foveae small, about two or three times longer than wide. Mandibles similar to those of female. Head similarly shaped, the cheeks little widened and usually simple, but with a small conical process in *P. mitchelli* Timberlake. Hind knee plate distinct. Tarsal claws bifid, the teeth nearly equal. Hair of hind tibiae rather sparse and long, and not close set on outer margin. Seventh tergite with a distinct pygidiform area, which resembles the pygidium of the female, but is generally more broadly rounded and never notched at apex. Aedeagus agreeing closely in general structure with that of *Xerophasma*.

When describing *Xerophasma*, Cockerell (1923, Amer. Mus. Novitates, 66:2) discussed the origin of the supernumerary cell, the probable ancestry of bees exhibiting it, and stated that *Xerophasma* might be allied to *Alloperdita* but that this is not necessarily the case. He speculated whether such bees diverged from the ancestral stem of *Perdita* before the second submarginal cell had been lost, or whether this small cell is a later development.

Robertson (1922, Psyche, 29:159) concluded that in the Perditiinae the usual second submarginal cell has been lost by coalescence of the first and second intercubital nervures. In accordance with this view the intercalary cell is the result of the splitting of the dual nervure, and it is consequently a genuine second submarginal (Timberlake, 1928, Amer. Mus. Novitates, 321:8, footnote).

That the intercalary cell is the true second submarginal appears to be incontrovertible, but I cannot now believe that its presence is due to a reversal of the coalescence of two nervures. In the species exhibiting this cell (five of *Alloperdita*, and two of *Xerophasma*) there is great variation in its size from entire absence to a condition where it reaches a little more than halfway toward the radius. The proximal nervure defining this cell must be the genuine first intercubitus, but I can see no virtue in the view that it coalesces with the second intercubitus as the cell becomes smaller and smaller; on the contrary it seems more logical to assume that its point of union with the other nervure is merely local and migrates up and down that nervure as the cell becomes larger or smaller. An exactly parallel condition is observable in the subgenus *Perditella* where the first and second intercubital nervures (the morphological second and third) unite on the radius or sometimes appear to be coalesced for a short distance. A true coalescence of two nervures should, or might, produce a thicker nervure than usual, but this is not the condition to be observed in any of the species where two nervures form a union.

In other genera of bees there are many species with only two submarginal cells either constantly or occasionally present, and it is evident that the reduction in the number of cells has taken place by the elimination of one of the intercubital nervures, and that this loss is through the action of an abrupt mutation in cases where the character is inconstant. It seems reasonable to conclude that the loss of one of the intercubital nervures in most bees took place abruptly instead of gradually, but is this true for *Perdita*? Unless *Alloperdita* and *Xerophasma* are more remotely related to all other perditiine bees than all characters, apart from the venation, would indicate, one might conclude that ordinary members of *Perdita* did not lose the first intercubitus by an abrupt mutation, but by a gradual

Head about one and one-half times longer than wide; face markings restricted to three yellow marks on clypeus, a short median stripe on disk, and a spot on anterior margin of each side; abdomen dark, without markings *novae-angliae* Viereck

Perdita obscurata Cresson

(Figs. 211, 212, 306)

Perdita obscurata Cresson, 1878, Trans. Amer. Ent. Soc., 7:70, ♀, ♂; Cockerell, 1896, Proc. Acad. Sci. Phila., 48:59, ♀; Timberlake, 1928, Amer. Mus. Novitates, 321:7.
Perdita bradleyi Viereck, 1907, Ent. News, 18:393, ♂.

The type locality of *obscurata* is Georgia, where it was collected by Morrison. In 1907 Viereck redescribed the male as *bradleyi* from Clementon, New Jersey. Cockerell recorded the species also from Orlando, Florida, where Robertson collected a male at flowers of *Hydrocotyle umbellata*. It has been recorded also from Kushla, Alabama.

The following material has been examined.—NEW JERSEY: 1 male, Clementon, May 24, 1902 (J. C. Bradley). NORTH CAROLINA: 1 male, 3 females, Fayetteville, on *Sarracenia flava*, May 16, 1940 (D. L. Wray); 1 female, McClellanville, May 10, 1944 (H. K. Townes); 1 female, Southern Pines, Apr. 29, 1913 (Manee). FLORIDA: 1 male, Jacksonville (Ashmead).

Perdita mitchelli Timberlake

(Figs. 213, 214, 307)

Perdita mitchelli Timberlake, 1947, Proc. Ent. Soc. Wash., 49:81, ♀, ♂; Michener, 1947, Amer. Midland Nat., 38:447.

The type locality of *mitchelli* is Hattiesburg, Mississippi, where Michener collected it at flowers of *Cyrilla racemiflora*, June 4, 1944. The male has been collected also in the sand hills near Lillington, North Carolina.

Additional material.—10 males, 9 females, Alabama, No. 2282 (C. F. Baker).

Perdita carolina Timberlake

(Figs. 215, 216, 308)

Perdita carolina Timberlake, 1952, Proc. Ent. Soc. Wash., 54:199, ♀, ♂.

This species has been collected at flowers of *Batodendron* at Taylor's Bridge, Sampson County, North Carolina, in May, and at Raleigh in August.

Additional material.—NORTH CAROLINA: 7 males, Southern Pines, Moore Co., May 17, 1953 (H. and A. Howden); 15 males, 119 females, Southern Pines, on persimmon (*Diospyros virginiana*), May 20, 1950 (T. B. Mitchell); 2 females, Manchester, Cumberland Co., May 24, 1953 (Mitchell). TEXAS: 4 females, 6.2 miles northwest of Grapevine, Tarrant Co., on *Stillingia sylvatica*, May 15, 1954 (L. H. Shinnars).

Perdita floridensis Timberlake

(Figs. 217, 218, 309)

Perdita floridensis Timberlake, 1938, Amer. Mus. Novitates, 321:7, ♀, ♂.

This species was first collected by Van Duzee, May 1, 1908, at Clearwater, Pinellas County, Florida.

Additional material.—FLORIDA: 1 male, Marion Co., Apr. 21-23, 1936 (B. L. Smith). NORTH CAROLINA: 2 males, 1 female, Holly Shelter, on *Batodendron*, May 18, 1950 (T. B. Mitchell).

Perdita novae-angliae Viereck

(Figs. 219, 220, 310)

Perdita novae-angliae Viereck, 1907, Ent. News, 18:394, ♀, ♂; Viereck, 1917, Bull. Amer. Mus. Nat. Hist., 37:241; Cockerell, 1923, Amer. Mus. Novitates, 66:2, fig. 3; Timberlake, 1928, Amer. Mus. Novitates, 321:7.

This species was recorded by Viereck from Poquonock, Connecticut (type locality) and from Hyannis Point, Massachusetts. In 1917 he recorded it from Beltsville, Maryland, at flowers of *Lyonia ligustrina*. In 1928 I recorded it from Lakehurst, New Jersey. The collection dates of these records range from June 9 to July 9.

Additional material.—NEW JERSEY: 1 female, No. 1786 (C. F. Baker); 2 females, 47 males, Chatsworth, Burlington Co., at flowers of huckleberry (*Gaylussacia?*), June 15, 1923 (J. C. Bradley). NORTH CAROLINA: 1 female, Orton Place, May 3, 1939 (C. S. Brimley).

Pygoperdita, n. subg.

Type.—*Perdita interrupta* Cresson.

The *Pygoperdita* group was not included in my table of subgenera, published in the first part of this study; it runs without much discrepancy to the end of the table and may be distinguished from *Perdita* as follows:

Apical tergite of male abdomen strongly emarginate on each side to set off a median, pygidiform process, or with two broad submedian lobes, or with various modifications of these structures; female of comparatively robust form, with head broader than long, and margin of clypeus sometimes strongly dentate on each side of labrum.....*Pygoperdita*, n. subg.
Apical tergite of male usually simple and tapering to a rounded apex, or if somewhat modified, never deeply emarginate on each side nor strongly bilobate at apex*Perdita* F. Smith

This group has its center of distribution in California, but extends northward to Vancouver Island and eastward to Colorado, with one known species in Colorado and Lower California, two in Washington and Arizona, three in Utah and Oregon, five in Nevada, and twenty-seven in California. Although several of the species visit Compositae, especially *Layia* and *Malacothrix*, most of them visit flowers of various other families such as the Rosaceae, Papaveraceae, Rhamnaceae, and Liliaceae; the genera *Eschscholtzia* and *Calochortus* both are frequented by several different species.

There are two main sections of *Pygoperdita* centering around *P. interrupta* Cresson and *P. californica* (Cresson). In *interrupta* and allies the seventh tergite has a median, triangular, pygidiform process, with a deep ventral bifid keel, usually set off by a large, rounded emargination on each side. In *californica* the seventh tergite ends in a broad median lobe which has a slight emargination on each side to set off a pair of laminate lobes with their blades semivertical or oblique to the dorsal wall of the segment. In other species the laminate lobes become less oblique to more or less horizontal, and in one species the segment ends in two broad and truncate lobes, separated by a broad rounded notch, and without trace of lateral emarginations. For other modifications the following description should be consulted, especially of the new species *P. calochorti* and *P. leucostoma*, both of which are allied to *californica*, but which might be confused with the *interrupta* group without careful consideration.

Male.—Head broader than long, never much enlarged, the cheeks moderately broad and simple. Clypeus with a broad low disk and long lateral extensions, which are well exposed in frontal view. Facial foveae faint, sometimes hardly discernible. Mandibles stout, moderately long, sometimes slightly dilated on inner margin, then abruptly narrowed near apex, the narrowed part often set off by a small notch; or in the *californica* subgroup simple and tapering gradually to apex. Antennae of usual length and form, the joints of flagellum about as long as thick. Mouth parts normal, moderate in length, the maxillary palpi six-jointed and as long, or nearly as long, as the galeae. Thorax and legs normal, the knee plate of hind legs distinct, the tarsal claws bifid, with the inner tooth about one-half as long as the outer. Stigma of wings moderately slender, never more than one-half as wide as the marginal cell. The latter nearly as long as the first submarginal cell, with the part beyond stigma usually distinctly longer than the part beneath. Second submarginal cell narrowed about one-half toward marginal and receiving both recurrent nervures. Second recurrent and subdiscoidal nervures variably faint or nearly as strong as the other nervures. Seventh tergite as described above. Eighth ventral plate usually more or less triangular, and often medially keeled or thickened. Aedeagus with dorsal lobes small and acute, and the parameral lobes long, stout, and much notched above, so that the inner wall at the base crosses obliquely over to the outer margin; sagittae generally considerably fused and massive, either blunt or acute at apex, or with the component parts at apex sometimes conspicuously separated.

Female.—Robust in form, the head more or less distinctly broader than long. Clypeus much as in the male, except that the disk is much larger in proportion to the lateral extensions; anterior margin of disk produced into an obtuse lobe on each side of base of labrum, or often sharply dentate. Facial foveae linear, not very strongly impressed, and reaching from level of antennae, or a little below that level, about two-thirds to four-fifths of distance to level of anterior ocellus. Mandibles, unless worn, usually with a small inner notch near apex to set off a small inner tooth. Pygidial plate in the *interrupta* subgroup moderately broad at base and narrowed to a rounded point at apex; usually much narrower throughout in the *californica* group and acute at apex. Claws with a small tooth on inner margin. Scopal hairs of hind tibiae usually rather close set, coarse and stiff, moderately curved and not much longer than the greatest width of tibia.

KEY TO SPECIES

- | | |
|---|--|
| 1. Females | 2 |
| Males | 45 |
| 2. Abdomen with well-defined light markings | 3 |
| Abdomen at the most with markings that are ill-defined or nubilous | 38 |
| 3. Basal area of propodeum more or less rugulose | 4 |
| Basal area of either finely tessellate or rugulose on only a small part of the surface | 11 |
| 4. Face with light markings | 5 |
| Face and thorax entirely dark; an interrupted yellow band on tergites 1 to 3, or 4 | |
| | <i>vandykei</i> , n. sp. |
| 5. Basal area densely rugulose all over | 6 |
| Basal area variably and finely rugulose or striate on basal half; mesonotum polished, with sparse minute punctures; yellow bands of abdomen broad, with posterior emarginations on each side appearing as oval dark marks | <i>malacothricis</i> , n. sp. |
| 6. Larger species, about 7 to 8.5 mm. long; mesonotum black, with extremely short, fine appressed pubescence | 7 |
| Smaller, about 5 to 6 mm. long; mesonotum usually dark green, with moderately long, erect, fine hair | 9 |
| 7. Mesoscutum finely and densely punctured | 8 |
| Mesoscutum polished, the punctures on the disk minute and widely spaced; face marks restricted to small lateral marks | <i>aureovittata stenoazona</i> , n. subsp. |
| 8. Clypeus yellow, with two black stripes on disk, or broadly black in middle with a large yellow spot on each side; bands of abdomen very broad and orange yellow | |
| | <i>aureovittata aureovittata</i> Cockerell |

- Face marks pale yellow, or sometimes whitish, restricted to small marks on clypeus and at sides of face, or the clypeus sometimes entirely dark; abdominal bands chrome yellow
aureovittata maderensis, n. subsp.
9. Mesoscutum sparsely punctured on the disk10
Mesoscutum closely and finely punctured; dark olive green, the mesonotum sometimes a little brassy; face sometimes entirely dark, but usually with a narrow, more or less broken, yellowish-white band on anterior border, including small lateral marks
layiae excisa, n. subsp.
10. Posterior half of mesoscutum and the scutellum black, or bluish-black; face marks almost entirely restricted to an irregular band across the clypeus.....*layiae layiae* Cockerell
Mesonotum dark green, or a little brassy; clypeus, almost completely, and small lateral marks yellowish-white*layiae basalicola* Cockerell
11. Mesonotum green (the posterior disk of scutum and scutellum somewhat blackish in *duplontata*, *cowaniae*, *molina*, and *sculleni*)12
Mesoscutum, except anterior border, and the scutellum, black and usually more or less polished, at least on the disk24
12. Mesoscutum tessellate and more or less dull13
Mesonotum more or less polished, at least on disk of mesoscutum18
13. Tubercles dark; facial foveae linear, little impressed; clypeus not sharply dentate on each side of labrum14
Tubercles pale yellow; head much broader than long, the clypeus dentate in each side of labrum and facial foveae well impressed; face marks pale yellow, the lateral marks oblique or triangular, reaching level of antennae, the clypeus with a transverse mark on each side and a small one in middle, or these spots sometimes much reduced
nevadensis molina, n. subsp.
14. Pygidium broader, less acute at apex, and less convex on the disk of apical part; head generally only moderately broader than long15
Pygidium moderately narrow, acute at apex, the convex apical part but little recurved; head distinctly broader than long, the clypeus strongly but obtusely produced on each side of labrum; face with four creamy white spots, which are usually small; abdominal bands whitish and broadly interrupted*quadrisignata*, n. sp.
15. Abdominal markings less broadly interrupted, the marks on tergite 2 separated by less than their own transverse width16
Abdominal markings more yellowish and broadly interrupted, the marks on tergite 2 more or less small and lateral; face marks pale yellow, the clypeus broadly black in middle, sometimes nearly all black, the lateral marks sometimes broken or reduced to small spots at anterior corners of face*micheneri micheneri*, n. subsp.
16. Abdominal bands narrow, always well interrupted, never appearing emarginate behind on each side17
Abdominal bands broad, narrowly interrupted, or some of them entire, and broadly emarginate behind on each side; clypeus creamy white, the two blackish stripes on disk more or less evanescent*interrupta kernensis*, n. subsp.
17. Mesonotum more or less tessellate but usually shiny on middle of disk; disk of clypeus with two dark stripes, which rarely become confluent to form a large black mark
interrupta interrupta Cresson
Mesonotum more strongly and uniformly tessellate and dull; black mark on disk of clypeus usually involving the lateral dots; abdominal bands a little more broadly interrupted and that on tergite 5 reduced or absent*interrupta vernalis*, n. subsp.
18. Markings on tergite 2 restricted to a straight and interrupted basal band; bands on next two segments curved backward and more or less narrowed at outer ends, where they barely attain the lateral margins17
Band on tergite 2 bent backward at outer ends, or the segment with a discrete subapical spot on the lateral margins20

19. Face and abdominal markings yellow, the bands of abdomen generally broad and narrowly interrupted; clypeus with the two dark stripes more or less confluent, forming a broad dark area on disk; pygidium narrow, acute at apex, the apical part recurved and convex on the disk *robustula*, n. sp.
 Markings more whitish; abdominal bands narrow, broadly interrupted, generally restricted to tergites 2 to 4, that on tergite 2 sometimes reduced to two widely separated spots *cowaniae*, n. sp.
20. Tubercles dark 21
 Tubercles yellowish-white 23
21. Clypeus obtusely produced on each side of labrum; facial foveae narrow and moderately impressed 22
 Head moderately broader than long, the clypeus acutely dentate on each side of labrum, and facial foveae broader and more strongly impressed than usual; face marks creamy white, the clypeus entirely black or with a narrow oblique mark on each side of the upper margin, the lateral marks transverse or produced upward on orbits to level of antennae *bohartorum*, n. sp.
22. Face marks creamy white, the clypeus with two dark stripes, which are sometimes confluent, the lateral marks transverse, or transversely triangular; mesonotum polished, with very fine sparse punctures; abdominal bands moderately interrupted, those on tergites 4 and 5 broad, and that on tergite 2 abruptly bent backward at outer ends; wings slightly dusky, the nervures testaceous *nitens*, n. sp.
 Similar, but mesonotum moderately closely punctured; abdominal bands more widely interrupted, those on tergites 4 and 5 not much broadened, and that on tergite 2 represented by basal marks that are separated by less than their transverse width, and by a discrete subapical spot on lateral margins; wings whitish, the nervures pale testaceous; pygidium with a narrow, recurved, and acute apical part *duplonotata*, n. sp.
23. Mesonotum polished, or faintly tessellate, and with fine sparse punctures; dark green, the disk of mesonotum slightly blackish; clypeus, except two dark stripes, triangular lateral marks reaching level of antennae and a supraclypeal mark, creamy white; abdominal bands rather narrowly interrupted, curved backward and a little widened at outer ends; wings slightly dusky hyaline; pygidium narrow and acute, with a short apical part that is a little convex and recurved *sculleni sculleni*, n. subsp.
 Similar, but markings more yellow and mesonotum without a blackish tinge on disk; subantennal as well as supraclypeal marks frequently present, although they may be evanescent; wings whitish hyaline, the nervures pale testaceous, subcosta a little brownish *sculleni segona*, n. subsp.
24. Mesoscutum closely punctured 25
 Mesoscutum polished and with minute, more or less sparse punctures 29
25. Mesonotum tessellate and dullish, except on middle of disk of scutum and on scutellum, the punctures comparatively dense 26
 Mesonotum more shining, the punctures moderately close 27
26. Abdomen brownish, darker toward apex, with an interrupted, creamy white band on tergites 2 to 4; clypeus black, an oblique mark on each side of disk, and transverse lateral marks, creamy white; mesonotum with fine close punctures, and short, erect, whitish pubescence *macrostoma* Cockerell
 Abdomen more or less ferruginous, but tergite 1, except apical margin, and a band across middle of tergites 2 to 4, fuscous; light area at base of tergites 2 to 4 slightly tinged with yellow, forming bands that are nubilous and hardly differentiated from the pale ground color *bilobata*, n. sp.
27. Abdominal markings in the form of interrupted bands; apex of abdomen and the venter more or less ferruginous 28
 Abdominal markings reduced to small lateral marks on tergites 2 to 4, those on tergite 3, and sometimes 4, curved and oblique; mesonotum shining, very finely punctured, the anterior border of scutum tessellate and dullish *fallugiae*, n. sp.

28. Mesoscutum somewhat dullish around margins, the punctures coarser than usual, rather close, but becoming sparser on middle of disk; band on tergites 3 and 4 bent backward at outer ends and that on tergite 2 usually separated from a subapical spot on lateral margins; clypeal process on each side of labrum as long as wide and obtuse at apex
leucostoma, n. sp.
Mesonotum polished and shining, and with fine, moderately close punctures; clypeal processes shorter and broader than in *leucostoma* and the pygidium sharply acute and recurved at apex; thorax dark green, the disk of mesoscutum and the scutellum only slightly blackish
duplonotata, n. sp.
29. Abdominal bands narrowly interrupted medially, or sometimes entire. 30
Abdominal bands more broadly interrupted, or reduced to lateral marks. 33
30. Face marks creamy white, confined to clypeus and lateral marks, or more rarely with small supraclypeal and subantennal marks. 31
Face bright yellow below level of antennae, or the yellow extends a short distance above antennae almost without interruption across the face; abdominal bands narrowly interrupted, or broad and entire. *eriogoni* Cockerell
31. Face marks restricted to the clypeus and lateral marks; bands on tergites 2 to 4 rather narrow, that on tergite 2 basal, or narrowly joined to a small subapical mark on lateral margins; clypeus with a narrow dentiform process on each side of labrum. 32
Face usually with a supraclypeal mark, or two spots, and sometimes with subantennal spots; bands on tergites 2 to 5, narrowly interrupted, those on tergites 2 to 4 strongly bent backward at outer ends; clypeus with a rather short blunt process on each side of labrum; wings dusky hyaline *distropica*, n. sp.
32. Abdomen dark, with narrowly interrupted yellowish bands on tergites 2 to 4, not quite reaching the lateral margins, that on tergite 2 straight and basal, the others bent backward at outer ends; wings dusky hyaline. *santaclarensis*, n. sp.
Abdomen ferruginous brown, becoming dusky on tergite 1, with pale-yellow bands on tergites 2 to 5, those on tergites 2 to 4 broadly confluent with subapical mark on lateral margins, and that on tergite 5 very broad and entire; wings whitish hyaline. . . . *coalingensis*, n. sp.
33. Thorax entirely dark 34
Tubercles at least tipped with white, and sometimes the disk of pronotum marked. 36
34. Mesoscutum with moderately sparse punctures; clypeus obtusely produced on each side of labrum; wings whitish hyaline 35
Mesonotum, except anterior border of the scutum, polished black, with remote fine punctures; clypeal process on each side of labrum narrow and almost acute; tergites 2 to 4 each with a broadly interrupted, yellowish-white band, the marks broad at outer end and pointed within *fieldi*, n. sp.
35. Mesonotum, except anterior third of scutum, black; bands of abdomen narrow and moderately widely interrupted, those on tergites 3 and 4 bent backward at outer ends and that on tergite 2 discrete from a small subapical spot on lateral margins. . . *mohavensis*, n. sp.
Mesonotum dark green, somewhat tinged with black on scutellum and middle of scutum; bands of abdomen pale yellow, broadly interrupted medially, that on tergite 2 without a supplementary subapical mark on lateral margins. *cowanae*, n. sp.
36. Scape of antennae and pronotum, except tubercles, entirely dark; clypeus acutely dentate on each side of labrum 37
Clypeus, large, triangular lateral marks reaching slightly above antennae, supraclypeal mark, scape of antennae beneath, interrupted band on hind margin of disk of pronotum, tubercles, anterior side of front and middle trochanters and tibiae, and large mark at apex of front and middle femora pale yellow; abdomen ferruginous, or yellow stained with ferruginous at the apex and beneath, becoming fuscous on disk of tergites 1 to 3, or 4, and with a narrow, interrupted, pale-yellow band at base of tergites 2 and 3
argemones, n. sp.
37. Clypeus, except two dark stripes on disk, and large triangular lateral marks pale yellow; tergites 2 to 4 with yellow lateral marks, those on tergites 3 and 4 broad at outer ends and pointed mesad, and those on tergite 2 similar but more slender or broken
nevadensis nevadensis Cockerell

- Similar to *nevadensis* but disk of mesonotum less blackened; clypeus black, but upper margin of the lateral extension of clypeus and lateral marks, pale yellow; abdominal markings similar, with those on tergites 2 and 3 generally well developed, but that on tergite 4 more or less evanescent. *nevadensis culbertsoni*, n. subsp.
38. Mesoscutum moderately closely or sparsely punctured. 39
 Mesoscutum more or less strongly, closely, or densely punctured 40
39. Mesonotum black, except on anterior border of scutum, and with minute sparse punctures; abdomen dark; clypeus, except two dark stripes on disk, and small lateral marks creamy white *montereyensis*, n. sp.
 Thorax dark green; the posterior middle of mesoscutum and the scutellum black; abdomen ferruginous, suffused with yellowish across the base of tergites 2 to 4; clypeus, except two brown stripes on disk, and rather small lateral marks creamy white; mesonotum polished, and with fine, moderately close punctures *mormonica*, n. sp.
40. Punctures of mesoscutum not coarse and striately lengthened on anterior border. 41
 Punctures of mesoscutum a little coarser than usual, striately lengthened on anterior border and becoming well separated on middle of disk; thorax dark blue, the mesoscutum except anterior border, scutellum, and metanotum black; abdomen ferruginous. *arizonica*, n. sp.
41. Pubescence of mesonotum very short, fine, and depressed. 42
 Pubescence of mesonotum longer, denser, and erect. 43
42. Head and thorax dark green; the mesoscutum except anterior border, scutellum, and metanotum black; mesoscutum with fine, very close punctures; abdomen dark ferruginous, more or less fuscous toward base; wings dusky hyaline. *calochorti*, n. sp.
 Head and thorax similar, but nearly anterior half of mesoscutum tessellate and dullish, the punctures less dense and becoming faint on anterior border; abdomen light ferruginous becoming fuscous at the base, wings whitish hyaline. *bispinata*, n. sp.
43. Larger species, about 6.5 to 7.5 mm. long; abdomen ferruginous, or more or less clouded with fuscous, and usually with little indication of lighter bands or markings. 44
 About 5.5 to 6 mm. long; abdomen ferruginous, banded with fuscous and ferruginous yellow, the latter color at base of tergites 2 to 4, but the bands not sharply defined. *bilobata*, n. sp.
44. Dark green or blue-green; the posterior disk of scutum and the scutellum black; mesoscutum closely punctured, the punctures about two to four or five times their own diameter apart on posterior part of disk; abdomen dark ferruginous, or more or less infuscated, sometimes with narrow, obscure, yellowish bands at base of tergites. *californica* (Cresson)
 Very similar to *californica*, but more densely punctured, the punctures on posterior part of mesoscutum not much more than two puncture-widths apart, except in a small area in middle *tularensis*, n. sp.
45. Tergite 7 with a narrowly triangular median lobe, which is more or less pygidiform, with a grooved keel beneath, or becoming a slender process, extending straight backward or bent downward between the lateral lobes 46
 Tergite 7 with two more or less laminate, apical lobes, which may be horizontal, oblique, or more or less vertical, and usually offset by lateral emarginations; these lobes in one species, taking the form of vertical opposed plates, which slightly diverge, or replaced by a strongly recurved and grooved median lobe. 6
46. Basal area of propodeum more or less uniformly rugulose, the sculpture coarser than that of other parts of body; tergites 1 to 6 with a light band, strongly emarginate, or sometimes interrupted, on each side behind, and sometimes interrupted medially on basal segments 47
 Basal area of propodeum tessellate, the sculpture not obviously coarser than that of the frons or other parts of the body; abdomen with pale yellow bands, usually interrupted medially, and sometimes much reduced, evanescent, or absent. 5
47. Face with more or less extensive light markings. 48
 Face dark, with at most a very small yellowish spot on orbits near anterior end of eyes; abdomen with yellow bands that are often divided with four spots; head and thorax with rather abundant erect pubescence *vandykei*, n. sp.

48. Face not nearly all light below level of antennae.....49
 Mandibles, except tips, labrum, and nearly all of face below level of antennae creamy white; abdominal bands creamy white, with a large oval emargination, or interruption, on each side, and those on tergites 1 to 2, or 3, sometimes with a discrete supplementary band across the middle subapically *malacothricis*, n. sp.
49. Larger species, about 6 to 8 mm. long; head and thorax dark green, or blue-green; the disk of mesoscutum and the scutellum black.....50
 Smaller species; mesonotum uniformly dark green or blue-green.....53
50. Mesoscutum more or less closely and minutely punctured; abdominal bands yellow and entire; pubescence of mesonotum very short, fine, and depressed.....51
 Head blue, the thorax blue-green; mesoscutum polished, with very fine sparse punctures, and a comparatively long erect pubescence; abdominal bands creamy white, more or less interrupted, or strongly emarginate, on each side..... *transversa*, n. sp.
51. Punctures of mesoscutum uniformly, or nearly uniformly, close.....52
 Punctures of mesoscutum close on the green anterior border and rather sparse on the black disk; clypeus and lateral marks, not extending above level of summit of clypeus, yellow; abdominal bands moderately narrow and emarginate behind on each side
aureovittata stenozona, n. subsp.
52. Face marks bright yellow, the lateral marks generally large and sometimes reaching level of antennae, and a small supraclypeal mark often present; abdominal bands broad and orange-yellow, with a broad emargination behind on each side
aureovittata aureovittata Cockerell
 Face marks pale yellow, the lateral marks transverse and emarginate above, the supraclypeal area and narrow dorsal margin of disk of clypeus black; abdominal bands yellow and comparatively narrow *aureovittata maderensis*, n. subsp.
53. Mesoscutum with very fine, sparse, and rather indistinct punctures.....54
 Mesoscutum dullish on anterior border, but shining on the disk, and with distinct moderately close punctures; abdominal bands pale yellow, emarginate behind on each side, or sometimes interrupted on the middle segments..... *layiae excisa*, n. subsp.
54. Mesoscutum dullish anteriorly, more shining on the disk, and with rather sparse punctures; abdominal bands yellowish-white, interrupted medially on tergites 1 to 3, and emarginate or interrupted on each side, but those on tergites 5 and 6 tending to be entire; head and thorax with abundant, rather long erect hair..... *layiae layiae* Cockerell
 Similar to *layiae*, but abdominal bands sometimes broader and entire, although emarginate behind on each side; head and thorax with shorter and thinner hair
layiae basalicola Cockerell
55. Median lobe of tergite 7 slender, more or less grooved on outer margin or bifid at apex... 56
 Median lobe of tergite 7 distinctly triangular and pygidiform, with a broad ventral keel... 58
56. Median lobe of tergite 7 not expanded beneath, but inflexed or bent downward between the large and well-separated lateral lobes.....57
 Median lobe of tergite 7 extending straight backward between the lateral lobes and with a broad rounded expansion beneath as seen from the side; head and thorax dark green; the disk of mesonotum polished black and sparsely punctured; abdomen sometimes entirely dark, or with a pale-yellow spot on each side of tergites 2 and 3..... *fieldi*, n. sp.
7. Abdomen blackish, with a narrow, yellowish-white band on tergites 2 to 5; head and thorax blue, or blue-green; the face below antennae white; median lobe of tergite 7 moderately inflexed, very narrow and bifid at apex..... *mucronata*, n. sp.
 Abdomen ferruginous, without markings; head and thorax dark blue-green, the face below antennae pale yellow; median lobe of tergite 7 somewhat blunt and bifid at apex, and much inflexed *inflexa*, n. sp.
58. Mesonotum more or less tessellate and dull or dullish.....59
 Mesonotum polished, the disk sparsely punctured; head and thorax dark green or blue-green, the face marks yellowish-white, including large subantennal and supraclypeal marks; abdomen with an interrupted, pale-yellow or whitish band on tergites 2 to 5, or 6
nitens, n. sp.

59. Abdomen usually with the bands rather narrowly interrupted; basal area of propodeum generally more granular-tessellate than usual, or finely wrinkled; keel of median lobe of tergite 7 not produced beneath beyond apex of dorsal part; face with erect white hair, which is denser than usual.60
- Slightly smaller species, usually about 4 to 4.5 mm. long; abdominal bands usually reduced to lateral marks; basal area of propodeum generally not more granular-tessellate than usual; keel of median lobe of tergite 7 strongly emarginate at apex as seen from the side, with its apex produced beyond the dorsal part; face with comparatively thin white hair62
60. Abdominal bands never entire on one or more segments and sometimes reduced to lateral marks61
- Abdominal bands interrupted on tergites 2 to 4, entire, or almost entire, on tergite 5, or tergites 5 and 6, and those on 5 and 6, or 4 and 5, strongly emarginate behind and bowed on each side; mesoscutum rather weakly tessellate and moderately closely punctured
interrupta kernensis, n. subsp.
61. Abdomen generally with an interrupted band on tergites 2 to 5, that is bent backward and widened on outer ends, and with lateral marks on tergites 1 and 6; scape of antennae usually entirely dark, but sometimes white beneath; mesoscutum usually strongly tessellate and rather sparsely punctured*interrupta interrupta* Cresson
- Abdominal bands mainly restricted to a small mark on lateral margins of tergites 2 to 5, but tergites 2 and 3 have each a basal transverse streak, which is mostly well separated from the lateral marks; mesoscutum more strongly tessellate and duller
interrupta vernalis, n. subsp.
62. Face marks restricted to the clypeus and lateral marks, and scape of antennae always dark; tergites 2 to 5 each with a small yellow mark on lateral margins, those on tergites 2 and 3 often confluent with a transverse basal line, which forms a spur directed mesad
micheneri micheneri, n. subsp.
- Face almost entirely yellowish-white below level of antennae; yellow lateral marks of abdomen with a well-developed inner spur on tergites 2 to 4 and traces of a spur on tergite 5; mesoscutum more weakly tessellate than in *micheneri*, moderately shining, and with sparse fine punctures*micheneri rhizophila*, n. subsp.
63. Median lobe of tergite 7 either curved downward and strongly grooved, or split apically into two thin, opposed, and diverging plates64
- Tergite 7 with two apical lobes, which may be nearly horizontal, oblique, or almost vertical in respect to the dorsal surface of the segment.65
64. Median lobe of tergite 7 triangular, reflexed, and broadly grooved; head and thorax dark blue-green, the disk of mesonotum black, and face nearly all yellow below level of antennae*calochorti*, n. sp.
- Tergite 7 deeply emarginate on each side, with apical half of the median lobe split into two opposed and diverging plates; dark blue-green, the face and abdominal markings creamy white*leucostoma*, n. sp.
65. Apical lobes of tergite 7 nearly vertical and appear as more or less linear structures when viewed from above; abdomen without light markings.66
- Apical lobes of tergite 7 more or less horizontal or conforming more or less closely with the transverse curvature of the segment, or if more vertical and narrow as seen from above, the abdomen with distinct light markings.68
66. Apical lobes of tergite 7 comparatively short and oval when viewed from the side, with the inferior margin rounded and the base about level with the angulation on an outer margin of the segment.67
- Apical lobes of tergite 7 longer and more narrowed toward apex, with the inferior margin nearly straight and the base somewhat beyond the angulation on outer margin of the segment; mesoscutum tessellate but rather shiny and with rather close fine punctures, abdomen varying from blackish to almost entirely ferruginous.*californica* (Cresson)
67. Apical lobes less rounded beneath, sometimes nearly as in *californica*, but shorter; mesoscutum dark green, less tessellate, and less closely punctured than in *californica*, the

- punctures rather sparse on middle of disk; wings just perceptibly dusky, without a whitish cast *montereyensis*, n. sp.
- Apical lobes strongly rounded beneath; mesoscutum dark blue-green, moderately shiny, minutely tessellate, and more closely punctured than in *californica*; wings and size as in *californica*; sagittae of the genitalia abruptly widened at apex..... *tularensis*, n. sp.
68. Apical lobes of tergite 7 not continuous laterally with the sides of the segment; middle coxae not spined69
- Tergite 7 ending in two broad lobes conforming to the curvature of the segment and continuous laterally with the side margins of the base; middle coxae armed with a slender spine beneath; abdomen ferruginous, without markings; face marks yellow
bispinata, n. sp.
69. Abdomen ferruginous, or partly clouded with fuscous, the light markings absent or ill-defined70
- Abdomen dark, or partly ferruginous, and with distinct light markings.....73
70. Mesoscutum tessellate, dullish, and closely punctured71
- Mesoscutum shining on the disk, with punctures, at most, moderately close.....72
71. Tergite 7 deeply emarginate on each side, the apex broadly bilobate, the lobes about one-half as wide as the notch between them; abdomen with an ill-defined, or nubilous, yellowish band at base of tergites 2 and 3; face marks yellowish-white.....*macrostoma* Cockerell
- Similar, but abdomen clear ferruginous, without trace of yellowish bands; face marks more yellowish; apical lobes of tergite 7 somewhat less than half as wide as the notch between them*bilobata*, n. sp.
72. Face nearly all creamy white below level of antennae; abdomen dark ferruginous, the tergites very finely but distinctly punctured; median lobe of tergite 7 angulate on each side and apically bilobate*arizonica*, n. sp.
- Face yellow below level of antennae, the lateral marks sending a broad spur above the antennae; abdomen ferruginous, or more or less yellowish-ferruginous, the first tergite with a fuscous or black patch on each side; pronotum and legs marked with yellow; median lobe of tergite 7 short and strongly angulate close to the base of the two apical lobes*argemones*, n. sp.
73. Tergite 7 more or less broadly or deeply emarginate on each side of a bilobate median lobe.75
- Tergite 7 angulate on each side of the broad apex, which bears two nearly horizontal lobes 79
74. Apical lobes of tergite 7 broad, nearly horizontal, or obliquely inclined.....75
- Apical lobes more or less oblique or vertical, and set off by an angulation or blunt lobe on each side77
75. Face marks white76
- Face marks yellow, covering most of area below antennae; abdomen dark, or more or less ferruginous, with a yellow band, often entire, at base of tergites 2 to 4; apical lobes of tergite 7 subequal in width to the notch between them.....*robustula*, n. sp.
76. Abdomen dark, with an interrupted whitish band at base of tergites 2 and 5, and a transverse subapical mark on each side of tergites 2 to 6, these two sets of marks sometimes confluent on some of the segments on each side; apical lobes of tergite 7 broader than the shallow notch between them.....*mohavensis*, n. sp.
- Similar, but only tergites 2 and 3 with a broadly interrupted basal band, the two sets of markings not confluent; apical lobes of tergite 7 more inclined and nearly as broad as the rounded notch between them.....*duplonotata*, n. sp.
77. Median lobe of tergite 7 short, with two diverging lobes, and set off on each side by a bluntly rounded lobe78
- Median lobe of tergite 7 much exceeding the small acute lobe on each side, and shallowly bilobate at apex as seen from above, but with vertical side walls; clypeus and lateral face marks white; abdomen with transverse subapical marks on each side of tergites 2 to 6, and a broadly interrupted basal band on tergites 2 and 3 (or tergite 2 only), sometimes confluent with the subapico-lateral marks*fallugiae*, n. sp.
78. Face nearly all white below level of antennae; abdomen with narrowly interrupted, pale-yellow band, sometimes bent backward and enlarged at outer ends, or with discrete

- subapico-lateral spots, on tergites 2 to 4; apical lobes of tergite 7 much inclined, appearing rather broad and blunt in dorsal view, but much narrower than the broad, rounded notch between them *distropica*, n. sp.
- Supraclypeal and subantennal marks more or less small, or evanescent; abdomen with a transverse subapical mark on each side of tergites 2 to 6 and a broadly interrupted basal band on tergites 2 and 3 (or tergites 2 to 4); apical lobes of tergite 7 vertical and narrow as seen from above, and set off on each side of the segment by a broadly rounded lobe *cowaniae*, n. sp.
79. Apical lobes of tergite 7 about as wide as the notch between them, or broader than the notch 80
- Apical lobes of tergite 7 not as wide as the notch between them 82
80. Apical lobes of tergite 7 not much if any broader than the notch between them, and somewhat narrowed to the rounded apex 81
- Apical lobes of tergite 7 distinctly broader than the notch between them, about as broad as long, with the outer corners broadly rounded off; dark green, the disk of mesoscutum black and shining; face nearly all yellowish-white below level of antennae; abdomen with a small yellow spot on lateral margins of tergites 1 to 4, or 5, and sometimes a transverse line on each side of base of tergites 2 and 3. *nevadensis nevadensis* Cockerell
81. Apical lobes of tergite 7 almost as broad as the notch between them, and mesoscutum typically without a black suffusion and sometimes more distinctly tessellate than in *nevadensis*; face and abdominal markings similar to *nevadensis*, or the subapico-lateral marks on tergites 2 and 3 sometimes confluent with the transverse basal marks
nevadensis culbertsoni, n. subsp.
- Like *culbertsoni*, but the mesoscutum more strongly tessellate; face and abdominal markings brighter yellow, and the markings on tergites 2 and 3 less broadly interrupted
nevadensis molina, n. subsp.
82. Face marks white, or yellowish-white. 83
- Face entirely bright yellow below level of antennae, the yellow extending a short distance above antennae except for small interruptions; legs yellow with dark markings; abdomen with an interrupted yellow band on tergites 2 to 6. *eriogoni* Cockerell
83. Tubercles white, and face all, or nearly all, yellowish-white below level of antennae. 84
- Tubercles dark, or only slightly tipped with white; lateral marks of face triangular, with the green of frons intruding between them and subantennal mark on each side; interrupted yellowish bands at base of tergites 2 and 3 (or 2 to 5) not confluent with the subapico-lateral marks except sometimes on tergites 2 and 3. *bohartorum*, n. sp.
84. Head and thorax dark bluish-green, the disk of mesonotum and scutellum often somewhat blackish; abdomen with yellowish bands on tergites 2 to 6, rather narrowly interrupted medially and confluent on sides with the subapico-lateral marks, which are present also on tergite 1; wings slightly dusky *sculleni sculleni*, n. subsp.
- Similar to *sculleni*, but mesonotum not at all blackish and the abdominal markings much less developed, sometimes with the broadly interrupted and narrow basal bands on tergites 2 to 4 (or 5) well separated from the subapico-lateral marks; wings somewhat whitish hyaline
sculleni segona, n. subsp.

INTERRUPTA GROUP

As mentioned above, the species of *Pygoperdita* may be divided into two main groups based on the structure of the apical tergite of the male. In the *interrupta* group the median lobe of this segment is triangular, with a broad vertical keel beneath, which is sulcate on its inferior margin. In two species this median lobe becomes slender, mucronate, and more or less inflexed. Four species of this group have been found visiting *Eschscholtzia*, one at flowers of *Rhamnus* and one at flowers of *Adenostoma*. Five species of this group, however, collect pollen from Compositae and are remarkable for having the basal area of propodeum of both

sexes finely rugose, this sculpture although fine in itself being more or less distinctly coarser and rougher than the sculpture of other parts of the body. The discussion of the species begins with this peculiar subgroup, the members of which appear to be actively undergoing evolution and as yet not too well distinguished from each other. The material at hand is much too meager to work out all relationships, and with further collecting probably other local forms will be brought to light. In fundamental structure, including the genitalia, the forms depart but little from the mode, but vary in size, sculpture, pubescence, and color markings.

Perdita aureovittata aureovittata Cockerell

(Figs. 221, 222, 311, 337)

Perdita aureovittata Cockerell, 1916, *Canad. Entom.*, 48:391, ♀.

The type locality of *aureovittata* is Claremont, Los Angeles County, California, where it was collected by C. F. Baker. On several visits to Pomona College, I was unable to find the type of *aureovittata*, and it may be lost, but Cockerell's description conforms closely to the species here treated. The species is now divided into three races and it is possible that the type, or material from the type locality, may be somewhat intermediate between the two more southern races.

Female.—Agreeing with Cockerell's description of *aureovittata*, except that the clypeus is yellow, with two short black stripes on disk, usually broad enough to involve the usual dark dots and often confluent at the summit, but falling short of the anterior margin; occasionally a small, supraclypeal mark present. According to Cockerell the type has the clypeus dark, with a large, pale-yellow spot on each side, and no supraclypeal mark. Abdominal bands orange-yellow and involving most of the dorsal surface of abdomen except base of tergite 1, all emarginate behind on each side, hardly notched medially in front except sometimes on tergite 2, and those on tergites 3 to 5 notched or narrowed in front at each end.

Head somewhat broader than long. Facial foveae extending from lower level of antennal sockets nearly to level of anterior ocellus. Mesoscutum shining and with fine, almost dense punctures and a very short fine pubescence. Basal area of propodeum finely rugose, the sculpture much coarser than usual in *Perdita*. Length, 8–8.5 mm.; anterior wing, 5–5.2 mm.

Male.—Head and thorax dark blue-green, the disk of mesoscutum and the scutellum black. Mandibles, except reddish tips, labrum, clypeus, transverse or subtriangular lateral marks, and often a small irregular supraclypeal spot pale yellow. Usual dots of clypeus close to upper border and the summit of disk sometimes narrowly margined with black. Antennae and legs dark, the flagellum dull yellowish beneath except more or less at each end, and a spot on front knees yellow. Abdomen blackish, with a broad orange-yellow band on tergites 1 to 6, each notched in front in middle and broadly emarginate behind on each side. Tergite 7 rufotestaceous. Tegulae testaceous on outer margin, yellow within, and brown at base. Wings dusky hyaline, the nervures ferruginous brown, the subcosta blackish.

Head somewhat broader than long, the inner orbits a little diverging anteriorly. Facial foveae several times longer than wide and usually widened at upper end. Mandibles stout, with a strong inner tooth. Marginal cell more obliquely truncate at apex than usual. Second recurrent and subdiscoidal nervures usually faint. Tergite 7 strongly emarginate on each side, the median lobe triangular, rather blunt and retuse at apex, the keel with a truncate, furrowed apex and divided on inferior margin into two laminate plates which diverge basad. Head and thorax moderately shining, the frons and vertex minutely tessellate, the face nearly to level of ocelli with close fine punctures. Thorax moderately tessellate and dullish, except disk of mesoscutum and the scutellum which are polished, and the whole mesonotum with very fine and close punctures. Basal area of propodeum large and finely rugose, the sculpture much coarser than elsewhere on head and thorax. Pubescence dull white, rather dense, but short and erect, that on the mesonotum forming a short fine down. Length, 6.5–8 mm.; anterior wing, 5–5.5 mm.

Twelve females, 28 males, Herkey Creek, San Jacinto Mts., on *Malacothrix californica*, var. *glabrata*, June 3, 1939 (Timberlake); 7 females, 13 males, Herkey Creek on *Layia*, May 22, 1939 (E. G. Linsley); 1 male, Herkey Creek, May 22, 1939 (B. Brookman); 1 male, Hemet Reservoir, on *Layia*, May 22, 1939 (Ray F. Smith); 1 male, Hemet Reservoir, May 22, 1939 (E. S. Ross); 15 males, Hemet Reservoir, June 3, 1939 (E. G. Linsley).

***Perdita aureovittata maderensis*, n. subsp.**

Female.—Structurally like typical *aureovittata*, the markings paler yellow, those of face sometimes whitish and those of abdomen not orange-yellow. Clypeus entirely black, or in three out of five specimens, with a yellowish mark on each side; the clypeal and lateral marks about equally small, the latter sometimes L-shaped. Abdominal bands clear yellow, broad, broadly emarginate behind on each side, notched or narrowed at outer ends on anterior margin and often notched in middle, especially on tergites 2 and 3. Antennae and legs dark, the flagellum dull yellow beneath. Tegulae testaceous, brown at base. Wings dusky hyaline, the nervures pale ferruginous brown, the subcosta blackish. Length, 6.5–7 mm.; anterior wing, 4.6–5.4 mm.

Male.—Like the male of *aureovittata*, with the abdominal bands a little narrower and less orange and that on tergite 6 broadly interrupted on each side. Upper margin of disk of clypeus sometimes more broadly black than usual. Flagellum yellowish beneath except on the first and the last three joints. Front knees and sometimes anterior side of front tibiae yellow. Length, 6–7 mm.; anterior wing, 4.5–4.9 mm.

One female (holotype), Madera Co., California, April 4, 1936 (G. E. and R. M. Bohart); 1 male (allotype), 4 females (paratypes), Cuyama, Santa Barbara Co., on a yellow composite (presumably *Malacothrix californica*), April 26, 1954 (L. D. Anderson); 2 males (paratypes), Bakersfield, Kern Co., March 30, 1949; and 1 male (paratype), 20 miles east of Bakersfield, March 28, 1953 (J. S. MacSwain).

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

***Perdita aureovittata stenozona*, n. subsp.**

Female.—Similar to *maderensis* but punctures of the face stronger and those of the mesoscutum sparse over a large part of the disk, although dense on the anterior third and narrowly around the remainder of the margin. Small spot on base of mandibles and small lateral marks pale yellow, the clypeus entirely black. Abdominal bands clear, bright yellow, a little narrower than in the other races, emarginate behind on each side, narrowed on anterior side at outer ends on tergites 3 to 6 and notched medially in front on tergites 2 and 3. Flagellum dull yellowish beneath except on first joint and apical half of the last.

Male.—Similar to the male of *maderensis*, but disk of mesoscutum more sparsely punctured, although not so sparsely as in the female. Face more strongly punctured than in the other races and the foveae rather distinct. Large mark on mandibles, labrum, clypeus, and transversely triangular lateral marks yellow. Abdominal bands rather narrow, that on tergite 6 either entire, or more or less broken. Length, about 7 mm.; anterior wing, 5 mm.

Three males, two females (holotype female, allotype, and paratypes), Pinnacles National Monument, San Benito Co., California, May 19, 1941, May 3, 1946 and April 24, 1948 (J. S. MacSwain).

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

***Perdita vandykei*, n. sp.**

This new species from Carmel is a close ally of *aureovittata*, but distinct in having the face of female dark, the abdominal bands narrow and interrupted medially, and the pubescence, including that of the mesonotum, long and erect. The male usually has small lateral face marks and abdominal bands that are often divided into four spots.

Female.—Dark olive green; the clypeus, disk of mesoscutum, and the scutellum black. Mandibles black at base and dark reddish on apical half. Face and thorax entirely dark. Abdomen dark, with a yellow band on tergites 1 to 5, each moderately wide, emarginate behind on each side, and interrupted in middle, or those on tergites 4 and 5 entire and notched medially in front. Antennae and legs dark, the flagellum yellowish beneath. Tegulae testaceous, becoming more opaque and brownish at base. Wings faintly dusky, the nervures brownish testaceous, subcosta blackish.

Head somewhat broader than long, the inner orbits parallel. Facial foveae narrow, slightly arcuate and reaching from level of lower margin of antennal sockets not quite to level of anterior ocellus. Frons and vertex minutely tessellate and dull; face below antennae more shining, with fine close punctures, but the punctures of frons very obscure. Thorax somewhat roughly tessellate and dull, except disk of mesoscutum and the scutellum, which are polished; mesonotum minutely and very sparsely punctured, the punctures becoming a little closer on anterior third of the scutum. Basal area of propodeum finely rugose as in *aureovittata*. Marginal cell slightly less acute at apex than in that species. Length, about 7 mm.; anterior wing, 5-5.4 mm.

Male.—Dark blue-green; the disk of mesoscutum and the scutellum black. Base of mandibles, labrum, and clypeus black, the apical half of mandibles red. Small marks at anterior corners of face pale yellow, also sometimes a small spot at base of mandibles and in two paratypes a more or less interrupted, pale-yellow band across anterior part of the clypeal disk. Antennae and legs blackish and entirely dark. Abdomen blackish, with a narrow yellow band on tergites 1 to 6, each broken into four marks by median and sublateral interruptions, except that the median interruption is lacking on tergites 5 and 6, and sometimes on 4, and generally the marks on tergite 1, especially the submedian ones, tend to be small or absent. Tegulae and wings as in female.

Head distinctly broader than long, the inner orbits parallel. Facial foveae very faint. Sculpture and pubescence as in female. Tergite 7 and aedeagus virtually the same as in *aureovittata*. Length, 6-6.5 mm.; anterior wing, 4.8-5 mm.

Eight males, 10 females (holotype female, allotype and paratypes), Carmel, Monterey Co., California, May 19, 1913 (E. C. Van Dyke); and 1 male, 1 female (paratypes), Point Lobos, Monterey Co., on dandelion, June 18, 1938 (Isabelle McCracken).

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

Perdita transversa, n. sp.

(Fig. 312)

P. transversa is closely allied to *vandykei*, but its male differs in having a broad, transverse white band across the anterior border of the face.

Male.—Head dark blue; the under parts of thorax, the metanotum, and propodeum blue-green, the mesoscutum and scutellum black, with anterior border of scutum green. Mandibles, except apical third and inner margin, clypeus and large lateral marks and a vestigial supra-clypeal mark, creamy white. White of mandibles grading into testaceous, and the latter into red at apex. Labrum, antennae, most of prothorax, and legs blackish. Abdomen blackish, with a white band on tergites 1 to 6, each band emarginate behind or interrupted on each side, those on tergites 1 to 3 interrupted medially, but that on tergite 3 is the only one that is completely divided into four spots. Tergite 7 testaceous. Tegulae testaceous, becoming darker at base. Wings dusky hyaline, with a brownish tinge, the nervures brown, subcosta blackish.

Head somewhat broader than long, the inner orbits nearly parallel. Facial foveae about three to four times longer than wide. Mandibles stout, with a distinct inner tooth. Head and thorax shining, with mesopleura and propodeum dull. Frons faintly tessellate and with strong close punctures, which spread more sparsely onto face below antennae. Mesonotum with fine, sparse punctures of two sizes, which become widely separated on middle of the disk. Basal area of propodeum finely rugose. Pubescence whitish, fine, long, and erect as in *vandykei*. Tergite 7

and aedeagus nearly as in *vandykei*, but apex of the median lobe of the tergite with a distinct notch, visible in dorsal view. Length, about 6.5 mm.; anterior wing, 4.5 mm.

One male (holotype), Dead Indian Road, 12-15 miles east of Ashland, Jackson Co., Oregon, 4,500-4,900 feet, July 17, 1930 (H. A. Scullen), in collection of the Citrus Experiment Station, Riverside.

Perdita layiae layiae Cockerell

(Figs. 223, 224, 313, 338)

Perdita layiae Cockerell, 1938, Ann. Mag. Nat. Hist. (11)2:152, ♀, ♂.

At the time *layiae* was described, both Dr. Cockerell and I considered it distinct from *P. excisa*, then a manuscript species known from Claremont. Since that time, the discovery of *P. layiae basalicola* Cockerell and the collection of additional specimens of *excisa* make it certain that all three forms are local variations of one species.

Female.—Dark blue; the posterior half of mesoscutum and the scutellum black. Face marks white, restricted almost entirely to an irregular band across the clypeus. Tergites 1 to 5 each with a broad yellowish-white band, emarginate behind on each side and usually narrowly interrupted medially on the first three segments. Head somewhat broader than long. Head and thorax shining, the frons tessellate, with moderately close punctures, but the black part of disk polished and sparsely punctured. Length, about 6 mm.; anterior wing, 4.5 mm.

Male.—Dark blue; the mandibles, except tips, labrum, and broad band across anterior border of face white. The more or less interrupted or emarginate bands on tergites 1 to 6, white, divided into four spots on tergite 3 and sometimes on tergites 1 to 3. Face, including frons, tessellate and rather faintly punctured. Mesoscutum moderately sparsely punctured, nearly polished on disk and more tessellate anteriorly. *Layiae* differs from *transversa* in smaller size, bluish mesonotum, which is more closely punctured and less shining, and in the acute median lobe of tergite 7. Length, about 5 mm.; anterior wing, 3.9 mm.

Two males, 3 females, San Miguel Island, California, on *Layia platyglossa*, May 4-8, 1938 (T. D. A. and W. P. Cockerell), type and cotypes.

Perdita layiae basalicola Cockerell

Perdita layiae basalicola Cockerell, 1941, Trans. San Diego Soc. Nat. Hist., 9:398, ♀, ♂.

Female.—Head and thorax dark green, the disk of mesoscutum somewhat brassy green, not black. Spot on base of mandibles, usually a spot on each side of labrum, the clypeus, and small, triangular lateral marks white. Sculpture nearly as in *layiae*, but disk of mesoscutum a little less polished and faintly tessellate. Length, about 5-6 mm.; anterior wing, 4-4.2 mm.

Male.—Blue-green, the markings about as in *layiae*, but abdominal bands sometimes broader and entire, although emarginate behind on each side, and middle and hind knees sometimes yellowish-white. Head and mesonotum with shorter and thinner hair. Median lobe of tergite 7 broader, with flaring margins and obtuse apex. Length, 4-5 mm.; anterior wing, 3.6-3.9 mm.

Nine females, 24 males, Ensenada and Santo Tomas, Lower California, Mexico, on *Layia platyglossa*, March 26 to April 20, 1941 (T. D. A. and W. P. Cockerell).

Perdita layiae excisa, n. subsp.

Perdita excisa Timberlake, 1928, Amer. Mus. Novitates, 310:10 (nom. nud.).

Female.—Dark olive green, the head and propodeum more bluish, the mesonotum sometimes a little brassy green. Spot on base of mandible and narrow, more or less broken band on anterior border of face yellow-white, or face rarely entirely dark. Abdomen dark brown or blackish, with a yellowish-white band on tergites 1 to 5; these bands emarginate behind on each side, notched medially in front on tergites 2 to 5, or sometimes slightly interrupted on tergites 2 and 3, or 1 to 3. Antennae and legs dark, the flagellum brown beneath, the front knees with a pale-yellow spot. Tegulae pale testaceous, becoming brown at base. Wings dusky hyaline, with a brownish tinge, the nervures pale brownish testaceous, subcosta blackish.

Head somewhat broader than long. Foveae linear, extending from level of antennal sockets nearly to level of anterior ocellus. Clypeal margin rather strongly, but obtusely angled on each side of the base of labrum. Head and thorax moderately shining, the face with fine moderately close punctures, the frons and vertex tessellate and rather dullish. Mesonotum with fine, very close punctures, the surface minutely tessellate between the punctures; scutellum more sparsely punctured than the scutum. Basal area of propodeum large and finely rugose. Length, 5.5-6 mm.; anterior wing, 4-4.2 mm.

A female from Verdemont differs in having the clypeus light except two triangular black patches on disk that fail to reach the anterior margin, the yellow of front knees extending as a line on anterior side of front tibiae, the middle knees with a yellow spot, and the tubercles white. This female and one from East Highlands have the mesoscutum less closely punctured than in the types from Claremont.

Male.—Dark blue-green; the mandibles except tips, labrum, or two spots on labrum, clypeus, small lateral marks, and sometimes a small supraclypeal mark yellowish-white. Thorax entirely dark, or the tubercles sometimes creamy white at apex. Abdomen blackish; tergites 1 to 6 each with a narrow, yellowish-white band, often interrupted medially on basal segments, and broadly emarginate behind on each side, or sometimes sublaterally interrupted, so that the band on one or two segments may be broken into four spots. Antennae and legs dark, the flagellum brown or more or less yellowish beneath, a spot on front and middle knees and short line on anterior side of front tibiae pale yellow.

Head broader than long, the inner orbits nearly parallel. Facial foveae rather faint, about four times longer than wide. Face with fine, moderately close punctures, the frons and vertex tessellate and dullish. Mesoscutum tessellate on anterior third, but the disk more polished, with fine and moderately close punctures. Pubescence a little shorter and thinner on head and mesonotum than in *layiae*, although the short, fine hair, that is intermixed on mesonotum, may be more abundant. Median lobe of tergite 7 about as in *layiae*, and narrower and more acute at apex than in *basalicola*. Length, about 5 mm.; anterior wing, 3.9 mm.

Five females, 19 males (holotype female, allotype, and paratypes), Claremont, Los Angeles Co., California (C. F. Baker); 1 female (paratype), Dulzura, San Diego Co., 2,800 feet (W. S. Wright); 1 female (paratype), East Highlands, San Bernardino Co., on *Layia platyglossa*, May 4, 1945 (Timberlake); and 1 female (paratype), Verdemont, San Bernardino Co., on *Chaenactis glabriuscula*, May 1, 1946 (Timberlake).

Types (Cat. No. 43402) in U. S. National Museum; paratypes in collection of the Citrus Experiment Station, Riverside, and one paratype in collection of the American Museum of Natural History.

Perdita malacothricis, n. sp.

(Figs. 225, 226, 314, 339)

This is an exceptionally large, robust species of the deserts of California, that collects pollen from the flowers of *Malacothrix californica* and from other Compositae. The basal area is more or less roughened across the base but not finely rugose all over as in other members of the *aureovittata* subgroup. In size and robustness it rivals members of the *californica* group.

Female.—Dark green; the mesoscutum except anterior border, the scutellum, and metanotum shining black. Spot at base of mandible, three marks on clypeus, sometimes confluent, larger lateral marks widened on orbits and reaching level of antennae, and rarely a small supraclypeal mark yellowish-white. Labrum, anterior margin, and two stripes on disk of clypeus brown or black, the stripes generally broad, but occasionally faint or broken. A line on each side on hind margin of disk of pronotum and the tubercles broadly, pale yellow. Abdomen brown or blackish, with a rather broad pale-yellow band on tergites 1 to 5; these bands more or less notched medially in front, or sometimes interrupted on tergites 1 to 3, and each with a transversely oval, shining dark spot on each side posteriorly; the dark spots on tergites 1 to 3, or 4, sometimes joined together by a dark band, which may become confluent with the dark color of the

median interruption, but more commonly the dark color of the median notch sends a spur outward on each side toward the dark sublateral spots, these spurs decreasing in size on successive segments beginning at the base; light band on tergite 5 usually entire, but sometimes broadly interrupted medially. Mandibles testaceous in middle and red at apex. Antennae dark, the flagellum increasingly browner toward apex and yellowish beneath. Legs brown or blackish; a spot at apex of front and middle femora, and sometimes also hind femora, anterior side of front tibiae, and streak on anterior side of middle tibiae pale yellow. Tegulae pale testaceous, becoming yellowish at base. Wings slightly dusky hyaline, the nervures brownish testaceous, subcosta blackish.

Head moderately broader than long, the inner orbits somewhat diverging anteriorly. Facial foveae well impressed, linear, reaching from lower level of antennal sockets nearly to level of anterior ocellus. Tongue rather elongate, the galeae longer than the maxillary palpi. Pygidium rather broad at base, the sides converging to obtuse apex, the disk of apical half a little convex. Head and thorax shining, the frons and vertex tessellate and a little dullish, the face and frons with strong, fine, and rather close punctures. Mesonotum polished, the disk of scutum with minute, moderately sparse punctures, the scutellum with coarser punctures, the anterior border of scutum somewhat roughened by punctures in the form of short longitudinal furrows. Proximal half of basal area, or sometimes only the basal border, finely wrinkled or rugose, the sculpture rather similar to that in *aureovittata* but less extensive. Pubescence short, fine, erect, and whitish, the disk of mesonotum nude. Apical fimbria of abdomen dense and pale brownish. Length, about 7-9 mm.; anterior wing, 4.8-5.2 mm.

Male.—Dark green; the mesoscutum except anterior border, scutellum, and metanotum black. Mandibles except red tips, labrum, and face more or less completely below level of antennae, creamy white; lateral marks generally with a narrow extension along orbits to middle of frons. Apex of tubercles and two spots on hind margin of disk of pronotum, creamy white. Abdomen dark brown or black with a white band on tergites 1 to 6; these bands emarginate on each side behind on tergites 1 to 5, and in front on tergite 6, and notched medially in front on tergites 1 and 2, or 1 to 3; the sublateral emarginations sometimes becoming interruptions on tergites 3 and 4, or 3 to 6, and the median notch on tergites 1 and 2 emitting spurs to join the sublateral emarginations, to isolate three marks, with the inner ends of the lateral marks narrowed mesad and generally overlapping and more basal in position than the outer ends of the median mark. Tergite 7 brown. Venter brown, generally with a whitish mark on middle of segments 2 to 4, or 5. Scape of antennae white beneath, the flagellum yellowish beneath and brown above. Legs dark; the apex of femora and anterior side of front and middle tibiae pale yellow or creamy white. Tegulae and wings as in female, with the nervures much more tinged with fuscous.

Head distinctly broader than long, the inner orbits diverging in front. Facial foveae small and faint. Mandibles stout, little tapering, and with a small inner tooth near apex. Second recurrent and subdiscoidal nervures well developed. Tergite 7 emarginate on each side, the lateral lobes short and rounded; median lobe narrow and acute at apex, with the ventral keel about as broad or deep at apex as the length of lobe, and forking into laminate plates, which extend basad nearly parallel. Aedeagus similar to that of allied species, but inferior lobes of volsellae much larger than the superior lobes and the sagittal rods spreading apart at apex and also strongly curved upward as seen from the side. Length, 5.5-7.5 mm.; anterior wing, 4-4.9 mm.

Holotype female and allotype, Whitewater Canyon, Riverside Co., on *Malacothrix californica* var. *glabrata*, April 25, 1936 (Timberlake). Paratypes from California as follows: 11 males, 8 females taken with the types; 2 males, 1 female, south of Avawatz Mts., San Bernardino Co., April 30, 1927; 3 males, Morongo Valley, San Bernardino Co., April 19, 1937; 1 male, Morongo Pass, San Bernardino Co., April 22, 1937; 3 males, 7.5 miles south of Twentynine Palms, Riverside Co., May 7, 1948; 5 males, 7.5 miles north of Kramer Junction, San Bernardino Co., April 30, 1953; 2 males, 2 miles north of Kramer Junction, April 30, 1953; 1 male, Goldstone Dry Lake, San Bernardino Co., April 26, 1953; 1 male, Garnet, Riverside Co., April 17, 1952; 6 males, 7 females, Borego, San Diego Co., April 26-30, 1954; 10 females, Borego, April 24-29, 1955 (Timberlake, all on *Malacothrix*, except eleven females from Borego on *Chaenactis fremontii* and *Stephanomeria exigua*); 1 female, Kramer Junction, May 1, 1936 (C. M. Dam-

mers); 4 males, 6 females, 22 miles east of Barstow, San Bernardino Co., April 11, 1952 (E. E. Gilbert); 1 male, 7 miles north of Kramer Junction, on *Malacothrix*, April 30, 1953 (G. A. Marsh); 2 males, Borego, April 7, 1950 (P. D. Hurd, Jr.); 2 males, Borego, April 10, 1952 (Joan Linsley); 5 males, 1 female, Borego, April 1, 1953 (Hurd); 2 males, 4 females, Borego, April 28-30, 1954 (Hurd); 1 male, Borego, April 20, 1954 (J. G. Rozen); 1 female, Lone Pine, Inyo Co., May 21, 1937 (E. C. Van Dyke); 1 male, 1 female, April 16, 1933 (Aitken and Downes); 1 male, Cave Springs, San Bernardino Co., on *Larrea*, April 8, 1939 (C. D. Michener); 1 male, 1 female, 7 miles west of Lone Pine, Inyo Co., on *Aster*, May 19, 1937 (C. D. Michener); 1 male, Trona, San Bernardino Co., April 19, 1930 (F. B. Foley); and 3 males, 2 females, Yermo, San Bernardino Co., April 28, 1949 (E. G. Linsley, J. W. MacSwain, and R. F. Smith). Also 1 female (paratype), Nelson, Clark Co., Nevada, April 27, 1952 (H. Washburn).

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

Perdita fieldi, n. sp.

(Figs. 227, 228, 315, 340)

Perdita fieldi and the seven following species form the typical section of the *interrupta* group and differ from members of the *aureovittata* subgroup in lacking the fine rugosity on the base of the propodeum. The male of *fieldi* differs from other members of its subgroup in having the seventh tergite almost without lateral emargination. The female collects pollen from *Adenostoma fasciculatum*.

Female.—Dark green; the mesoscutum except anterior border, scutellum, and metanotum black. Large mark on base of mandibles, clypeus except two dark stripes on disk or a blotch across the summit, and triangular lateral marks yellowish-white. Supraclypeal area and dark part of the clypeus black, the latter sometimes involving upper half of disk and extending broadly in middle nearly to apical margin. Lateral marks equilateral or broader than high and hardly reaching level of antennae. Labrum testaceous or yellowish. Abdomen dark, with a broadly interrupted, yellowish-white band on tergites 2 to 4; the halves of these bands separated by a space about equal to their own transverse width, pointed mesad and extended backward, but not widened at outer ends on tergites 3 and 4. Antennae dark, the flagellum pale brown or somewhat yellowish beneath. Legs dark, the apex of front femora and anterior side of front tibiae pale yellow. Tegulae subhyaline testaceous, becoming yellowish at base. Wings slightly dusky hyaline, the nervures testaceous, subcosta fuscous.

Head considerably broader than long, with the inner orbits hardly divergent in front. Facial foveae reaching from lower level of antennal sockets about three-fourths of the distance to level of anterior ocellus. Clypeus dentate on each side of base of labrum, the teeth about as long as wide at base and blunt at apex. Mandibles with a distinct inner tooth, unless worn. Proboscis short, the galeae in repose reaching less than halfway to base of stipes, each about twice as long as wide and shorter than either the labial or maxillary palpi. Pygidium rather narrow, almost acute at apex, and a little ridged or convex on apical half. Head and thorax shining, the frons and vertex finely tessellate, but not dull; punctures of face and mesonotum fine but distinct, moderately close on the frons, somewhat sparse on the mesonotum and sparse on face below antennae. Pubescence fine, whitish and erect, sparse and short on mesonotum and moderately long elsewhere. Length, about 4.6-5.5 mm.; anterior wing, 3.6-3.9 mm.

Male.—Head and thorax dark green, the mesoscutum, except anterior border, and the scutellum black. Mandibles except red tips, labrum, clypeus, and lateral marks creamy white, the markings almost evenly truncate above at level of the summit of clypeus. Thorax entirely dark. Abdomen entirely dark brown or blackish, rarely with a broadly interrupted, narrow yellowish band on tergite 2. Antennae and legs dark, the flagellum brownish beneath; spot at apex of front femora, anterior side of front tibiae and basitarsi yellow, and a slight suffusion of yellow on anterior side of middle tibiae and basitarsi. Tegulae and wings as in female.

Head much broader than long, the facial foveae small and faint. Mandibles moderately

slender, tapering, and simple. Second recurrent and subdiscoidal nervures obsolete. Sculpture and pubescence much as in female, but the frons more strongly tessellate and dull, with the punctures faint except on each side between the antennal socket and eye. Tergum of abdomen finely and distinctly punctured, the punctures becoming sparser and fainter toward the base. Tergite 7 hardly emarginate laterally, the median lobe narrow, slightly furrowed above and bifid at apex, with the ventral keel broader or deeper than long. Dorsal lobes of caulis of the aedeagus very short, the sagittal rods broadened apically and taken together broadly rounded at apex. Length, 3.25-4.5 mm.; anterior wing, 2.9-3.6 mm.

One female (holotype), San Diego, California (G. H. Field); male (allotype), The Gavilan, Riverside Co., on *Adenostoma fasciculatum*, June 13, 1938 (Timberlake). Paratypes as follows: 110 males, 31 females, The Gavilan, on *Adenostoma*, June 13, 21, and 24, 1938, June 8, 1950 and May 28, 1952; 1 male, 1 female, The Gavilan, on *Eriogonum fasciculatum*, May 12, 1950; 1 female, along highway below Idyllwild, San Jacinto Mts., about 4,500 feet, on *Adenostoma fasciculatum*, June 9, 1940 (Timberlake); 1 female, Jamesburg, Santa Lucia Mts., Monterey Co., on *Adenostoma fasciculatum*, June 9, 1938 (C. D. Michener); and 1 male, Jamesburg, on *Calochortus splendens*, June 7, 1938 (Michener).

Type (Cat. No. 43,509) in United States National Museum; allotype and paratypes in collection of the Citrus Experiment Station, Riverside, and paratypes in the Michener collection, University of Kansas.

Perdita interrupta interrupta Cresson

(Figs. 229, 230, 316, 341)

Perdita interrupta Cresson, 1878, Trans. Amer. Ent. Soc., 7:70, ♂; Cockerell, 1896, Proc. Acad. Sci. Phila., 48:55; Cockerell, 1918, Ann. Mag. Nat. Hist. (9)1:163.

Cresson described *interrupta* from California without a more definite locality. In 1918, Cockerell recorded the male from Claremont, Los Angeles County. Formerly I considered the advisability of describing the material then at hand (mostly from Riverside) as a subspecies, but the lack of an exact type locality and the rather close agreement of material over a wide area from Gorman and Morongo to Orange County now shows that such a course is unwarranted. The following subspecies, *vernalis*, is also rather doubtfully valid, but *kernensis* is more distinct.

Female.—Head and thorax dark olive or bluish-green, the thorax entirely dark. Basal half of mandibles, clypeus, and lateral marks creamy white; anterior margin of clypeus narrowly testaceous or blackish, and the disk with two blackish arcuate stripes, which are sometimes faint or absent, or sometimes confluent and involving the usual dots to cover the disk, except on each side. Lateral marks triangular, or more or less transverse, with an extension along orbits nearly to level of antennae. White of mandibles shading into testaceous at middle, and the testaceous into red at apex. Labrum more or less blackish, or testaceous when dark markings of clypeus are absent. Abdomen brownish black, the first tergite slightly greenish; tergites 2 to 5 each with an interrupted, yellow or yellowish-white band, and tergite 1 with a spot on lateral margins of disk; band on tergite 2 abruptly bent backward and somewhat broadened at outer ends; and that on tergite 5 much broader than others, except at outer ends, and very narrowly interrupted. Antennae blackish, the flagellum brown or yellowish beneath except on basal joint. Legs dark, the apex of front femora and anterior side of front tibiae yellow, as well as a small spot at apex of middle femora and sometimes a line on anterior side of middle tibiae. Tegulae pale testaceous, becoming brown at base. Wings slightly dusky hyaline, the nervures brownish testaceous, subcosta fuscous.

Head somewhat broader than long, the inner orbits parallel. Facial foveae faintly impressed, reaching from lower level of antennal sockets about two-thirds of distance to level of anterior ocellus. Clypeus bluntly produced on each side of base of labrum. Proboscis moderately short, the galeae of maxillae about four times longer than wide, equal to the maxillary palpi, and shorter

than the stipes. Pygidium moderately narrow, subacute at apex, and convex on apical part of disk. Frons and vertex tessellate and dull, the punctures fine and obscure, becoming more distinct on face below antennae. Mesonotum tessellate, moderately shining, with fine sparse punctures, the anterior border of scutum duller and more closely punctured. Basal area of propodeum finely tessellate, the sculpture similar to that of frons. Length, 5-6 mm.; anterior wing, 3.8-4.2 mm.

Male.—Dark blue-green or blue; the mandibles except red tips, labrum, clypeus, and large lateral marks creamy white, and often small supraclypeal and subantennal spots also present. Scape of antennae sometimes white beneath. Abdomen dark, with a narrow interrupted yellow or yellowish-white band, abruptly dilated at outer ends, on tergites 2 to 5; sometimes also a spot on lateral margins of disk of tergite 1 and a more or less broken band on tergite 6. Spot at apex of femora and anterior side of front and middle tibiae yellow.

Head broader than long, with facial foveae small and faint. Frons and vertex strongly tessellate and subopaque; frons on each side below obscurely and the face below antennae finely and sparsely punctured. Tergite 7 emarginate on each side, the median lobe triangular, about as long as the width at base, with the ventral keel as seen from the side also triangular, nearly as broad at apex as the dorsal length of lobe, and distinctly grooved on ventral edge. Aedeagus with the parameral lobes squarely truncate at apex as seen from above, and the sagittae narrowed to apex, with outwardly hooked tips, but slender, straight, and mucronate at apex as seen from side. Length, 4-5 mm.; anterior wing, 2.9-3.9 mm.

This species collects pollen from *Eschscholtzia californica* and frequently visits *Cryptantha* for nectar. Material of the typical subspecies has been examined from the following localities. CALIFORNIA. LOS ANGELES Co.: Claremont (Baker); Pasadena, April 13, 1910 (F. Grinnell, Jr.); La Crescenta, on *Cryptantha*, April, 1936 (Linsley); Gorman, on *Eschscholtzia*, May 5, 1947 (Timberlake). SAN BERNARDINO Co.: Miller Canyon, San Bernardino Mts., May 14, 1941 (Van Dyke); Morongo, on *Cryptantha*, April 22, 1937 (Timberlake). RIVERSIDE Co.: Riverside, on *Eschscholtzia* and *Cryptantha*, March 16 to May 9 (Timberlake); 3 miles west of Perris, on *Eschscholtzia*, April 16 and 20, 1939 and 4 miles west of Perris, on *Eschscholtzia*, April 10, 1946; The Gavilan, on *Cryptantha*, April 6, 1950; near Lake Matthews, on *Eschscholtzia*, April 11, 1954 (Timberlake); Piñon Flat, San Jacinto Mts., on *Yucca* (?),¹ May 18, 1939 (Ray F. Smith); Palm Springs, April 3, 1925 (Van Dyke). ORANGE Co.: Rancho Santa Ana Botanic Garden, on *Eschscholtzia* and *Cryptantha*, May 1, 1950 (Timberlake).

Perdita interrupta vernalis, n. subsp.

Female.—Like *interrupta*, but frons and vertex more opaque, the mesoscutum strongly tessellate and rather dull. Clypeus broadly black down middle of disk as in some individuals of *interrupta*. Bands on tergites 2 to 4 somewhat more broadly interrupted than in *interrupta*, and tergites 1 and 5 entirely dark. Length, about 5 mm.; anterior wing, 3.5 mm.

Male.—Similar to the male of *interrupta*, with the subantennal and supraclypeal spots small or absent. Abdominal markings reduced, restricted to a yellow mark on lateral margins of tergites 2 to 5 and a small streak on each side of the base of tergites 2 and 3, these mostly well separated from the lateral marks. Length, nearly 5 mm.

Two females, 1 male (holotype female, allotype, and paratype). Poway, San Diego Co., California, March 22 and April 1, 1885 (F. E. Blaisdell).

Holotype in collection of California Academy of Sciences (No. 2,990); allotype in United States National Museum (No. 43,510); and paratype at Riverside.

Perdita interrupta kernensis, n. subsp.

Female.—Dark stripes on disk of clypeus weak or evanescent, and sometimes a small supraclypeal mark present. Abdominal bands on tergites 2 to 5 broad, entire, and pale yellow, those on tergites 2 and 3 sometimes slightly interrupted, and those on tergites 2 to 4 broadly and shallowly emarginate behind on each side. A rather large spot on each side of disk of

¹ As *Yucca* flowers are not attractive to bees, the plant in question was presumably *Nolina parryi*.

tergite 1. Mesoscutum weakly tessellate, shining, and more or less strongly and rather closely punctured. The punctures distinctly stronger in the holotype than in the paratypes. Length, about 6 mm.; anterior wing, 3.9-4 mm.

Male.—Face marks white, including a medium-sized supraclypeal mark. Abdominal bands interrupted in middle on tergites 2 to 4, entire on 5 and sometimes 6, that on 5 more or less notched medially in front and broadly emarginate behind on each side, and sometimes the inner end of each half on tergite 4 curved backward to form posterior emarginations. Mesoscutum weakly tessellate, shining, but dull and more strongly tessellate on anterior border, the puncturation fine, but distinct and rather close. Length, 4.5 mm.; anterior wing, 3.5 mm.

Three females, 2 males (holotype female, allotype, and paratypes), Woody, Kern Co., California, on *Cryptantha*, April 24, 1949 (Linsley, MacSwain, and R. F. Smith).

Types at the University of California at Riverside, and paratypes at Berkeley.

Perdita micheneri micheneri, n. subsp.

(Figs. 231, 232, 317, 342)

This species is similar to *interrupta*, but has a less hairy face and a duller sculpture, flies later in the season, and visits flowers of *Rhamnus* and *Ceanothus*.

Female.—Head and thorax dark olive green. Mandibles except reddish tips, mark on each side of clypeus, and rather small lateral marks yellow; marks of clypeus sometimes reduced or sometimes yoked together by a narrow line across summit of disk, the anterior margin and a broad area on disk usually not quite involving the dark dots black; lateral marks generally broader than high but extending on orbits to level of antennae, or often broken into two spots or restricted to a longitudinal mark on orbits. Labrum and supraclypeal area black. Abdomen blackish, with a distinct green tinge on tergite 1; a small spot on each side of tergite 1 and an interrupted band on tergites 2 to 5 yellow; these bands shaped as in *interrupta*, but tend to be more broadly interrupted and that on 5 sometimes broken or evanescent. Antennae dark, the flagellum brown beneath. Legs blackish, a spot at apex of front and middle femora, anterior side of front tibiae, and sometimes a line on middle tibiae yellow. Tegulae subhyaline testaceous, but very dark or fuscous at base. Wings dusky hyaline, the nervures testaceous brown, subcosta fuscous.

Head distinctly broader than long, the clypeus obtusely dentate on each side of labrum. Facial foveae rather faintly impressed and reaching from lower level of antennal sockets about three-fourths of distance to level of anterior ocellus. Proboscis moderately short, the galeae when folded in repose reaching about two-thirds of distance to base of stipes. Apex of pygidium narrowly rounded and convex on disk. Head and thorax tessellate, the frons and vertex dull and obscurely punctured; face below antennae more distinctly punctured, with punctures on disk of clypeus rather coarse; mesonotum dull, but a little more shining than the frons, and with fine, rather sparse punctures. Pubescence whitish, fine, erect, and moderately thin on head and thorax; apical fimbria of abdomen pale brownish. Length, 4.8-5.4 mm.; anterior wing, 3.5-4 mm.

Male.—Dark bluish-green; the thorax entirely dark. Mandibles except reddish tips, labrum, clypeus, and lateral marks pale yellow; lateral marks generally a little broader than high and reaching along orbits to level of antennae; sometimes evanescent or fragmentary supraclypeal and subantennal marks present. Abdomen blackish, with a yellow mark on lateral margins of tergites 2 to 5, or 1 to 6; usually the marks on tergite 2, and sometimes those on tergite 3, or tergites 3 and 4, with a spur directed mesad from their inner basad corner, and this spur may be cut off or fragmentary. Antennae dark, the scape with a yellowish spot beneath at base, the flagellum broadly brown beneath except on apical joint. Legs blackish; a spot at apex of femora, anterior side of front and middle tibiae, line on hind tibiae beneath, and front and middle basitarsi yellow, the tarsi otherwise pale brown. Tegulae and wings as in female.

Head broader than long, the facial foveae small and faint. Mandibles rather slender, only slightly tapering, with a short apical part abruptly narrowed and acute. Head and thorax tessellate, the frons and vertex subopaque and impunctate, the face below antennae shining; mesonotum strongly tessellate and dull, with sparse and obscure punctures. Median lobe of tergite 7 triangular as in *interrupta*, with ventral keel, as seen from side, as broad as length of lobe, its

apical margin rather strongly emarginate and the ventral edge strongly grooved and bilaminate. Aedeagus much as in *nitens*, but lobes of volsellae longer and more unequal, and apical truncation of the parameral lobes less broad. Length, about 3.5–4.5 mm.; anterior wing, 3–3.6 mm.

Thirty-three females, 11 males (holotype female, allotype, and paratypes), Eagle Rock Hills, Los Angeles County, California, on *Rhamnus crocea*, May 5, 1935 (Timberlake). Additional paratypes as follows: Los Angeles Co.: 1 female, 4 males, Eagle Rock Park, on *Rhamnus crocea*, April 14, 1933 (C. D. Michener); 10 males, La Crescenta, on *Cryptantha muricata*, May 5, 1935 (Timberlake); 1 female, 1 male, Claremont, on *Cryptantha intermedia*, May 4, 1945 (Timberlake); 21 males, Tanbark Flat, San Gabriel Mts., on *Ceanothus*, April 16, 1950 (E. G. Linsley). San Bernardino Co.: 10 males, Mill Creek, 6,000 feet, San Bernardino Mts., on *Ceanothus cordulatus*, June 6, 1937; 1 female, 19 males, Mill Creek, 4,400 feet, on *Cryptantha intermedia*, May 30, 1938; 1 female, 2 males, Mill Creek, 4,800 feet, on *Cryptantha intermedia*, May 13, 1940; 2 females, Mill Creek, 6,000 feet, on *Cryptantha micrantha* var. *lepida*, July 2, 1944; 7 males, on *Cryptantha*, May 16, 1948; 2 males, on *Cryptantha*, April 23, 1950; 3 males, on *Cryptantha*, and 1 female, on *Ceanothus cordulatus*, May 28, 1950, same locality (Timberlake); 10 males, Cajon Camp, Cajon Pass, on *Rhamnus crocea*, May 1, 1936 (Timberlake). Riverside Co.: 2 males, Keen Camp, San Jacinto Mts., on *Ceanothus*, May 16, 1939 (E. G. Linsley); 1 female, Mt. San Jacinto, 4,000 feet, June 6, 1946 (R. M. Bohart). Kern Co.: 1 male, Dutchmen's Camp, Tehachapi Mts., on *Rhamnus crocea*, April 2, 1939 (C. D. Michener).

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

Rarely the female of *micheneri* has the clypeus almost entirely black and the lateral marks small and adjacent to the eyes. Such specimens resemble *P. quadrisignata* Timberlake, but the face and abdominal markings are yellow instead of whitish, the head less transverse, the mesoscutum more strongly tessellate, the scutellum tessellate like the scutum instead of being polished or almost polished, and the pygidium is broader and blunter at apex.

Perdita micheneri rhamnophila, n. subsp.

Although *rhamnophila* is evidently only a subspecies of *micheneri*, there are no leads toward it in the large series of *micheneri* at hand.

Male.—Head and thorax dark bluish-green, the mesonotum slightly brassy, the thorax entirely dark. Mandibles except tips, labrum, and face below level of antennae almost entirely creamy white. Abdomen black, the first tergite with a greenish luster. A well-interrupted band on tergites 2 to 5 and a small mark on each side of tergites 1 and 6 yellow; the marks on middle segments straight inwardly and expanded and bent backward at outer ends. Antennae dark, the flagellum dull yellowish beneath, except on basal and apical joints. Legs black; a spot at apex of femora, anterior side of front and middle tibiae and tarsi, and line on under side of hind tibiae yellow. Tegulae pale testaceous, darker at base. Wings slightly dusky, the nervures brown, subcosta fuscous.

Head distinctly broader than long, the mandibles simple and tapering. Pubescence and sculpture about as in *interrupta*, except that the mesonotum is slightly more shining (in *micheneri* mesonotum duller than in *interrupta*). Median lobe of tergite 7 triangular, with the ventral keel less strongly sulcate beneath than in *interrupta*. Length, 4.5 mm.; anterior wing, 3.2 mm.

One male (holotype), Rock Creek, north side of San Gabriel Mts., about 4,200 feet, Los Angeles Co., California, on *Rhamnus crocea*, April 25, 1926 (Timberlake).

Type in United States National Museum (No. 43,401).

Perdita nitens, n. sp.

(Figs. 233, 234, 343)

Except for the polished mesonotum, *nitens* is very similar to *micheneri*, and as the structural characters, except sculpture, are nearly the same, it may prove to

be a race of that species. The flower records of *nitens* are yet too meager to indicate the source of its pollen.

Female.—Dark blue-green or blue; the thorax entirely dark. Mandibles except tips, clypeus, and lateral marks creamy white; clypeus with two brown or blackish curved stripes on middle of disk, which are usually united on anterior margin, or even more coalescent; lateral marks usually broader than high, but sometimes with an extension on orbits to level of antennae. Abdomen blackish, the first tergite with a greenish or bluish luster and a small, yellowish-white spot on lateral margin of disk; tergites 2 to 5 each with a yellowish-white band, narrowly interrupted medially, enlarged and bent backward at outer ends, except the one on tergite 5, the halves of which are broader mesad; these bands nearly as in *interrupta*, but tend to be a little broader and less broadly interrupted. Apical third of mandibles reddish. Labrum whitish, varying to testaceous and blackish. Antennae dark, the flagellum yellowish-brown beneath. Legs dark; a spot at apex of front and middle femora, anterior side of front tibiae, and sometimes a line on anterior side of middle tibiae pale yellow. Tegulae testaceous, becoming brownish at base. Wings somewhat dusky hyaline, the nervures brownish testaceous, subcosta fuscous.

Structural characters much as in *micheneri*, but frons and vertex a little less strongly tessellate, and nearly the whole thorax, except propodeum, is polished. Length, 5.25–6 mm.; anterior wing, 3.9–4.2 mm.

Male.—Dark blue; the mandibles except tips, labrum, clypeus, lateral, subantennal, and supra-clypeal marks white, but face usually falls short of being entirely pale below level of antennae. Thorax entirely dark. Abdomen blackish, with a pale-yellow or yellowish-white band on tergites 2 to 5; these bands rather narrowly interrupted medially and that on tergite 5 sometimes emarginate behind on each side; sometimes a small spot on lateral margins of tergite 1, and fragments of a band sometimes present on tergite 6. Spot at apex of femora, anterior side of tibiae, and anterior side of front tarsi and middle basitarsi yellow; the tarsi otherwise pale brown, with the hind pair blackish.

Structure similar to *micheneri*. Frons subopaque, but the thorax shining and the mesonotum polished, with fine sparse punctures. Median lobe of tergite 7 with its ventral keel less broad than in *interrupta*, its width equal to about half the length of the lobe. Aedeagus like that of *interrupta*, but the sagittae taken together are fusiform, acute at apex, and without out-turned points, and thus nearly the same as in *micheneri*. Length, 4–4.75 mm.; anterior wing, 3.3–3.8 mm.

One female, 2 males (holotype female, allotype, and paratype), Adobe Creek, western Stanislaus Co., California, April 20, 1948 (Ray F. Smith). Paratypes as follows: 1 female, 2 males, Adobe Creek, on *Phacelia*, May 6, 1948 (Ray F. Smith and MacSwain); 1 female, 3 males, Yorkville, Mendocino Co., April 24, 1928 (E. P. Van Duzee); 1 female, Mt. Hamilton, 3,000–4,000 feet, Santa Clara Co., June 2, 1933 (Mont Cazier); 1 female, 1 male, Mt. Hamilton, May 18, 1952 (Don Burdick); and 3 females, 2 males, Jamesburg, Santa Lucia Mts., on *Eschscholtzia* and *Eriogonum*, June 4, 6 and 8, 1938 (C. D. Michener).

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

Perdita quadrisignata, n. sp.

This species apparently is closely allied to *interrupta* and *micheneri*, although its position cannot be confirmed by the male structure, since only the female is known. It resembles certain specimens of *micheneri* in which the face marks are much reduced, but differs in having the head more transverse, the clypeal margin more prominently produced on each side of labrum, with the lobes appearing acute in frontal view although actually a little obtuse, the markings whitish instead of yellow, the mesoscutum much more shining, and pygidium very acute at apex.

Female.—Dark green; the labrum and clypeus black. Mandibles except reddish apical third, small mark on each side of clypeus close to anterior margin, and small lateral marks adjacent

to the eyes creamy white. Thorax entirely dark. Abdomen black, the first tergite with a greenish tinge; tergites 2 to 4 each with interrupted white band, each part enlarged and curved backward at outer end, and acute mesad, especially on tergites 2 and 3; tergite 5 with two moderately separated marks sometimes absent or concealed by preceding segment. Antennae and legs dark, the flagellum yellowish-brown beneath, a spot at apex of front femora and a streak on anterior side of front tibiae yellow. Tegulae pale testaceous, becoming fuscous at base. Wings somewhat dusky hyaline, the nervures testaceous brown, subcosta fuscous.

Head considerably wider than long, with clypeus subdentate on each side of labrum. Facial foveae rather weakly impressed and extending from level of middle of antennal sockets about three-fourths of the distance to level of anterior ocellus. Pygidium narrow, the sides converging to the acute apex, the disk of apical part convex. Frons and vertex tessellate, dull and obscurely punctured; other parts of head more shining, the sides of face opposite and below antennae and disk of clypeus with sparse, fine punctures. Mesoscutum dull and rather strongly tessellate on anterior border and around margins but the disk weakly tessellate or polished and sparsely punctured; scutellum polished and more distinctly punctured. Basal area of propodeum tessellate, with a narrow band across the base that is finely rugose. Proboscis moderately long, the galea when folded in repose reaching about halfway to base of stipes. Length, about 5 mm.; anterior wing, 3.8-3.9 mm.

One female (holotype), Santa Cruz Mts., 300-500 feet, Santa Cruz Co., California, May 20-25, 1907 (J. C. Bradley); 2 females (paratypes), Pinnacles, San Benito Co., on *Salix*, April 24, 1948 (P. D. Hurd, Jr.); 1 female (holotype), Adobe Creek, western Stanislaus Co., on *Baccharis*, May 6, 1948 (J. W. MacSwain and Ray F. Smith).

Type in collection of Cornell University (No. 1,007.1); and paratypes in collection of the University of California at Berkeley and Riverside.

***Perdita mucronata*, n. sp.**

(Figs. 235, 236, 318, 344)

This species and *P. inflexa* differ from other species of the *interrupta* group in having the median lobe of the seventh tergite mucronate and bent downward between the lateral lobes instead of extending straight backward.

Male.—Dark green or blue-green; the thorax entirely dark. Mandibles except red tips, labrum, and nearly entire face below level of antennae white, but the sutures separating sclerites of face, except between clypeus and supra-clypeal area, narrowly black. Abdomen blackish, with tergite 1 tinged with green and tergite 7 testaceous brown; tergites 2 to 5 each with a narrow, pale-yellow band, narrowly interrupted medially on tergites 2 to 3, or 2 to 5, and widened and bent backward at outer ends; remnants of bands sometimes present in tergites 1 and 6; venter brown. Antennae dark, the flagellum broadly brown beneath. Legs blackish; a spot at apex of front and middle femora, anterior side of front and middle tibiae, front tarsi, middle basitarsi except outer margins, small spot at apex of hind femora, and line on hind tibiae yellow; the middle tarsi otherwise pale brown. Tegulae subhyaline testaceous, becoming brownish at base. Wings slightly dusky, the nervures testaceous brown, subcosta a little infuscated.

Head somewhat broader than long, the inner orbits slightly diverging in front. Facial foveae small, barely longer than wide. Mandibles stout, with the apical fourth tapering to acute apex. Frons and vertex strongly tessellate and dull, the frons with fine and rather close punctures. Remainder of head and the thorax polished, the basal area of propodeum tessellate; mesoscutum and scutellum with fine, rather close punctures. Tergite 7 broadly emarginate apically, with a narrow, mucronate median lobe, which is bent downward at an angle of about 45° with the plane of disk, slightly furrowed on outer edge, bifid at apex, and as seen in profile about twice as long as wide and acute at apex. Aedeagus with the dorsal lobes of caulis short and obtuse, the parameral lobes acute at apex, and the sagittae fusiform and acute. Length, 4-5 mm.; anterior wing, 3.6-4 mm.

Two males (holotype and paratype), 7.5 miles south of Twentynine Palms, Riverside Co., California, on *Eschscholtzia minutiflora* var. *darwinensis*, May 7, 1948 (Timberlake), in collection of the Citrus Experiment Station, Riverside.

***Perdita inflexa*, n. sp.**

(Figs. 237, 238, 319, 345, 346)

This species is a close ally of *mucronata*, with which it flies on the Mohave Desert, but differs in having the abdomen ferruginous, the mucro of the seventh tergite much more inflexed, and the genitalia very distinctive.

Male.—Dark bluish-green; the tips of the tubercles pale yellow. Mandibles except red tips, labrum, and face below level of antennae pale yellow. Abdomen ferruginous, the first tergite infuscated, except broadly at apex. Scape and pedicel of antennae blackish, the former yellow beneath, the flagellum brown, becoming much darker above. Legs brownish fuscous, the apex of front and middle femora, anterior side of their tibiae, and front tarsi yellow; hind tarsi brown and the middle pair pale brown. Tegulae nearly clear hyaline, with a yellow spot at base. Wings faintly dusky hyaline, the nervures testaceous brown, subcosta fuscous.

Head distinctly broader than long, the inner orbits slightly diverging in front. Mandibles moderately long, slender, tapering, and curved, being distinctly more falcate than in allied species. Posterior corners of disk of pronotum hardly produced but subacute. Stigma narrower than in *mucronata*, and the marginal cell a little longer, with the part beyond the stigma slightly longer than the part beneath. Head and thorax tessellate, the frons and vertex dull, but other parts shining, with tessellation of thorax weak except on basal area of propodeum; puncturation fine and moderately close on mesoscutum, sparse on scutellum, and very obscure on frons. Pubescence white, erect, fine, and moderately thin. Tergite 7 with a very broad shallow emargination between the short lateral lobes, the mucronate median lobe suspended from inferior wall of the emargination, visible only when the segment is viewed from behind, and about four times longer than its width at apex, which is strongly bifid. Aedeagus with the dorsal lobes of caulis more produced than usual and rounded at apex; parameral lobes tapering from the broad base and without an oblique incision; volsellae with coarse tubercles and very fine, erect hairs; sagittae fusiform, with a broad, slightly concave truncation at apex. Length, 4 mm.; anterior wing, 3.5 mm.

One male (holotype), 7.5 miles south of Twentynine Palms, Riverside Co., California on *Eschscholtzia minutiflora* var. *darwinensis*, May 7, 1948 (Timberlake), in collection of the Citrus Experiment Station, Riverside.

Another specimen, from which the drawings of the terminalia were made, was collected at the same flower in Morongo Pass, in Riverside County, but close to the San Bernardino line, on April 23, 1939. This specimen, unfortunately, was destroyed by a dermestid larva.

CALIFORNICA GROUP

The species belonging in this group differ from *interrupta* and its allies in having two submedian lobes at apex of seventh tergite, which are more or less oblique to the disk of segment or extend horizontally backward. In the two species first treated here, the seventh tergite has the apical part curved downward, with a broad, deep central furrow, or it has two thinly laminate vertical lobes, but in other characteristics and in habits these species agree with the *californica* group.

There are many species in this group that collect pollen from *Calochortus* and at least two that collect pollen from both *Calochortus* and *Eschscholtzia*, and one or two that are probably mostly dependent on the latter flower. Other species collect pollen from *Fullugia*, *Cowania*, and *Argemone*, and some have been taken visiting flowers of *Eriogonum*, *Hyptis*, *Eriodictyon*, *Opuntia*, *Prosopis*, *Larrea*, *Senecio*, and *Stanleya*, but probably in most cases only for nectar.

***Perdita calochorti*, n. sp.**

(Figs. 239, 240, 320, 347)

This species is obviously allied to *P. californica* (Cresson), but the male has the apical tergite broadly and deeply furrowed instead of bilobate.

Female.—Head and thorax dark green, the mesoscutum except anterior border, the scutellum, and metanotum black. Mandibles except broadly at apex, labrum, clypeus, and lateral marks yellow, or sometimes partly stained with testaceous, especially the labrum; disk of clypeus with two broad, brown or black submedian stripes, which are sometimes confluent to form a quadrate dark mark; lateral marks triangular, generally broader than high and hardly extending above level of clypeus. Abdomen testaceous brown or reddish brown, the first tergite somewhat infuscated except on apical margin. Antennae and legs dark, the flagellum brown beneath, the apex of femora and anterior side of front tibiae yellow. Tegulae pale testaceous, becoming brownish at base. Wings faintly dusky hyaline, the nervures testaceous, subcosta fuscous.

Head somewhat broader than long, the inner orbits parallel. Clypeus rather acutely dentate on each side of base of labrum. Mandibles stout, acute at apex, and with a small inner tooth. Facial foveae rather strongly impressed and reaching from slightly below level of antennal sockets about two-thirds of distance to level of anterior ocellus. Pygidium narrow and subacute at apex. Marginal cell nearly squarely truncate at apex, with the part beyond the stigma somewhat longer than the part beneath. Frons and vertex tessellate, dullish, and with fine, close punctures, except around the ocelli. Mesoscutum, except the tessellate anterior border, and scutellum polished and with fine punctures which are slightly unequal and almost dense; propodeum, except basal area, and the mesopleura more sparsely punctured. Pubescence whitish, rather short and erect, and becoming very short and subdepressed on the mesonotum. Length, 6–8 mm.; anterior wing, 4.5–5.3 mm.

Male.—Dark blue; the anterior border of mesoscutum broadly greenish; its disk, the scutellum, and metanotum black. Mandibles except reddish tips, labrum, almost entire face below level of antennae, and mark on anterior end of cheeks yellow. Tubercles brown, or sometimes with a yellow spot at apex. Abdomen sometimes reddish as in female, but usually more or less strongly infuscated, without light markings. Antennae dark brown, the under side of scape and flagellum dull yellow. Legs usually tinged with brown, a spot at apex of front femora, anterior side of front tibiae yellow, and anterior side of middle tibiae often tinged with yellow. Tegulae and wings as in female.

Head considerably broader than long, truncate anteriorly, and with inner orbits slightly divergent in front. Facial foveae shallow, about four times longer than wide. Mandibles stout, moderately curved, a little dilated on inner margin, and very acute at apex. Sculpture and pubescence nearly as in female. Tergite 7 deeply emarginate on each side, the lateral lobes acute; median lobe broad, with apical part strongly recurved, deeply and broadly furrowed, or inversely tectiform, and as seen from side with apex subacute and nearly level with tips of lateral lobes. Dorsal lobes of caulis of aedeagus short, blunt, and a little divergent; parameral lobes incised within apically to appear very acute in dorsal view; sagittae very broadly fusiform, with their apex and apex of parameral lobes appearing narrowly truncate in profile view. Length, 5.75–8 mm.; anterior wing, 4.1–5 mm.

Five females, 2 males (holotype female, allotype, and paratypes), Swartout Valley, at Wrightwood, about 6,800 feet, San Gabriel Mts., San Bernardino Co., California, on *Calochortus nuttallii*, June 3, 1928 (Timberlake). Additional paratypes as follows: 3 females, 1 male, Big Pine Creek, 4,500 feet, Inyo Co., June 23, 1942 (R. M. Bohart); 1 female, 2 males, Mill Creek, 7,400 feet, San Bernardino Mts., June 29, 1942 (R. M. Bohart); and 1 male, South Fork Camp, Santa Ana River, San Bernardino Mts., June 28, 1950.

Types in United States National Museum (No. 43,404); paratypes in collections of the University of California at Riverside and Davis.

***Perdita leucostoma*, n. sp.**

(Figs. 241, 242, 321, 348)

The male of *leucostoma* differs from other members of its group in having two broad, laminate lobes at apex of abdomen which are vertical and slightly divergent.

Female.—Dark blue-green; the middle of disk of mesoscutum and the scutellum black. Base of mandibles, clypeus, lateral, and sometimes a small supraclypeal spot white; face marks forming a band across anterior border of face, with lateral marks broader than high, yet often with a narrow extension on orbits to level of antennae; disk of clypeus often with two narrow, arcuate, brownish stripes between the usual dots. Thorax entirely dark. Abdomen black, tinged with brown, becoming ferruginous at apex, the pygidium red; a broadly interrupted, yellowish band on tergites 2 to 4, that on tergite 2 narrow, basal, and widely separated from a subapical spot on lateral margins, and those on tergites 3 and 4 curved backward at outer ends, although that on tergite 4 sometimes has a subapical spot on lateral margin nearly discrete; venter ferruginous. Mandibles shading from white at base to testaceous in middle and red at apex. Labrum and apical margin of clypeus testaceous. Antennae dark, the flagellum broadly dull yellowish beneath. Legs dark; the hind tibiae, hind and middle tarsi brown; the front tarsi pale brown; a spot at apex of front and middle femora and anterior side of front tibiae pale yellow. Tegulae pale testaceous, becoming yellowish at base. Wings milky hyaline, the nervures whitish, subcosta brown.

Head a little broader than long, the inner orbits parallel. Facial foveae linear and reaching from lower level of antennal sockets about three-fourths of distance to level of anterior ocellus. Proboscis of medium length, the galea of maxillae as long as the stipes and a little longer than the maxillary palpi. Pygidial plate narrow and very narrowly obtuse at apex. Frons and vertex rather dull and tessellate, the frons with close, moderately distinct punctures. Mesonotum closely punctured, the scutum tessellate and dullish, with the posterior border next to scutellum almost opaque, but the middle of the disk and the scutellum faintly tessellate and shining. Pubescence white, erect, moderately dense, and that on the mesonotum rather short. Length, 5–6.5 mm.; anterior wing, 4–4.5 mm.

Male.—Dark blue-green; the head and propodeum bluer than other parts. Thorax entirely dark. Mandibles except reddish tips, labrum, clypeus, lateral, subantennal, and supraclypeal marks white, but face much less than entirely pale below level of antennae, as lateral marks hardly extend above level of clypeus except on the orbits. Abdomen blackish, with a bluish luster on tergite 1; other segments partly suffused with brown or ferruginous, and tergites 6 and 7 ferruginous. Abdominal markings yellowish-white, consisting of an abbreviated, interrupted basal band on tergites 2 to 4, and a narrow subapical band on tergites 2 to 5; the subapical bands interrupted, or nearly so, on each side, with the middle part sometimes evanescent, or absent, on tergites 2 and 3, and the inner ends of thickened lateral parts sometimes confluent with outer ends of the basal band on tergite 3, or tergites 3 and 4. Scape of antennae white beneath, the flagellum brownish above and yellowish beneath. Legs dark; the apex of femora, tibiae in front, and the tarsi yellow. Tegulae as in female, the wings less whitened, with nervures and margins of stigma pale testaceous.

Head distinctly broader than long, the inner orbits a little divergent anteriorly. Mandibles stout, slightly dilated on inner margin and acute at apex. Facial foveae faint, about four times longer than wide. Sculpture and pubescence similar to that of female, but the frons obscurely punctured and a little duller, and the mesoscutum shining over a larger part of the disk. Tergite 7 with broad lateral lobes ending very obtusely; median lobe divided at its middle into two vertical laminae, which diverge apically and appear very broad across the apex as seen from side, with the upper corner acute and the lower corner somewhat rounded. Caulis of aedeagus with short, acute, dorsal lobes and broad parameral lobes; sagittae fusiform and tapering from the middle to the subacute apex in both dorsal and lateral views. Length, 3.5–5 mm.; anterior wing, 3.1–4 mm.

Eighteen females, 50 males (holotype female, allotype, and paratypes), summit of Westgard Pass, Inyo Co., California, on *Calochortus leichtlinii*, June 15, 1937 (C. D. Michener). Additional paratypes as follows: 1 pair, same data (W. C. Reeves); 6 males, same data (A. E. Meier); 2 females, 2 males, same data (collector unknown); 5 females, 6 males, Lone Pine, Inyo Co., on *Calochortus*, June 16, 1937 (E. C. Van Dyke); and 2 males, Big Pine Creek, 7,500 feet, Inyo Co., June 17, 1942 (R. M. Bohart).

Types in collection of the Citrus Experiment Station, Riverside;² paratypes in collection of the University of California at Berkeley and Davis, the University of Kansas, and the California Academy of Sciences.

Perdita californica (Cresson)

(Figs. 243, 244, 322, 349)

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

Perdita californica Cresson, 1887, Synopsis Hymen., north of Mexico, Cat.: 296; Cockerell, 1896, Proc. Acad. Sci. Phila., 48:58.

Perdita californica is widely distributed in the coastal region of California from Mt. Diablo southward, and the female collects pollen from several species of *Calochortus*.

Female.—Dark green, or bluish-green; the disk of mesoscutum, scutellum, and metanotum black. Thorax entirely dark. Base of mandibles, clypeus, and lateral marks pale yellow; disk of clypeus usually with two arcuate, blackish stripes, not reaching anterior margin, sometimes abbreviated, or broadened and confluent to form a dark patch, which does not involve the usual pair of dots; lateral marks usually broader than high and not reaching above level of clypeus, or sometimes widened on orbits to reach level of antennae; rarely traces of a supraclypeal mark present. Mandibles dark red at apex and testaceous in middle. Labrum and anterior margin of clypeal disk narrowly testaceous. Abdomen ferruginous, usually more or less infuscated, or sometimes almost uniformly fuscous, except that the junction of the segments, especially of the first three, remain light, and sometimes the base of tergites 2 and 3, or 2 to 4, have a narrow, ill-defined yellowish band. Antennae and legs dark, the flagellum brown beneath, the front knees and anterior side of front tibiae more or less yellowish. Tegulae subhyaline testaceous, becoming brownish at base. Wings slightly whitish hyaline, the nervures testaceous, subcosta infuscated.

Head a little wider than long, the inner orbits parallel. Facial foveae linear, a little more than their own width from margin of eyes, and extending from level of middle of antennal sockets about three-fourths of distance to level of anterior ocellus. Mandibles stout, with a small inner tooth. Pygidial plate narrowly triangular, slightly obtuse at apex, with apical third of disk convex. Head and thorax moderately shining, the disk of mesoscutum and the scutellum weakly tessellate; frons, vertex, and anterior border of mesoscutum strongly tessellate and dullish; frons, mesopleura, and sides of propodeum with fine, rather close punctures, the mesoscutum and scutellum with equally close and slightly stronger punctures. Pubescence whitish, fine, and erect, rather dense for a *Perdita* and short on the mesonotum. Length, 6–7.5 mm.; anterior wing, 4.5–5 mm.

Material examined.—CALIFORNIA. Contra Costa Co.: Mt. Diablo, May 18 (P. D. Hurd, Jr.), May 21 (E. S. Ross), May 29 (R. M. Bohart); Pine Canyon, Mt. Diablo, May 23 (R. L. Usinger). Alameda Co.: Cedar Ridge, May 3 (E. G. Linsley); Midway, May 24 (Mont Cazier). Santa Clara Co.: Palo Alto, May 19 (Ross); Mt. Hamilton, 4,000–4,500 feet, June 2 (Cazier); San Antonio Valley, on *Calochortus*, June 3, 1954 (J. S. Rozen). Santa Cruz Co.: June 1 (Bohart). San Benito Co.: Idria, on *Calochortus*, June 14, 1955 (D. Burdick). Fresno Co.: Coalinga, May 14 and 15 (collector ?); Los Gatos Canyon, Mt. Diablo Range (J. C. Bradley). Kern Co.: summit of Tejon Pass, May 15 (E. C. Van Dyke); Mt. Pinos, on *Calochortus ken-*

² Charles D. Michener has kindly agreed to let the types, collected by him in California, remain at Riverside, with the proviso that ultimately they must go to collection of the California Academy of Sciences.

nedyi (collector ?). Los Angeles Co.: Mint Canyon, on *Cryptantha*, May 3 (Linsley); Eagle Rock Hills, on *Calochortus*, June 30 (C. D. Michener); Laurel Canyon, Santa Monica Mts., on *Calochortus*, July 9 (J. C. Bridwell); Westwood Hills, July 27 (Linsley); Crystal Lake, San Gabriel Mts., July 7 (Bohart); Tanbark Flat, San Gabriel Mts., July 7 (J. W. MacSwain); Los Angeles (Davidson); Los Angeles, April 12 (S. A. Leshim). San Bernardino Co.: May (Coquillett); near Devore, on *Calochortus plummerae*, June 23 (Timberlake); Lytle Creek, June 6 (Van Dyke). Riverside Co.: Riverside, June 2 (C. M. Dammers); base of Mt. Santiago, above Glen Ivy, on *Calochortus splendens*, May 13 (Timberlake); The Gavilan, on *Calochortus splendens*, May 2-31 (Dammers, Timberlake); 1.5 miles west of Perris, on *Eriogonum fasciculatum*, June 2 (Timberlake); Hemet, May 10 (Linsley); 8 miles west of Keen Camp, San Jacinto Mts., on *Eriodictyon*, May 16 (Linsley); San Jacinto River, San Jacinto Mts., May 30 (Usinger); Keen Camp, San Jacinto Mts., on *Calochortus splendens*, June 10 (Linsley, Ross); Herkey Creek, San Jacinto Mts., June 11 (Ross); Vandevanter Flat, San Jacinto Mts., May 19 (R. M. Wells); Piñon Flat, San Jacinto Mts., on *Calochortus concolor*, May 15 to June 21 (R. Husbands, Linsley, Michener, Van Dyke, Timberlake), on *Opuntia*, May 28 (Michener), on *Eriodictyon*, May 21 (collector ?); Mt. Santa Rosa, San Jacinto Mts., May 31 (collector ?).

LOWER CALIFORNIA: Ensenada, June (N. L. H. Krauss); San Vicente, May 11 (W. E. Simonds).

Perdita montereyensis, n. sp.

(Figs. 245, 246, 350)

This species is similar to *californica* and possibly may prove to be only a subspecies, but it is darker in color and differs appreciably in sculpture. The female collects pollen from both *Eschscholtzia* and *Calochortus*.

Female.—Dark bluish-green; the mesoscutum except anterior border, scutellum, and metanotum black. Face marks as in *californica*, except that the submedian dark stripes of clypeus usually are narrow, broken, evanescent, or absent. Abdomen always blackish, tinged with brown, the juncture of tergites more or less brown or ferruginous. Antennae, legs, and tegulae as in *californica*, the wings slightly dusky hyaline, without the whitish cast of *californica*.

Structural characters, including sculpture and pubescence, similar to those of *californica*, but disk of mesoscutum polished, with sparse fine punctures and sparse pubescence, the scutellum also polished and only a little less closely punctured than the scutum; punctures of frons slightly sparser than in *californica*. Length, 5.5-7 mm.; anterior wing, 4.4-4.8 mm.

Male.—Dark bluish-green; the mandibles except tips, labrum, clypeus, lateral, subantennal, and supra-clypeal marks white, but the face not completely pale below level of antennae. Abdomen fuscous, or brownish fuscous, usually more brownish at juncture of segments, and the base of tergites 2 and 3 sometimes with a narrow, nubilous, somewhat yellowish band. Legs brownish fuscous; the apex of front femora and anterior side of front tibiae yellow; the front tarsi pale brown. Tegulae pale testaceous. Wings slightly dusky hyaline, the nervures testaceous brown, subcosta fuscous.

Head distinctly broader than long, the mandibles stout and acute at apex. Facial foveae faint and about four times longer than wide. Proboscis moderately long, the galea of maxillae subequal to stipes and slightly longer than the maxillary palpi. Frons and vertex tessellate, dullish, with close fine rather distinct punctures on the frons; mesonotum shining, with disk of scutum and the scutellum polished, the punctures moderately close and becoming finer on middle of scutum. (In *californica*, the frons dull and rather densely punctured, and the mesonotum closely punctured, with disk of scutum faintly tessellate.) Tergite 7 as in *californica* with a broad, rounded emargination at apex, and two submedian lobes, which are thinly laminate, semivertical, and oblique to the plane of the disk, and somewhat longer than wide as seen from side and rounded at apex. Aedeagus nearly as in *californica*, with the parameral lobes straighter and almost hairless, the sagittae a little more constricted at middle and bulbously enlarged at apex. Length, 4.5-5.9 mm.; anterior wing, 3.8-5.2 mm.

Holotype female and allotype, collected June 7, on *Eschscholtzia*, and 57 females, 101 males (paratypes), collected May 20 to June 24, 1938, Hastings Natural History Reservation, James-

burg, Santa Lucia Mts., Monterey Co., California (C. D. Michener), the females collecting pollen from *Eschscholtzia californica* and *Calochortus splendens*, and some of the males on *Eriogonum*.

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

***Perdita tularensis*, n. sp.**

(Figs. 247, 248, 351)

This is another close ally of *californica* and so similar that an examination of the male genitalia is often necessary for positive identification. The known range of *tularensis* now extends from Alpine, Tuolumne, and Mariposa counties southward to Tehachapi Pass.

Female.—Like the female of *californica*, but the dark stripes on disk of clypeus, although sometimes distinct, usually evanescent or absent. Mesonotum a little more densely punctured and the disk sometimes more tessellate. Length, 6.5–7.5 mm.; anterior wing, 4.6–5 mm.

Male.—Resembling the male of *californica*, but the mesonotum sometimes more or less blackish on the posterior half of disk, instead of green, with the punctures closer, and sometimes tessellate and dullish. Submedian lobes of tergite 7 shorter and broader than in *californica* and not much longer than wide as seen from the side, with the inferior margin rounded, and as seen from above more divergent. Aedeagus similar, but the parameral lobes acute and curved upward at apex as seen from the side; the fused sagittae strongly compressed, with a median sharp ridge above, and the apical part expanding into a transversely quadrate flange, that is about three times broader than long and almost squarely truncate across the apex. Length, 5–7 mm.; anterior wing, 4–5 mm.

Three males, 3 females (holotype male, allotype, and paratypes), along Highway 65, a little above Badger, Tulare Co., California, on *Calochortus venustus*, June 28, 1929 (Timberlake). Additional paratypes as follows: 1 male, Alpine Co., June 20 (E. P. Van Duzee); 1 male, 3,500 feet, Tuolumne Co., June 9, 1938 (T. R. Barden); 1 male, 2 females, Yosemite Valley, 3,800–4,000 feet, June 8 (N. F. Hardman); 1 female, Nipinnawasse, Madera Co., May 24, 1936 (E. S. Ross); 1 male, Bass Lake, 2,800 feet, Madera Co., April 3, 1938 (N. F. Hardman); 7 males, Kings Canyon, Fresno Co., on *Calochortus*, June 18, 1953 (G. D. Butler); 2 males, 3 females, 1.5 miles west of Three Rivers, Tulare Co., on *Calochortus luteus*, April 29, 1947 (Timberlake); 8 males, 1 female, California Hot Springs, Tulare Co. (E. R. Leach); 3 males, 6 females, California Hot Springs, June 3, 1939 (E. C. Van Dyke); 1 female, Isabella, Kern Co., May 17, 1937 (Van Dyke); 2 males, 3 females, Kernville, Kern Co., June 14, 1953 (Butler); and 29 males, 19 females, Tehachapi Pass, Kern Co., on *Calochortus venustus*, June 19, 1953 (Timberlake).

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

***Perdita bispinata*, n. sp.**

(Figs. 249, 250, 323, 352)

This species is the most distinct member of the *californica* group. The male has a slender, sharp spine, extending backward and a little inward from the underside of the apex of the middle coxae, and tergite 7 is without notches on the sides but ends in two broad, horizontal lobes, that are separated by a semicircular emargination. In both sexes the abdomen is ferruginous, without pale markings.

Female.—Dark green; the disk of mesoscutum, the scutellum, and metanotum black. Thorax entirely dark. Spot at base of mandibles, clypeus, and transverse or triangular lateral marks, not or hardly reaching above level of clypeus, pale yellow. Mandibles testaceous except at base and dark red at apex. Labrum testaceous, rufotestaceous, or rarely tinged with yellow. Anterior

margin of clypeus testaceous, and on the disk two fuscous stripes, which may be separate and abbreviated, or more or less confluent anteriorly. Abdomen ferruginous, but basal tergite fuscous except on lateral and apical margins. Antennae blackish, the antennae broadly dull yellowish beneath. Legs black; a small spot at apex of front femora and anterior side of front tibiae yellow. Tegulae subhyaline testaceous, becoming yellowish at base. Wings whitish hyaline, the nervures and margins of stigma pale testaceous, subcosta fuscous except at base.

Head distinctly broader than long, with inner orbits slightly convergent above. Facial foveae very slender and reaching from lower level of antennal sockets about three-fourths of the distance to level of anterior ocellus. Mandibles with a small inner tooth. Head and thorax moderately shining, the frons and anterior third of mesoscutum minutely tessellate; the puncturation very fine, moderately close on frons, the punctures of mesoscutum mostly two or three puncture-widths apart and those of scutellum somewhat sparser. Propodeum finely tessellate, the basal area finely roughened on the middle of the base. Pubescence whitish, very short and fine on the mesonotum. Length, 5.2-6.5 mm.; anterior wing, 4.2-5 mm.

Male.—Dark olive or bluish-green; the propodeum more bluish, with only the scutellum and metanotum usually blackish. Mandibles except reddish tips, labrum, clypeus, transverse lateral marks, and often small subantennal and supraclypeal marks pale yellow. Scape of antennae yellow beneath, the flagellum dull yellow beneath and ferruginous brown above. Front knees, anterior side of front tibiae, and front tarsi yellow. Color characters otherwise as in female.

Head much broader than long, the inner orbits divergent anteriorly. Facial foveae linear and very short. Mandibles massive, but tapering and acute at apex. Middle coxae each with a slender, conical spine directed backward and inward. Sculpture about as in the female, but frons and vertex subopaque, with the punctures of frons minute and indistinct; mesoscutum dullish all over and a little more densely punctured than in the female. Tergite 7 without lateral emarginations, moderately convex from side to side and bilobate at apex, with the lobes obliquely truncate and generally about as wide as the rounded emargination between them. Aedeagus with parameral lobes rather roundly dilated at apex; sagittae massive and dividing into two acute points at apex as seen from above. Length, 4-6 mm.; anterior wing, 3.6-4.5 mm.

Holotype female and allotype, 3.5 miles southwest of Victorville, San Bernardino Co., California, on *Calochortus kennedyi*, May 4, 1939 (Timberlake). Paratypes as follows, all from the Mohave Desert in San Bernardino Co., on *Calochortus kennedyi*, except one female on *Ericameria*, and one male from Hemet: 4 males, near Victorville, May 17, 1930; 5 males, at mouth of Deep Creek, May 5, 1936; 3 males, 1 female, near mouth of Deep Creek, May 16, 1937; 10 males, May 4, 1 male, May 6 and 1 male, 1 female, May 12, 1939, 3.5 miles southwest of Victorville; 2 males, 1 female, 4 miles southwest of Victorville, May 4, 1939, the female on *Ericameria cooperi*; 14 males, 6 females, 2.4 miles southeast of Desert Springs, May 14, 1952 (Timberlake); 3 males, 3.5 and 4 miles southwest of Victorville, May 4, 1939 (W. P. Cockerell); 1 male, Phelan, May 31, 1933 (C. M. Dammers); and 1 male, Hemet, Riverside Co., May 10, 1936 (E. G. Linsley).

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

Perdita macrostoma Cockerell

(Figs. 251, 252, 324, 353)

Perdita macrostoma Cockerell, 1922, Proc. U. S. Nat. Mus., 60(18):18, ♂, ♀.

The type locality of *macrostoma* is Los Angeles County, California, where it was collected by Coquillett in May. The pollen borne by some of the Coquillett specimens is rather coarse, has now turned nearly black, and came almost certainly from some species of *Calochortus*. No one has found this species recently, and besides the Coquillett specimens, I have seen only one female, without data, but from the Davidson collection and now in the Los Angeles Museum.

Perdita bilobata, n. sp.

(Figs. 253, 254, 354)

Perdita bilobata is very similar to *macrostoma* and may prove to be a subspecies, but as yet there is no evidence of intergradation. The female has the abdomen banded with fuscous and ferruginous, with the clear-cut pale-yellow bands of *macrostoma* much more poorly defined. The male is more similar to *macrostoma*, but lacks a yellowish band at base of the second and third segments of the abdomen.

Female.—Dark green; the middle of disk of mesoscutum and the scutellum black. Large mark on base of mandibles, marks on clypeus, and transverse lateral marks pale yellow. Disk of clypeus usually broadly black in middle, with a yellow mark on each side, but sometimes, as in holotype, the yellow becomes confluent across apex of disk, with a slender spur onto the lateral extensions, and the black area enclosing a short median yellow streak on upper part of disk. Abdomen ferruginous, marked with fuscous or blackish; first tergite dark, except a light band across apex; tergites 2 to 4 each with a dark band across the middle, tergite 2 having an enclosed light band at base and broader one across apex, and tergites 3 and 4 having the dark band a little abbreviated, but with a dark spot at basal corners, the light band at base slightly interrupted in middle but confluent at sides with the broader apical band. The basal bands on tergites 2 to 4 may be slightly tinged with yellow, and thus suggestive of the clear-cut and distinctly interrupted pale-yellow bands of *macrostoma*. Antennae and legs dark, the flagellum brown beneath, the extreme apex of front femora and anterior side of front tibiae yellow. Tegulae subhyaline testaceous, becoming brownish at base. Wings hyaline with a whitish cast, the nervures testaceous, and subcosta pale fuscous except at base.

Head distinctly broader than long, the inner orbits parallel. Clypeus rather obtusely dentate on each side of base of labrum. Facial foveae linear, reaching from lower level of antennal sockets not quite to level of anterior ocellus. Pygidium narrow, acute at apex, with apical part convex and recurved. Head and thorax tessellate and dullish, the frons with fine, moderately close punctures, which become sparse on the middle and toward the vertex; mesonotum with fine close punctures, which become sparse on the nearly polished black part of the mesoscutum and scutellum. Pubescence whitish, erect, and rather short, especially on the mesonotum. Length, about 5.5–6 mm.; anterior wing, 4.5–4.8 mm.

Male.—Head and thorax dark green or blue-green, the abdomen ferruginous, except that the first tergite is more or less fuscous across the base. Mandibles except red tips, labrum, clypeus, transverse lateral marks, and sometimes subantennal and supraclypeal marks pale yellow. Scape of antennae yellow beneath and dark above, the flagellum brown, becoming paler beneath. Legs dark, the apex of front and middle femora, anterior side of front and middle tibiae, and front tarsi yellow; middle and hind tarsi more or less brown. Tegulae and wings as in the female.

Head much broader than long, with the inner orbits slightly divergent anteriorly. Mandibles stout, tapering, and acute at apex. Head and thorax dull, the frons subopaque, with close and rather obscure fine punctures; mesonotum closely and finely punctured, with the punctures sometimes slightly sparser and the surface more shining on the middle of mesoscutum and on the scutellum. Tergite 7 deeply emarginate on each side, the median lobe broad, with a small secondary emargination on each side and a bilobate apex. Aedeagus nearly as in *macrostoma* but the parameres of caulis blunt at apex, with a high crest on apical third, that overhangs the outer margin, and as seen from side with a broader excision at middle. (In *macrostoma* the tip of the parameres acute and incurved, with subapical crest not overriding the outer margin.) Length, 4.5–6 mm.; anterior wing, 4–4.6 mm.

Four females, 4 males (holotype female, allotype, and paratypes), Wild Rose Canyon, 6,000 feet, Panamint Mts., Inyo Co., California, on *Calochortus aureus*, May 29, 1937 (C. D. Michener); 11 males (paratypes), mouth of Deep Creek, San Bernardino Co., on *Calochortus*

kennedyi, May 5, 1936 (Timberlake); and 1 male (paratype), west side of Mohave River, 1.5 miles north of mouth of Deep Creek, on *Ericameria cooperi*, May 5, 1936 (Timberlake).

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

***Perdita mohavensis*, n. sp.**

(Figs. 255, 256, 325, 355)

This species, like the two preceding, belongs to that branch of the *californica* group with two broad, subhorizontal lobes at apex of abdomen, and has creamy white markings on face and abdomen in both sexes. It has been collected from several flowers on the deserts of California, but probably collects pollen mainly from *Eschscholtzia*.

Female.—Dark blue-green; the disk of mesoscutum and the scutellum black. Basal half of mandibles, clypeus except a broad black patch on disk, sometimes resolved into two dark stripes, and transverse lateral marks creamy white. Apex of mandibles reddish, shading into testaceous at middle. Abdomen fuscous, with a more or less distinct bluish tinge on the first tergite; tergites 2 to 4 each with a yellowish-white band, more or less broadly interrupted medially, and those on tergites 2 and 3 bent backward at outer ends; tergite 5 with a mark on lateral margins, sometimes enlarged to form an interrupted band, or more rarely replaced by a small discal spot on each side. Pygidium and apical segment of venter ferruginous. Antennae black, the flagellum broadly yellowish-brown beneath. Legs dark, a spot at apex of front femora and anterior side of front tibiae yellow, the front tarsi sometimes pale brown. Tegulae subhyaline testaceous and brownish at base. Wings somewhat whitish hyaline, the nervures testaceous, margins of stigma darker, and subcosta brown except at base.

Head only slightly broader than long, with the clypeus obtusely produced on each side of labrum. Facial foveae linear and reaching from level of middle of antennal sockets about two-thirds of distance to level of anterior ocellus. Pygidium narrow, with parallel sides on basal half, the apical disk convex and recurved, with the sides converging to the acute apex. Head and thorax shining, but frons and vertex tessellate and somewhat dullish, with fine, rather close punctures on the frons; disk of mesoscutum and scutellum polished, with fine, well-separated punctures, and anterior border of scutum faintly tessellate and more closely punctured. Pubescence whitish, moderately long and rather thin, becoming short on disk of mesonotum; apical fimbria pale ochreous. Length, about 5–5.5 mm.; anterior wing, 3.7–4 mm.

Male.—Dark blue-green; the disk of mesoscutum dark green, not black as in female. Mandibles except red tips, labrum, clypeus, and almost always subantennal and supraclypeal marks creamy white, with upper limit of the white very uneven, the lateral marks reaching no higher on inner side than middle of subantennal plates, but reaching on orbits nearly to level of antennae. Abdomen dark, with a bluish luster on basal tergite; tergite 7, also sometimes tergite 6 and apical border of 5 ferruginous or amber color; tergites 2 to 5, or 6, each with a transverse subapical white mark far to each side and extending onto the reflexed ventral part of the segment, or sometimes tergites 4 and 5, more rarely 3 to 6, each with a thin subapical white band across the middle of the segment, or with small subapical discal marks; tergites 2 and 3 with a broadly interrupted white band at base, rarely confluent at outer ends with the subapicolateral marks, tergite 4 sometimes with a similar band, or this represented by two widely separated spots. Venter dark, becoming ferruginous apically, and sometimes also across apical margin of basal segments. Antennae blackish, the scape white beneath and flagellum ferruginous beneath. Legs dark, with apex of front and middle femora, anterior side of front and middle tibiae, and the tarsi yellow; hind legs sometimes entirely dark, or with a spot at apex of the femora and tibiae, and the tarsi yellow. Tegulae and wings as in female, except the subcosta and margins of stigma more fuscous.

Head usually a little broader than long, with inner orbits slightly diverging anteriorly. Facial foveae about four times longer than wide. Sculpture and pubescence much as in female, but frons and vertex more opaque, with more obscure fine punctures, and punctures of mesoscutum somewhat closer. Tergite 7 deeply emarginate on the sides and ending in two broad subhorizontal

lobes, that are about as wide as the rounded notch between them (the median notch in males from Painted Gorge, Imperial Co., shallow and hardly as wide as the lobes). Dorsal lobes of caulis of aedeagus short and acute, the parameral lobes slender and rather strongly bowed; sagittae fusiform and acute at apex. Length, 3.5–4.5 mm.; anterior wing, 3.2–3.8 mm.

Two females, 4 males (holotype female, allotype, and paratypes), Mohave Desert, south of the Avawatz Mts., San Bernardino Co., California, on *Eschscholtzia glyptosperma*, April 30, 1927 (Timberlake). Additional paratypes as follows: 1 female, Cave Spring, Avawatz Mts., on *Larrea divaricata*, April 8, 1939 (E. G. Linsley); 1 female, 2 males, on *Monardella exilis* and 2 males on *Larrea*, Piute Butte, Los Angeles Co., May 12, 1944 (Timberlake); 1 female, south base of Piute Butte, on *Chaenactis stevioides* var. *brachypappa*, May 12, 1944 (Timberlake); 1 male, Lovejoy Buttes, Los Angeles Co., on *Ericameria cooperi*, May 11, 1944 (Timberlake); 2 males, 7.5 miles south of Twentynine Palms, Riverside Co., on *Eschscholtzia minutiflora* var. *darwinensis*, May 7, 1948 (Timberlake); 1 female, 11 males, Box Canyon, Riverside Co., on *E. darwinensis*, April 4, 1937 (Timberlake); 1 male, Lost Palm Canyon, Riverside Co., April 9, 1937 (Mrs. R. C. Dickson); 6 females, 15 males, 10 and 11 miles south of Highway 60, Blythe to Niland cutoff, Little Chuckawalla Mts., Riverside Co., on *E. darwinensis*, April 13, 1947 (Timberlake and Dickson); 1 female, 13.6 miles south of Highway 60, Little Chuckawalla Mts., on same flower, April 13, 1949 (Dickson); 1 male, Indio, Riverside Co., on *Hyptis emoryi*, April 1, 1946 (J. W. MacSwain); 1 female, Borego, San Diego Co., April 5, 1949 (P. D. Hurd, Jr.); 1 female, 20 males, Painted Gorge, Imperial Co., on *Hyptis emoryi*, April 12, 1949 (R. A. Flock); 1 female, 1 male, Barstow, San Bernardino Co., April 16, 1938 (Aitken and Downes); 1 female, 15 miles north of Wild Rose Canyon, 4,000 feet, Panamint Mts., Inyo Co., May 27, 1937 (C. D. Michener); 1 male, 6 miles north of Wild Rose Canyon, 5,000 feet, Panamint Mts., on *Salvia*, May 28, 1937 (Michener); 1 male, Wild Rose Canyon, 4,000 feet, Panamint Mts., on *Calochortus aureus*, May 29, 1937 (Michener); and 1 female, Bonanza King Mine, Providence Mts., San Bernardino Co., April 2, 1934 (F. W. Morand).

Types in collection of United States National Museum (No. 42,409); paratypes in collections of the University of California at Riverside and Berkeley, the University of Kansas, and the American Museum of Natural History.

Perdita duplonotata

(Figs. 257, 258, 356)

This species is closely allied to *mohavensis*, but the female has the mesonotum more closely punctured and less black than in that species. The male is somewhat larger than *mohavensis* and has the apical lobes of the abdomen much more oblique.

Female.—Head and thorax bluish-green, the middle of the disk of mesoscutum and the scutellum blackish, but the black color less extensive and more faintly developed than in most of the allied species. Mandibles except rufous tips, clypeus except a broad blackish mark on middle of disk, and transverse lateral marks creamy white. Thorax entirely dark. Abdomen black, the first tergite with a greenish luster, the apical depression of the tergites brownish, and an abbreviated preapical band on tergite 5 and the apical part of the venter ferruginous; tergites 2 to 5 each with a pale-yellow band, well interrupted medially, those on tergites 3 to 5 bent backward at outer ends and that on tergite 2 straight and basal, with a supplementary subapical spot on lateral margins. Antennae dark, the flagellum brown beneath. Legs black, a small spot at apex of front and middle femora, and anterior side of front tibiae yellow. Tegulae subhyaline, becoming yellowish toward base and brown at extreme base. Wings whitish hyaline, the nervures pale testaceous, subcosta brown, and margins of stigma pale brown.

Head somewhat wider than long, the inner orbits parallel. Clypeal process on each side of labrum obtuse and nearly as long as wide at base. Facial foveae as in *mohavensis*, and the pygidium similar but more acute at apex. Head and thorax shining, the frons and vertex tessellate but not much dulled, the punctures distinct and close on frons and sparse on vertex; mesonotum polished, the punctures fine and moderately close. Pubescence as in *mohavensis* except that it is somewhat longer and less thin on the mesonotum. Length, 5.5 mm.; anterior wing, 4.4 mm.

Male.—Head and thorax blue-green, without black on mesonotum, the thorax entirely dark. Basal half of mandibles, labrum, clypeus, lateral, subantennal, and supraclypeal marks white, but the lateral marks narrowed toward clypeus so that the face is not entirely light below level of antennae. Abdomen black, the first tergite strongly tinged with green, the apical tergite brownish or dark ferruginous; abdominal markings yellowish-white, consisting of broadly separated and transverse marks at base of tergites 2 and 3, preapical marks on lateral margins of tergites 2 to 6, extending onto the reflexed ventral part of the segments, and a more or less distinct, abbreviated preapical band across the middle of tergites 5 and 6. Mandibles reddish at apex, shading into testaceous, then into white at base. Scape and pedicel of antennae black, the former white beneath, the flagellum ferruginous, becoming more or less fuscous above. Legs black; the apex of femora, anterior side of front tibiae, a line on middle tibiae, and the tarsi yellow. Tegulae and wings as in female. The paratype from Utah differs in having a basal band only on tergite 2, subapico-lateral marks on tergites 2 to 5, and the preapical band across disk of tergites 4 and 5, as well as a broader band on tergite 6, and tergite 7 ferruginous.

Head distinctly broader than long, the inner orbits hardly diverging in front. Facial foveae faint and about three times longer than wide. Mandibles moderately stout, tapering, and acute at apex. Head and thorax shining, except the tessellate frons and vertex (these more opaque in the paratype from Nevada), the mesonotum polished, becoming faintly tessellate around the margins (tessellate throughout in the Nevada specimen); puncturation fine and moderately close on mesonotum and a little closer on frons. Tergite 7 with apical lobes obliquely inclined and flaring outward, broad and rounded at apex, the subapical carina on each side curving inward to merge with their inner margin and the emargination between them semicircular and about as wide as either lobe. Aedeagus similar to that of *mohavensis*, but the parameral lobes thicker as seen from above, with the ridge on inner margin forming a distinct hump medially, and the sagittae less broadly fusiform and longer in relation to other parts. Length, about 4.5–5 mm.; anterior wing, 3.7–4 mm.

One female, 2 males (holotype female, allotype, and paratype), Trachite Ranch, 5,000 feet, Garfield Co., Utah, 32 miles south of Hankville, May 19, 1952 (J. C. Downey); and 1 male (paratype), Lee Canyon, about 5,500 feet, Charleston Mts., Clark Co., Nevada, on *Fallugia paradoxa*, June 3, 1941 (Timberlake).

Types in collection of Citrus Experiment Station, Riverside.

Perdita robustula, n. sp.

(Figs. 259, 260, 326, 357)

Perdita robustula is rather similar to *mohavensis*, but the female has the disk of mesonotum green, instead of black, and the male has yellow face marks and a partly ferruginous abdomen.

Female.—Dark green, or blue-green; the thorax entirely dark, with the tubercles brownish. Mandibles except reddish tips, clypeus, and triangular lateral marks generally rather pale yellow; disk of clypeus with two black stripes, which are often broad and confluent, but leave a small, central yellow streak; lateral marks equilateral or slightly broader than high and reaching level of antennae. Abdomen blackish, or tinged with dark brown, with a greenish tinge on tergite 1, and the last two ventral segments in large part and the pygidium, ferruginous. Tergites 2 to 5 each with a basal yellow band, rather broadly interrupted in the type and other specimens from San Diego County, and more narrowly in paratypes from Riverside County, and those on tergites 3 and 4 bent backward at outer ends, and either reaching lateral margins, or slightly abbreviated. Labrum black or piceous. Antennae dark, the flagellum brown beneath. Legs dark, a spot at apex of front femora and anterior side of front tibiae yellow. Tegulae testaceous subhyaline and brownish at base. Wings hyaline, the nervures pale testaceous, subcosta and margins of stigma infuscated.

Head distinctly broader than long, the inner orbits parallel. Clypeus obtusely produced on each side of labrum. Facial foveae reaching from lower level of antennal sockets about two-thirds of distance to level of anterior ocellus. Pygidial plate narrow and subacute at apex, the

apical half recurved and convex on the disk. Head and thorax shining, the frons and vertex moderately tessellate and with fine close punctures on the frons; mesonotum almost polished, with fine sparse punctures. Pubescence white, erect, moderately short on mesonotum, the apical fibria slightly tinged with ochreous. Length, about 5.5–6 mm.; anterior wing, 4.3–5 mm.

Male.—Head and thorax dark green or bluish-green. Mandibles except reddish tips, labrum, nearly entire face below level of antennae, mark at anterior end of cheeks, and usually the tubercles yellow. Abdomen ferruginous, but tergite 1 fuscous, except on apical margin, and with a greenish luster; tergites 2 and 3, or 2 to 4, or 5, each with a narrow yellow band at base, not quite reaching lateral margins, and followed by a fuscous band; more rarely the fuscous bands become broader, with the dark color predominating over the ferruginous. Antennae dark, the scape yellow beneath, the flagellum brown or yellowish beneath. Legs blackish; apex of front and middle femora, broad anterior side of front tibiae, front tarsi, and sometimes a short line on middle tibiae yellow. Tegulae and wings as in female.

Head distinctly wider than long, the inner orbits slightly diverging in front. Facial foveae faint, about two or three times longer than wide. Mandibles strong, curved, tapering, and acute at apex. Head and thorax shining, the mesonotum almost polished, with fine and moderately close punctures; frons and vertex tessellate and dullish, the punctures of frons fine and close. Tergite 7 deeply emarginate on each side, with two broad lobes apically, which are obliquely truncate and a little narrower than the emargination between them; preapically on the disk is a slight transverse ridge, which becomes an oblique elevated carina on each side to form a rounded prominence, from beneath the edge of which a fringe of long hairs projects. Parameral lobes of aedeagus rather stout, a little narrowed at the middle, and with a sharp ridge on inner border of apical half; sagittae fusiform and bluntly rounded at apex. Length, about 4.2–4.9 mm.; anterior wing, 4–4.4 mm.

One female, 3 males (holotype female, allotype, and paratypes), Palm Canyon, Riverside Co., California, on *Prosopis juliflora*, April 3, 1925 (Timberlake). Additional paratypes as follows: 2 females, 1 male, San Diego Co., April (Coquillett); 1 female, 1 male, Borego, San Diego Co., the female on *Eschscholtzia minutiflora* var. *darwinensis*, the male on *Agave deserti*, April 29, 1954 (Timberlake); 2 females, Borego, on *Eschscholtzia*, April 26 and 30, 1954 (P. D. Hurd, Jr.); 7 males, Beal's Well, Imperial Co., on *Argemone platyceras*, April 20, 1949 (R. C. Dickson); 2 females, 4 males, Lost Palm Canyon, Riverside Co., April 9, 1949 (Mrs. R. C. Dickson); 1 female, 11 miles south of Highway 60, Little Chuckawalla Mts., Riverside Co., on *Eschscholtzia*, April 13, 1949 (Timberlake); 1 male, Andreas Canyon, on *Prosopis juliflora*, April 11, 1936 (Timberlake); 8 males, Andreas Canyon on *Argemone platyceras*, April 2, 1955 (Timberlake); and 1 male, Surprise Canyon, Panamint Mts., Inyo Co., on *Stanleya pinnata*, April 29, 1953 (Timberlake).

Types in United States National Museum (No. 43,406), and paratypes in the collections of the University of California at Riverside and Berkeley.

Perdita argemones, n. sp.

(Figs. 261, 262, 327, 358)

This Arizona species is similar to *robustula*, but the subapical carina of the seventh tergite forms a small subacute tooth near base of the apical lobes, and the female has the disk of mesonotum black and the pronotum marked with yellow.

Female.—Dark green; the posterior half of mesoscutum and the scutellum black. Mandibles except rufous tips, clypeus, large lateral marks, usually a transverse supra-clypeal mark, and a spot at anterior end of cheeks pale yellow; lateral marks triangular, a little higher than wide, and reaching slightly above antennae; anterior margin of clypeus testaceous, the labrum whitish, tinged with testaceous. Collar of pronotum, interrupted line on hind margin of the disk, and the tubercles pale yellow. Abdomen fuscous, more or less tinged with brown, the apical depression of tergite 4, or of tergites 3 and 4, ferruginous brown, the two apical tergites and the venter ferruginous (or venter more or less tinged with yellow), and the pygidium rufous. An interrupted band, not reaching lateral margins, on base of tergites 2 to 4, a pre-

apical spot on lateral margins of these segments, and sometimes a preapical band across the middle of tergite 4 pale yellow. Antennae blackish, the scape yellowish-white, and the flagellum yellowish-brown beneath. Legs dark, the apex of front and middle femora, anterior side of front and middle tibiae and of middle trochanters yellow; front tarsi pale brownish. Tegulae hyaline, pale yellow at base. Wings hyaline, the nervures testaceous, margins of stigma and subcosta fuscous.

Head somewhat broader than long, the inner orbits barely divergent in front. Clypeal margin subacutely produced on each side of labrum. Facial foveae linear, reaching from lower level of antennal sockets about two-thirds of distance to level of anterior ocellus. Apical half of pygidium very narrow, nearly parallel-sided, except next to the broader basal part, convex on disk and strongly recurved. Head and thorax shining, the frons and vertex weakly tessellate, with fine, moderately close punctures on the frons, the mesonotum polished, with widely spaced punctures. Pubescence fine, white, rather sparse, and that of mesonotum short and erect. Length, 5-5.5 mm.; anterior wing, 3.9-4.1 mm.

Male.—Head and thorax dark green, without black on mesonotum. Anterior end of cheeks, mandibles except red tips, labrum, face below level of antennae except dark sutures, scape of antennae, and pronotum and legs in large part bright yellow. Lateral face marks with an orbital extension that intrudes between the foveae and eye margin. (In paratypes from Maricopa Mts., they are triangular and intersect the middle of the subantennal plates.) Pronotum with a narrow to broad dark band from side to side, or occasionally with the yellow reduced as in female. A blotch or streak on posterior side of the front and middle femora and tibiae, sometimes a blotch on anterior side of the femora, the hind femora except at apex and broadly beneath, hind tibiae except extreme base, and hind tarsi blackish. (In paratypes from Tucson and Maricopa Mts. the front and middle femora except at apex, and the hind legs, except trochanters, and apex of coxae and femora are dark.) Flagellum of antennae ferruginous brown beneath and dark brown above. Abdomen ferruginous yellow, with the apical depression of tergites more ferruginous; tergite 1 with a fuscous patch on lateral margins of disk, sometimes divided into a large anterior and a small posterior spot, or enlarged and extending to the base, or confluent across the disk, and with a definite greenish luster; tergites 2 and 3 sometimes with a transversely oval fuscous spot on each side subapically. (Abdomen in paratypes from Tucson more ferruginous, with nubilous darker shadings.) Tegulae and wings as in female.

Head sometimes enlarged and distinctly broader than long, with inner orbits moderately divergent in front. Mandibles tapering and acute at apex. Facial foveae faint and about three times longer than wide. Sculpture and pubescence as in female, except the puncturation of frons is close and that of mesonotum moderately close. Tergite 7 emarginate on each side, the median part ending in two broad lobes, which are about as wide as the notch between them and preceded by a small sharp tooth on each side. Parameral lobes of aedeagus rather slender and acute at apex, with a crest on inner margin helping to form a broad shallow emargination on the upper margin when viewed from the side; sagittae fusiform and subacute at apex. Length, 3.5-5 mm.; anterior wing, 3-3.7 mm.

Nine females, 14 males (holotype female, allotype, and paratypes), Oracle Junction, Pinal Co., Arizona, on *Argemone*, April 9, 1953 (G. D. Butler). Additional paratypes as follows: 1 male, Tucson, Pima Co., April 23, 1937 (W. Benedict); 5 males, Tucson, on *Argemone*, April 5, 1953 (Butler); 2 males, Maricopa Mts., Maricopa Co., April 14, 1947 (H. and M. Townes); and 1 male, Arizona (C. F. Baker), No. 2571.

Types in the collection of the Citrus Experiment Station, Riverside; paratypes in collections of the University of Arizona, the University of Kansas, and the United States National Museum.

Perdita arizonica, n. sp.

(Figs. 263, 264, 328, 359)

This is another species similar to *robustula*, with a dark ferruginous abdomen, but the male has the medioapical part of the seventh tergite much less broad, with the apical lobes a little narrower, curled upward at their tips, and more divergent, the face marks white, and the abdomen more distinctly punctured than usual. The

female differs from *robustula* and *mohavensis* in lacking yellow markings on the abdomen.

Female.—Dark blue; the mesoscutum except anterior border, scutellum, and metanotum black. Mandibles except reddish tips, clypeus, triangular lateral marks barely reaching level of antennae, and transverse supraclypeal mark white; labrum, anterior margin of clypeus, and a broad mark on middle of disk testaceous brown. Thorax entirely dark, with the tubercles brown. Abdomen dark ferruginous, suffused with fuscous on each side of the disk of tergite 1, and in holotype with dusky suffusions on following segments; also in holotype a narrow, nubilous, interrupted yellowish band is faintly apparent at base of tergites 2 to 4. Antennae and legs dark, the flagellum brown beneath, the front knees and anterior side of front tibiae yellowish. Tegulae subhyaline, with the base testaceous. Wings hyaline, but faintly dusky in comparison with *robustula*, *mohavensis*, and *argemones*, the nervures brownish testaceous, subcosta tinged with fuscous.

Head somewhat broader than long, the inner orbits parallel. Clypeal margin bluntly produced on each side of labrum. Facial foveae close to eye margin and reaching from level of middle of antennal sockets about three-fourths of distance to level of anterior ocellus. Pygidial plate moderately narrow at base, with the sides converging to the subacute, recurved apex, the disk of apical part convex. Head and thorax shining, the frons and vertex rather weakly tessellate, the frons with fine close punctures, but the anterior border of scutum a little tessellate and dullish, with close striate punctures. Abdomen hardly more distinctly but a little more closely punctured than in allied species. Pubescence whitish and of the usual density, becoming short on the mesonotum. Length, 6.5–6.7 mm.; anterior wing, 4.2–4.4 mm.

Male.—Dark blue-green; the scutellum blackish, the tubercles brown. Mandibles except rufotestaceous tips, labrum, and nearly the entire face below level of antennae creamy white. Abdomen almost uniformly dark ferruginous, becoming a little dusky on each side of tergite 1 and on lateral margins of tergite 2. Antennae blackish, the scape white, and the flagellum ferruginous brown beneath. Legs dark, the tarsi brown, with apex of front and middle femora, anterior side of front and middle tibiae, and front basitarsi yellow. Tegulae and wings as in female.

Head distinctly broader than long, the inner orbits slightly divergent in front. Mandibles stout, tapering, and acute at apex. Facial foveae faint and about five to six times longer than wide. Frons and vertex tessellate and dull, the punctures of frons fine and close. Mesonotum polished and only faintly tessellate on anterior border of the scutum, the punctures fine, but strong and moderately close, not becoming closer and striate on anterior border of scutum as in female. Abdomen with fine punctures, which are closer and stronger than in allied species. Tergite 7 deeply emarginate on the sides with the medioapical part rather narrow in comparison with *robustula*, the apical lobes not quite so broad as the emargination between them, obliquely inclined, rounded on their outer corners, and upturned at tips; the preapical carina forming a prominent but obtuse angle on each side. Aedeagus similar to that of *argemones*, but the crest on apical half of the parameral lobes humped at its proximal end, and the paramere showing a narrow emargination followed by a rounded knob when viewed from the side. Length, 5 mm.; anterior wing, 3.9 mm.

Two females, 1 male (holotype female, allotype, and paratype), Oak Creek Canyon, 4,000–5,000 feet, Coconino Co., Arizona, June 11, 1940 (R. M. Bohart); in collection of the Citrus Experiment Station, Riverside.

The types were taken in copula, and the pollen borne by the females is apparently from a species of *Calochortus*.

Perdita mormonica, n. sp.

This species, known only from a single female, is similar to *arizonica*, but differs in having the abdomen paler ferruginous and more shaded with yellow across the base of the tergites, the wings whiter, the clypeal margin less obtusely dentate, and the puncturation of face and mesonotum finer.

Female.—Head and thorax dark green, the propodeum more bluish, the disk of mesoscutum except broadly on sides and anterior border, and scutellum black. Small spot on base of mandibles, clypeus except two broad brown stripes, almost confluent on middle of disk, and transverse lateral marks, with orbital extension to level of antennae, white. Abdomen ferruginous, shading into yellowish at base of tergites 2 to 4 and on almost entire disk of tergite 5, but the yellow not forming clear-cut markings; tergite 1 infuscated except in middle and on apical margin, the darker part on each side with a greenish tinge. Antennae dark, the flagellum brown beneath. Legs blackish; a small spot at apex of front and middle femora, and anterior side of front and middle tibiae yellow; front tarsi brownish yellow; the middle and hind tarsi brown. Tegulae pale testaceous subhyaline, becoming brown at base. Wings somewhat whitish, the nervures testaceous, margins of stigma brown, the subcosta somewhat fuscous.

Head much like that of *arizonica*, but the clypeal process on each side of labrum about as long as wide at base and more subacute at apex. Pygidium as in *arizonica*. Head and thorax shining, the mesoscutum polished, the frons and vertex tessellate and somewhat dullish; puncturation moderately close on mesonotum and still closer on frons, being much as in *arizonica*, but finer and not at all striate on anterior border of mesoscutum. Pubescence whitish, about as in *arizonica*, but perhaps slightly longer and denser on the mesonotum (the type of *arizonica* has pubescence somewhat worn and abraded). Length, 6.1 mm.; anterior wing, 4.4 mm.

One female (holotype), Fremont Pass, Onaqui Mts., Tooele Co., Utah, on *Sphaeralcea*, 1950 (G. F. Knowlton and G. E. Bohart), in collection of the Citrus Experiment Station, Riverside.

Perdita distropica, n. sp.

(Figs. 265, 266, 329, 360)

The seventh tergite in the male of this species is rather similar to that of *arizonica*, but the apical lobes conform with the transverse curvature of the segment and are narrowed toward the apex as seen from the side. The abdomen in both sexes is dark with distinct light bands. The female resembles *coalingensis* and *santaclarensis* but it is a little larger, with a supraclypeal mark and sometimes subantennal spots, and larger markings on tergites 2 to 5. It collects pollen with equal readiness from *Eschscholtzia* and *Calochortus*.

Female.—Dark blue-green; the mesoscutum, except anterior border, and scutellum black. Mark on basal half of mandibles, clypeus, lateral marks, and more or less small supraclypeal and subantennal spots creamy white. Lateral marks rounded at inner ends and widened on orbits to reach level of antennae. Mandibles reddish at tips. Labrum testaceous and anterior margin of disk of clypeus rufotestaceous. Thorax entirely dark, the tubercles blackish. Abdomen blackish, with a band on tergites 2 to 5 and a small spot on lateral margins of tergite 1 pale yellow; the bands narrowly interrupted medially and those on tergites 2 to 4 abruptly bent backward and outward at outer ends. Antennae dark, the scape more or less pale yellow, and the flagellum yellowish-brown beneath. Legs blackish, with a spot at apex of front femora and anterior side of front tibiae yellow. Tegulae testaceous subhyaline, with the base yellowish-white. Wings somewhat dusky hyaline, the nervures testaceous brown, the subcosta fuscous, except at base.

Head moderately broader than long, with disk of clypeus subacutely dentate on each side of labrum. Facial foveae reaching from a little below the level of middle of antennal sockets about three-fourths of distance to level of anterior ocellus. Proboscis moderately elongate, the galeae and maxillary palpi about equal in length. Pygidium subacute at apex, with disk of the narrow apical part convex and recurved. Head and thorax shining, the disk of mesonotum polished, with fine, sparse punctures; frons and vertex tessellate, somewhat dullish, the frons with rather close, fine, but strong punctures. Pubescence whitish, rather thin and short, that on the mesonotum sparse, the apical fimbria dense and pale ochreous. Length, 6–6.5 mm.; anterior wing, 4.1–4.5 mm.

Male.—Head and thorax dark blue-green, the mesonotum without black. Mandibles except tips, labrum, clypeus, lateral, subantennal, and supraclypeal marks white, but the upper margin of the white uneven and the face not quite all light below level of antennae. Abdomen piceous,

more brownish beneath, the first tergite with a bluish luster; tergites 2 to 4 with a pale-yellow or yellowish-white band, usually abbreviated and basal, but sometimes bent backward and enlarged at outer ends, or with a discrete subapical streak far to each side on tergite 3; tergite 5 sometimes with vestiges of a band. Antennae dark, the scape broadly white, and the flagellum brown beneath. Legs dark, the front and middle femora at apex, anterior side of front and middle tibiae, and their basitarsi yellow. Tegulae and wings as in female.

Head distinctly broader than long, with the inner orbits slightly diverging anteriorly. Facial foveae four to five times longer than wide, and usually faint. Mandibles stout and tapering to acute apex. Head and thorax shining, except the dullish and tessellate frons and vertex, the frons with close fine punctures; mesonotum almost polished, except on anterior border of scutum, and with fine, moderately close punctures, which become well separated on middle of disk of scutum and on scutellum. Abdomen with distinct, minute puncturation, which becomes much sparser on the basal tergites. Tergite 7 strongly emarginate on each side, with the rather narrow medioapical part set off by secondary emarginations; the apical lobes rather small, obtuse at apex, oblique to disk of segment, and separated by a rounded notch which is a little broader than the lobes themselves. Aedeagus rather similar to that of *macrostoma*, but the sagittae in combination end much more acutely. Length, about 4.5-5 mm.; anterior wing, 3.8-4.1 mm.

Twenty-four females, 26 males (holotype female, allotype, and paratypes), Hastings Natural History Reservation, 1,900-2,700 feet, Santa Lucia Mts., near Jamesburg, Monterey Co., California, on *Calochortus splendens* and *Eschscholtzia californica*, the females collected June 6-8, 1938, and the males (two on *Eriogonum*) June 4-24 (C. D. Michener); 1 female (paratype), Pinnacles, San Benito Co., May 3, 1946 (J. S. MacSwain); and 3 females, 4 males (paratypes), San Antonio Valley, Santa Clara Co., on *Calochortus*, June 3, 1954 (J. G. Rozen).

The females from Monterey County are equally divided between those that bear pollen from *Eschscholtzia* and those with *Calochortus* pollen (one is labeled from *Adenostoma*, but bears *Calochortus* pollen).

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

Perdita coalingensis, n. sp.

In the characters of the female, the only sex known, *coalingensis* is similar to *distropica*, but has the abdomen rather distinctly tinged with ferruginous, the sub-antennal and supra-clypeal marks undeveloped, the wings whitish hyaline, and the mesoscutum slightly more closely punctured.

Female.—Head and thorax dark green, the propodeum more bluish, the posterior half of mesoscutum except at sides, and the scutellum black. Base of mandibles, clypeus, and transverse lateral marks creamy white; upper margin of disk of clypeus fuscous, the dark color narrowly united on each side with usual pair of dots. Abdomen brownish ferruginous, the first tergite infuscated and without the usual greenish tinge of allied species; a spot on basal corners of tergites 2 to 5 and a subapical band on tergites 2 to 4, subinfuscated; tergites 2 to 4 each with a pale-yellow band, abruptly bent backward at outer ends and extended narrowly to lateral margins, those on tergites 2 and 3 narrowly interrupted medially and that on tergite 4 broader and almost entire; tergite 5 tinged with yellow, becoming brownish subapically. Venter yellowish ferruginous, shaded with brown across the middle of the segments. Mandibles rufous at apex. Labrum and narrow anterior margin of disk of clypeus, pale testaceous. Antennae dark, the flagellum brown beneath. Legs blackish, the tarsi brown, and a spot at apex of front femora and anterior side of front tibiae yellow. Tegulae testaceous subhyaline, becoming yellowish at base. Wings whitish hyaline, the nervures pale testaceous, stigma testaceous, and subcosta brownish.

Head somewhat broader than long, the inner orbits nearly parallel. Clypeus rather acutely dentate on each side of labrum. Facial foveae linear, elongate as in allied species. Pygidium with the apical part narrow, convex, recurved, and acute. Head and thorax shining, with fine punctures that are moderately sparse on mesonotum and close on the frons; mesonotum polished, the frons and vertex tessellate and moderately dullish. Pubescence whitish, about as in *mormonica* in length and density. Length, about 6 mm.; anterior wing, 4.3 mm.

One female (holotype), 4 miles southwest of Coalinga, Fresno Co., California, on *Eschscholtzia californica*, May 11, 1938 (Timberlake), in collection of the Citrus Experiment Station, Riverside.

***Perdita santaclarensis*, n. sp.**

This species is closely allied to *coalingensis*, but distinct in having the wings dusky hyaline and the abdomen dark, with three, narrowly interrupted, yellowish-white bands, that on the second tergite straight and strictly basal.

Female.—Dark blue-green, the anterior border of mesoscutum more brassy green, with a variable and partly purplish luster where it intergrades with the black, which covers the remainder of the mesoscutum and the scutellum. Base of mandibles, clypeus, transversely triangular lateral marks creamy white; mandibles testaceous at middle and rufotestaceous at apex; anterior margin of clypeus testaceous and the middle of the disk with two abbreviated, fuscous stripes, which converge and meet on the dorsal margin. Abdomen blackish, the first tergite with a distinct greenish luster; tergites 2 to 4 each with a narrowly interrupted, yellowish-white band, that on tergite 2 narrow, straight and basal, and those on tergites 3 and 4 a little broader, curved backward at outer ends, and not quite reaching the lateral margins. Antennae dark, the flagellum reddish-brown, becoming darker above. Legs brownish-black, with a large mark on anterior side of front tibiae and a spot at apex of front femora pale yellow. Tegulae testaceous subhyaline, with the base pale brown. Wings dusky hyaline, the nervures testaceous, the subcosta and margins of stigma dark brown.

Head somewhat broader than long, the clypeus armed with a small subacute process on each side of labrum. Facial foveae linear, well impressed and extending from lower level of antennal sockets about two-thirds of the distance to level of anterior ocellus. Pygidium with a very narrow, recurved, and acute apex. Head and thorax shining, the frons, vertex, and anterior border of mesoscutum tessellate and slightly dullish, the remainder of mesoscutum and the scutellum polished; punctures of frons and mesonotum fine, but strong, rather close on the frons and scutellum and widely spaced on the mesoscutum. Pubescence whitish and sparse, except on the cheeks and mesosternum, and very short and sparse on the mesoscutum. Length, about 5.5 mm.; anterior wing, 4.1 mm.

One female (holotype), Santa Clara Co., California (C. F. Baker), in United States National Museum (type No. 43,407).

***Perdita fallugiae*, n. sp.**

(Figs. 267, 268, 330, 361)

In *fallugiae* and the following species, *cowaniae*, the lateral emarginations of tergite 7 are little developed, but the preapical carina on each side helps to form a secondary emargination and a lateral prominence to set off the medioapical part. The last-mentioned part in *fallugiae* is comparatively long, with the two apical lobes strongly inclined. The female is notable for having very small marks on each side of tergites 2 and 4 and longer curved marks on tergite 3, or more rarely on 3 and 4.

Female.—Head and thorax dark green, the scutellum, and mesoscutum, except anterior third and the narrow hind margin, black. Mark on each side of clypeus and transverse lateral marks creamy white; a large, black median mark on clypeus, often involving the usual dots and upper margin of the lateral extensions. Labrum blackish. Mandibles rufotestaceous, more reddish at apex, and with a small whitish spot at base. Abdomen blackish, the apical segment ferruginous above and beneath; tergites 2 to 4 with a creamy white mark on each side, always very small or absent on 2, curved and oblique on 3 and 4, or more or less broken and obsolescent on 4. Antennae blackish, the flagellum brown beneath. Legs dark, the tarsi brown, and a small spot at apex of front femora and stripe on anterior side of front tibiae yellow. Tegulae pale testaceous, with the base brown. Wings slightly whitish hyaline, the nervures and margins of stigma pale testaceous brown, the subcosta somewhat infuscated except at base.

Head moderately broader than long, the clypeus with a small, subacute process on each side of labrum. Facial foveae linear and elongate as in allied species. Pygidium converging from the base to the acute apex, with the apical part recurved and a little convex. Head and thorax shining, but frons and vertex tessellate and dullish, with fine, close punctures on the frons; mesoscutum weakly tessellate on anterior border and almost polished on the disk; the punctures on the black part of the scutum sparse, and moderately close on remainder of mesonotum. Pubescence whitish, moderately abundant and erect. Length, 5-5.8 mm.; anterior wing, 3.4-4 mm.

Male.—Dark green or blue-green, without black on the mesonotum. Mandibles except rufous tips, labrum, clypeus, transverse lateral marks, and rarely a small subantennal spot on each side creamy white; upper margin of disk of clypeus usually with a transverse black mark; labrum sometimes testaceous instead of white. Abdomen black, the venter more brownish, with apical margin of segments testaceous; tergite 7 testaceous, and sometimes also an abbreviated, subapical band across disk of tergites 5 and 6 (or the latter may be more whitish than testaceous); a transverse subapical mark on each side of tergites 2 and 6, and often a pair of widely separated, transverse basal marks on tergite 2 and more rarely on tergite 3 creamy white. Antennae, tegulae, and wings as in female, or the tegulae sometimes with a whitish spot on anterior part of base. Legs blackish; a spot at apex of front femora, anterior side of front tibiae, and front and middle tarsi yellow; or sometimes a spot at apex of middle and hind femora, a line or the whole anterior side of middle tibiae, and hind tarsi also yellow, but the hind tarsi usually more or less brown.

Head distinctly broader than long, the inner orbits hardly diverging in front. Mandibles moderately slender and acute at apex. Facial foveae faint and about three to five times longer than wide. Head and thorax shining, except that the frons and vertex are granular-tessellate and subopaque, with fine, close, and moderately distinct punctures on the frons; mesonotum very faintly tessellate on disk, with fine moderately close punctures, which become remote in a small area on middle of disk of the scutum. Abdomen with sparse and very minute punctures. Medioapical part of tergite 7 about as long as wide, with the emargination between the apical lobes shallow and rounded, the lobes as seen from side (with inclusion of the reflexed side walls of the main medioapical structure) about twice as long as wide and tapering to the obtuse apex, but that part of the lobes projecting beyond the notch that lies between them, hardly as long as its greatest width. Parameral lobes of aedeagus rather slender as viewed from above, but broad as seen from side and with a hump on upper margin between the middle and apex; sagittae fusiform and acute at apex, and with apical part rather attenuate in lateral view. Length, 3.5-4.75 mm.; anterior wing, 3.1-3.7 mm.

Seven females, 35 males (holotype female, allotype, and paratypes), Kyle Canyon, about 5,600 feet, Charleston Mts., Clarke Co., Nevada on *Fallugia paradoxa*, June 4, 1941 (Timberlake), the types taken in copula. Additional paratypes, all from Kyle Canyon, as follows: 1 male, 5,500 feet, same flowers, June 3; 9 females, 29 males, 6,500 feet, on *Hymenoxys cooperi*, June 3; 4 males, 4,500 feet, on *Calochortus flexuosus*, June 3; 1 male, 6,200 feet, on *Hymenoxys*, June 4; 2 males, 6,000 feet, on *Fallugia*, June 5 (all Timberlake), and 4 males, June 3 and 4 (E. C. Van Dyke).

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

Perdita cowaniae, n. sp.

(Figs. 269, 270, 331, 362)

Although similar to *fallugiae*, the male of *cowaniae* is distinct in having the apical lobes of the seventh tergite much longer and the base on which they are set much shorter. The female differs from *fallugiae* in having the mesonotum entirely green and the abdominal markings more bandlike, although broadly interrupted medially.

Female.—Head and thorax dark green, becoming darker, but without black, on the disk of the mesoscutum. Mandibles except the rufous apical half, large mark on each side of clypeus,

and triangular lateral marks hardly extending above level of clypeus pale yellow. Labrum blackish, or sometimes tinged with red. Broad mark on disk of clypeus, usually involving the usual dots, and anterior margin of the lateral extensions black. Abdomen blackish, with a distinct green luster on tergite 1; a rather broadly interrupted, pale-yellow band on tergites 2 to 4, or 5, that on 2 straight, basal, and abbreviated, those on 3 and 4 curved backward at outer ends, and that on 5 irregular, or erose, on margins, usually abbreviated, and sometimes evanescent or absent. Antennae and legs blackish, the flagellum brown beneath, and a spot at apex of front femora and anterior side of front tibiae yellow. Tegulae testaceous subhyaline, becoming brown at base. Wings hyaline, with a whitish tinge, the nervures testaceous, margins of stigma a little brownish, the subcosta slightly infuscated except at base.

Head moderately broader than long, the inner orbits parallel. Clypeus with a short, subacute process on each side of labrum. Facial foveae linear, reaching from level of lower margin of antennal sockets about two-thirds of the distance to level of anterior ocellus. Pygidium narrowed to the acute apex, with the apical part recurved and convex. Head and thorax shining, but with the frons and vertex tessellate and dullish; anterior border of mesoscutum slightly tessellate, the disk very faintly tessellate, and the scutellum polished; puncturation fine, moderately close on the frons and scutellum and sparse on mesoscutum. Pubescence whitish, moderately sparse and erect. Length, about 4.75-6 mm.; anterior wing, 4-4.5 mm.

Male.—Dark blue-green; the thorax entirely dark. Mandibles except reddish tips, labrum, clypeus, transverse lateral marks, and sometimes supraclypeal and subantennal marks creamy white. Abdomen blackish, with a greenish luster on tergite 1 and yellowish-white markings; an interrupted and abbreviated basal band on tergites 2 and 3 and sometimes a pair of widely separated basal spots on tergite 4; transverse and subapical marks on lateral margins of tergites 2 to 6 and sometimes two small subapical spots on disk of tergites 4 to 6. Antennae dark, the flagellum yellowish-brown, and the scape sometimes white beneath. Legs blackish; a spot at apex of front and middle femora and sometimes hind femora, anterior side of front tibiae, a line on middle tibiae, and front and middle tarsi yellow; hind tarsi pale brownish. Tegulae and wings as in female.

Head distinctly broader than long, the inner orbits parallel. Mandibles moderately slender and acute at apex. Facial foveae faint and about four times longer than wide. Sculpture and pubescence nearly as in female, but the frons and vertex almost subopaque and with minute sparse punctures. Tergite 7 with the subapical emargination on each side strong, the lateral lobes broadly rounded, the medioapical part short; the apical lobes obliquely inclined, about one and one-half times longer than wide, rounded at apex and the notch between them semi-circular. Aedeagus with the dorsal lobes of caulis broader and blunter than usual; parameral lobes also broad in both dorsal and lateral views, and from the latter viewpoint deeply and narrowly incised at middle and appearing emarginate at apex; sagittae fusiform and rather acute at apex. Length, about 3.9-5 mm.; anterior wing, 3.2-4 mm.

Thirteen females, 35 males (holotype female, allotype, and paratypes), Tuber Canyon, Panamint Mts., Inyo Co., California, on *Cowania stansburiana*, June 20, 1937 (C. D. Michener). Additional paratypes as follows: 119 males, 39 females, on same flower, Wild Rose Canyon, Panamint Mts., 7,500-8,000 feet, June 18 and 19, 1937 (Michener); 2 males, Wild Rose Canyon, 6,000 feet, on *Calochortus kennedyi* var. *munzii*, June 29, 1937 (Michener); 3 males, 1 female, on *Cowania*, Wild Rose Canyon, 6,500 feet, June 28, 1937 (collector unknown); 2 males, Wild Rose Canyon, May 29, 1937, and summit of Westgard Pass, Inyo Co., June 3, 1937 (collector unknown); and 1 male, Panamint Mts., May 30, 1937 (N. W. Frazier).

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

Perdita nevadensis nevadensis Cockerell

(Figs. 271, 272, 332, 363)

Perdita nevadensis Cockerell, 1896, Proc. Acad. Sci. Phila., 48:58, ♀.

Perdita nigricollis Timberlake, 1929, Pan-Pac. Ent., 6:54, ♀ (new synonymy).

Perdita nevadensis and the three following species form a rather distinctive section of the *californica* group. The females have the facial foveae comparatively short and strongly impressed and the pygidium rather broad at base, more or less acute at apex, with the apical part of disk flat and not, or hardly, recurved. The males have only a small subapical emargination on each side of the seventh tergite and two horizontal lobes at apex. In *nevadensis* these apical lobes are about as broad as long and broader than the notch between them.

Female.—Dark green; the mesonotum except anterior border, scutellum, and metanotum black. Base of mandibles, clypeus except anterior margin and two brown stripes on middle of disk, triangular lateral marks, often a supraclypeal mark, and rarely evanescent subantennal spots pale yellow; clypeus sometimes broadly black on disk, or more rarely the face marks nearly restricted to lateral marks. Thorax dark, except yellow tubercles. Abdomen black, with oblique lateral marks on tergites 2 to 4, or 5, and a small spot on lateral margins of tergite 1 yellow (abdominal markings rarely restricted to a small spot on lateral margins of tergites 2 and 3). Antennae dark, the flagellum brown beneath. Legs blackish, with a spot at apex of front femora and anterior side of front tibiae yellow; sometimes similar markings on middle legs. Tegulae testaceous hyaline, with the base brownish and an anterior spot yellowish. Wings somewhat smoky hyaline, the nervures and margins of stigma testaceous brown, the subcosta darker brown.

Head broader than long, with the clypeus rather acutely dentate on each side of labrum. Facial foveae well impressed and reaching from level of middle of antennal sockets about two-thirds of distance to level of anterior ocellus. Frons and vertex granular tessellate and subopaque, the frons with very fine sparse punctures. Mesonotum polished, except on the anterior border of the scutum, and finely and remotely punctured. Pubescence thin and whitish, the mesonotum nearly nude, but the hair dense, as usual, on the front coxae and mesosternum. Length, 4.75–6 mm.; anterior wing, 3.5–4 mm.

Male.—Head and thorax dark green, the disk of mesoscutum and scutellum black, although sometimes with a slight greenish tinge. Mandibles except rufous tips, labrum, and nearly the entire face below level of antennae yellowish-white. Tubercles yellow, or thorax rarely entirely dark. Abdomen blackish, with the apical lobes testaceous; tergites 1 to 5 each with a pale-yellow mark on lateral margins, those on tergites 2 and 3, often, and sometimes those on tergite 4, with a spur directed mesad and basad, or these markings sometimes entirely absent. Scape of antennae more or less yellowish-white and the flagellum brownish-yellow beneath. Legs dark, with mark at apex of front and middle femora, anterior side of front and middle tibiae, front tarsi, middle basitarsi, and sometimes a spot at apex of hind femora yellow. Tegulae subhyaline, becoming yellowish or brownish at base. Wings as in female.

Head much broader than long, the inner orbits parallel. Facial foveae oval, about twice as long as wide. Mandibles moderately stout, curved, and tapering, and sometimes with a small inner tooth. Sculpture as in the female, but with the frons and vertex more opaque. Tergite 7 with a small subapical emargination on each side, setting off a very small subacute lobe at the base of the apical lobes; the latter quadrate, about as broad as long, truncate at apex, and broader than the notch between them, which is deeper than broad. Parameral lobes of aedeagus long, acute, and incurved at apex, a little dilated at middle as seen from above, with a ridge near inner margin, and with a broad emargination just before the middle as seen from the side; sagittae fusiform, each component acute at apex, but appearing obtuse and a little upturned at apex in profile. Length, about 3.5–4.5 mm.; anterior wing, 2.6–3.2 mm.

Cockerell's type of *nevadensis* was from Nevada, without further particulars in regard to locality, season, and collector. The type of *P. nigricollis* Timberlake, which seems to be unquestionably the same species, was collected by E. C. Van Dyke, June 29, 1920, at Victoria, British Columbia.

Material of *nevadensis* has been examined as follows.—CALIFORNIA: 3 females, 9 males, Fallen Leaf, Eldorado Co., August, 1931 (O. H. Swezey); 3 females, 16 males, Lake Forest, Lake Tahoe, Placer Co., July 16, 17, and 23, 1949 (E. G. Linsley); 3 females, 3 males, Silver Lake,

Eldorado Co., August 11, 1936 (R. M. Bohart); 1 female, 1 male, Weber Lake, Sierra Co., July 4, 1951 (E. T. Schlinger); 25 females, 28 males, 4 miles west of Quincy, Plumas Co., some from flowers of *Eriogonum*, June 19, 21, 22, and 25, and July 2, 1949 (J. S. MacSwain, P. D. Hurd, Jr., J. E. Gillaspay, F. Morishita, E. L. Atkinson, Claude T. Smith, and W. R. Schreader); 2 females, 5 males, Onion Valley, Plumas Co., July 23, 1952 (R. M. Bohart); 1 female, Entrance Station, Big Oak Flat, Mariposa Co., July 12, 1952 (R. C. Bechtel); 3 females, Gold Lake, Sierra Co., July 12, 17, and 18, 1921 (C. L. Fox); 1 female, Pope Valley, Napa Co., June 11, 1939 (E. C. Van Dyke); 1 female, 1 male, Carrville, Trinity Co., June 20, 1931 (Van Dyke); 1 male, Carrville, June 18, 1934 (Van Dyke); and 1 male, Walker, Siskiyou Co., May 29, 1920 (C. L. Fox). OREGON: 4 females, 2 males, 43 miles east of Klamath (M. F. McClay); 1 female, Mt. Hood, Hood River Co., July 29, 1921 (A. L. Melander); 3 females, 1 male, Mt. Hood, 3,000 feet, July 29, 1921 (Melander); and 2 females, Hood Rapids, Mt. Hood, July 29, 1921 (Melander). WASHINGTON: 1 male, Blewett, Chelan Co., July 17, 1920 (Melander), and 2 females, Blewett Pass, July 26, 1949 (R. H. Beamer).

Perdita nevadensis culbertsoni, n. subsp.

Perdita culbertsoni was described in manuscript many years ago from a single pair collected by Culbertson at Three Rivers, California, and is now considered to be a subspecies of *nevadensis*.

Female.—Like *nevadensis*, but the disk of mesoscutum and scutellum not so intensely black, or with a faint greenish or bluish tinge. Labrum, clypeus, supraclypeal area, and subantennal plates black; usually the upper margin of lateral extensions of clypeus, more or less narrowly, and sometimes a small spot on middle of disk, and triangular lateral marks yellow. (*Nevadensis* sometimes, at least in the Lake Tahoe region, may have similar face marks.) Abdominal marks on tergites 2 to 4 (or 1 to 4), small, and only those on tergites 2 and 3 oblique. Head generally much broader than long. Mesoscutum often with a very faint tessellation. Length, about 5–6 mm.; anterior wing, 3.9–4.4 mm.

Male.—Hardly distinguishable from the male *nevadensis*, except that the apical lobes of the seventh tergite are less broad, with outer apical corners more rounded off, although in a male from the Yosemite region they are nearly as broad as in typical *nevadensis*. Length, about 4.2–5 mm.; anterior wing, 3.2–3.6 mm.

One female, 1 male (holotype female and allotype), Three Rivers, Tulare Co., California (Culbertson); 2 females (paratypes), Bear Valley, Santa Cruz Mts., Santa Cruz Co., August, 1913 (F. C. Clark); 3 females (paratypes), Mineralking, Tulare Co., August 12, 1935 (R. M. Bohart); 1 male (paratype), Loyds, Tulare Co., July 2, 1935 (Evans); and 2 females, 2 males (paratypes), Miguel Meadow, Yosemite National Park, July 7, 1940 (E. G. Linsley).

Types in the United States National Museum (Cat. No. 43,408), and paratypes in the collections of the California Academy of Sciences and the University of California at Berkeley and Riverside.

Perdita nevadensis molina, n. subsp.

(Figs. 273, 274, 364)

Perdita molina is almost certainly only a race of *nevadensis* and differs in the entirely green and somewhat dullish mesonotum.

Female.—Head and thorax dark green, with the propodeum and mesopleura more bluish and posterior disk of mesoscutum and the scutellum slightly blackish; anterior half of cheeks, clypeus in large part, supraclypeal area, and subantennal plates black. Upper margin of the lateral extensions of clypeus, sometimes a small spot on middle of disk, and triangular lateral marks reaching level of antennae, and anterior end of facial foveae yellow. Mandibles testaceous yellow at base, changing to rufotestaceous and finally to piceous at apex. Tubercles yellow. Abdomen blackish, with a greenish luster on tergite 1 and yellow markings on tergites 1 to 4; marks on tergite 1 small and on lateral margins of the disk, those on following segments larger.

curved, oblique, and widely separated, with those on tergites 2 and 3 a little thickened at outer ends and hardly reaching the lateral margins. Antennae dark, the flagellum yellowish-brown beneath. Legs blackish, with a small spot at apex of front femora and anterior side of front tibiae yellow. Tegulae testaceous hyaline, becoming brown at base. Wings more strongly tinged with fuliginous than usual, the nervures testaceous brown, the subcosta fuscous, except toward base.

Head much broader than long, with inner orbits parallel. Clypeus with a small subacute process on each side of labrum. Facial foveae rather broadly linear, well impressed, and extending from level of middle of antennal sockets about two-thirds of distance to level of anterior ocellus. Apical part of pygidium moderately narrow and hardly recurved, with the apex narrowly obtuse. Frons and vertex rather strongly tessellate and moderately dull, with fine and moderately close punctures on lower part of the frons; thorax moderately shining, the mesonotum delicately tessellate and with fine, widely spaced punctures. Pubescence whitish, not abundant except on cheeks and mesosternum, that on the mesonotum very thin. Length, about 5.5-5.75 mm.; anterior wing, 4-4.1 mm.

Male.—Head and thorax dark blue-green, the tubercles yellow. Mandibles except rufous tips, labrum, and almost the entire face below level of antennae pale yellow; the lateral marks truncate at level of the lower margin of antennal sockets, but the green intruding slightly between them and the subantennal plate on each side. Abdomen blackish, the first tergite with a greenish tinge, and the apical lobes of tergite 7 testaceous; tergites 1 to 5 with a subapical yellow mark on lateral margins, those on tergites 2 and 3 with a long spur from the inner basal corners to form a broadly interrupted band. Antennae blackish, the flagellum brownish-yellow, and the scape yellow beneath, except at apex. Legs black, with apex of front and middle femora, front and middle tibiae on anterior side, and front basitarsi yellow, the front tarsi otherwise brown. Tegulae and wings as in the female.

Head much broader than long, the inner orbits slightly diverging in front. Mandibles stout, and rather abruptly narrowed close to the apex. Facial foveae faint and about four times longer than wide. Head and thorax moderately shining, the frons and vertex tessellate and subopaque, the mesoscutum distinctly tessellate on anterior border and faintly tessellate on disk, the disk of scutellum polished; punctures of mesonotum fine and widely spaced, those of frons moderately close and rather indistinct. Apical lobes of tergite 7 nearly as wide as long and about equal to the notch between them, and thus very similar to those of *culbertsoni*, but the small lateral lobes somewhat larger and more obtuse. Aedeagus very similar to that of *culbertsoni*, but the notch visible in lateral view of the parameres is broad and very deep, and the tips of the sagittae are spread apart in the single example examined. Length, 4.2-4.6 mm.; anterior wing, 3.2-3.6 mm.

Two females, two males (holotype female, allotype, and paratypes), Mill Creek, 7,400 feet, San Bernardino Mts., San Bernardino Co., California, June 29, 1942 (R. M. Bohart); and 1 female, 1 male (paratypes), Bear Valley, San Bernardino Mts., August, 1913 (F. C. Clark).

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

Perdita bohartorum, n. sp.

(Figs. 275, 276, 365)

This species is distinguished from *molina* by the more polished sculpture, clearer wings, and entirely dark thorax.

Female.—Head and thorax dark bluish-green, the clypeus and supraclypeal area black. Inner side of mandibles except at apex, transversely triangular lateral marks generally broadened on orbits to reach level of antennae, and often an oblique mark on each side of dorsal margin of clypeus, mostly on the lateral extensions, creamy white. Mandibles more testaceous than whitish on outer margin and rufous at apex. Labrum blackish. Thorax entirely dark, although in one paratype the tubercles are slightly tipped with white. Abdomen blackish, with a greenish luster on tergite 1, and pale-yellow markings on tergites 2 to 4, or 1 to 5; the marks when present small and lateral on tergite 1, and in the form of an interrupted and usually abbreviated band on tergite 5; tergites 2 to 4 each with a broadly interrupted band, more or less broadened

and bent backward at outer ends and fused with a subapical mark on lateral margins. Antennae dark, the flagellum brown beneath. Legs blackish, with a small spot at apex of front and middle femora, anterior side, more or less, of front tibiae, and sometimes a small mark on the middle tibiae yellow. Tegulae testaceous subhyaline, with the base brown. Wings slightly dusky, the nervures testaceous, the margins of stigma and subcosta brown.

Head somewhat broader than long, the inner orbits parallel. Clypeus produced into a small, subacute tooth on each side of labrum. Facial foveae well impressed, broader and slightly longer than in *molina*, broadening slightly toward anterior end and distinctly broader than the interspace between them and the eye. Pygidium rather broadly triangular, with the apex narrowly truncate or obtuse, and the disk flat and slightly recurved toward apex. Head and thorax shining, the mesonotum polished, and the frons and vertex tessellate and somewhat dullish; punctures of the face fine, but strong, close on anterior part of frons and rather sparse on the face below antennae; punctures of mesonotum moderately sparse. Pubescence whitish, dense as usual on the mesosternum, and rather thin elsewhere, with the hair on mesonotum a little shorter and thinner than that on the frons and vertex. Length, about 5.5–6.4 mm.; anterior wing, 4–4.4 mm.

Male.—Dark bluish-green. Mandibles except reddish tips, labrum, clypeus, triangular lateral marks about as high as wide, and large subantennal and supraclypeal marks creamy white, but the green strongly intruding between the lateral and subantennal marks on each side. Thorax entirely dark, or the tubercles sometimes slightly tipped with white. Abdomen brownish-black, marked with yellowish-white; a transverse subapical mark on lateral margins of tergites 1 to 6, and an interrupted basal band on tergites 2 and 3, or 2 to 5, with those on tergite 2, or tergites 2 and 3, confluent at outer ends with the subapico-lateral marks; and in the allotype the last-mentioned marks supplemented on tergites 4 and 5 by a narrow subapical band across the disk, that on 4 interrupted medially. Antennae brownish fuscous, the flagellum brownish-yellow beneath, the scape darker, with the under margin white. Legs blackish, with a mark at apex of the femora, anterior side of front and middle tibiae, front tarsi, and middle basitarsi pale yellow. Tegulae and legs as in female.

Head moderately broader than long, the inner orbits parallel. Facial foveae faint, about two or three times longer than wide. Mandibles moderately stout and tapering to the acute apex. Sculpture as in female, except the frons and vertex much duller, with the punctures comparatively faint, and the anterior border of the mesoscutum more tessellate. Apical lobes of tergite 7 a little longer than wide and narrower than the notch between them, with the small lobes on each side rather prominent and acute. Aedeagus very much as in allied species, with the notch visible in lateral view of parameres deep and rounded. Length, about 4.5 mm.; anterior wing, 3.8 mm.

Seven females, 2 males (holotype female, allotype, and paratypes), Mammoth Lake, Mono Co., California, July 23–25, and August 5, 1936 (R. M. and G. E. Bohart).

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

Perdita sculleni sculleni, n. subsp.

(Figs. 277, 278, 333, 366)

This species differs from *molina* and *bohartorum* in having the clypeus more obtusely dentate on each side of labrum, and the pygidium narrower and more acute.

Female.—Head and thorax dark green, more bluish on the pleura and the propodeum, the disk of mesoscutum and scutellum almost blackish. Mandibles except piceous tips, clypeus except usual dots and two dark stripes on middle of disk, triangular lateral marks reaching slightly above level of antennae, supraclypeal mark sometimes divided, and sometimes small subantennal marks yellowish-white. Labrum more or less tinged with testaceous. Tubercles pale yellow. Abdomen blackish, tinged with green on tergite 1; an interrupted band on tergites 2 to 4, or 5, and mark on lateral margins of tergite 1, pale yellow; the bands on tergites 2 and 3 curved backward at outer ends and narrowly reaching the lateral margins. Pygidium rufous. Antennae

dark, the flagellum yellowish-brown beneath. Legs blackish, with spot at apex of front femora, anterior side of front tibiae, and the middle knees pale yellow. Tegulae testaceous hyaline, with the base brown. Wings slightly dusky hyaline, the nervures and margins of stigma testaceous brown, the subcosta brownish fuscous, except toward base.

Head somewhat broader than long, with inner orbits parallel. Facial foveae linear, a little narrower than the interval between them and the eyes and slightly more than two-thirds as long as distance between antennal sockets and anterior ocellus. Process of clypeus on each side of labrum rather broader than long and bluntly rounded. Pygidium moderately wide at base, acute at tip, with the short apical part convex on disk and slightly recurved. Head and thorax shining, except for the rather dull frons and vertex, the disk of mesoscutum and the scutellum polished, or with a weak tessellation; puncturation of frons close, that of the mesonotum very fine and sparse. Pubescence whitish, that on mesonotum rather short, sparse, and erect, but long and dense as usual on front coxae and mesosternum. Length, about 5-6.4 mm.; anterior wing, 3.8-4.5 mm.

Male.—Head and thorax dark green or bluish-green, the disk of mesoscutum and scutellum slightly blackish. Mandibles except rufous tips, labrum, and face below level of antennae, except for the green intruding slightly between the lateral and subantennal marks, pale yellow; lateral marks with a slender orbital extension going well above level of antennae. Tubercles pale yellow. Abdomen blackish, the first tergite with a green luster, the apical lobes of tergite 7 testaceous. Markings of abdomen pale yellow, including a small mark on lateral margins of tergite 1 and a rather broadly interrupted band on tergites 2 to 4, or 5, those on tergites 2 to 4 bent backward at outer ends and confluent with transverse subapical marks on lateral margins, and that on 5 sometimes reduced to subapico-lateral marks. Antennae dark, the flagellum yellowish-brown, and the scape pale yellow beneath. Legs blackish, with a mark at apex of all the femora, anterior side of front and middle tibiae very broadly, and their tarsi, and often the under side of hind tibiae yellow. Tegulae and wings as in the female.

Head somewhat broader than long, the inner orbits parallel. Facial foveae very faint and about three or four times longer than wide. Mandibles rather slender and acute. Frons and vertex subopaque, with fine, indistinct, and rather close punctures; remainder of head and the thorax shining, the mesonotum polished and with very fine sparse punctures. Pubescence rather short and very thin on the mesonotum. Apical lobes of tergite 7 somewhat longer than wide, narrowed toward apex, somewhat convergent, and about as broad at their base as the notch between them; lateral lobes small, but rather prominent and acute. Aedeagus similar to that in other species of this section, having the parameres rather shallowly and broadly notched above in lateral view, and the sagittae blunter than usual. Length, about 4.4-5 mm.; anterior wing, 3.5-3.8 mm.

Five females, 13 males (holotype female, allotype, and paratypes), Weston (Lincoln Mt.), Umatilla Co., Oregon, July 14, 1938 (K. Gray and J. Schuh). Paratypes as follows: Oregon: 8 females, 1 male, Milton, Umatilla Co., July 14, 1938 (Gray and Schuh); 1 male, Lostine, Wallowa Co., July 14, 1938 (Gray and Schuh); 5 females, 4 males, 5 miles south of Dufur, Wasco Co., June 15, 1938 (Gray and Schuh); 3 males, 25 miles east of Prineville, 3,800 feet, Crook Co., July 13, 1936 (H. A. Scullen); 1 female, 1 male, 33 miles east of Prairie City, Grant Co., July 10, 1935 (Joe Schuh); 2 females, North Powder, Union Co., July 13, 1931 (J. Nottingham). Washington: 1 male, Saints Rest, Pullman, Whitman Co., June 11, 1921 (A. L. Melander); 3 females, 1 male, Colfax, Whitman Co., July 9, 1925 (C. L. Fox).

Types in collection of the Citrus Experiment Station, Riverside; paratypes in collections of the Oregon State Agricultural College and the California Academy of Sciences.

The material of *sculleni* from Oregon and Washington is rather variable, and I attempted at first to recognize two races, but the pattern of distribution does not permit this. Typical material from Weston and Milton has the wings somewhat dusky and the pale markings generally small, but specimens from vicinity of Dufur have the wings a little whitish, the subantennal marks sometimes well developed, and the abdominal bands broader and rather narrowly interrupted, with the fifth tergite sometimes nearly all pale yellow.

Unfortunately there is no flower record for *sculleni* but a few of the females have a small petal that was apparently white adhering to the legs, suggesting that they may have been collected at the flowers of some rosaceous plant allied to *Spiraea*.

***Perdita sculleni segona*, n. subsp.**

This race is distinguished from *sculleni* by the whitish wings and the blue-green color of head and thorax, with lack of a blackish tinge on the mesonotum. The pygidium of the female is also less convex and recurved at apex.

Female.—Similar to *sculleni*, but head and thorax blue-green, without a blackish tinge on the mesonotum. Subantennal marks well developed in the type, the supraclypeal mark divided into two spots, and the abdominal marks well separated medially, with the inner spur of the marks on tergite 2 evanescent, but those on following segments well developed. Subantennal marks occasionally absent. In one paratype from the Grand Tetons the usual dark stripes on disk of clypeus are absent, and the abdominal markings are unusually large, forming narrowly interrupted bands on tergites 2 to 4, with tergite 5 pale yellow, except for the apical depression and a dark spot on basal corners and one on middle of disk.

Sculpture usually as in *sculleni*, but in holotype the punctures of frons and mesonotum are unusually strong, and the abdomen is also distinctly punctured, but this condition may be an individual or local variation. Pygidium in the form of an elongate, narrow triangle with apical part only slightly convex and recurved. Length, 5-5.5 mm.; anterior wing, 4 mm.

Male.—Not much different from the male of *sculleni*, except in the bluer head and thorax and whiter wings. The type has the spurs from the subapico-lateral marks of abdomen very slender, and a thin subapical band across the middle of tergites 5 and 6. Apex of hind femora and under side of hind tibiae yellow in type but with only a small spot at apex of each in the paratype from Nevada. Length, 4-5 mm.; anterior wing, 3-3.6 mm.

One female and male, mounted on one pin (holotype female and allotype), Hyrum, Cache Co., Utah, on sego lily (*Calochortus nuttallii*), July 11, 1950 (G. E. Bohart). Paratypes as follows: 5 males, taken with the types; 1 female, Honeyville, Box Elder Co., Utah, July 10, 1907 (E. G. Titus); 2 females, Grand Teton National Park, Wyoming, July, 1937 (R. M. Bohart); and 1 female, 1 male, Marys River, 5,000 feet, Elko Co., Nevada, July 8, 1935 (R. M. Bohart).

Types in collection of the Citrus Experiment Station, Riverside, and paratypes in collections of the University of California at Davis and the Utah State Agricultural College.

***Perdita eriogoni* Cockerell**

(Figs. 279, 280, 367)

Perdita eriogoni Cockerell, 1925, Ann. Mag. Nat. Hist. (9)16:621, ♀, ♂; Timberlake, 1929, Jour. New York Ent. Soc., 37:122.

This species is known only from Colorado, where it has been collected during the month of July on both sides of the Continental Divide, in Montrose and Larimer counties. Only one new record is now available, based on a female collected at Mishawauka, July 11, 1937, by C. L. Johnston.

The original description by Cockerell is adequate for the recognition of the species, but it may be noted that the structure of the seventh tergite and the genitalia of the male place it in the *nevadensis* section of the *californica* group, and that these characters only feebly differentiate it from other species in this section. The color characters, however, are well developed in *eriogoni*, and Cockerell has commented on the fact that the female has as much yellow on the face as the male, and that the yellow may even extend shortly above the antennae in the median line, a condition which is remarkable for this subgenus.

This bee has been taken at flowers of *Eriogonum umbellatum*, but I have some doubt that it collects pollen from that plant.

SUPPLEMENT TO PART I

The material reported below, including six new species and one subspecies, has either come to my attention, or has been collected, since the publication of Part I.

Subg. *Cockerellula* Strand

Perdita seminigra, n. sp.

(Figs. 281, 282, 334)

In the key to *Cockerellula* (Univ. Calif. Publ. Entom., 9:354-355) this species runs to *opuntiae*, but it has the elevated thickening at apex of the second ventrite less broad and less sharply dentate on each side, the apical prongs of the seventh tergite less broadly separated and each widened by a distinct flange on its inner margin, and the head and thorax duller and blacker, and with a very short thin pubescence.

Male.—Head and thorax black, tinged a little with red on the pronotum and propodeum, but much blacker than in *opuntiae*. Mandibles testaceous with red tips, the labrum rufotestaceous; lateral extensions of the clypeus testaceous, but the small disk mostly blackish; the pale-yellow lateral marks (discolored in type) large, a little broader than high, and covering sides of face below level of antennae. Thorax entirely dark. Abdomen dusky ferruginous, with the first tergite, except apical border, and a band across disk of the second dilute fuscous. Antennae and legs blackish, tinged with brown, the flagellum yellowish-brown beneath. Tegulae pale testaceous. Wings dusky hyaline, the nervures brown, stigma and subcosta fuscous.

Structural characters in general duplicating those of *opuntiae*. Head large, broader than long, with eyes diverging below, the vertex very broad behind eyes and ocelli. Subantennal plates very small and triangular. Mandibles stout, strongly curved, and acute at apex (obtuse in *opuntiae*). Facial foveae linear, deeply impressed, close to margin of eyes and reaching from level of middle antennal sockets about three-fourths of the distance to level of anterior ocellus. Head and thorax nearly uniformly and finely tessellate, moderately dullish, and with very fine punctures, which are moderately sparse on the frons and vertex and moderately close on the mesonotum. Pubescence very short and thin, the fringe on each side of propodeum little developed (dense in *opuntiae*), but tibiae and tarsi and apex of abdomen with very coarse, spinelike setae. Abdomen very broad, depressed, and unusually thickly chitinized, the base of tergites 2 and 3 transversely grooved, and having the special features noted above, with only the second ventrite thickened locally in the middle as in *opuntiae*. Aedeagus very similar to that of *opuntiae* but the parameral lobes diverge more prominently from the walls of the caulis and the outer lobe of the basellae is much broader. Length, 4.75 mm.; anterior wing, 3.8 mm.

One male (holotype), 34 miles south of Acatlan, 6,000 feet, Puebla, Mexico, July 10, 1952 (E. E. Gilbert and C. D. MacNeill). Acatlan, however, is not much more than 25 miles north of the border of Oaxaca, so that the locality is probably in that state instead of Puebla.

Type in collection of the Citrus Experiment Station, Riverside.

Subg. *Macroteropsis* Ashmead

Perdita portalis Timberlake

Perdita portalis Timberlake, 1954, Univ. Calif. Publ. Entom., 9:357, ♀, ♂.

An additional male of this species from northern Arizona has the clypeal margin strongly tridentate, with the median tooth rather large and sharp, but it otherwise agrees with the type male from Portal.

One male, Gray Mt., Coconino Co., Arizona, July 20, 1952 (M. Cazier and R. Schrammel).

Subg. *Macroterella* Timberlake***Perdita opacella*, n. sp.**

This is a small black species, with a distinct green tinge on the head, which runs to *tristella* in the *Macroterella* table (Univ. Calif. Publ. Entom., 9:361). It differs from *tristella* in having the head somewhat larger and broader; the facial foveae comparatively small; the space between eye and lateral ocellus much less than twice as great as space between the ocelli; mesonotum without erect hairs, except a few on the scutellum; pygidium much broader, with the apex obtuse; and wings somewhat whitish.

Female.—Entirely black, without light markings, except that the face and vertex have a distinct green tinge, and pygidium is pale ferruginous. Mandibles rufotestaceous, reddish at tips. Antennae and legs dark, the flagellum reddish-brown beneath, the small joints of tarsi brownish. Tegulae testaceous, with the base infuscated. Wings whitish hyaline, the nervures pale testaceous, margins of stigma and subcosta brownish.

Head rotund, as wide as long. Facial foveae elongate oval, about their own width from margin of eyes, and rather distinctly shorter than space between lateral ocelli. Space between eye and lateral ocellus about one and one-third times greater than space between the ocelli. Pygidium in form of an isosceles triangle, with the apex narrowly rounded and the disk flat (in *tristella* only the apex exposed, but it is extremely narrow, sharp, and dark-colored). Head and thorax almost uniformly tessellate and rather dull, the mesopleura more opaque than other parts; puncturation very fine, sparse, and distinct only on the clypeus, the frons impunctate, and the mesoscutum with extremely minute and widely spaced punctures, visible only in certain lights. Pubescence short, whitish, and sparse on vertex, cheeks, and sides of propodeum, the scutellum and metanotum with a very few erect hairs; mesoscutum apparently nude, but provided with extremely short thin appressed hair. Length, 3.8 mm.; anterior wing, 2.7 mm.

One female (holotype), Marble Canyon, near Lee's Ferry, Grand Canyon, Arizona, on *Stanleya*, June 5, 1953 (G. D. Butler), in collection of the Citrus Experiment Station, Riverside.

Perdita mortuaria Timberlake

Perdita mortuaria Timberlake, 1954, Univ. Calif. Publ. Entom., 9:361, 362, ♀, ♂.

One male, Lava Fall, Grand Canyon, Arizona, 179.2 miles below Lee's Ferry, June 11, 1953 (G. D. Butler).

This species is new to Arizona, and the specimen differs from the type in having the head much enlarged, the head, prothorax, propodeum, and legs reddish-brown, much like the abdomen in color, and size rather larger. Length, about 3.5 mm.; anterior wing, 2.8 mm.

Because of the large head and reddish-brown color of head and parts of the thorax, this specimen has a distinctive appearance and runs with some difficulty to *Macroterella* in the key to the subgenera, but an examination of the genitalia confirms its status as a form of *mortuaria*.

Subg. *Glossoperdita* Cockerell***Perdita hurdi*, n. sp.**

(Figs. 283, 284, 335)

On August 29, 1946, Paul D. Hurd, Jr., collected a female *Perdita* at Palo Verde in a flower of *Proboscidea* (or *Martynia*). This bee had a very long tongue but seemed too different from species of *Glossoperdita* in the sculpture, lack of light markings, larger stigma, and peculiar claws to be included in the group without further evidence. On account of the supposed rarity of the plant, which needs

summer rain for blooming, it seemed likely that additional specimens of the bee would be hard to come by, yet a small series, including a male, was collected by R. A. Dickson during the past season (1954). The characters of the male now validate the placement of *hurdi* in *Glossoperdita*.

Female.—Entirely dark, without light markings. Head and thorax dark blue-green, the face below antennae, mesoscutum except anterior border, scutellum, and metanotum black. Mandibles testaceous yellow, the tips reddish; labrum and anterior margin of clypeus testaceous brown. Abdomen black. Antennae and legs dark, the flagellum brown beneath; the front knees, anterior side of front tibiae, and front tarsi yellowish-brown; the other tarsi more or less brownish. Tegulae pale testaceous, or more whitish than usual, the base yellowish-brown. Wings slightly whitish hyaline, the nervures pale testaceous, the subcosta fuscous.

Head narrower than thorax, somewhat longer than wide. Facial foveae rather broadly linear, moderately impressed, and reaching from antennal sockets almost to level of anterior ocellus. Mandibles rather stout, curved, and acute, with a small sharp inner tooth, rather remote from apex. Ocelli a little larger than usual, with lateral pair closer to eyes than to each other. First submarginal and marginal cells equal in size, the part of marginal cell beyond the stigma distinctly longer than the part beneath; stigma rather large and about half as broad as the marginal cell. Claws strongly curved, very broad at base, very narrow at apex, and minutely bifid. Pygidium broad and flat, the sides a little arcuately converging to the narrowly rounded apex. Head and thorax shining, with all parts virtually polished, except the tessellate basal area of propodeum; frons and mesonotum with very fine, moderately close punctures; clypeus with larger sparse punctures, which are sometimes sulcate. Pubescence rather short, erect, and moderately dense for a *Perdita*, that of front coxae and mesosternum no denser but longer than elsewhere, the individual hairs minutely plumose; apical fimbria of abdomen dense and pale ochreous. Tongue very long and reaching base of abdomen, but the galeae of maxillae hardly surpassing the proboscis fossa. Length, about 6-7 mm.; anterior wing, 4.6-4.9 mm.

Male.—Dark blue; the mesoscutum except anterior border, scutellum, and metanotum black. Basal half of mandibles, labrum, and most of face below level of antennae creamy white, with the sutures narrowly dark and the lateral marks triangular, a little higher than wide, the blue intruding between them and the subantennal marks; the latter marks oval, twice as high as wide; supra-clypeal mark broadly transverse. Cheeks below anterior end of eyes testaceous white. Mandibles red at apex and shading through testaceous to white at base. Antennae pale brown, the scape white, and the flagellum slightly yellowish beneath. Collar and posterior margin of pronotum and tubercles brown. Legs rather pale fuscous, the front pair, except coxae and posterior side of femora, pale yellowish. Abdomen blackish, the apical depression of tergites more dilutely colored. Tegulae and wings as in female.

Head about as broad as long, somewhat broadened anteriorly and with the temples and vertex well developed behind summit of the eyes. Clypeus rather prominent and convex, with lateral extensions long, slender, and fully visible in frontal aspect. Labrum very large. Mandibles rather long, slender, and tapering to the acute apex. Subantennal plates very large. Facial foveae small and about twice as long as wide. Ocelli about normal in size, with the lateral pair about equidistant from each other and the eyes, and distinctly more distant from the vertical margin. Proboscis, venation, and claws as in female. Abdomen subdepressed, ovate, and broader than thorax. Sculpture and pubescence as in female. Aedeagus similar to that of *giliae*, but the apical knobs of the sagittae more hooked, with the outturned points directed somewhat downward as seen from side, and the ventral surface of apical part of sagittae invested with numerous hairs. Length, 5 mm.; anterior wing, 4 mm.

Six females, 1 male (holotype female, allotype, and paratypes), 10.6 miles west of Blythe, Riverside Co., California, on *Proboscidea altheaeifolia*, September 20, 1954 (R. C. Dickson); and 2 females (paratypes) at the same flower, one at Palo Verde, Imperial Co., California, August 7, 1946 (P. D. Hurd, Jr.), and the other taken at Three Point (or Robles Ranch), junction of Highway 35 and the road south to Sasabe, Pima Co., Arizona, August 30, 1954 (Dickson and Timberlake).

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

Subg. *Cockerellia* Ashmead***Perdita shinneri*, n. sp.**

The female of this species, with a rather dull and obscurely punctured frons and somewhat dusky wings, runs to *bequaerti* in the key to species of *Cockerellia*, but the frons is much less opaque, the mesonotum is coppery or brassy green, and the abdomen has three abbreviated and interrupted yellow bands. The male runs to *verbesinae*, or disregarding the dullish frons it would go to *obscuripennis*, but it differs from both species in the smaller size and in having the legs and the antennae, except the scape, entirely dark.

Female.—Head and thorax dark brassy or coppery green, the anterior part of clypeus black. Mandibles piceous at base, testaceous in middle, and rufous at apex. Labrum blackish. A slender transverse mark on each side of clypeus, a narrow longitudinal streak on disk, interrupted band on hind margin of disk of pronotum, and tubercles yellow. Abdomen black, with an interrupted and abbreviated yellow band across the base of tergites 2 to 4; pygidium rufotestaceous. Legs and antennae entirely blackish, except that the scape is narrowly yellow beneath. Tegulae testaceous, becoming fuscous at base. Wings slightly dusky hyaline, the nervures testaceous brown, margins of stigma and subcosta brownish fuscous.

Head as broad as long, the inner orbits of eyes a little diverging above. Mandibles and facial foveae normal for *Cockerellia*. Head and thorax shining, except for the moderately dullish frons and vertex; puncturation very fine throughout, the punctures distinct and moderately close on clypeus and supraclypeal area, rather indistinct on frons, and moderately close on mesonotum, with those on middle of the scutum mostly about two puncture-widths apart. Pubescence brownish-ochreous, more whitish on under parts, that on the mesonotum short, dense erect, and mosslike; hair of middle and hind legs, except that on inner side of tarsi, and fimbria of abdomen pale brownish. Proboscis moderately long, the galeae not surpassing the proboscis fossa. Length, about 6.5–7 mm.; anterior wing, 4.5 mm.

Male.—Head and thorax dark green, the thorax entirely dark. Mandibles except rufotestaceous margins and reddish tips, clypeus except a blackish mark or two spots on upper part of disk, transverse lateral marks, small spot on cheeks below anterior end of eyes, and line on underside of scape of antennae yellow. (In one paratype, the face marks are reduced to a mark on each side of anterior part of clypeus and a small spot at anterior corners of face.) Labrum more or less fuscous or blackish. Tegulae as in female. Wings less dusky than in female, or sometimes even a little whitish, but subcosta and margins of stigma not so pallid as in white-winged species.

Head quadrate, nearly as long as wide, the cheeks broad. Head and thorax shining, the mesonotum polished, the cheeks, pleura, and the propodeum minutely and delicately tessellate, and the frons and vertex more strongly tessellate and dullish; puncturation very fine and moderately close, that on frons rather faint, and that on the mesoscutum becoming sparser on the anterior border; face below antennae nearly impunctate. Pubescence whitish, that on the mesonotum somewhat longer and considerably sparser than in the female. Length, 6–6.5 mm.; anterior wing, 4–4.5 mm.

Four females, 3 males (holotype female, allotype, and paratypes), 2.5 miles north of Roanoke Prairie, Grimes Co., Texas, on *Coreopsis basalis*, May 3, 1953 (L. H. Shinner, No. 804), the types mounted on one pin. Paratypes from Texas as follows: 1 female, 3 males, 13.6 miles south of Fairfield, Freestone Co., on *Coreopsis basalis*, May 2, 1953 (Shinner, No. 797); 1 female, 15 miles south of Fairfield, on *Hymenopappus artemisiaefolius*, May 3, 1953 (Shinner, No. 805); 1 female, Victoria, Victoria Co., May 18, 1913 (B. R. Coad); and 1 female, Victoria, on *Brazoria truncata*, May 8, 1911 (J. D. Mitchell).

Types in collection of the Citrus Experiment Station, Riverside; two paratypes in collection of the United States National Museum.

Perdita perpulchra perpulchra Cockerell

Perdita perpulchra Cockerell, 1896, Proc. Acad. Sci. Phila., 48:99, ♀.

Perdita baileyae Cockerell, 1909, Canad. Ent., 41:151, ♂; Timberlake, 1954, Univ. Calif. Publ. Entom., 9:387, 391, 394, ♂, ♀ (new synonymy).

In the first part of this study *P. perpulchra* and *P. baileyae* were treated as distinct species, although the females were separated on insufficient characters, whereas the males as described by Cockerell were obviously distinct. New material from Texas permits a better understanding of *perpulchra*, and it is now apparent that the male described under this name by Cockerell belongs elsewhere and presumably to *P. beata* Cockerell, and that the male described as *baileyae* actually belongs with *perpulchra* (new synonymy).

One female, El Paso, Texas, on *Isocoma heterophylla*, November 13, 1950 (H. V. Daly), presumably belongs to the typical subspecies, but it has the abdomen missing.

Perdita perpulchra flavidior Timberlake

Perdita perpulchra flavidior Timberlake, 1953, Univ. Kansas Sci. Bull., 35:975, ♀.

Perdita baileyae Timberlake, 1953, l. c., ♂.

This subspecies was based on one female from Great Bend, Kansas. An additional female has been collected by L. H. Shinnars, 2.8 miles southeast of Glen Rose, Somervell County, Texas, at flowers of *Aphanostephus skirrhobasis*, on June 5, 1953. A male from the same locality at flowers of *Rudbeckia bicolor* is not distinguishable from the males recorded below under *punctissima*. Another male from Rice County, Kansas, recorded previously as *baileyae*, must belong here.

The female taken near Glen Rose has the abdomen rather bright yellow, with four narrow dark bands.

Perdita perpulchra punctissima, n. subsp.

The race *punctissima* differs from *perpulchra* and *flavidior* in having the legs mainly dark and the abdomen dark, with a yellow band on tergites 2 to 4, a mark on lateral margins of tergite 1, and often two discal yellow marks on tergite 5. The male is hardly distinguishable from either *perpulchra* or *flavidior*.

Female.—Head and thorax dark green, the mandibles except reddish tips, clypeus, and lateral marks pale yellow or almost creamy white. Clypeus sometimes with the anterior and lateral margins narrowly black. Lateral marks transverse, rounded within, and often with a narrow extension along orbits to level of antennae. Pronotum bright yellow, with a narrow green band from flank to flank. Abdomen black, more or less tinged with brown, with the base, extreme lateral margins, and a triangular mark on each side of the disk of tergite 1, a moderately broad band across disk of tergites 2 to 4, two marks, or a narrow abbreviated band on disk of tergite 5 pale yellow. Antennae blackish, with the scape except above (sometimes only briefly at apex), underside of pedicel, and first joint of flagellum yellow, the flagellum otherwise ferruginous beneath. Legs dark, more or less tinged with brown, the apex of front and middle femora, and anterior side of their tibiae yellow; front tarsi pale brownish.

In structure and sculpture like *perpulchra*, with the frons tessellate, dullish, and finely, rather closely punctured, and the mesonotum finely and very densely punctured. Pubescence yellowish or ochreous above and more whitish on cheeks and under parts of thorax, that on mesonotum short, erect, and plumose; scopal hair of hind legs more or less tinged with brown. Length, 5.5-8.9 mm.; anterior wing, 4.8 mm.

Male.—Not distinguishable from *flavidior* and apparently not always from *perpulchra*. In all male specimens of the species at hand, except a cotype of *baileyae*, the light bands of the abdomen are preapical, very narrow, and more or less interrupted by a broad lobal extension of the dark color of the disk on each side. (In *baileyae* according to Cockerell's description and in accordance with a cotype, the bands are comparatively broad and the dark lobes may become a discrete enclosed spot on each side on tergites 2 and 3.) Dorsal margin of disk of clypeus also more or less broadly black or greenish. Otherwise agreeing with the characters given for *baileyae* (= *perpulchra*) in the key to the species of *Cockerellia*. Length, 6.5–7.5 mm.; anterior wing, 4.5–5 mm.

Four females, 1 male (holotype female, allotype, and paratypes), Somerset, Bexar Co., Texas, Nov. 2, 1952 (M. Wasbauer). Also the following paratypes from Texas: 4 females, 5 males, Mineola, Wood Co., on *Heterotheca subaxillaris*, Oct. 2, 1906 (F. C. Bishopp); 4 females, 2 males, Calvert, Robertson Co., on *Heterotheca subaxillaris*, Oct. 19 (Bishopp); and 1 female, Paris, Lamar Co., Aug. 26, 1905 (Bishopp).

Types in collection of the Citrus Experiment Station, Riverside; paratypes in collections of the University of California at Berkeley and the United States National Museum.

Perdita purpurascens, n. sp.

(Figs. 285, 286)

A male *Cockerellia* from Fedor, Texas, runs to couplets 39–45 in my table (Univ. Calif. Publ. Entom., 9:390) and agrees better with *P. coreopsidis obscurior* than anything else. It is distinct from *P. albipennis* and *P. tricincta*, as well as from all forms of *P. coreopsidis* in the following characters:

Entirely dark, without yellow markings, the face and mesonotum a sort of purplish bronze; wings small and whitish, but with a slight opacity, nearly as in *P. pulchella*; hair of mesonotum short, erect, and coarsely mosslike; clypeus with a triangular process on each side of labrum that appears acute in frontal view of head, but is actually slightly blunt (more similar in the clypeal structure to *coreopsidis* than to *albipennis* or *tricincta*, but the processes more prominent).

Male.—Head and thorax dark green, changing more or less to a purplish bronze on the face, vertex, and mesonotum. Mandibles testaceous, becoming a brilliant red on the margins and at apex. Labrum and antennae brown, the flagellum pale brown beneath. Legs and abdomen brown, the apical tergite, venter, and the tarsi much paler brown, and the apical depression of tergites 1 to 6 subhyaline. Tegulae yellowish-testaceous. Wings whitish, with a slight opacity, the nervures and stigma pale yellowish.

Head quadrate, as wide as long and about as broad as the thorax. Cheeks very broad and bluntly angulate anteriorly. Mandibles long, tapering, very acute at apex, and each reaching the base of the other. Proboscis elongate, the protruded tongue equaling the head and thorax in length. Clypeus armed on each side of base of labrum with a triangular process, that is about as long as its basal width. Pronotum rather deeply impressed on the flanks, and with the posterior corners of the disk moderately prominent. Tergite 7 about as broad at apex as *coreopsidis*, but more truncate. Wings smaller than usual in *Cockerellia*. Head and thorax shining, the frons and vertex minutely tessellate and slightly dullish, the frons with minute, rather indistinct punctures; mesonotum with fine close punctures, which are mostly about two to three puncture-widths apart. Pubescence whitish, rather long and moderately dense on head, underside of thorax and legs, and short, erect and coarsely mosslike on mesonotum. Length about 5.7 mm.; anterior wing, 4 mm.

One male (holotype), Fedor, Lee Co., Texas, May 25, 1899 (G. Birkmann), in the United States National Museum.

Subg. *Pentaperdita* Cockerell and Porter

A revision of couplets 5 and 10 in the key to species of *Pentaperdita* (Univ. Calif. Publ. Entom., 9:405-406) is desirable to help distinguish the female of *P. bradleyana* Timberlake and the male of *P. amoena*, n. sp.

- 5. Abdomen duller, with disk of tergites 3 and 4 more evidently punctate and with a sparse, appressed sericeous pubescence; pygidium more acute at apex.....5a
 - Abdomen more shining, hardly punctate and almost nude on disk of tergites; pygidium narrowly rounded at apex*melanochlora* Cockerell
- 5a. Tergites 2 to 4 each with an interrupted white band, that on tergite 2 but little more widely interrupted than the others; frons and vertex more tessellate and dullish; mesoseutum moderately sparsely punctate and hairy*coahuilensis* Timberlake
 - Band on tergite 2 widely interrupted, the interruption generally at least equaling one-third of the width of the segment; vertex tessellate, but the frons rather highly polished and shining; punctures of mesoseutum more widely separated than in *coahuilensis* on posterior part of disk*bradleyana* Timberlake
- 10. Stipital parameres broadest at the middle, or on apical half, and not tapering to apex as seen from side10a
 - Stipital parameres broadest at the base, truncate at tip, and as seen from the side appearing to taper to the slender apex11
- 10a. Stipital parameres broadest on apical half, but not appearing truncate at apex in either dorsal or lateral view; dark blue or blue-green, the disk of mesoseutum and scutellum black; clypeus and transverse lateral marks white, the disk of clypeus with two abbreviated brown stripes*bradleyana* Timberlake
 - Stipital parameres broadest at the middle and appearing truncate at apex in both dorsal and lateral views; coloration as in *bradleyana*, but dark stripes of clypeus obsolete
amoena, n. sp.
- 11. Disk of clypeus with broad dark 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
- 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* Timberlake

Perdita bradleyana Timberlake

Perdita bradleyana Timberlake, 1954, Univ. Calif. Publ. Entom., 9:709, ♂.

A series of this species in the U. S. National Museum from the type locality includes the female, which is new.

Female.—Dark blue-green; the disk of mesoseutum and the scutellum black. Clypeus, except two abbreviated stripes on disk and usual pair of dots, and lateral marks, not or hardly reaching above level of clypeus, creamy white. Labrum and mandibles testaceous, the latter more whitish at base and reddish on inner margin and apex. Tubercles and spot on posterior corners of disk of pronotum white. Abdomen dark, more or less tinged with brown, with a white band on tergites 2 to 4; bands on tergites 3 and 4 arcuate and moderately narrowly interrupted, and that on tergite 2 abruptly bent backward at outer ends and with the interruption generally equaling at least one-third of the width of the segment. Pygidium ferruginous. Antennae and legs dark, tinged with brown, the flagellum of antennae mainly brown, and the small joints of tarsi testaceous. Tegulae subhyaline with a whitish spot at base. Wings whitish hyaline, the nervures pallid.

Structurally similar to *melanochlora* and *coahuilensis*. Mandibles rather broadly expanded on inner margin. Pygidium subacute at apex. Head and thorax shining, the frons and mesonotum polished, but the vertex tessellate and somewhat dull. Punctures of frons fine, but strong and moderately close, and those of mesoseutum moderately sparse anteriorly and widely separated

on posterior part of disk. Abdomen slightly dullish, with a minute puncturation and a very fine, short, and sparse sericeous pubescence on disk of tergites 2 to 4. Length, about 4.5-5 mm.; anterior wing, 3.3-3.6 mm.

Ten females, 4 males, El Paso, Texas, Aug. 12 and 18, 1909 (F. C. Pratt)

Perdita coahuilensis Timberlake

Perdita coahuilensis Timberlake, 1954, Univ. Calif. Publ. Entom., 9:409, ♀, ♂.

Also taken by F. C. Pratt at El Paso, Texas, August 21, 1908, are two females and one male of *coahuilensis*. The species is new to the United States.

Perdita amoena, n. sp.

(Figs. 287, 288, 336)

This *Pentaperdita* is not readily separated from *P. bradleyana*, *P. melanochlora*, and *P. coahuilensis* except by the genitalia, which are distinctive as outlined in the preceding key.

Male.—Dark blue; the disk of mesonotum and the scutellum black. Spot on base of mandibles, clypeus, and large transverse lateral marks creamy white; the labrum white, tinged with testaceous. Thorax dark, except the apex of tubercles, and a small band on collar white. Abdomen blackish, the apical depression of tergites whitish subhyaline. Antennae and legs dark, the flagellum brown beneath, the tarsi yellowish-brown, and the front and middle knees with a small whitish spot. Tegulae testaceous subhyaline, more yellowish at base. Wings faintly dusky hyaline, the nervures testaceous, subcosta and margins of stigma pale brown.

In structural characters, sculpture, and pubescence similar to *bradleyana*, with the head in the type rather large and broader than the thorax, and the abdomen only a little less broad than long. Subgenital plate of eighth ventrite less elongate than in *bradleyana* and hairy only on the thickened apex. Caulis of aedeagus infossate dorsoapically on each side of the median fissure, with margin of the outer wall of the cavity continuous with outer margin of the parameral lobe, and the inner wall in the form of a sharp laminate projection. Parameral lobes very broad across their middle and narrowed about one-half of the truncate tip. Only one pair of volsellae, each armed with about twenty-five dark tubercles. Sagittal rods even more strongly hooked at the proximal end than in *bradleyana*; the fused body of sagittae moderately stout, but rather strongly constricted at middle opposite the volsellae and slightly expanded beyond. Length, about 4 mm.; anterior wing, 3 mm.

One male (holotype), Mule Mts., 5,500 feet, 3 miles north of Bisbee, Cochise Co., Arizona, Sept. 7, 1950 (T. Cohn, P. Boone, and M. Cazier), in the American Museum of Natural History.

Perdita erudita Cockerell

Perdita erudita Cockerell, 1923, Proc. Calif. Acad. Sci., 12(4):99, ♂.

The type of *erudita* was recently examined at San Francisco, and it belongs undoubtedly in *Pentaperdita*, although its position could not be verified by examination of the mouth parts, which are retracted. In my key to *Pentaperdita* (Univ. Calif. Publ. Entom., 9:405-406) it runs to *P. albovittata* Cockerell, and is closely allied but presumably distinct in having the head very large, with broad cheeks and temples, in peculiarities of the pronotum, and in having a large whitish area at anterior end of cheeks and the abdomen entirely dark, except for the subhyaline apical depression of the tergites. Cockerell compared it also with *P. crassiceps* Cockerell (a *Hexaperdita*) and with *P. laticeps* Cockerell. It is presumably very close to the latter species, and a study of fresh material of both *erudita* and *laticeps* is needed for a better understanding of their relationship to *albovittata*. In the meantime the following notes on the type of *erudita* may prove useful if used in conjunction with Cockerell's description.

Male.—Head and thorax dark blue-green, the vertex and mesonotum almost blackish. Face virtually all white below level of antennae, as well as the labrum and mandibles. Cheeks with a large whitish area anteriorly. Tubercles and posterior corners of disk of pronotum white. Abdomen dark, without trace of light markings, except for the broad subhyaline apical depression of tergites. Legs dark, without markings. Wings whitish, but subcosta and margins of stigma sepia brown.

Head very large, considerably broader than thorax, and with broad cheeks and temples. Eyes little diverging anteriorly. Labrum a little broader at apex than at base and somewhat less than twice as broad as long. Mandibles stout but becoming very acute at apex, and each reaching the middle of the other. Flanks of pronotum hardly impressed, but the disk abbreviated behind, with the posterior corners distinctly closer together than small anteriolateral prominences, which appear carinate, the carinae running obliquely to the longitudinal axis of body. Face, including vertex, moderately tessellate and shiny, and rather closely and finely punctured; mesonotum almost polished.

Type from Angel de la Guarda Island, Lower California, Mexico, May 3, 1921 (E. P. Van Duzee).

Perdita species

A male *Pentaperdita* from Hollywood, New Mexico, September 17 (R. H. Crandall) is hardly separable from the male of *P. chrysophila* from Pecos, New Mexico, figured in the first part of this study (Univ. Calif. Publ. Entom., 9:406, figs. 93, 94, 162) except by the distinctive genitalia. Since Cockerell considered the Pecos specimen a variety of *chrysophila*, there are grounds for suspecting that the Hollywood specimen may represent the true *chrysophila*. Additional material from New Mexico and a study of the type are therefore needed for better understanding of the two species involved.

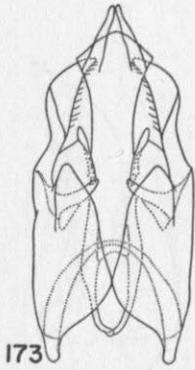
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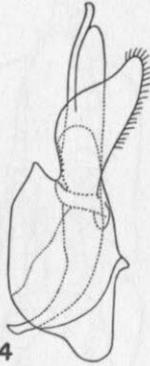
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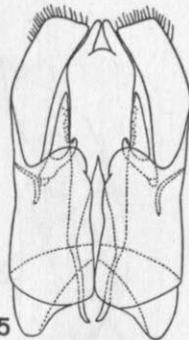
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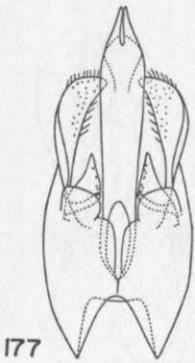
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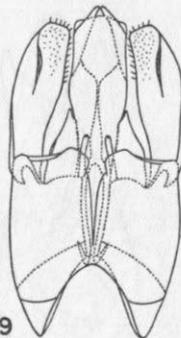
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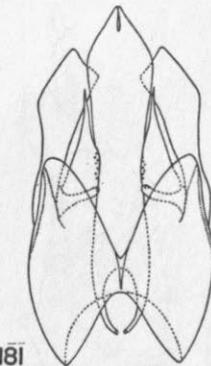
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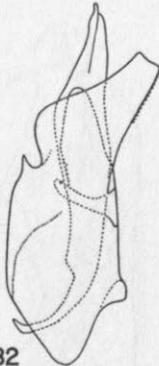
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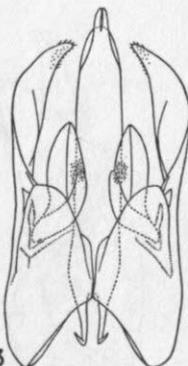
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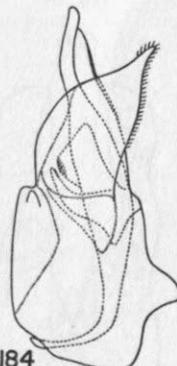
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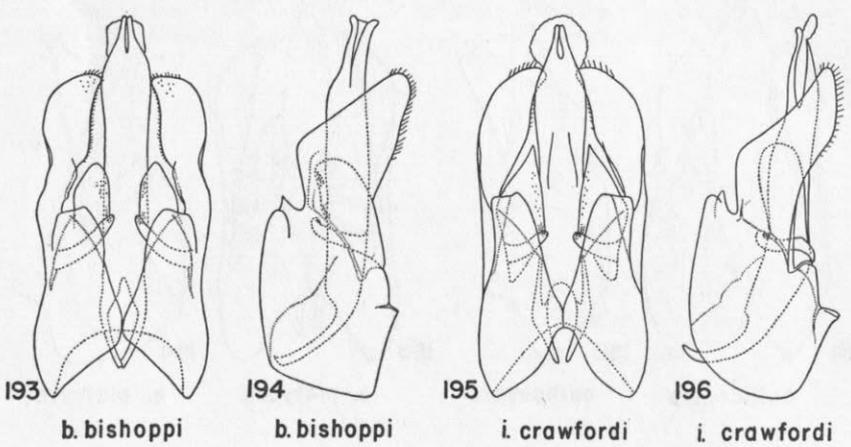
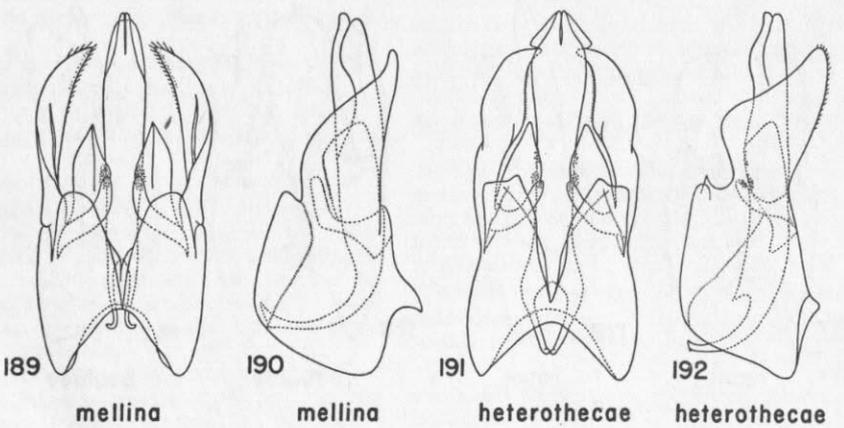
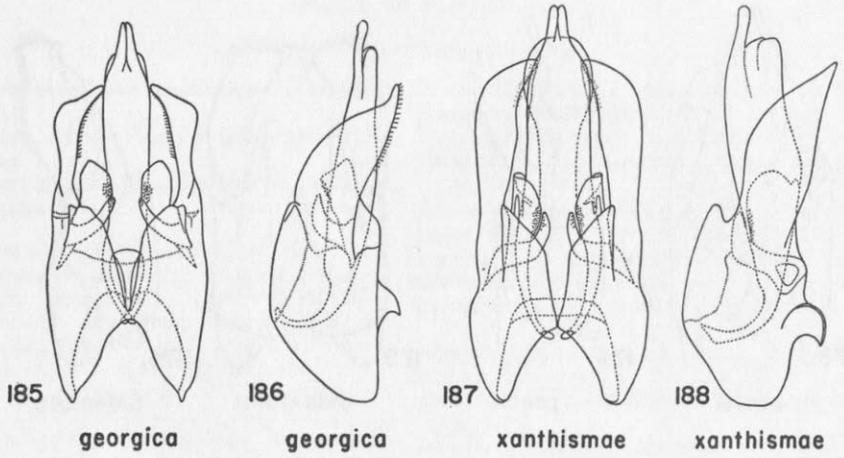
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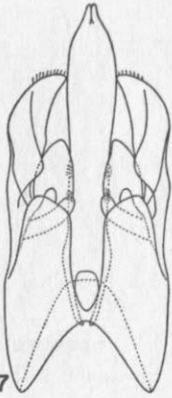
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c. platyura





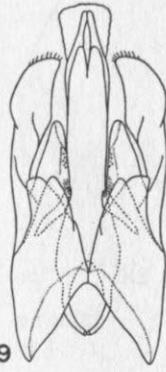
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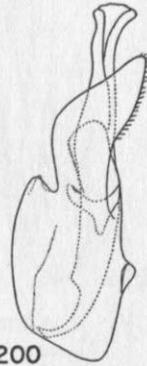
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graenicheri



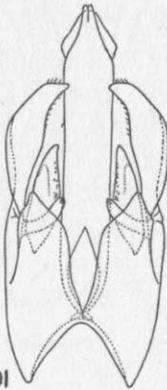
199

b. chrysopsina



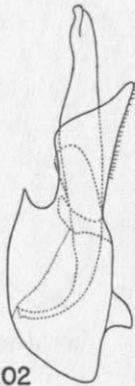
200

b. chrysopsina



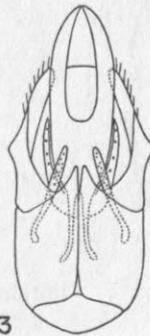
201

f. foveata



202

f. foveata



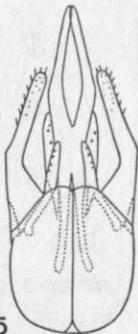
203

larreae



204

larreae



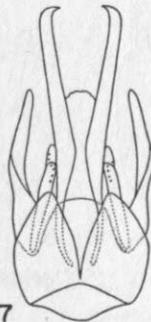
205

marcialis



206

marcialis



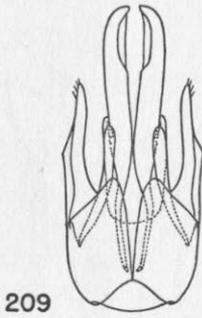
207

cladothricis



208

cladothricis



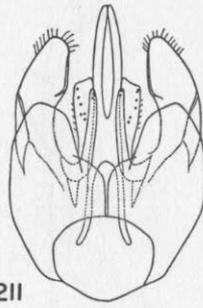
209

minima



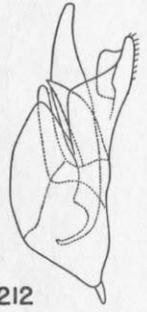
210

minima



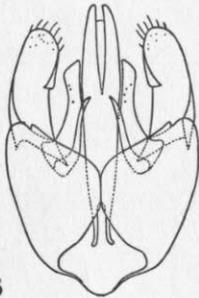
211

obscurata



212

obscurata



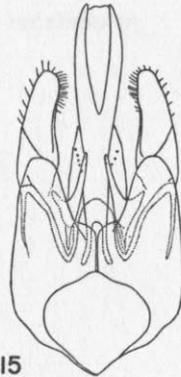
213

mitchelli



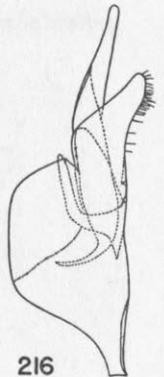
214

mitchelli



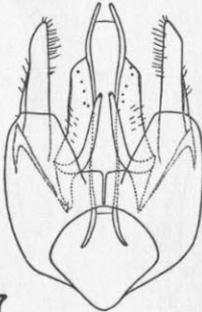
215

carolina



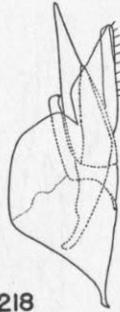
216

carolina



217

floridensis



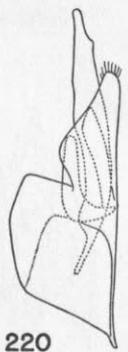
218

floridensis



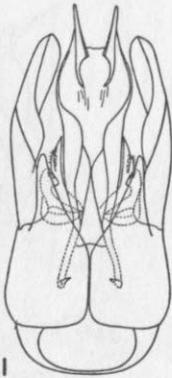
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novae-angliae



220

novae-angliae



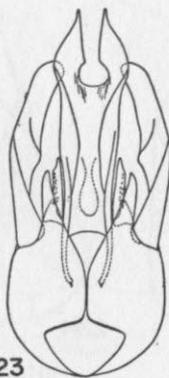
221

aureovittata



222

aureovittata



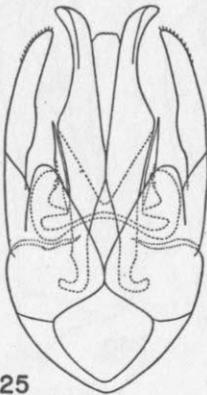
223

l. layiae



224

l. layiae



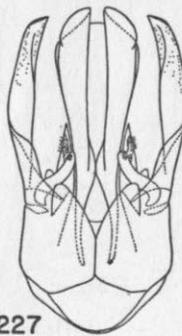
225

malacothricis



226

malacothricis



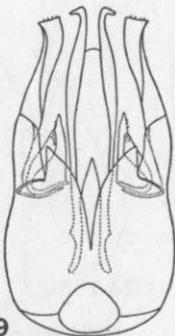
227

fieldi



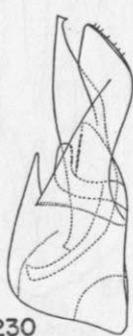
228

fieldi



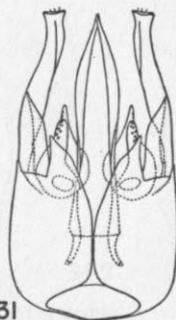
229

i. interrupta



230

i. interrupta



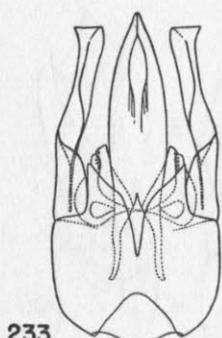
231

m. micheneri



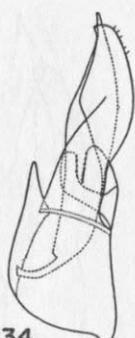
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m. micheneri



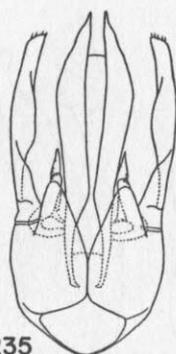
233

nitens



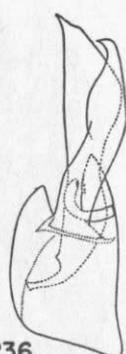
234

nitens



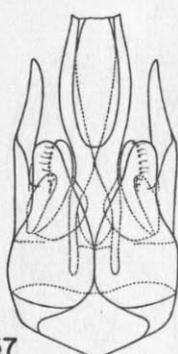
235

mucronata



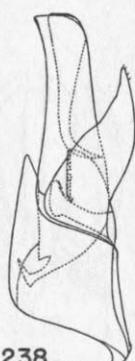
236

mucronata



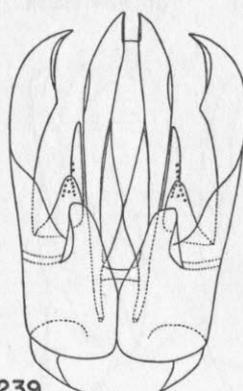
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inflexa



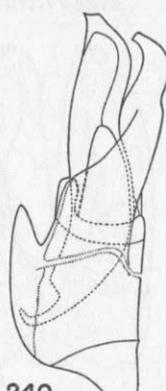
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inflexa



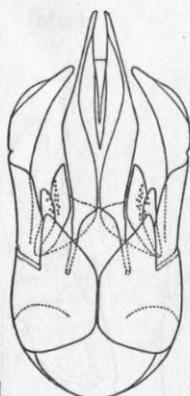
239

calochorti



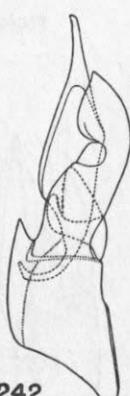
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calochorti



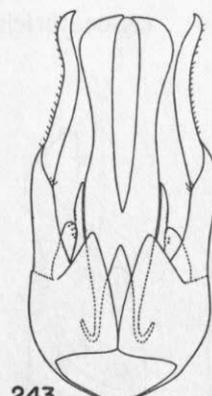
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leucostoma



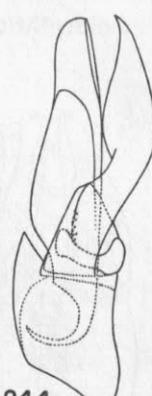
242

leucostoma



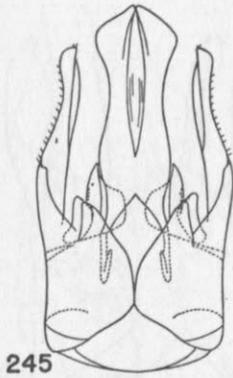
243

californica



244

californica



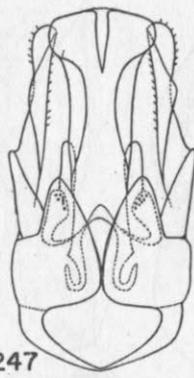
245

montereyensis



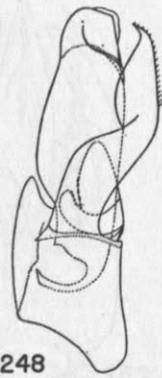
246

montereyensis



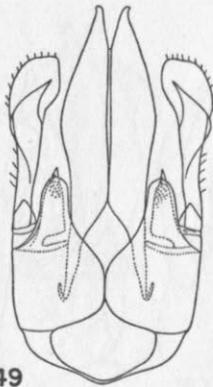
247

tularensis



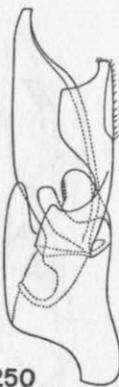
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tularensis



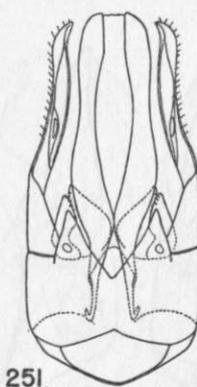
249

bispinata



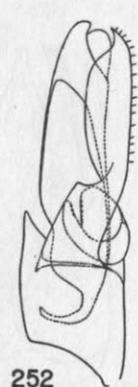
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bispinata



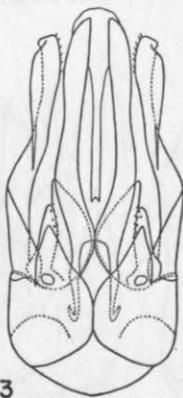
251

macrostoma



252

macrostoma



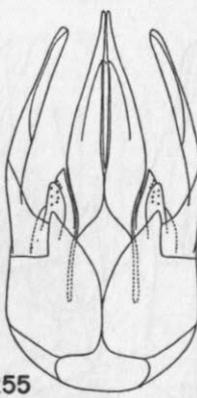
253

bilobata



254

bilobata



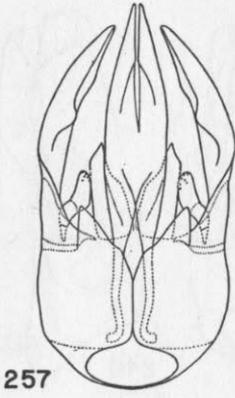
255

mohavensis



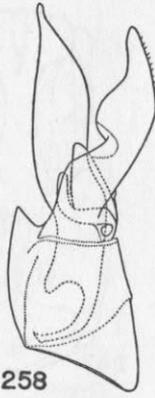
256

mohavensis



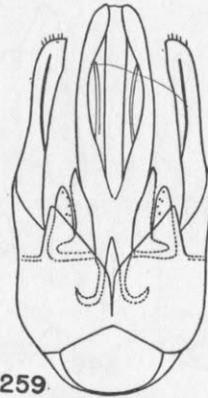
257

duplonotata



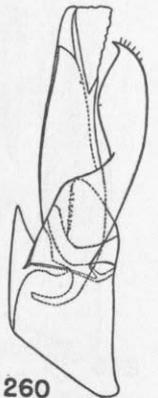
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duplonotata



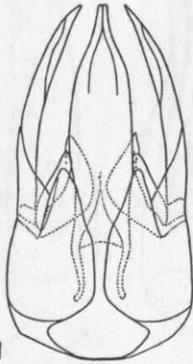
259

robustula



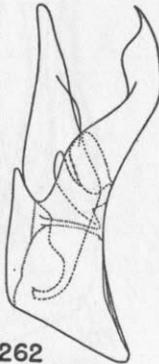
260

robustula



261

argemones



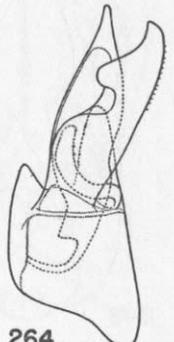
262

argemones



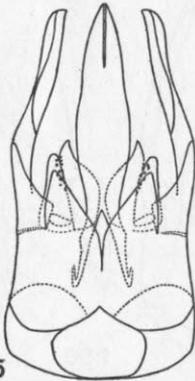
263

arizonica



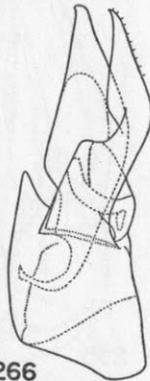
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arizonica



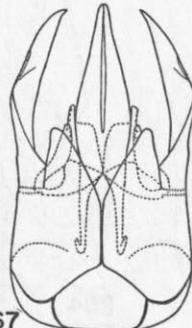
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distropica



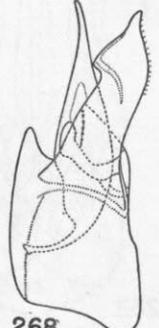
266

distropica



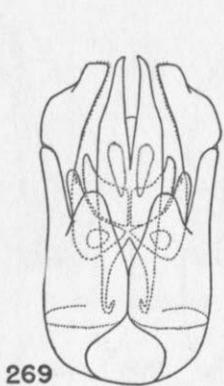
267

fallugiae



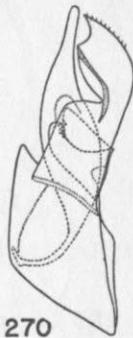
268

fallugiae



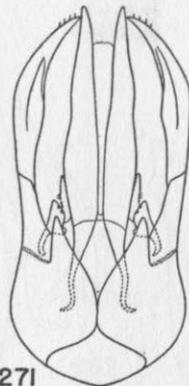
269

cowaniae



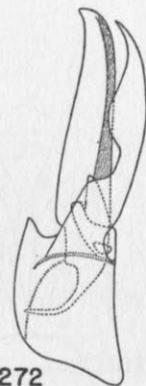
270

cowaniae



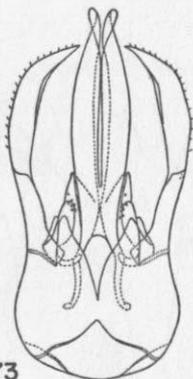
271

n. nevadensis



272

n. nevadensis



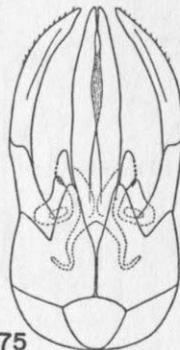
273

n. molina



274

n. molina



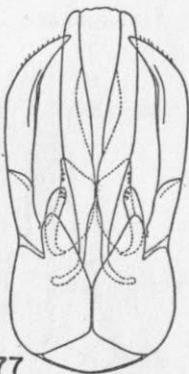
275

bohartorum



276

bohartorum



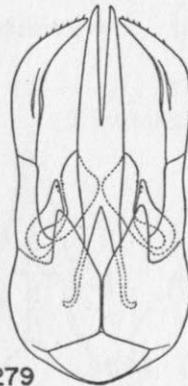
277

s. sculleni



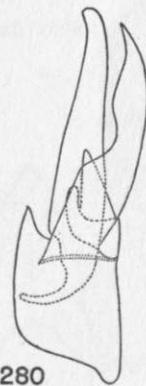
278

s. sculleni



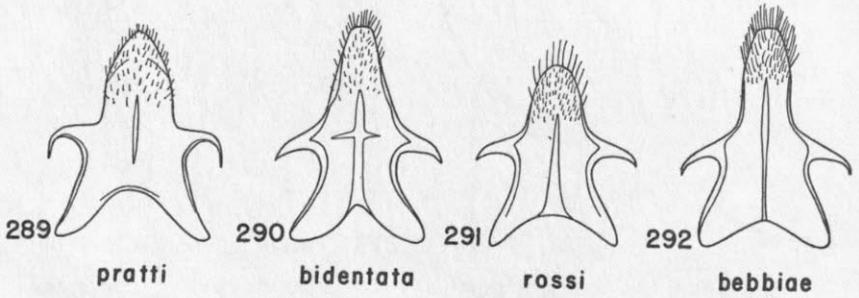
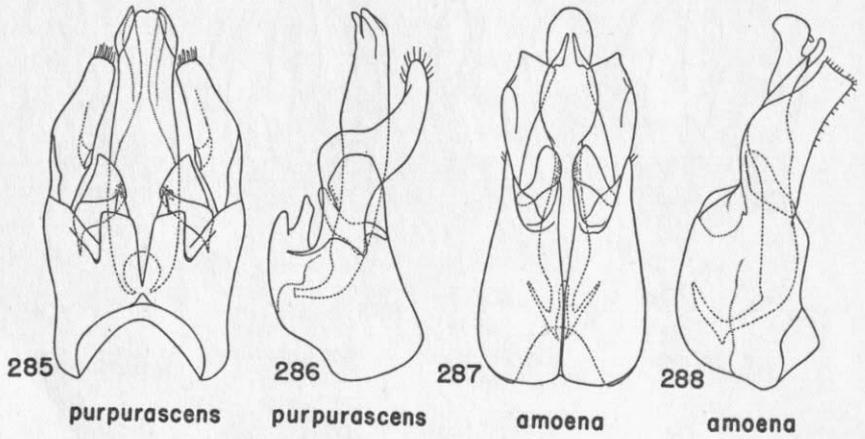
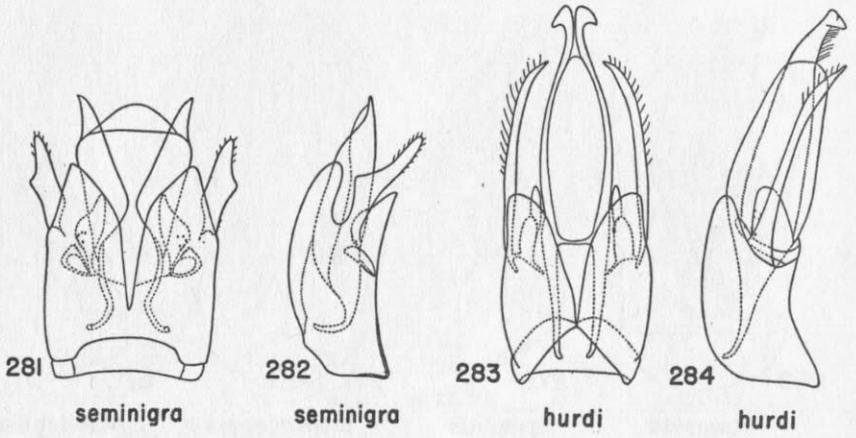
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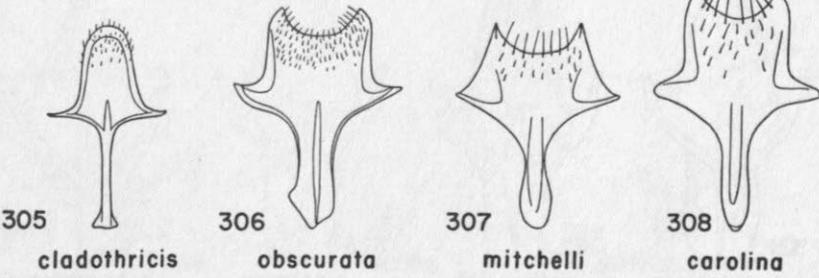
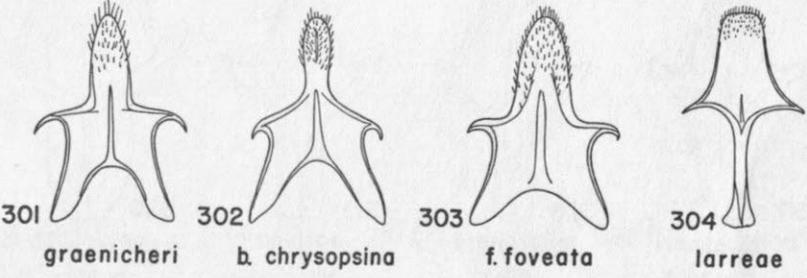
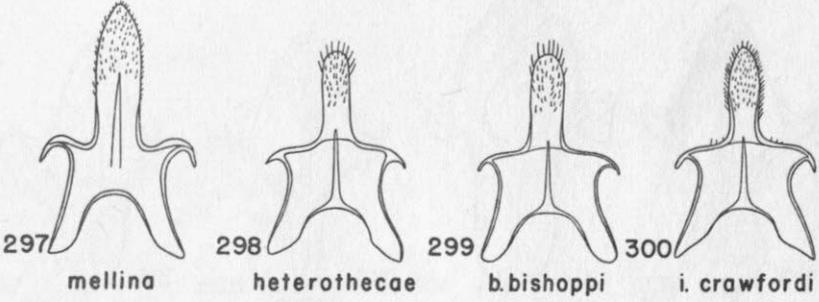
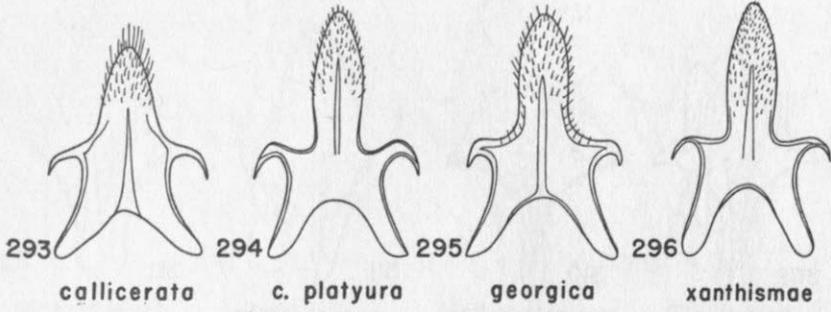
eriongi



280

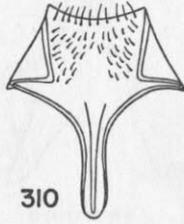
eriongi







309
floridensis



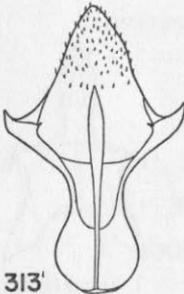
310
novae-angliae



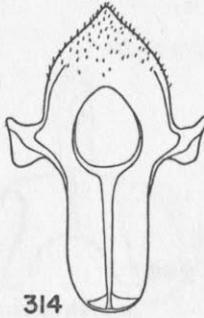
311
aureovittata



312
transversa



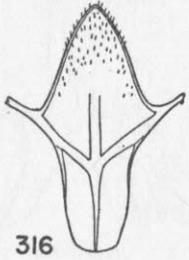
313'
l. layiae



314
malacothricis



315
fieldi



316
i. interrupta



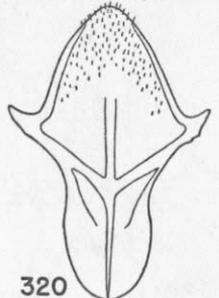
317
m. micheneri



318
mucronata



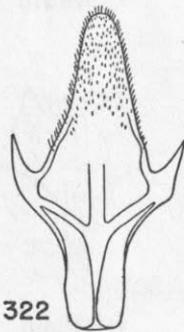
319
inflexa



320
calochorti



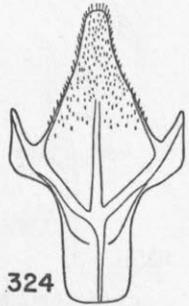
321
leucostoma



322
californica



323
bispinata



324
macrostoma



325

mohavensis



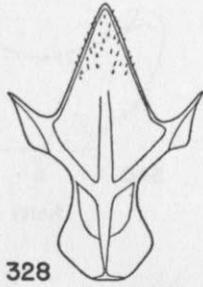
326

robustula



327

argemones



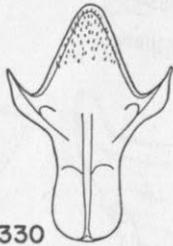
328

arizonica



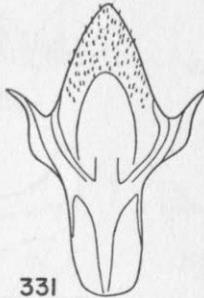
329

distropica



330

fallugiae



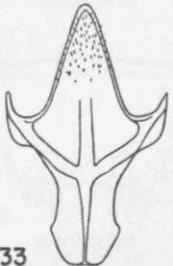
331

cowaniae



332

n. nevadensis



333

s. sculleni



334

seminigra



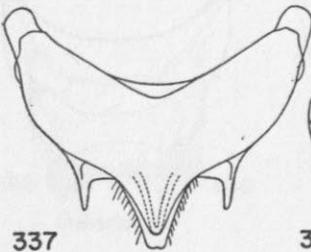
335

hurdi



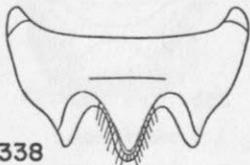
336

amoena



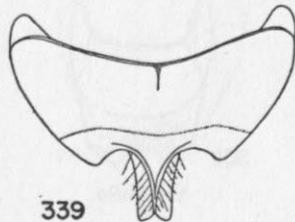
337

a. aureovittata



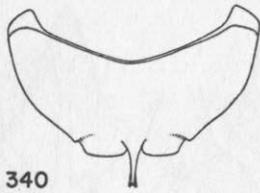
338

l. layiae



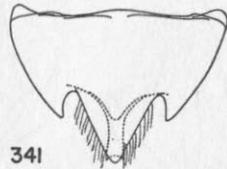
339

malacothricis



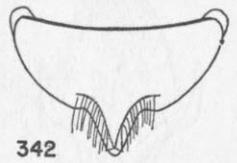
340

fieldi



341

i. interrupta



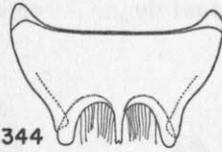
342

m. micheneri



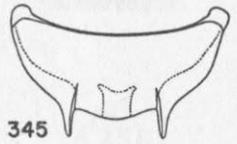
343

nitens



344

mucronata



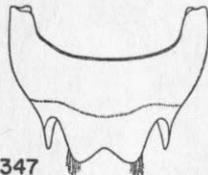
345

inflexa



346

inflexa



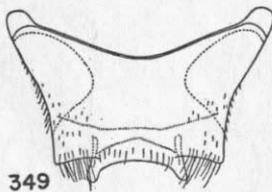
347

calochorti



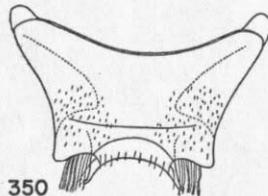
348

leucostoma



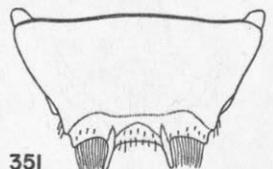
349

californica



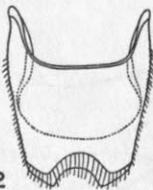
350

montereyensis



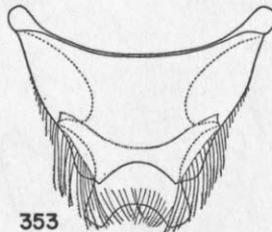
351

tularensis



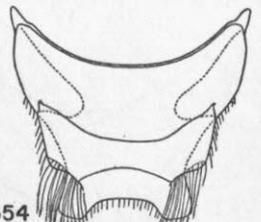
352

bispinata



353

macrostoma



354

bilobata

